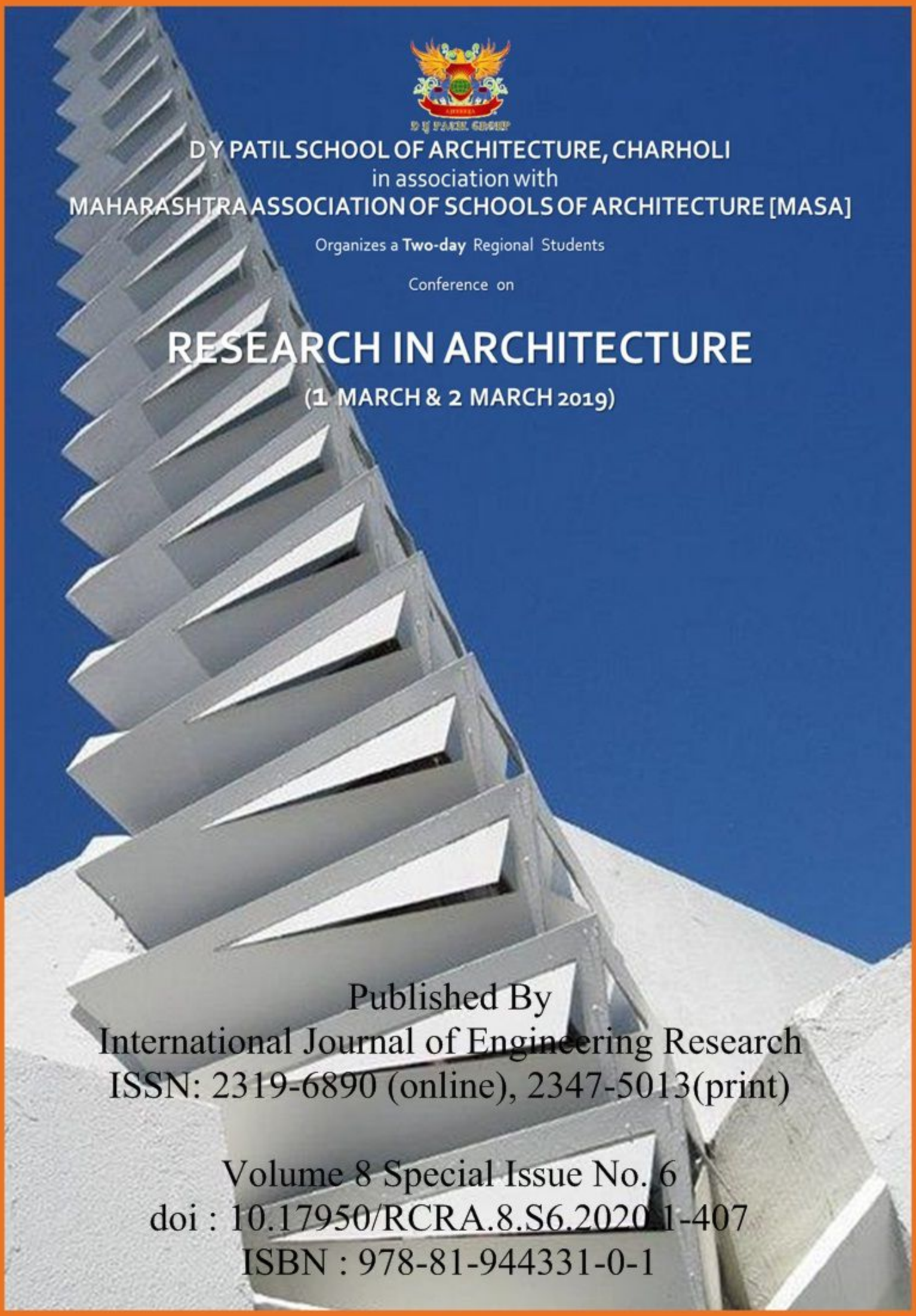

D Y PATIL SCHOOL OF ARCHITECTURE, CHARHOLI
in association with
MAHARASHTRA ASSOCIATION OF SCHOOLS OF ARCHITECTURE [MASA]

Organizes a **Two-day** Regional Students

Conference on

RESEARCH IN ARCHITECTURE

(1 MARCH & 2 MARCH 2019)

Published By
International Journal of Engineering Research
ISSN: 2319-6890 (online), 2347-5013(print)

Volume 8 Special Issue No. 6
doi : 10.17950/RCRA.8.S6.2020.1-407
ISBN : 978-81-944331-0-1

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Regional Conference
on
Research in Architecture
(in association with MASA)

On

1st& 2nd March 2019

Published By
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Message from Chairman

I am pleased to know that D Y Patil School of Architecture is organizing a Regional Conference on "Research In Architecture" on 1st and 2nd March,2019. I am sure that this conference which is first of its kind in Pune and provides a platform to the students of Architecture to present their research to academicians and professionals will be an influential one.

The conferencewill also provide an oppurtunity to the student and teacher researchers to exchange ideas and learn about the developments in Architecuralfield.I hope the conference proceedings will go a long way in dissemination of knowledge of this noble profession.

I congratulate the Management, Principal, Convenor and organizing committee, staff and all students on this occasion and I wish the conference a great success.

Dr Ajeenkya D Y Patil
Chancellor
Ajeenkya D Y Patil University, Pune

Message from Advisor

I am delighted to welcome you all for this student's conference on "Research In Architecture" to be hosted by D Y Patil School of Architecture, Lohegaon, Pune.I have been associated with the school of Architecture since 20111 and I am proud to see their progress and growth since the beginning.

This conference is another milestone for the school which is synonymous with their ethos and goals which focusses on the overall development of the students.

I am sure it will be a grand success.

My Best wishes to everyone associated with the conference.

Dr Sushant Patil,
Advisor,
Ajeenkya D Y Patil University, Pune

Message from Masa President

Maharashtra Association of Schools of Architecture (MASA) works extensively to promote meaningful activities for students of Architecture. These activities are meant to support the core education of architecture and to widen their knowledge by exploring avenues for research like the Fellowship Program of MASA and the soon to be published biannual Research Journal.This first of its kind Students Conference for Research in Architecture, in Pune, is one such initiative where MASA is happy to be a Knowledge Partner.

We congratulate D Y Patil School of Architecture, Lohegaon for organising and successfully conducting this conference and look forward to this annual event every year.

Best Wishes !

Dr. Ujjawala Chakradeo,
Principal, VNIT, Nagpur

Message from Principal

We, at DY Patil School of Architecture believe that inculcating research habits in the students is an important task of an educational institute. Having a subject dedicated to Research is the first step towards developing inclination and propensity for research. We think providing a platform to present this work is equally important. This helps to get peer -reviews, see what work is done by contemporaries, interact with co-students from other institutes and open up channels for intellectual discussions. We feel this will sincerely help students to develop their thought processes and create healthy debates and arguments bringing in new thoughts.This will immensely benefit the profession of Architecture, as these students are the future.

This is the first of a kind conference dedicated specifically to students of architecture. In this first edition we have encouraged students of B Arch and M Arch in all disciplines and kept our focus on the students of SavitribaiPhule Pune University.

The work done by Prof Aparna Mhetras, convener of this conference, to come up with the idea and bring it to fruition is commendable. Congratulations to the whole team of faculty and students who have worked tirelessly for this conference and made it a success. We thank all the paper reviewers and the panel of judges who gave their time and valuable inputs for this Students Conference for Research in Architecture. We thank all the students from various institutes for contributing their research papers and making this conference a grand success.

The overwhelming response from the students has given us a lot of encouragement and we look forward to expand the reach and invite students at the National level as also Research Scholars from various universities in the future.

Best Wishes

Prof Shubhada Chapekar,
Principal,
DYPatil SOA, Lohegaon, Pune

Message from Convenor

It gives me immense pleasure to be the Convenor for the first ever Regional Conference on Research In Architecture.The idea originated with an opportunity to teach the subject of Dissertation & API now known as Research In Architecture in the year 2015. We found that few students are good at research and if given an opportunity and a platform to present their work it would help them to gain more confidence, enhance their presentation skills and would be a small start point to bridge the gap between academics and practice. The idea was discussed with none other then our Principal maam and she took no time in giving a go ahead ,further it was discussed in front of all the members present for RIA subject meeting hosted by BKPSCOA in June 2018.Most of the colleges appreciated the idea and Students Conference for Research In Architecture was born.

The first flier of the conference was sent during 2nd week of September and here began the journey of hard work for four months. The first detailed poster was sent to various colleges in November 2018. And we started receiving the abstracts as per the given date of 28th January which was extended to 30th January on request of many colleges.

In total we received 90 abstracts for B Arch out of which 60 were selected for full paper submissions.28 for M Arch and all were selected for full paper submission.

A paper reviewing committee was appointed to review the abstracts and full papers. The committee consisted of eminent experts in the field of Architectural research who are not teaching in any of the architecture colleges associated with Savitri Bai Phule Pune University.

Full papers received were 37 for B Arch and 21 for M Arch. Out of which 30 were selected for presentation for B Arch & 12 for M Arch for the final days of conference.

Some very good observations & comments were made by the panel members and paper reveiwers. Few of which are;

1. Good attempt by all participants especially at undergraduate level.
2. Presentations could have been more graphical and less text.
3. The body language and oratory skills to be worked upon.
4. The scope of research to be narrowed and defined.
5. More analysis required , conclusion should be linked with the research question selected.

I am sure each one of us has got enriched with the knowledge, guidance & insights shared by all the panel members as well as the paper presenters.

No idea can be executed without a dedicated team to work for it success. Three people who have been working behind the scenes tirelessly since last months and whom I cannot thank enough to our Principal maam Prof Shubhada Chapekar, the faculty core committee members, Prof Alisha Sinha & Prof Nupur Soni.All my colleagues who are part of different committees and all the dear students, special mention Ms Jessica Quadros, Ms Aditi Tayade & Ms Veda Deshpande from 4th year B Arch for getting the student volunteers and helping in the smooth conduct of the conference.

Last but not the least all the paper presenters, participants and faculty of all the colleges, all the panel members, paper reviewrs and guests for gracing the occasion by their presence.

Looking forward to host a bigger conference next year RIA 2020, I once again thank everyone associated with the conference.

Prof Aparna Mhetras
Associate Professor
HoD M.Arch Environmental Arch.
DYPSOA, Lohegaon, Pune

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BEST PAPERS (B.Arch and M.Arch)

VALEDICTORY

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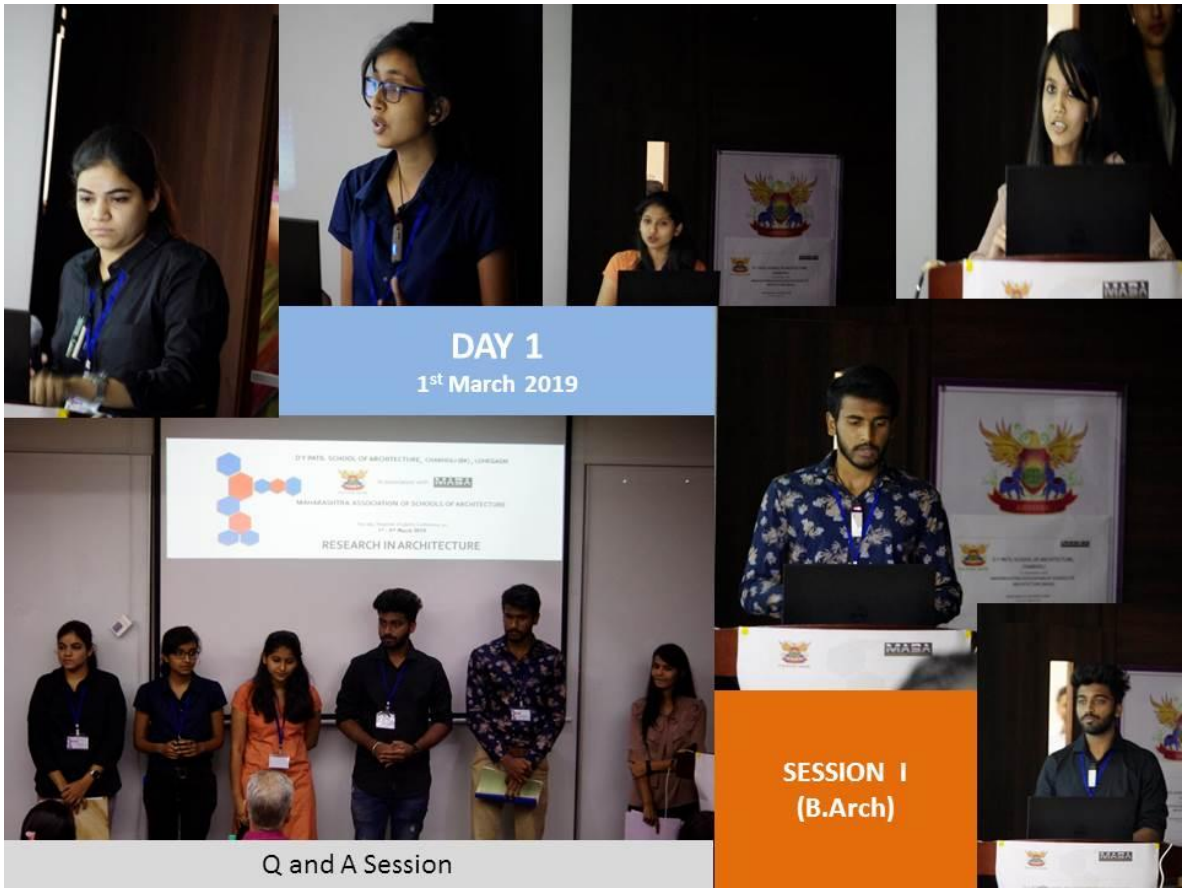

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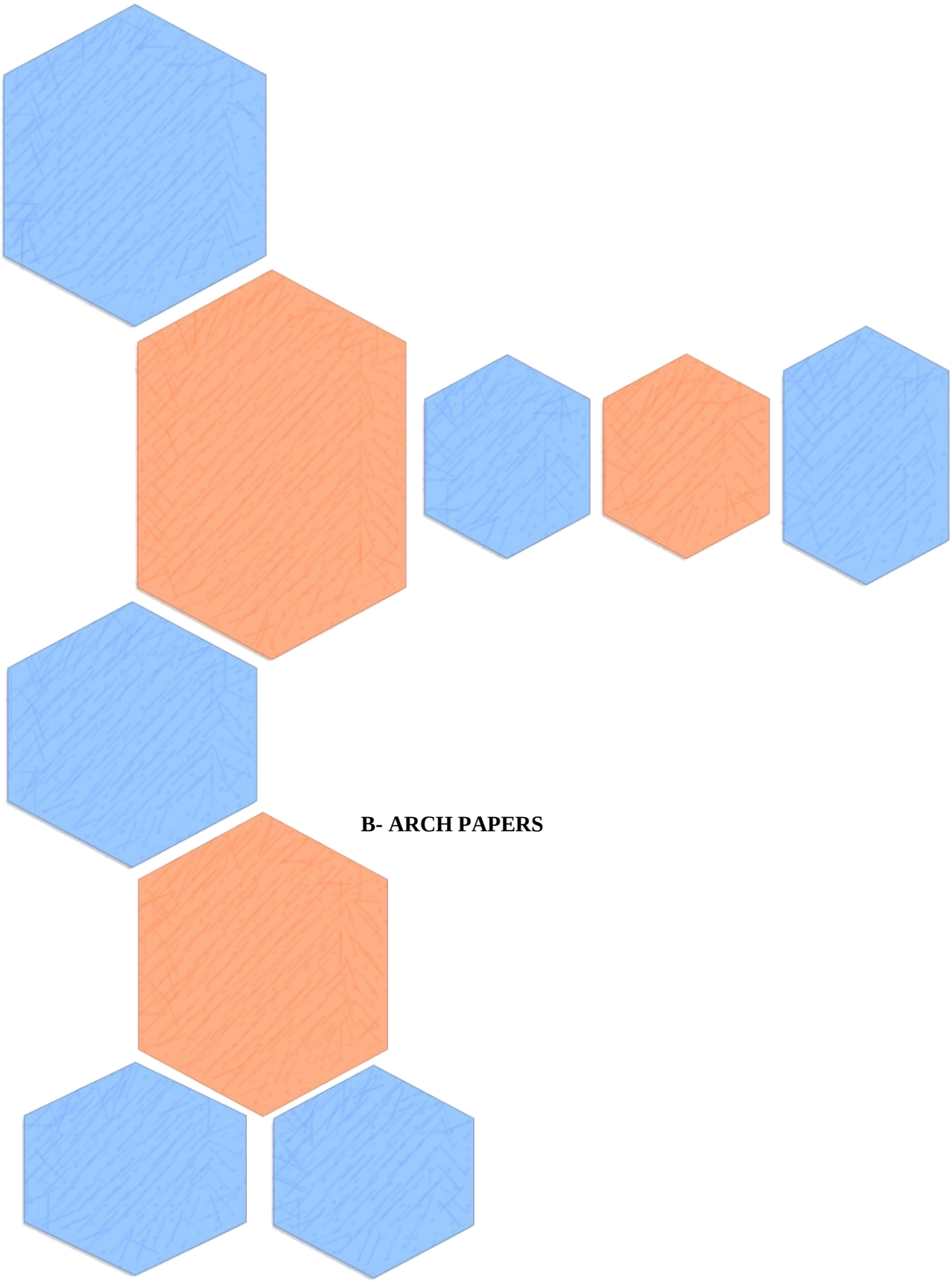

B- ARCH PAPERS

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Study the Technological Applicability of Vertical Forest in Indian Urban Context

Ayushee Vijay Tupe[1], Ar.Alisha Sinha[2]
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alisha@dypatilarch.com

Abstract : The Vertical Forest is a model of vertical densification of green and built within the city" (Stefano.B, 2014). It is a model that operates correlated to the policies for reforestation and naturalization of the large urban and metropolitan borders. The presence of trees, bushes and green walls distributed throughout the facades of the building, contributes to the regeneration of the environment and urban biodiversity while limiting the expansion of the city. India with its increasing population rate has led to vertical housing construction due to the decrease in amount of horizontal land parcels. With increasing demand for shelter and the need for survival in this country has led to negligence of the environmental conditions. Ruthless cutting down of trees, increasing pollution due to increasing vehicles, usage of non-biodegradable items, has led to pollution of air, health disorders and bad living conditions. The need for landscape has increased but gets restricted on the horizontal plane, thus need for vertical landscape takes the front row .This research paper discusses the technological applicability of vertical forest in Indian urban context by understanding the concept of Vertical Forests. It intends to study the construction technology, cost and time needed for integrating Vertical Forest in Residential buildings, analyzing "tree typologies "on the basis of vertical forest concept, climate and location, and to finally determine the feasibility of vertical forest concept in India. The Bosco Verticale, in Milan, Italy ,Europe is the only residential building in the world of its kind .Due to the pollution issues faced by the people of Milan; Architect Stefano Boeri initiated the concept of vertical forest . India having a similar need may benefit from this concept conclusively .This paper provides much of a foundation of knowledge for the students and professionals that would be interested in landscape technology and environmental aspects.

Keywords: Vertical Forest, India, Residential building

1.1 Introduction

The synergy of the urban sprawl for the environmental survival is useful to reconstruct the relation between nature and city. Vertical Forest acts by subverting the principle of enclosed green spaces (gardens, parks) typical of the tissue of cities and proposes a diffused yet adaptable system of vertical green.Each vertical forest equals, in amount of trees, a large area of level and forest.

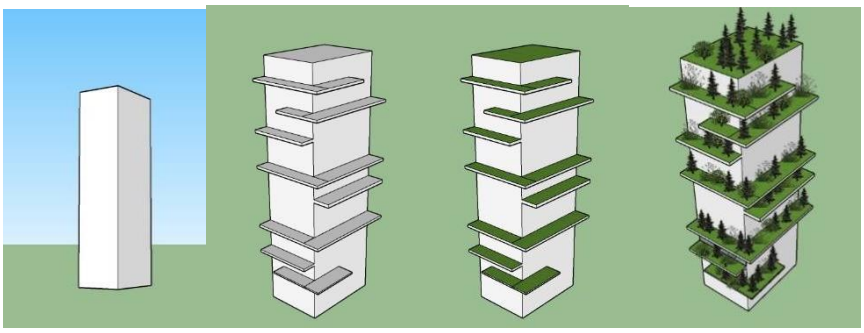

Figure 1: Understanding a Vertical Forest

The concept of vertical forest can be adopted to different typologies of intervention, private or public residential buildings, tertiary, representative or public buildings. It can also add value to abandon buildings or buildings whose construction has been interrupted.

Vertical forest aids in the creation of a micro - climate and to filter small particles of dust from the urban environment. The diversity of plants and their individual characteristics produce humidity, absorb carbon dioxide

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and dust particles, produce oxygen and protect from solar irradiation and acoustic pollution increasing the level of comfort.

Each vertical forest can be designed to host rooftop wind power mills, rooftop and facade photovoltaic panels for the production of electric energy and solar panels for the production of thermal energy. Plant irrigation can take place to a great extent through the filtering and purification of grey water. The screen produced by the plants located along the perimeter favors in significant reduction of energetic consumption produced by artificial air conditioning of spaces.

Vertical forests not only offer their inhabitants an extraordinary perspective from within cyclically changing their skin according to the diversity of the plants and their disposition with respect to the sun's axis , the vertical forest also offers a changing landscape to city dwellers.

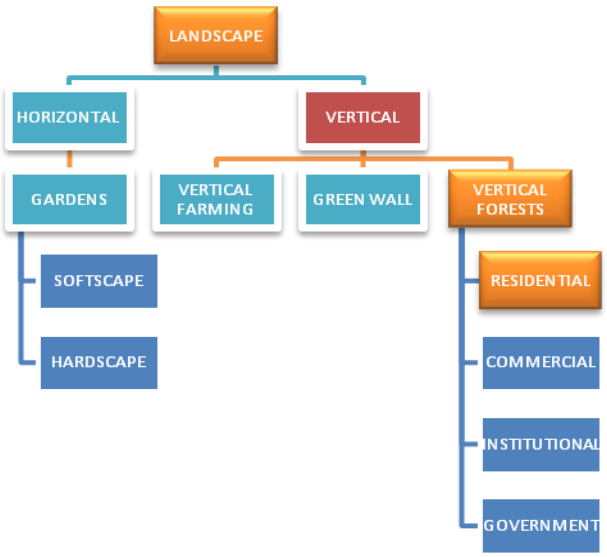

Figure 2: Framing of the Research Topic

1.2Aim & Objective

To study the technological applicability of vertical forest in urban residential buildings in India.

The objectives are to understand the concept of vertical forests, study the construction technology,tree typologies of vertical forest in Residential buildings on the basis of concept, climate and location. Studying the Bosco Verticale in Milan will help learn all the aspects of the Vertical Forest. The main objective is to check the feasibility of vertical forest concept in India.

1.3 Scope & Limitations:

1. Explanation of vertical forest
2. To study the different aspects connected to vertical forest concept like technology, environmental aspects.
3. Description and application of Indian trees in vertical forests.
4. To study the aspects of urban residential buildings in Indian context.
5. Study of maintenance cost, construction cost, time needed, acceptance of this concept inIndia.
6. Analytical procedures needed to explain the new concept in India.

LIMITATIONS:

1. Design of residential buildings in India with building layouts and final drawing sets with the application of vertical forest technology
2. Problems in the existing building (case study Milan) and analyzing the drawbacks and concerns of the people already using the building.

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2.1 Need of the Research

Trees are one such element that purify the air, but with increasing demand for housing the number of trees have been cut down. The need for landscape has increased but gets restricted on the horizontal plain, thus need for vertical landscape take the front row.

This concept of vertical forests will not only take care of the pollution but is the solution for vertical construction technique and it will help us beautify our cities. This may be only restricted to metropolitan cities for now but it may act like a future plan for the country. It will benefit the people living in this country, it will also help in the advancements of technology of architecture.

2.2 Changing Environment

World population is expected to rise 33% by the 2050 (united nation 2013) and the fact that 50-75% of this population will live in the urban centres and will add unprecedented pressure on urban land, making the conditions worse for the environmental health and resulting in need for sustainable mixed use towers to work live and play in; thus nature and infrastructure ecology growing upwards.

According to the World Health Organization, the air in these 30 cities was found to be the most polluted in 2016. The air in these cities contains high levels of dangerous particulate matter, small enough to enter the human bloodstream through the lungs—a problem that contributes to an estimated 7 million premature deaths each year (Pamela Falk. Cbsnews 2018). More than 50% of these deaths occurred in China and India with about 1.1 million lives lost prematurely in each of these countries.

Table 1 : Most polluted cities in the world [in rank]

RANK	CITY
2	Gwalior
3	Allahabad
6	Patna
7	Raipur
11	Delhi
12	Ludhiana
15	Kanpur
16	Khanna (Punjab)
17	Firozabad
18	Lucknow
21	Amritsar
22	Mandi Gobindgarh (Punjab)
27	Agra
30	Jodhpur

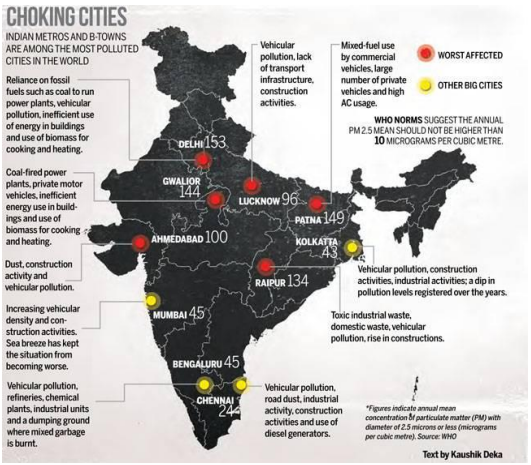

Figure 3: Choking cities of India (Source: Indiatoday.in Dec2015)

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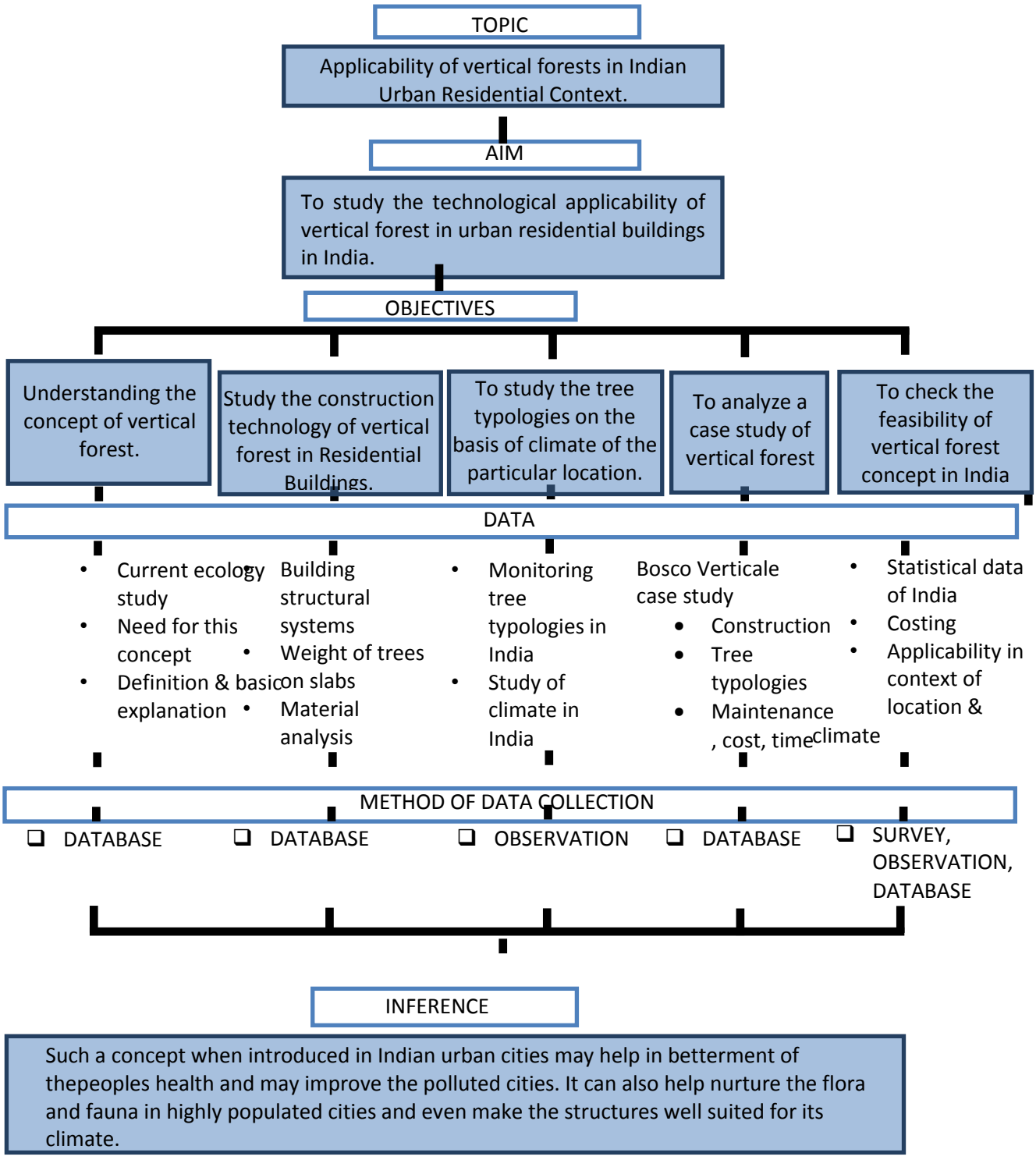
3.1 Data Collection Methodology



4.1 A Study of Bosco Verticale, Milan

Table 2 : Project Data

Country	Italy
City	Milan
Street Address	Via De Castilla & Via Confalonieri, Puorta Nova I-20100
Postal Code	20122
Building Function	residential
Structural Material	concrete
Energy Label	LEED Gold
Proposed	2008
Construction Start	2010
Completion	2014
Owner	Fondo Porta Nuova Isola
Developer	COIMA; Hines Italia
Architect	Stefano Boeri Architetti
Structural engineer	Arup
Interiors	COIMA Image; Dolce Vita Capital S.r.l.
Landscape	Studio Emanuela Borio; Studio Laura Gatti
LEED	Deerns
Property Management	COIMA SGR
Vertical transportation	Deerns

Stefano Boeri Architetti is an architectural and urban design studio for 20 years headed by Stefano Boeri. They develop projects and regeneration strategies in complex environments, outlining and supporting synergies between the various stakeholders, public and private entities.

Bosco Verticale towers, built in a city called New Porta Nuoa, which was previously accommodated by an amusement park and was abandoned. This city area was later transformed into an extended urban sprawl of Milan, and the plot area for the towers is 40,000 sq.m.

Milan experiences a total of four seasons and has a humid, subtropical climatic conditions. The temperature here ranges from -1◦C to 31◦C, thus making the summers really hot and humid while the winters cold and damp.

Bosco Verticale also known as “green skyscraper” with planted cantilevering balconies consisting of 2 residential towers 26 &18 floors in height respectively. According to the Ar. Stefano Boeri the project represents a different idea of sustainability (Giacomello2014).
The main aim was to reproduce an equivalent of 1 hectare of green forest vertically with additional benefits like reducing air pollution, building ecological footprint, noise pollution, shading for cooling & aesthetic enhancement.

For the provision of trees and bushes, the architect had to construct projecting balconies on each floor and on each face which are draped by green trees and luscious bushes placed in concrete planters acting as parapets. Soil in the container is a mixture of agriculture soil, organic matter and volcanic material specially curated in order to reduce the volume weighing on the perimeter of the balconies.

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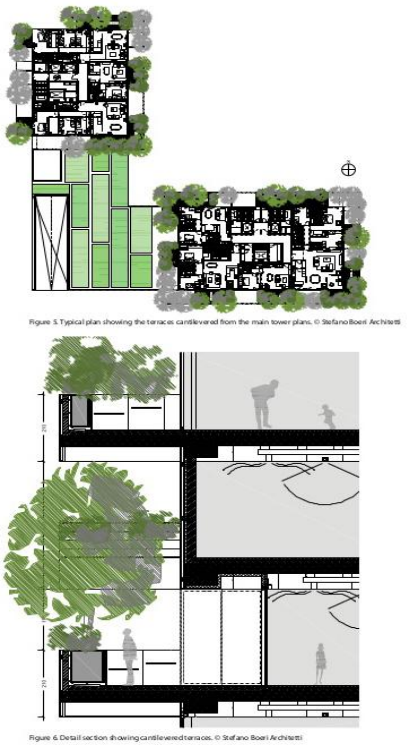

Figure 4:Plan & Section of the terrace

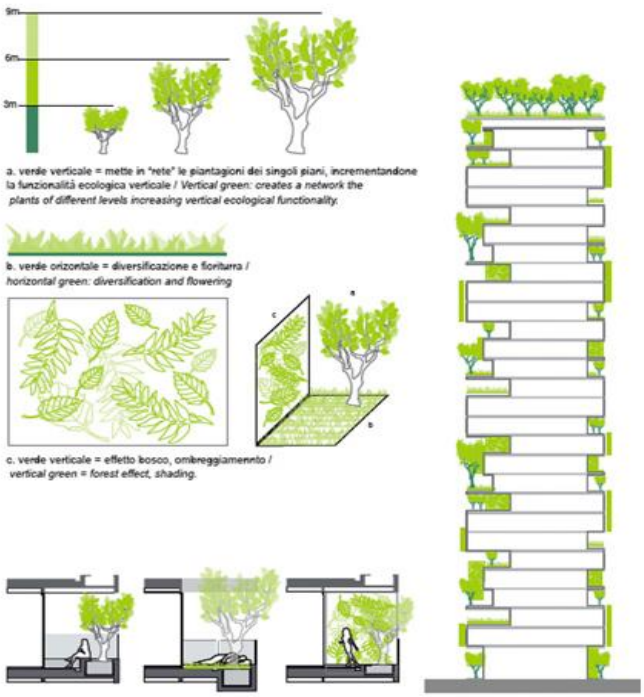

Figure 5:Ecosystem of the façade

(Source: stefano boeri architects)

The tower is home to 480 big and medium size trees, 250 small size trees, 11,000 groundcover plants and 5,000 shrubs, which is equivalent to an entire hectare of forest cover. As the selection of specific species of trees was very important in this project, specialist have chosen trees after experimenting the wind condition at the 20th floor, storms and heat conditions; in order to take care of this condition wind breakers were used. The green trees act like the protagonist against the grey exterior palette. Trees change with seasons and these trees as a part of a building façade depicts as the changing skins of the building as well as the city view.

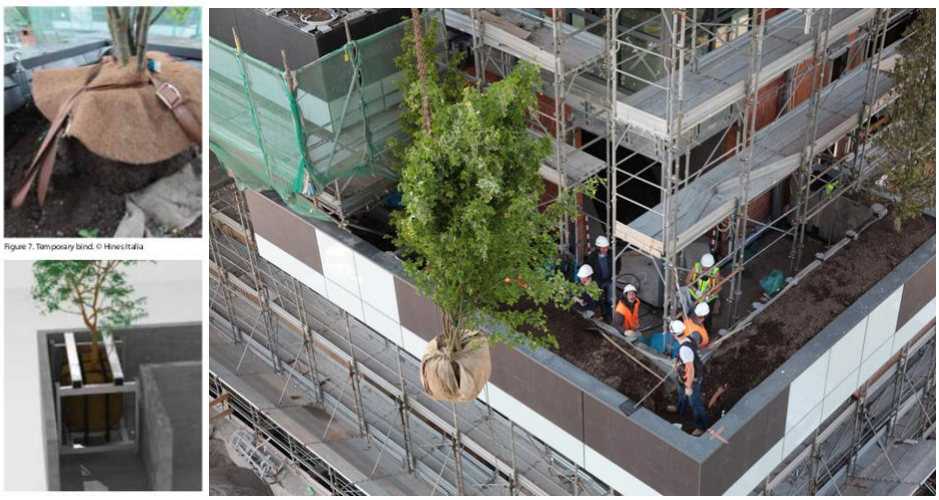

Figure 6: Planter detail with waterproofing and transfer of trees to the 12th floor

(Source: stefano boeri architects)

5.1 Benefits of Vertical Forest

After studying the Bosco Verticale, Milan; the benefits of application of this concept in India needs to be analysed. The following implications may help execute this study:

1] Creating urban ecosystems

- A new concept in the field of high rise urban development, promoting the co-existence of architecture and nature in urban areas with varied benefits.
- India being a developing country has a scope in creating new satellite cities using this ecosystem.

2] Help reduce air pollution

- The green barrier between the inside and outside of inhabited spaces, is capable of absorbing the excess CO2, thus reducing the pollution in the vicinity, and also dampens the noise.
- Vehicular Pollution has increased in Indian metropolitan cities leading to unhealthy environment for Indians to breathe in; adding such natural filters may help such choking cities.

3] Increases the green cover of the city

- Accommodating forests occupying thousands of square meter in just few square meters of vertical urban space, hence making up for the massive loss of natural vegetation due to the extensive expansion of concrete forest.
- May help give the Indian cities the same green cover status as of rural Indiaand help the migrating people get comfortable in this huge concrete jungle.

4] The tree tower made for humans

- This sets up the living standard between humans and trees within the built environment. It also sets up the benchmark for the development in urban policies for including plants and animal species inside a man-made urban context, making it a worldwide appeal for the development for such concepts.
- Having a correlated environment with different species to stay in a tower may give a new identity to the Indian urban context.

5] Vertical landscaping

- The fact that only people from suburban areas could live closer to the nature, as they have gardens surrounding their houses can be a reality in urban context to.
- This might create new and innovative relations between build environment and new landscaping techniques, giving birth to a new city skylines in India.

6] Reducing urban heat

- The high density vertical forestation can simply cut down the inappropriate temperature increase due to the reflecting facades.
- India has a tropical climate but due to the excessive use of glass; urban heat effect has been a rising issue that can be resolved by proposing such green concepts.

7] Reducing energy consumption

- As the ground water is supplied to the plants through the pump that works on the solar energy, this creates a healthy natural cycle, as the used ground water is then evaporated. This acts as a filter on the tower balconies making a considerable cooler environment inside the structure.
- Energy demand is at large in a country with 1.3 billion people leading to the need of self-sustainable architectural concepts.

8] Biodiversity

- As a number of trees were found out to be appropriate to be grown on the façade, this diversity led to the nesting of birds and helping the fauna suffice its needs and not making them extinct.
- Use of native Indian tree species when applying the concept in India will lead to increase in biodiversity of that specific area. As native trees attract the nesting of Indian native birds helping the fauna thrive.
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9] Changing skins

- Due to the variety of plants species hosted of the balconies, their characteristics differ from season to season which gives a gradual variation in the look of the tower in different climatic conditions.
- India with its changing climate and seasons leads to the ever-changing trees to have a new appeal to it with fading colours of green to flowering season. This may help give such buildings a new identity and the city a new view to appreciate.

6.1 Perspective and Preference Survey

A public survey was taken during this research. The conclusion drawn from the survey is as follows:

1] After studying the probability of people knowing it and source of information, need to publish the needed information for the vertical forest in newspapers, show it on TV for the further development of this concept in India.

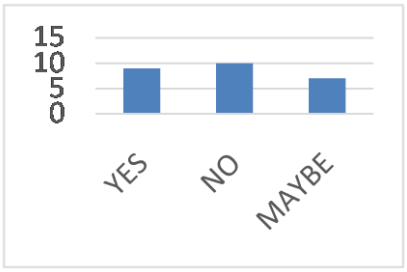

Figure 7: No. of people aware of the concept

2] Looking at the willingness to pay extra defines the broad minds of Indians to accept new concepts in Indian architecture and allow architects , clients to have broader aspects in terms of designing.

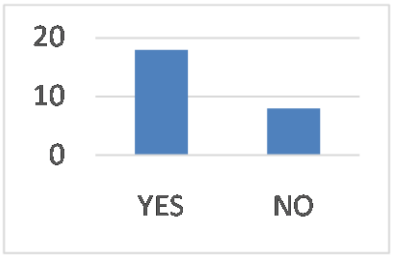

Figure 8: No. of people willing to pay extra for the construction

3]Most of the people consider Mumbai an ideal site in terms of new concept and on terms of accepting such trend in India.

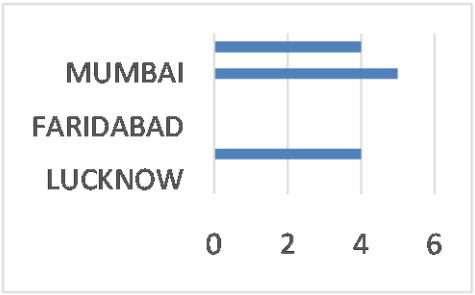

Figure 9: City where vertical forest may be incorporated.

7.1 Conclusion

21st century city infrastructure observes environmental, social, and economic instability. The high density urban sprawl and evolution in designs from changing forms to technical advancement in glazing, facades and materials & incorporation of new sustainable, renewable energy sources.

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Air pollution has reached its alarming quota in India and is affecting the people with respiratory diseases due to the smog. It's getting difficult to breathe fresh air in metropolitan cities like Mumbai, Chennai, and Delhi.
Pollution cannot be totally controlled but a step can be taken to help reduce it; plants are the solution that will help produce fresh air. "Bringing trees to the sky" creating small forests in the balconies, roof terraces can help clean a large amount of polluted air. Plants are dynamic elements that change colour, form,and shape according to their biological make up .imagining a changing façade of this calibre itself makes this influential.

Figure 10: Mumbai cityscape (Source: news18.com) **Figure 11: Conceptualizing a cityscape (Source: Jacob Devaney)**

There can be an opinion on the costing, the technological application, additional maintenance & study of the trees at such heights but creating such people concentric glass towers for the future may damage our environment even more. These buildings can be modules along the metro corridor as the people travelling in metros will have a view of the green cityscape rather than the concrete jungle. Humanizing these huge urban giant habitats with the application of dynamic characters as trees may help India regain its green ethnicity.

8.1 Acknowledgements

I would like to express my gratitude towards the Principal Ar. Shubhada Chapekar, RIA Coordinator Ar. Aparna Mhetras and Research Guide Ar. Alisha Sinha for their patient guidance, enthusiastic encouragement and useful critiques on this research paper. I would also like to thank my Family and Friends for their support and encouragement.
Lastly I would thank the management of D.Y. Patil School of Architecture for providing me with such an amazing platform to embark on this project.

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Capsule Hotels: An Alternative to Conventional Short Term Accommodation Facilities in Pune City and the Perception of Students & I.T. Professionals Towards it

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Abstract : The present research is aimed towards studying the possibility of capsule hotels as a solution to the space shortage and as an alternative to the existing temporary residential facilities. 'A capsule hotel is a type of hotel developed in Japan that features a large number of small bed sized rooms known as capsules'. The purpose of this study is the identification of existing and possible attributes of such capsule hotels, which would make it a preferred choice for short term accommodation over conventional options, for the user groups in consideration. This study tries to explore the possibility of similar comfort and amenities as that of the existing temporary accommodation facilities, achieved in a smaller space as a better choice. The study is conducted by means of a combination of an interview, questionnaire (mixed and pictorial) and a checklist. The user group for capsule hotels is spread over a wide range and is broadly classified into three categories viz. People travelling for certain purposes and hence having a short duration of stay, Individuals living in the same city, who wish to avoid the wastage of time due to long travel distances and the persons whose routines do not leave much room for the utilization of an entire residence. The major portion of this user group constitutes of students & I.T. professionals. Since there is an abundance of both in the city of Pune the region of survey is limited to it. **At the end of the study, a thematic analysis of the conducted survey results in the listing of attributes of capsule hotels, which would make it a plausible option for accommodation in the region under consideration.**

Keywords: capsule hotels, pods, space utilization, chambers

Introduction

Capsule hotels is a concept that originated in Japan in the year 1970 as a place for exhausted white collar workers to spend the night after a long and tiresome day, in the same price as a long train home. These were proposed mainly in the business areas because of the majority in clientele being businessmen [3].

In capsule hotels prefabricated chambers made of metal, aluminum or fiberglass are stacked vertically and horizontally in a room. These chambers or pods are just big enough to accommodate a single mattress. In this capsule of 1.2m width, 2m length and 1m height certain facilities such as a T.V, Wi-Fi, a power plug for charging electronic devices, a movable platform for working etc[1]. Just like there are types of hotel rooms (Regular, deluxe, suite etc.) the capsules are also classified as exclusive ladies pod, classic pod, private pod and a suite pod (accommodates a double bed). Any form of temporary accommodation unit consists of three major parts viz. sleeping area, W.C. and bath & storage. These capsules are also modified to accommodate two persons in a double or couples pod. In capsule hotels all of these are deconstructed in such a way that all the sleeping areas together in a big room and likewise for the other parts. Much like the conventional short term accommodation facilities, amenities like the restaurant, gym, swimming pool are communally shared.

The size of a hotel/motel rooms in India range from 200sq.ft. to 1500sq.ft depending on the kind of hotel and room. A standard room in an average 3 star hotel is of 325sq.ft. In this room the bed takes up 25-30sqft, the bathroom about 40sqft and about 10sqft for storage. his combined makes 80sqft, the remaining 245sq.ft comprises of some furniture and facilities, all of which can be assumed to be of 40sqft. The remaining 200sqft of open space is what usually defines the luxury of a room, as luxury is often equated with spaciousness.

Graph 1: Space distribution in a standard three star hotel room (325sqft)

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In the deconstructed planning of capsule hotels the open space is shared by a certain number of pods, hence making it a more efficient use of available space. Although the living space is significantly small, the luxury is maintained by means of various advanced technologies and facilities, e.g. 'The Millennials' is a smart pod facility in Tokyo where functions are carried out in a centralized manner with the help of an in-house app [5] . In a fast growing city like Pune, a facility like this could also serve different purposes depending on the user group.

Capsule hotels have been developing in India in big cities like Mumbai, Bangalore, Delhi, Chennai etc. The utility varies from various categories of people ranging from students to businessmen. Urban pod is a firm of introducing capsule hotels all over India in cities mentioned earlier. A co-founder of Urban Pod, Hiren Gandhi has said in an Interview, "Going forward, we see a huge potential with the rising real estate prices. Not only in metros, we are looking at pilgrimages, where there are different sorts of travellers. We are also trying to work something with the city railways"[2].On similar lines, in the city of Pune has there is a majority of the I.T. industry and there's a large number of people spending 10 to 12 hours a day in the office space. There also exists a significant number of individuals coming from out of station or by travelling large distances for certain events that last for a few days or less. Such events may include training sessions, conferences, meetings, business events etc. For such a target audience a luxury capsule hotel instead of individual or shared rooms in a business hotel becomes much more economical and well utilized without having to compromise on comfort and luxury. The individuals from this category are going to spend the major part of the day engaged in activities and the usage of the accommodation is going to be mainly for resting. Such capsule hotels in the form of a business hotel when placed near airports or similar such transport hubs can serve various categories of travelers. Also an on campus facility would serve the purpose of a rest house and for individuals looking to avoid a long travel distances and the time spent in that.

The second category of target audience is students in residential schools and hostels for colleges, a perfect balance of private and interactive spaces as seen in capsule hotels is ideal. In regular hostels privacy is very rare. Allotted pods for students for privacy and lockers for storage of belongings seem appropriate. The additional spaces within the structure would constitute of canteen, library, study, entertainment room, game room etc. The same for the business space would vary in terms of business amenities and luxury.

Methodology

The survey consisted of an online questionnaire formulated with the help of Google forms. The questionnaire was sent 15 individuals by the author with a request to forward it to at least 5 individuals each and so on, thus creating a snowball effect. The portal cut off the receiving of responses after receiving a sample size of 100, 15 responses of which were scrapped due to the inadequacy of data received. The questionnaire consisted of questions categorising the user group on the basis of age, gender, type of user (student, I.T. professional/ Traveller), usage of accommodation facility etc. Throughout the questionnaire questions regarding the subject's preference of amenities and services provided are asked, thus directing them towards the same facilities and more provided in capsule hotel. The opinion of the subject regarding the shortage of space or shared bating space is asked. However knowing the persons opinion towards these characteristics, the preconceived notions are cleared with the help of images

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showing images of existing capsule hotels, hence the comfort and luxury of the pods and supplementary amenities and services are introduced to the subject. In order to very clearly introduce the entire concept of capsule hotels and its planning, video clip of an existing pod hotel in India is shown. After which the possibility of the subject's preference of capsule hotels as compared to the existing accommodation facilities was enquired about. Finally an open ended question regarding any specific facilities or amenities that would ease or aide the subjects stay with respect to the category he/ she belonged to. This resulted in the specification of the targeted user group and a list of facilities specific to the considered user groups which make pod hotels a valid alternative to the regular accommodation options.

Results

The gender and age group of the subject has a significant influence on the choice of a possible user. Age limits the body movement and generates certain health concerns. Also the capsules are stacked in such a way that that one has to use a ladder similar to the ones on bunk beds in order to get into the top capsules, however the physicality varies from person to person. The age group of the samples received ranged from late teens to early sixties. The majority of the target audience belonged to the age group of 20 to 30yrs, which accounted for almost 57 % of the total whereas 12.9% was for age group more than 50yrs. The possibility of individuals giving preference to capsule hotels was seen as the highest in the age group of 21 to 30yrs at. And their respective responses were recorded in terms of yes, no and maybe. After which on enquiry of facilities that might ease the stay of the customer, the response resulted in the formation of a list.

Figure 4: Age group of survey sampling.

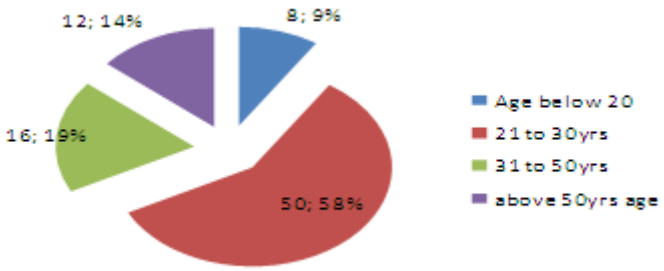
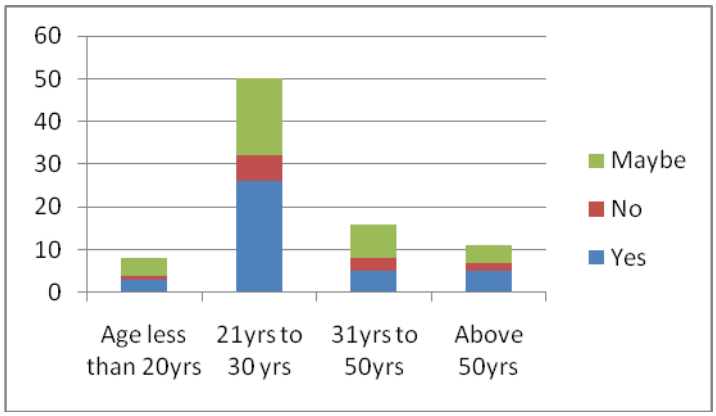


Figure 5: Response based on age group



Based on the category/ occupation of the subject, the duration of the stay, the nature of travel and work differs. To begin with out of the total sample of 85, 33 were students, 22 were I.T. professionals and 30 were travellers. The nature of most subjects was either on the computer or was entirely restricted to the work place; as a result their requirement of space for working after hours is satisfied within the capsule space itself.

Figure 6: Categories of targeted audience

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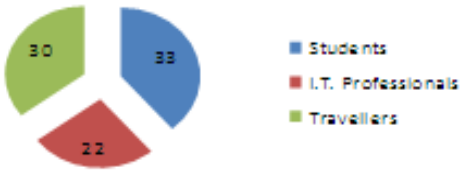
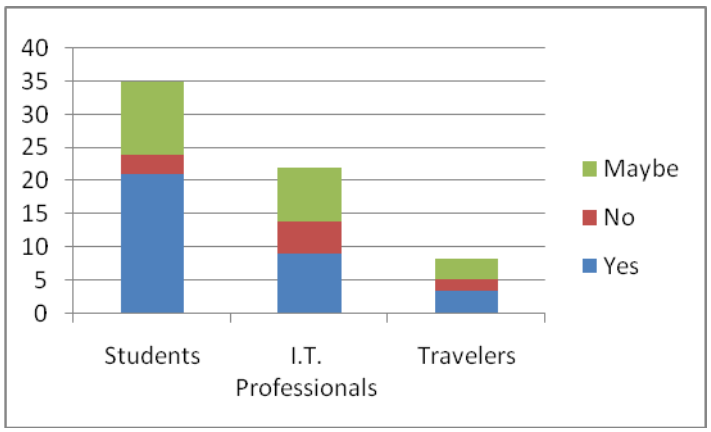


Students have a maximum positive response for the concept of capsule hotels to be incorporated in the planning of a hostel. Out of the total 35 students, 21 responded with a definite 'yes' and 11 students was 'maybe', thus stating a possibility of their opinion being positive. Amongst the 22 I.T. professionals, 9 voted for a definite yes and 11 opted for the option maybe. In the category of travellers, out of 28, 9 responded with a definite 'yes' and 4 with a definite 'No'. The remaining 15 had chosen the option 'Maybe'.

Figure 7: perception based on category of target audience



The choice of a subject is also governed by the duration of stay and also the actual amount of time spent in the accommodation facilities i.e. for individuals preferring to spend time indoors for long periods, may not find capsules as the most appropriate choice, hence students and individuals working in I.T., who spend maximum time at the work place are majorly in favor of this new concept.

The cost of a capsule or pod ranges from 1500 to 3200INR per night, based on the type of pod. An average person spends about 2500-3000 on a basic room.

Depending on the preferences and requirement of the subjects the following facilities were identified, which would make pod hotels a better preference as compared to the latter.

Table 3: Choice and requirement of user groups based on categories

Facilities/ Amenities	Students	I.T. Professionals	Travelers
Wi-Fi	✔	✔	✔
Storage in locker	✔	✔	✔
Storage within pod	✔	-	
Safety deposit box		✔	✔
Café/ Restaurant/ Canteen	✔	✔	✔
Gym	✔	-	✔
Library	✔	-	

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Reading room	✓	✓	✓
Laundry/ Ironing	✓	✓	✓
Informal/ Interactive spaces	✓	-	✓
Pickup and drop off to airport	-	✓	✓
Dressing rooms	✓	-	-
Study/ work rooms	✓	✓	
Outdoor spaces	✓	-	✓
Meeting rooms to rent		✓	
Game room	✓	✓	✓
Hall for events	-	✓	-
T.V. Room	✓	-	-
Pods in a shared room	✓	-	-
Spa	-	-	✓

Conclusion

Capsule hotels are an innovative new concept which can be repurposed while designing student hostels or tourist hostels. Given the ability of modifying the structure and planning of capsule hotels, this is an attempt for the same with the consideration of user groups. The research also focuses on the area calculations proving the optimum utilisation of space in capsule hotels as compared to the conventional hotels/motels. This study determines the possibility of the capsules being modified for students, people working in the I.T. industry and travellers. The majority of users lie in the age group of 20 to 40 years. The author also concludes, there are sections of people for whom space is still the primary criteria of luxury. These structures are inaccessible to the physically handicapped and the elderly.

Acknowledgement

Special thanks to all the participants of the survey, who filled out the questionnaire with thoughtful feedback. It contributed to producing this quality research. Also grateful for the guidance and support provided by the research guide, the academic co-ordinator of Indira college of Architecture and Design and the faculty of Research in Architecture throughout the process.

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Determinants of Community Spaces Facilitating Social Interaction in Residential Neighborhoods

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Abstract : This study aims at understanding determinants of spaces facilitating social interaction in residential neighborhoods in Pune city. The scope of the study extends to all community spaces in residential neighborhoods.For the purpose of this study, neighborhood is defined as a subsection of a larger community- a collection of both people and institutions occupying a spatially defined area influenced by ecological, cultural, and sometimes political forces (Park and Burgess). Four cases pertaining to different residential typologies were selected- traditional wada, chawl, apartment housing and detached housing. The research was carried out in two stages. The first stage involved observation and activity mapping to identify the spaces where social interaction was taking place. Then a questionnaire survey was conducted to identify factors which influenced user preference. Data was analyzed quantitatively as well as qualitatively to derive inferences. The conclusion was that social interaction in residential neighborhoods is determined by both physical as well as non-physical factors. How people adapt spaces in order to facilitate their social interaction is an interesting aspect that gives many useful insights. These inferences are crucial to guide future designers to create more sociable public spaces in residential neighborhoods in the future.

Keywords: social interaction, neighborhood, community, society

Introduction

A social interaction is a social exchange between two or more individuals. These interactions form the basis for social structure in a ‘society’; of which ‘communities’ are a part. Interaction is not, however, one-sided. It is a two-way process. From one point of view, society is the ‘web of social relationships,’ as sociologist Mac Iver puts it, or ‘a complex of forms or processes each of which is living and growing by interaction with the others’, as sociologist Cooley defines it. Residential neighborhoods can be considered to be communities in the sense that residents share a common territorial area as their base of operation for daily activities (Parsons). But are public spaces in these neighborhoods well-suited to creating good social relationships between the residents?

Studies by authors such as William Whyte and Jan Gehl argued that while physical design of a space is not a determining factor social interaction and sense of community, it influences the same in multiple ways. Author Bill Hillier also states in his book, ‘Social Logic of Space’ that architecture has a direct relation to social life, 'since it provides the material preconditions for patterns of movement, encounter and avoidance, which are the material realization- as well as sometimes the generator of social relations'.

In recent times, there is an ever-growing concern for individualism and the loss of a neighborhood community (Jacobs, 1961), with isolation as a consequence. Several studies have also linked health and well-being of people to the quality and frequency of social interaction in their lives. As such, it becomes important to understand the determining factors, both physical and non-physical, of spaces facilitating social interaction

Methodology

Purposive sampling of four cases was done in order to represent all typologies of residential neighbourhoods in the study sample. Two traditional typologies viz. wada and chawl; and two contemporary typologies viz. detached housing and apartment housing were selected. First, activity mapping was done at different times of the day in the

spaces identified. A questionnaire survey was then conducted to understand users' perspective and preferences about use of spaces in their neighborhood for social interaction.

Table 4: Selected case studies

Residential typology	Case study	Location	Number of residential units
Wada (Courtyard house)	Binniwale Wada	Budhwar Peth, Pune	1
Chawl	Laxminarayan Chawl	Shukrawar Peth, Pune	20
Apartment Housing	Regency Meadows Housing Society	Lohegaon, Pune	252
Detached Housing	Rajyavahtuk Society	Parvati Paytha, Pune	180

Case 1: Binniwale wada

Binniwale wada is owned by the Binniwale family since 120 years. urrently only 4 families of the same lineage are living in the wada, with a total population of 16 family members. Six of these residents are senior citizens. The family has rented two rooms of the wada for commercial activity and one of the family members also runs a private health clinic from one room.

In this case, spaces where social interaction was taking place were entrance porch, courtyard and shaded entrance lobbies on the ground floor; terrace, balcony, staircase landings and common entrance lobbies on the first floor.Entrance porch and the central courtyard on ground floor are semi-public spaces which non-residents can also access.Residents generally do not interact in these spaces except in case of certain festivals like Diwali, when the courtyard is decorated and all family members celebrate together. Terrace is used by residents as shared space where they come together to dry food items, dry clothes and chat with each other occasionally.The space which is mostly used for interacting with other residents in this case is the common lobby space and staircase landings on first floor.

Figure 1: Ground floor activity map (people in red, interaction spaces in green)

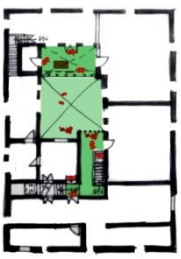


Figure 2: First floor activity map

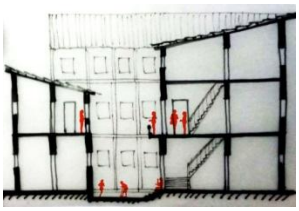


Figure 3: Section showing activities

As the entire ground floor is used for commercial and storage facility, the aged residents do not prefer to use it to interact with each other. They prefer the lobbies and balcony since they can immediately access it easily as well as maintain their privacy. Position of these spaces near the staircase creates opportunities for unplanned interaction among residents. The dimensions of the courtyard (5m x5m) are such that a person standing on the balcony can see and hear a person on the terrace and in the courtyard without difficulty. Also, the introvert planning with courtyard positioned centrally having balcony and terrace looking onto it create scope for interaction. Most predominant type of social interaction is casual and unplanned interaction occurring mostly among two people. In this case residents' need for privacy and their age determines whether spaces having the potential to be socially activated are actually activated or not. The need for privacy reflects cultural norms where women do not feel comfortable interacting in front of outsiders while age presents physical ability challenges.On the contrary, these limitations have in turn activated spaces like staircase landings and entrance lobbies with social interaction, when their primary function was not designed as such.

Case 2: Laxminarayan Chawl

Laxminarayan chawl presents an entirely different context than the previous case. The chawl is located in a very dense market area of Pune where the roads are crowded with vehicular and pedestrian movement throughout the day. The lower floor of both buildings is entirely commercial while two upper floors house residential units. Each building thus has 10 residential units with two rooms of 3m x 3m dimensions per unit, accessed from a 1.7m wide common corridor. A 4.5m wide road runs between the buildings.

Figure 4: Laxminarayan Chawl in the afternoon

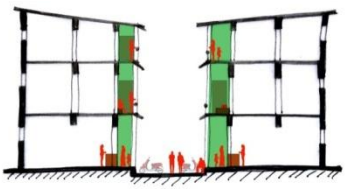
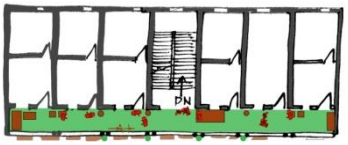


Figure 5:Section showing activities



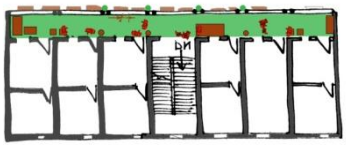


Figure 6: First floor activity map

In case of chawl, the shared corridor and staircase is the only public space owned by residents. The windows and doors of all units open onto the corridor. Corridors of both buildings face each other and the busy shopping street below. On the ground floor, one sees constant activity since late morning till evening. For the residents, road also becomes a public space at night which is used by the children to play. Due to lack of other public spaces, the shared corridor is used for regular activities including social interaction- like drying clothes, sitting and chatting and leisurely sleeping. Since the doors and windows of the residential units open onto the corridor, frequency of casual interactions between residents is increased. Since there is no provision of public space for children as well, the corridor is used by them to ride bicycle and play board games with their friends. Residents have made efforts to beautify the corridor by installing hanging planters on the columns. Interaction with neighbors across the roads is not observed.

In this case, privacy of residents is maintained only inside their residences. The positioning of furniture in corridor can be thought of as efforts taken by residents to privatize a part of the corridor; to mark their territoriality. Lack of designated public spaces for all age groups pressurizes shared facilities like the corridor and road to function as public spaces meant for social interaction. This also has resulted in residents selecting other places in the city to socially connect with others. In this case, maximum number of people interacting together at a time is 3-4 and as in case of wada, here too casual interactions are most common. The location of chawl in a busy street market of Pune is also an influential factor since it makes residents avoid use of ground floor for social interaction while also disturbing their privacy.

Case 3: Regency Meadows Housing Society

Regency Meadows Housing Society is an apartment housing project. 2BHK and 3BHK flats are provided. Residents comprise of a balanced mix of senior citizens, working class and children. Amenities provided include clubhouse, swimming pool, gym, children's play area and podium level garden. A municipal garden is located adjacent to the entrance gate while a private school is located on the other side. D.Y. Patil College is located at distance of 1.2 km from the project.

Figure 7: View of podium level garden

In case of apartment housing, both planned and unplanned social interaction was observed. Planned interaction takes place during events like republic day and festival celebrations which are organized on the podium level garden and clubhouse. The municipal garden in front of the buildings is also used for social gatherings like yoga club meets and festival celebrations with people who are not residents of the society. Unplanned interaction takes place in the ground floor lobby, upper floor lobbies, in the temple, on the pavements along inner roads, in children's play area and garden near clubhouse. For the children, inner roads and open ground serve as play and interaction spaces.

In the open spaces like gardens and pavements, casual, unplanned interaction is facilitated by provision of appropriate activities for all age groups as well as outdoor furniture for the same. Central location of podium level

garden makes it an inclusive space. People living up to the fourth floor also use balconies looking onto the podium and internal roads to interact with their neighbors when they do not want to meet for a long duration of time. The members of the society have taken efforts to make use of unused spaces like those created due to ventilation ducts on ground floor as play areas for children.

Most of them also are part of many social communities outside this neighborhood; hence sometimes they do not feel the need to know or socially engage with more people from their neighborhood. Also, some owner residents do not regard tenants as a part of the community. Hence, planned events are very important in bringing all residents together and determining the quality and quantity of social interaction among residents. Lobbies on ground floor and upper floors act as major spaces promoting social interaction among residents. On the ground floor lobby, quality of light, location of lifts and staircase such that it is easily accessed without crossing vehicles parked, provision of seating near staircase for visitors create feeling of safety and promote interaction. On the upper floors, open well staircase and window provide ample daylight.Here, the proximity of staircase and lifts to doors of residential units creates scope for social interaction among residents on same floor as well as on different floors. Design of doors facing another unit's door becomes important in terms of increasing the frequency of meeting neighbors casually, without taking extra efforts, as in case of wada. Also, many people prefer using staircase, which provides more opportunities to meet people while reaching their destination.

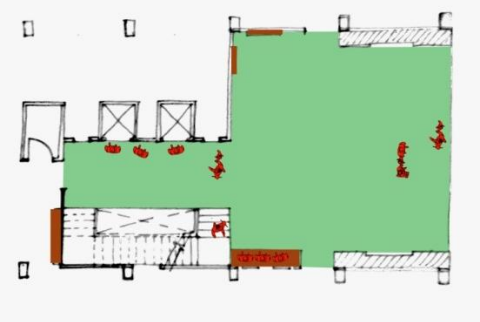


Figure 8: Ground floor lobby activity mapping (people in red, interaction space in green, furniture elements in brown color)

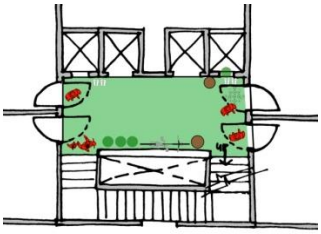


Figure 9: Upper floor lobby superimposed activity mapping (people in red, interaction space in green, furniture elements in brown color)

In this case too, attempts to beautify the lobby space with planters as well as cultural symbols like rangoli is seen, as seen in case of chawl. In this case, children of many residents go the same school and hence, that becomes another influential factor in bringing people together. Many residents prefer to go along with other residents for shopping. Provision of safe open, semi-open and covered community spaces catering to all age groups promotes social interaction and good social relationships amongst residents. The proximity of municipal garden creates opportunity for residents to socially interact with non-residents as well.

Case 4: Rajyavahtuk Society

Rajyavahtuk Society is a bungalow society near Parvati foothills in Pune comprising of around 180 residential units, most of which are G+2 structures. A part of the society comprising 45 units was selected as a sample for this

study. Some owners have rented first floor of the bungalows to tenants. The owners are mostly middle-aged and senior citizen couples having children while tenants are either singles or married couples. There are two municipal gardens in close proximity to the society and Rose Garden is within the society boundaries. There are other facilities like supermarket, restaurants, swimming pool, library and hospitals located within a 1km radius.

In this case, residents know their immediate neighbors and 20-30 people except immediate neighbors. Social interaction observed in this case is mostly between 2-3 people and only in case of planned events does it exceed. Residents mostly interact with residents immediately next to their homes, either over low-height compound walls or by visiting neighbor's homes. Interaction with others is planned.

Public spaces where social interaction takes place in this case are the pavements, benches along pavements, gardens, nearby restaurants and community halls. Feeling of safety, sense of belonging to the society and provision of various amenities near the society are the contributing factors in bringing residents together. Privacy of residents is well maintained in this case, but the frequency of social interactions as well as formation of social relations can be thought to be hindered by the same.

Conclusion

Frequency and amount of social interaction in residential neighborhoods is an essential indicator of sense of community among the residents. Determinants of social interaction can be categorized as universal and case-specific. As typology of the neighborhood changes, general determinants remain applicable to all cases while the case-specific ones vary.

From the analysis, location of the neighborhood with respect to municipal amenities, location of public space with respect to arrangement of the units (central, linear) and in relation to staircase/lifts, scale of the space with respect to number of users and type of interaction, physical distance from the residential unit, presence of seating facility, design of spaces with activities for all age groups (socially inclusive) were the universal physical factors determining the nature and frequency of social interaction taking place in a residential neighborhood. Age, privacy concerns, cultural norms and associations, feeling of safety, presence of a dedicated committee to initiate events at neighborhood level were the non-physical factors identified which were also case specific.

In case of traditional wada, age, small number of occupants, need for privacy due to cultural norms followed by residents (user group profile) largely determined the type and frequency of social interaction taking place. It also resulted in potentially sociable spaces like central courtyard becoming used for non-sociable purposes only, like parking and garbage collection centres.

In case of chawl, physical factors were the major determinant of social interaction. Lack of designated spaces resulted in the shared corridor being used as the public space, with delineations of territory created by the residents with use of furniture elements. These furniture elements further improved the sociability of the space. The semi-openness of the corridor also is an important factor, since it brings sense of safety and comfort due to daylight in an otherwise linear space. But in this case, the violation of privacy is acceptable to the residents.

In case of apartment housing, provision of socially inclusive spaces varying in scale, activities and varying in nature of openness provide increased opportunities of social interaction among residents. The physical design of lobby spaces to incorporate daylight, with seating elements and with doors of neighbors opening in front of another create possibilities for frequent encounters. In this case, presence of a committee which initiates community interaction through events is also a major determinant of social interaction among residents.

In case of detached housing, proximity to various facilities and public amenities and need for privacy largely determine the quality and quantity of social interaction among residents.

Thus, design of residential neighborhoods can incorporate certain features in order to create meaningful public spaces which improve social interactions and thus social relations:

1. Provision of public spaces catering to all members of the user group with seating facility and to accommodate different number of users.
2. Locating public spaces of appropriate scale and dimensions along the regular movement pattern of residents and making it easily accessible to all users, at preferably 2km radius maximum distance from their homes.
3. Ensuring good daylight in public spaces for comfort and safety of users.

4. Acknowledging cultural norms while designing public spaces- with respect to gender, privacy, aesthetics.

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Role of Natural Light in Hindu Temples of India

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Abstract: Importance of natural light was very vital in Hindu temples. Main aim of introducing natural light in temples was to create a connection or vision between God and the devotee. The paper will speak about the spatial quality of temple getting affected by light. It will understand the significance of natural light in sacred architecture. To analyse and study these aspects, examples will be taken from Dravidian Style of architecture. The study will focus on light quality in two different spaces of temples; the Mandapa and the Garbhagriha. It will conclude with the significance of light and divinity made in order to achieve goal of focusing one's mind to God.

Key words: Divinity, Dravidian style, Temple.

I - Introduction

The temples have provided a space which makes dialogue between man and god.[1]Daylight has been a symbol of cleanliness, purity, knowledge and haven. Sun is the giver of light and worshipped in Hinduism thus natural light is used in temple architecture. Divine light is a special aspect of symbolic light that represents the deity. Hence the role of light in temples is critical. The shrine has inherent significance and became a symbol of power and wealth. The plan of Hindu temples is based on geometric form and other parts of temple are organized around this chamber.[2] Their geometry is also emphasized by the play of light throughout.

Hindu temples include following elements which have different lighting and layout, thus make the space holy: Shrine, shikhara, stupi, antaral, mandapa, ardhamandapa, pradakshinapath.

This paper proposes to study how religious principles govern the treatment of light in sacred architecture. Specifically, this is applied to the study of natural light in three Hindu temples that were built in Tamil Nadu, India. The study addresses three major objectives. First, to understand the significance of religion in the treatment of light in sacred monuments. Second, to understand how spatial quality of temple get enhance by light quality. Third, to study and understand Hindu temple layout and lighting. It also proceeds by understanding the elements of Hindu temples and the principles of day-lighting related to them. This study may serve as a reference for architects and designers in order to understand and preserve the importance of light in Hindu temples of south India.

The methodology used to fulfil the objectives began with analysing Hindu temple with surroundings, study in detail with Plan, sections of temples which will helped to understand the space quality of temples. Understanding trends in religious style of architecture, study of light and shadow of particular space, Presence and absence of light as an element, this all gave data of Juxtaposition of the ritualistic importance of light and its interpretation. Study of openings, fenestrations and roof systems which will help to understand Lighting, Design, quality, distribution and methods to achieve desired light quality. Study of specific direction of light, cardinal directions, axis which will help to understand Hindu temple Layout and lighting. Study of elements in Hindu temples which will give a thorough understanding of each space.
The Research considers Hindu temples of Dravidian style of architecture. The Critical analysis of the temples was done with respect to few elements considering light as a focal point. Considering role of light in temples through principles and theories generated only .Giving relation between light in temple and not justifying the reverse

[1] Moore, Fuller, Concepts and practice of Architectural Daylighting,1985

[2] Ar. Snigdha Chaudhary, Role of Elements of in Temple Architecture,2017

process. Giving temple layout study with reference to selected topic and not overall. Significance of religion in treatment of light will be talked about Hinduism only. No specific season was taken for the study, no experimental tool was used in study of lighting quality.

Identified case studies are from Tamil Nadu- **Meenakshi Temple, Shore Temple, Brihadishwara Temple**. Reason behind selection is "Tamil Nadu is the only region which never came under any power and did not suffer any mass destruction."[3]

II- Overview of Temples

[4]**Elements of Hindu Temples**:

1. 'Sikhara' meaning the tower or the spire. It is the pyramidal or tapering portion of the temple which represents the mythological 'Meru' or the highest mountain peak. The shape and the size of the tower vary from region to region.

2. 'Garbhagriha' meaning the womb chamber. It is nucleus and the innermost chamber of the temple where the image or idol of the deity is placed. The chamber is mostly square in plan and is entered by a doorway on its eastern side. The visitors are not allowed inside the garbhagriha in most of the temples, only the priests perform the rituals and worship.

3. 'Pradakshina patha' meaning the ambulatory passageway for circumambulation. It consists of enclosed corridor carried around the outside of garbhagriha. The devotees walk around the deity in clockwise direction as a worship ritual and symbol of respect to the temple god or goddess.

4.'Mandapa', is the pillared hall in front of the garbhagriha, for the assembly of the devotees. It is used by the devotees to sit, pray, chant, meditate and watch the priests performing the rituals. It is also known as 'Natamandirameaning temple hall of dancing, where in olden days ritual of music and dance was performed. In some of the earlier temples the mandapa was an isolated and separate structure from the sanctuary.

5. 'Antarala' meaning the vestibule or the intermediate chamber. It unites the main sanctuary and the pillared hall of the temple.

6. 'Ardhamandapa' meaning the front porch or the main entrance of the temple leading to the mandapa.

7. 'Gopurams' meaning the monumental and ornate tower at the entrance of the temple complex, specially found in south India.

8. 'Pitha' the plinth or the platform of the temple.

9. 'Toranas' the typical gateway of the temple mostly found in north Indian temple.

1. Shore Temple

1.	Location	Mahabalipuram, TamilNadu
2.	Time	690-728 AD
3.	Built By	Pallava Dynasty
4.	Climate	Hot and Humid
5.	Layout and Planning	There are 3 shrines in temple complex.The main shrine faces the sea on east and second shrine faces the opposite direction. Above two shrines there is superstructure in pyramidal shape as vimana.Between these two structures is the third shrine without a superstructure.The entrance into the shrine is through richly ornamented doorway.The temple shrine was eastward facing which gets first rays of rising sun.

2. Brihadeshvara Temple

[3] Sterlin, Henri. Hindu India: From Khajurao to the temple city of Madurai,1998

[4]Ar. Snigdha Chaudhary, Role of Elements of in Temple Architecture,2017

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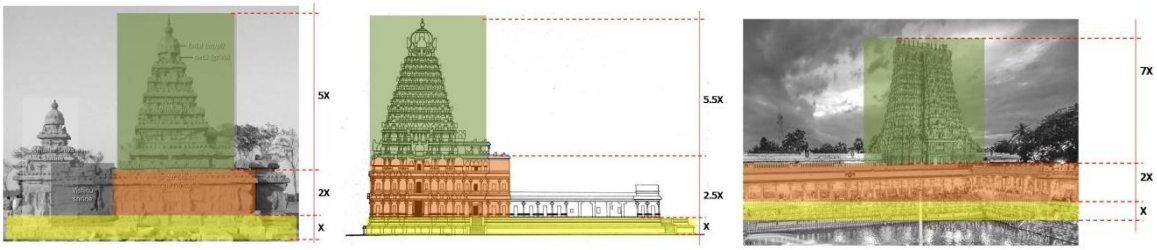
1.	Location	Tanjavur, TamilNadu
2.	Time	985-1014 AD
3.	Built By	Chola Dynasty
4.	Climate	Hot and Humid
5.	Layout and Planning	Brihadeshwara temple stands in the middle of rectangular walled courtyard.The prakaram has two entrance points and the entrance is dominated by two gopuras.The gopuras lead to six meters long Nandi mandap. The structure is centrally aligned with the gopuras and nandi mandapa.The mandapa adjoins antarala and garbhagriha. The absence of stairway make the openings of temple inaccessible which functions as a window.

3. Meenakshi Temple

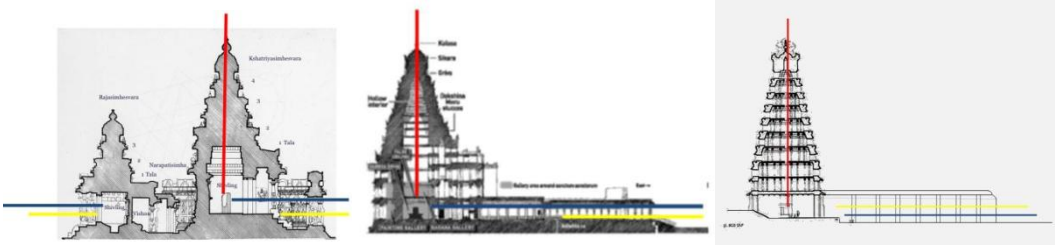
1.	Location	Madurai, TamilNadu
2.	Time	1623-1660 AD
3.	Built By	Nayak Dynasty
4.	Climate	Hot and Humid
5.	Layout and Planning	Temple has two main shrines, Sudareshwara temple and Meenakshi temple.Temple is surrounded by a prakaram and 4 main gopuras. Temple has a central axis from main gopura to smaller gopura then to mandap which leads to shrine.Temple has thousand pillar hall having central aisle with a double row of columns.The temple gopuras are exceptional for their proportion and detail carvings.The inner courtyard of Meenakshi shrine connects both the temple complex from the north gopuram.

4. Diagrammatic Study of The Temples :



(a)Shore Temple (b)Brihadeshwara Temple (c)Meenakshi Temple

Illustrations a,b,c demonstrates the hierarchy made in volume and space to make the innermost element of temple a focal point.



(a)Shore Temple (b)Brihadeshwara Temple (c)Meenakshi Temple

Axis of Light
Axis of Human
Axis of God

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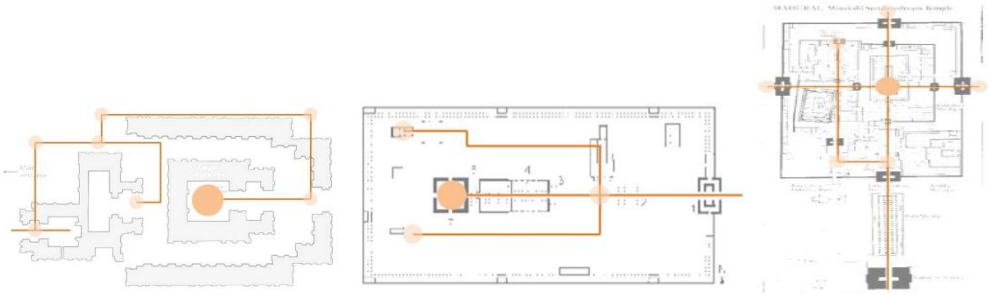
Illustrations a,b,c demonstrates the path in which one connects to god relates to the path of light source.

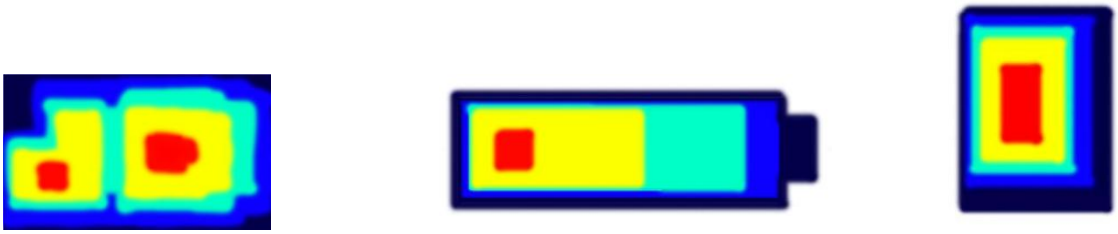


(a) Shore Temple (b) Brihadeshwara temple (C) Meenakshi Temple

Innermost Cell

Path :

Illustrations a,b,c demonstrates how the destination,(innermost cell) axially aligned from entry which act as a focal point. Physical movement path is shifted from the axis but also visual connection is dominated.

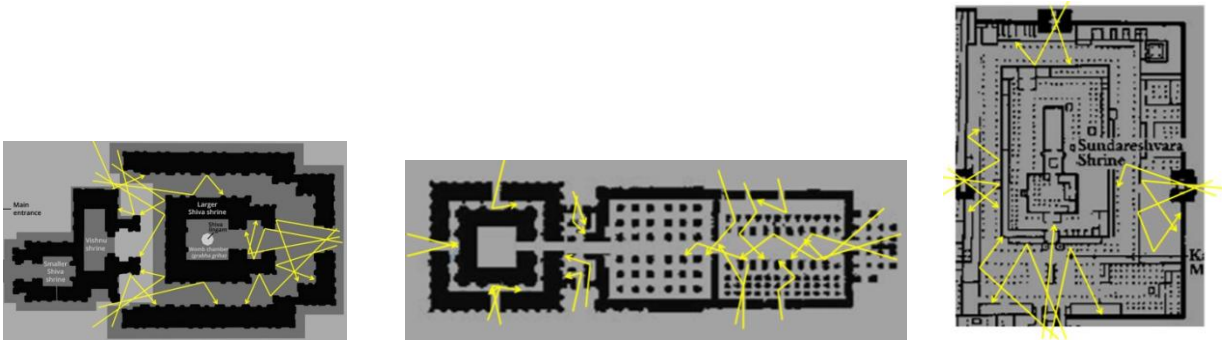


(a) Shore Temple (b) Brihadeshwara temple (C) Meenakshi Temple

Very Low Low

Medium High

Illustrations a,b,c demonstrates how the intensity of light changes from high to low as we go to the innermost cell of temple.



(a) Shore Temple (b) Brihadeshwara temple (C) Meenakshi Temple

Light Path

Illustrations a,b,c demonstrates how the light enters into the space and how the light movement is controlled by the space planning.

III - Temple Analysis

1. Garbhagriha

Garbhagriha, the innermost chamber of the temple where the idol or deity is placed. Based on different parameters the analysis talks about the light quality in this innermost chamber.

1.1 Type of light:

Shore temple having a square shaped garbhagriha gets Diffused light from its doorway whereas Brihadeshvara temple gets indirect light and Diffused light from small openings in the wall. In Meenakshi temple there is lowest diffused light almost minimum compared to other two temples; as the innermost chamber has no direct opening.

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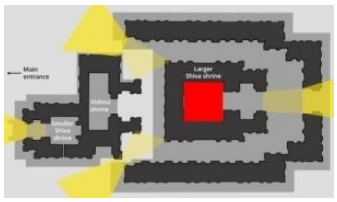
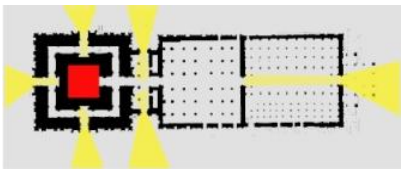
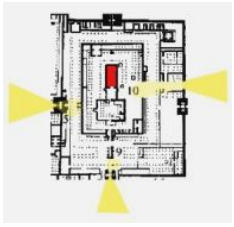
1.2 Entrance of light:

(a)Shore temple (b)Brihadeshvara temple (c)Meenakshi Temple

Shrine : Light :

Illustrations a,b,c demonstrates the ways in which light is entering inside the temple with respect to Grabhagriha.

1.3 Fenestration:

Shore temple and Brihadeshvara temple have no clerestory or skylights, which could have increased the illumination level or does not have other treatment by which light can enter in the Garbhagriha, thus avoid veiling reflection. Meenakshi Temple's innermost cell does not let sunlight penetrate inside thus inner section remains sacred.

1.4 Shade and Shadow:

Shore temple has unbalanced distribution of light, play of shadow is created by volume which gives the feeling of Divinity. Brihadeshwara temple innermost cell has continuous transaction with mandapa thus,a low angled indirect light is observed. Play of light and shadow is seen due to architectural elements and type of light entering the shrine. This make the space more focused and calm. Due to no light source in Meenakshi temple there is absence of distribution of light, thus the light on Deity act as a light source. As there is absence of direct and indirect light so brightness ratio does not exist.

1.5 Reflection of light:

In all three Garbhagriha's, light reflection is not observed due to use of granite as a surface material which is a low reflective surface.

1.6 Senses Evoked:

The interiors of shore temple's Garbhagriha are designed to be dark so that the human eye is not distracted by the material world. Also idea was that eastward facing shrine should be illuminated by first rays of rising sun. The holy light of shrine serves as a lighthouse on the sea front. In case of Brihadeshwara temples shrine, Light reflected from wall, filtered light, light as a focal point are ways used in which light represent fundamental connection to God. The Sundareshwara shrine has inherent significance and thus becomes a symbol of power and hope.The chief function of temple i.e walking barefoot to innermost chamber is fulfilled by lowering light and making one's mind to god.

Garbhagriha Analysis Chart :

NO.	PARAMETERS	SHORE TEMPLE	BRIHADESHVARA TEMPLE	MEENAKSHI TEMPLE
1.	Size	14 Sq.M [5]"The Dharalinga is deified in the garbhagriha, which is in square shape of 12 feet (3.7.m) and the height is 11 feet (3.4 m)."	64 Sq.M [6]"Each side of Garbhagriha measures around 8 meters and in the middle sits a colossal 3.66 m high linga."	Sq. M "BY method of graphical scale."
2.	Type of Light	Diffused Light	Indirect and Diffused Light	Lowest Light (Minimum)
3.	Fenestration	Absence of opening so no glare.	It does not have skylights or any other	No direct fenestration.

[5]Dr.S.A.V.Elanchezian, The Shore Temple-An Aesthetic Architectural Ecstasy,2018

[6]Sudha Jagannath,Brihadeeshwara Temple: "Dakshina Meru"

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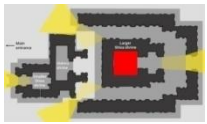
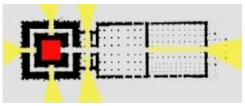
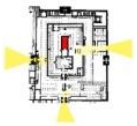
		No clearstories or skylights, which could have increased the illumination level.	treatment by which light can enter in the Garbhagriha thus avoid veiling reflection.	Does not let sunlight penetrate inside thus inner section remains sacred.
4.	Entrance of light			
5.	Shade and Shadow	Unbalanced distribution of light play of shadow created by volume which gives the feeling of Divinity. "Height of plinth – x Height of Mandap – 2x Height of shrine -5x"	Due to space enclosure a low angled indirect light is observed. Play of light and shadow is seen due to architectural elements and type of light entering the shrine thus makes the space more focused and calm. "Height of plinth – x Height of Mandap – 2.5x Height of shrine -7x"	Due to no light source there is absence of distribution of light. Thus the light on Deity acts as a light source. Absence of direct and indirect light brightness ratio does not exist. "Height of plinth – x Height of Mandap – 2x Height of shrine -12x"
6.	Reflection of Light	No reflective surface minimum reflection. [7]"Surface reflectance is minimal due to use of unpolished granite, a low reflective surface."	No reflective surface minimum reflection. [8]"Low reflectance granite surface do not provide enough indirect light."	No openings inside the main shrines, the absence of light plays an important role here which makes the space scared.
7.	Senses Evoked	The interiors are designed to be dark so that the human eye is not distracted by the material world.Also idea was that eastward facing shrine should be illuminated by first rays of rising sun. The holy light of shrine serves as a lighthouse on the sea front.	Light reflected from wall, filtered light, light as a focal point is way in which light represent fundamental connection to God.	The shrine has inherent significance and thus becomes a symbol of power and hope.The chief function of temple i.e walking barefoot to innermost chamber is fulfilled by lowering light and making one's mind to god.

2. **Mandapa**

Mandapa, the pillared hall in front of the garbhagriha, for the assembly of the devotees. Based on different parameters the analysis talks about the light quality in this cell.

1.1 Type of light:

Shore temple having rectangular Mandapa gets direct and diffused light from the main entrance doorway. Indirect and diffused light is observed in Brihadeshvara temple due to the adjacent mandapa. In Meenakshi temple lowest diffused light is observed due to no openings.

1.2 Entrance of light:

Illustrations a,b,c demonstrates the ways in which light is entering inside the temple with respect to Mandapa :

[7]Aitken, Donald. "Frank Loyd Wright: Daylighting Master",1998

[8]Aitken, Donald. "Frank Loyd Wright: Daylighting Master",1998

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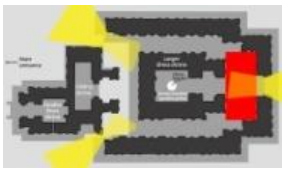
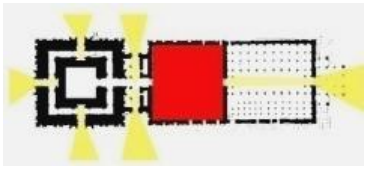
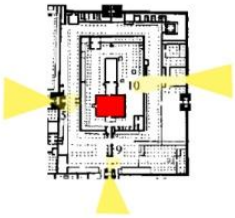

(a)Shore temple


(b)Brihadeshvara temple


(c) Meenakshi Temple

Shrine : Light :

1.3 Fenestration :

Shore temple has no openings or windows/niches inside the mandapa but the space is lit by adjoining enclosure walls punctures and from entrance. In case of Brihadeshvara, the walls are triple storied with doorways on north and south which function as token doors (windows) due to absence of stairs, thus it gives indirect light in mandapa. The Guda Mandapa of Sundareshwara Meenakshi temple, does not have any openings, clerestory or windows. Absence of openings along with the completely covered space does not allow direct light to penetrate inside the temple.

1.4 Shade and Shadow:

In shore temple the absence of openings inside the mandapa and presence of openings adjoining the mandapa (wall and doorway) creates an unbalance distribution of light.Due to extremely few openings the distribution of light is unbalanced in Brihadeshwara temple also. Daylight sources such as windows have been blocked by the use of colonnade as building element. A pattern of shade and shadow is created by the colonnades. In case of Meenakshi temple; Kambittari Mandapa is aligned with Guda Mandapa,Kambittari gets indirect light which creates an unbalance distribution of light in Guda mandapa. The space have minimum brightness.

1.5 Reflection of light:

Shore temple, light reflected from inner surface of enclosure wall, and from granite flooring. Brihadeshwara temple has thickness of wall is 1.2 m. which act as protection for light entering through windows. A slight recess in structure provides protection from side doorways, low height and small size openings provide low angle light. In case ofGuda Mandapa of Sundareshwara Meenakshi temple, there is no reflection of light due to use of granite as a surface material. A sense of walkway (colonnade) with spiritual feeling is created due to light quality and intensity.

1.6 Senses Evoked:

As you enter in shore temple's mandapa a feeling of Divinity is maintained, the reflected light gives a sense of peace; focus is achieved to the innermost chamber due to light quality. Where as in Brihadeshwara temple due to colonnade and indirect light from openings, light and shadow pattern is created which makes the space quality grand,spiritual, and peaceful with glimmering effect. In Sundareshwara temple main function of temple i.e walking barefoot to innermost chamber is fulfilled. Due to the light quality in mandapa and the transaction effect created from entrance to each mandapa to the innermost cell.

Mandapa Analysis Chart

NO.	PARAMETERS	SHORE TEMPLE	BRIHADESHVARA TEMPLE	MEENAKSHI TEMPLE
1.	Size	98 sq.M [9]"small mandapas surrounded by a heavy outer wall with little space between	289 sq. M [10]"West of the entrance porch of temple leads to 2 adjoining mandapas the one leading to garbrigriha is almost double in	500 sq. M "BY method of graphical scale."

[9]K.J Oijevaar,The South Indian Hindu temple building design system,2007

[10]K.J Oijevaar,The South Indian Hindu temple building design system,2007

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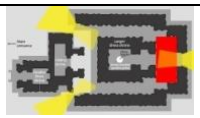
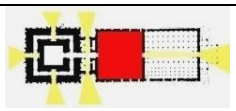
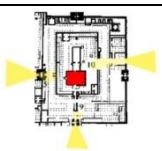
		for circumambulation."	its enclosure."	
2.	Type of Light	Direct and Diffused Light	Indirect and Diffused Light	Lowest Diffused Light
3.	Fenestration	No openings or windows/niches inside the mandapa but the space is lightened by the adjoining enclosure wall and from entrance.	The walls are triple storied with doorways on north and south which function as token doors (windows) due to absence of stairs, thus it gives indirect light in mandapa.	Guda Mandapa do not have any openings,clerestories or windows. Absence of openings along with the completely covered space does not allow direct light penetrate inside the temple.
4.	Entrance of light			
5.	Shade and Shadow	The absence of openings inside the mandapa and presence of openings adjoining the mandapa(wall and doorway) creats an unbalance distribution of light. "Height of doorway – x Height of Mandap – 1.2x Height of enclosure wall - x"	Due to extremely few openings the distribution of light is unbalanced.Daylight sources such as windows have been baffled by the use of colonnade as building element. A pattern of shade and shadow is created by colonnade. "Height of doorway – x Height of Mandap – 1.5x"	Kambittari Mandapa is aligned with Guda Mandapa, Kambittari gets indirect light which creates an unbalance distribution of light in Guda mandapa. The space have minimilastic brightness ratio. "Height of doorway – x Height of Mandap – 1.5x"
6.	Reflection of Light	Light reflected from inner surface of enclosure wall, and from granite flooring.	Thickness of wall is 1.2 m. which act as protection for light entering through windows.A slight recess in structure provides protection from side doorways. Low height and small size openings provide low angle light.	No reflection of light due to use of granite as a surface material. A sense of walkway(colonnade) with spiritual feeling is created due to light quality and intensity.
7.	Senses Evoked	As you enter in mandapa a feeling of Divinity is maintained, the reflected light gives a sense of peace, focus is achieved to the innermost chamber due to light quality.	Due to colonnade and indirect light from openings, light and shadow pattern is created which makes the space quality grand,spiritual, and peaceful with glimmering effect.	As discussed earlier main function of temple i.e walking barefoot to innermost chamber is fulfilled due to the light quality in mandapa and the transition effect created from entrance to each mandapa to innermost cell.

IV - Conclusion

This paper discussed the role of natural light that becomes the holy light in sacred architecture. The study addressed three major objectives First, to understand the significance of religion in the treatment of light in sacred monuments. Second, to understand how spatial quality of temple get enhance by light quality. Third, to study and understand Hindu temple layout and lighting.

As mentioned earlier in the study, the ritual of worship which included focussing one's mind completely on God, was extremely important in SouthIndian Hindu temples. The intensity of light decreases as we travel from the outer cell of temple to the innermost cell. In order to achieve this, the Hindu temples were designed to focus the human minds towards worship, the temple interiors were designed to be dark so the human eye was not distracted by the material world.

According to this qualitative analysis, it can be said that though the three monuments were built during different time periods, differed in their size and used different building technology, the quality of light in the three temples did not change much due to the strict religious requirements. In spite of the advancement in building technology and the increase in the size of the temples with time, the treatment of light inside the sacred part of the temple remained the same.

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Analysis on Spatial Planning of Wadas in Pune

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Abstract: ***The traditional form of residence of peshwas in their ruling period was wadas. It has unique design features like courtyard planning, spatial materials, decorative pillars and arches, well planned openings for good light and ventilations etc. Wadas were the administrative and dominant structures under peshwa period. Almost three generations of Maratha's rule their empire from this structure. During this period, after the establishment of the power of peshwas in Maharashtra several small, medium and some large scale traditional dwelling of a particular style came into existence. Today the wada style of architecture is became huge part of the heritage, which is deteriorating in the old areas of cities, losing its identity and importance due to introduction of concrete structures under the name of development and modernism. This research paper mainly focused on wadas of pune and their spatial planning in terms of features, circulation and surroundings which are being demolished due to present high rising real- estate value, due to which it requires a gentrification in today's urban context. The research also includes study of wadas on the basis of geographical, economic, social and surrounding aspects as they influence the development and evolution of traditional architecture. The paper emphasizes on the planning module of central courtyard and rooms, there spatial planning which is modified in today's contemporary world as need of the users. The paper also considers technical, legal and owners/renters constraints in preserving and protecting the structures. A various live case studies of wadas in pune conducted to identify various aspects of design. Which have been lead to gentrification of this structures. The case studies explore the features and characteristics of traditional architecture which transformed into contemporary architecture in today's conditions. The spatial planning of wadas has become obsolete because of its lack of maintenance and deficiency to fulfil contemporary aspirations of the users. This research gives reasons and solutions to the problems which are associated with gentrification in terms of renovations and improvement of structure or distinct so that it comforts to middle class people who owning or renting the residence of wadas.***

Keywords: Spatial planning, Features, Urban Context, Gentrification.

I. Introduction

The literal meaning of 'spatial planning' is space optimization of area considering surrounding urban aspects with integration of features, style and tradition of that period. Wadas was the popular type of residence which are designed with combination of several spatial aspects. This structure evolved under reins of peshwas, its style was a fusion. Where features from various architecture styles were combined with local construction techniques. Settlement developed around the residence was divided in wards known as 'Peths'. Streets and roads in the settlements were narrow as designed for non-motorised vehicle. The roads were never straight as the growth of this settlement is radial. The plots for construction of wadas were rectangular located next adjacent to the streets.

To understand the transmission of traditional design styles in today's urban context a case method was undertaken. Case of vishrambaug wada and bhau saheb rangari wada which located in heart of the pune city was selected for study as its design inspired from typical wada typology. Vishrambaug wada constructed in '1807' by peshwa bajirao II for his residence which is one of the royal residential structure of that period. It has three centrally located courtyard surrounded with kholi's (Room). Bhau saheb rangari wada constructed in '1870' by madhav(bhau) rangari which is the head quarters of peshwas where meetings and strategies where made against british government. This wada designed in small rectangular plot which has no courtyard but several kholi's are constructed with narrow access. This both wadas are provided with several traditional features and decorative fixtures.

Wada which derived from Sanskrit word 'Vata' which meant piece of land or area provided for residential purpose. The 'wada' included residence of one family or several families who stayed there. For this case another case study was undertaken where group of families live in wada. This was constructed 200 years before where '10 families' are living presently.

This house forms belonged to ruiling classes as well as commoners. This classification is very prominent in terms of historical, cultural and ecomical aspects. Although it is varying in size, scale and economical status but all wadas has some of the common elements and characteristics. The features of typical wada are shown in figure 1. The features and their present conditions are assessed in this paper.

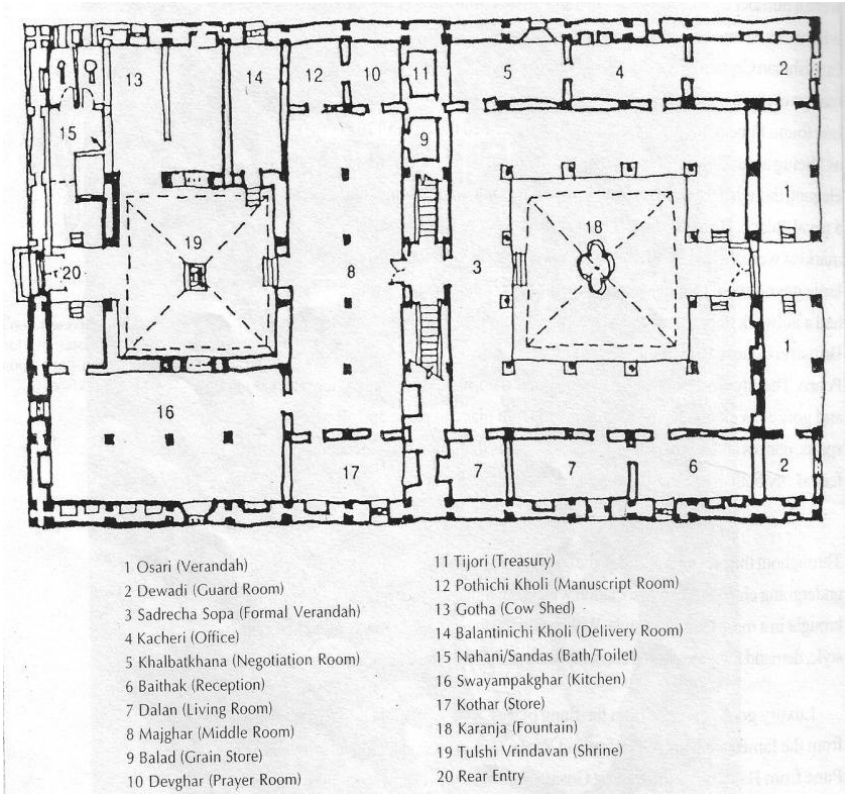


Figure 8 : Typical plan of Wada (Source-Diddee J. and Gupta S., 2000, pp.-80)

II.Methodology

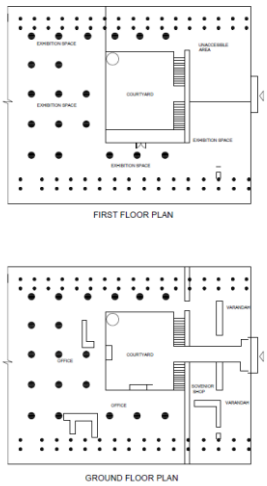
The literature survey was undertaken to study the spatial planning of wada architecture. case study method is employed to obtained data by interviewing the owner. The live visits to wadas was done in January 2019. Photographs of wadas has been taken and analysed by comparing each case. Typologies are identified as private or public structure and their adoptive usage. Analysis has been done on the basis of plan form, facade design and various elements. The streets and roads in surrounding 100m radius of wadas was studied and drafted on maps to understand surrounding urban context.

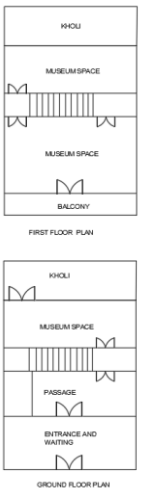
III. Results and Discussion

Vishrambaug wada is conserved and maintained by pune municipal corporation. The ground floor is provided for souvenir shops and municipal offices on rent and First floor has permanent exhibition on 'evolution of pune' which is chargeable to visitors. Bhau saheb rangari wada conserved and maintained by bhau rangari trust and used as museum space. The similar case of phadke haud wada is property of three owners where kholi's are rented by families from 100-150 years, as one of the owners said that people renting the kholi's in wadas for 40-50 rupees per month which is not sufficient to maintained and conserve this structure in present conditions, due to which wada is in partly demolished stage.

The analysis of plan form, facade design and features are as follows:

3.1 PLAN FORM:





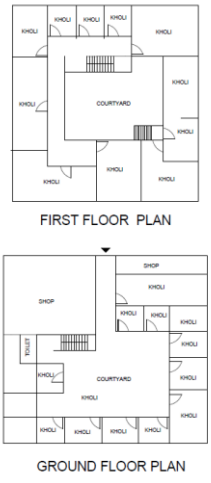


Figure 9A: Vishrambaug wada **Figure 2B: Bhau Saheb Rangari Wada** **Figure 2C: Wada at 'Phadke Haud'**

Vishram baug wada has been designed around three centrally located courtyard, at the present one courtyard and area around it is accesible,remain area is under restoration. It has wide varandah at the entrance. The entrance is narrow and open into the small courtyard. Two straight staircases provided opposites to each other and one spiral staircase in corner of the courtyard. Ground floor consist of rooms which has been provided for government offices and souvenir shops. First floor has access from left staircase in courtyard which leads to exhibition space 'punawadi to punyanagari'. As shown in figure 2 first floor plan is 'Diwan khana'(large hall for discussion purpose) where exhibition is take place.

Bhau saheb rangari wada constructed in small rectangular plot area it hasn't consist any open courtyard. Rooms are provided in linear axis which consist of centrally placed staircase. At the entrance first kholi is for waiting which opens into the passage area where, in year 2016 during restoration work underground tunnel (Bhuyar) is found in which weapons was buried. This weapons are displayed in first floor rooms(kholi) and this wada restored into a museum.

Wada which was studied at 'phadke haud' pune has several kholis provided on ground+ first floor which are rented by no. of families. This wada has shops In front which are attached to Rooms (kholis)from inside. Single and double rooms are provided with attached small bathroom, users modified the room as per their needs. The toilets are common which has access through courtyard. Wada also consist of second floor which has been demolished due to deteriotion. Planning philosophy is same carried out from old styles in all three wadas.

3.2 Facade Design :

Exterior facade of vishrambaug wada and bhau saheb rangari wada expresses the traditional style, whereas the wada at phadke haud consist of shopfront which shows the transformation of style.

Vishrambaug wada's facade has large projecting wooden balcony known as meghadambri (cloud capped balcony. An element of decoration such as carved arch which is non-structural arch within each bay has been carried from peshwas traditional architecture. Facade is fully ornamented with carvings on pillars and doors, windows.

Whereas facade of bhau rangari wada is kept simple but depicts the traditional style of architecture. It also has projecting wooden balcony with highlighted wooden doors and windows. Chandeliers fixed in balcony Added the beauty in facades design.

Facade of Phadke haud wada shows the structure of ground + two storey which is partly demolished. Decoration or ornamentation is not part of facade design. The shops which are in front are of more than 30-40 years which are not renovated in present condition which adding zero value in aesthetics of facade.

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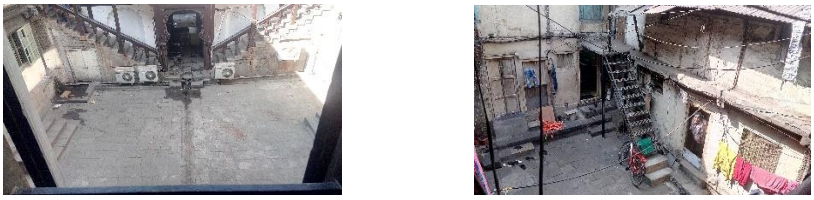
(A) **(B)** **(C)**

Figure 3 : A- Eastern Facade of Vishram
B- Northern facade of Bhau saheb rangari wada.
C- Southern Facade of Phadke haud wada.

3.3 Courtyard:

Wadas cannot be imagine without the courtyard it is a core of structure surrounded by verandah supported by pillars on ground floor and behind which rooms are enclosed in walls. Vishrambaug wada has three courtyards, first and second use for public activity and third one is private for peshwa bajirao II second courtyard is larger once compare to others which consist of two wells which cools the inner space, third courtyard has fountain in center. Presently only first courtyard is accessible for visitors which is the entry point to ground floor offices and above floor exhibition.

Bhau saheb rangari wada not consist of any courtyard as it wasn't residential wada. Phadke haud wada has centrally located courtyard surrounded by kholis. For flooring Shahabad tiles are used in both the cases of vishram baug wada and phadke haud wada. Windows and doors facing in courtyards which gives indoor view of space in both wadas. The characteristics of courtyard as a traditional element is connects the inside space to the outside space. This space connects the ground floor or first floor, family and group families living around the space. It is a private space which becomes a public space during festivals and cultural programme. It provides space for gathering, resting, chatting and playing for children's. It circulates the wind within the space and rooms.



(A) (B)

Figure 4 : A- Courtyard of Vishrambaug wada. B- Courtyard of Phadkehaud wada.

3.4Doors

In wadas door was the major dominating element of decorative facades, it consists of large door provided with small door known as 'Dindi Darwaza'. The large door always kept close where small one is open for entry usually for security and to enter someone inside with humble manner. The doorway consists of iron strip on lintel which has carved with auspicious symbol known as 'Ganesh Patti'

Vishrambaug wada consist of large wooden door with Ganesh patti, which also has small door (Dindi) but for easy access of visitor's large door is kept open.

Bhau rangari wada has double leaf small wooden door way which doesn't have (Dindi). But the locking system of door is design such as if door is locked from inside it can be opened from outside by pulling the metal strip which is hidden in middle door batten.

Phadke haud wada does not consist of any such door ways it has long narrow passage which opens into the courtyard.

(A) (B)

Figure 5: A- Door of Vishrambaug Wada. B- Door of Bhau Saheb Rangari Wada.

3.5 Window:

Vishrambaug wada consist of full height wooden window from floor to height which has cusped arch decoration provided two shutters with smaller opening on top. This feature conveys the traditional style of wada architecture. In wadas window are narrow but tall up tended from floor height. This window was designed to get view of outside for person seated folding his legs and for those who are standing. It provides ample amount of light inside the space and wind movements along floor level

Bhau rangari wada also has full height and narrow windows which are provided with partly closed wooden panel and double shutter. It has less ornamented but pretends the traditional style. This wada has one small window (as shown in figure 6 B1) which is located on floor level and where act as a c.c.t.v in peshwa period as it provides view of entrance for person seating inside last kholi of wada.

In phadke haud wada sizes and no. of windows depend on the size of kholis. Mostly small window opening with double shutter and iron railing is provided.

A **B** **B1** **C**

Figure 6: A- windows in vishrambaug wada.
B- windows in Bhau saheb Rangari wada.
C- Windows in Phadke haud wada.

3.6 Staircase:

In old wadas staircase were narrow and straight sandwiched between thick brick walls this is probably for maintaining privacy so that women wouldn't be seen from outside when move around in the house. Presently vishrambaug wada has one wooden staircase which is used to access exhibition space at first floor. This stairway supported on one side of wall and provided with wooden baluster on other side. Bhau rangari wada has centrally located straight narrow staircase which is sandwiched between two thick brick walls which pretends the traditional style of peshwas period. At phadke haud wada one dog legged wooden staircase and one aluminium staircase are provided opposite to each other. Wooden staircase is mainly used to access major kholis of first floor, other one is limited for access of 2-3 kholis. Wooden stairs is not in good condition the landings and flights are decomposed due to lack of maintenance and cleanliness.

A B C

Figure 8:A- Staircase in vishrambaug wada
B- Staircase in Bhau Saheb Rangari wada
C- Staircase in Phadke haud wada

IV. Conclusion:

The present conditions of vishrambaug wada and bhau saheb rangari wada showcases the integration of tradition and culture in wada design during past period. The implementation of features, spatial elements and ornamentation represent the quality of workmanship which is still holding the character of structure. Vishrambaug wada is conserved and maintain by pune municipal corporation whereas bhau rangari wada maintain by bhausaheb rangari trust. This structure conserved in present conditions which are adoptively reuse as exhibition space and museum respectively. it has large heritage value which increases tourism potential of city.

In other case of phadke haud wada several families are staying in wada from past three generations. This families belonging from lower and middle-income class, whose income is very less. Which results into poor maintenance of their residence.

Solution:

Phadke haud area has consist of large commercial development in frontage and residential behind. The same phenomenon can be implemented in wada by renovating its frontage into shops and above small offices. The rent obtained by shops and offices can be used to maintain and conserve the wada in present condition. This is one of the solution for gentrification of this structure in today's urban context.

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Changes in the openings & fenestrations in the wada's & mansion's of Pune in 19th, 20th& 21st Century

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Abstract : The study focuses on the various typologies in the openings and their fenestrations in the residences of Pune in the 19th ,20th and 21st century. The study is limited to the residences (wada or mansion) of Pune with only ground, ground+1 or ground+2 structures. The study is conducted in order to understand the changes and evolution that happened from 19th to 21st century in the opening typologies, what lead to these changes and their impacts on living style of people and surrounding. There are eight different aspects on which the study is conducted, which includes- light quality, ventilation, sizes of the openings, material, opening mechanism, shading devices, contribution to streetscape and ornamentation. Various cases from the core area in the city are selected in order to study the changes and evolution. The core area includes guruwarpeth, shukrawar peth, laxmi road, Bmcc road, tilak road. A cognizant study has been done in order to select all the examples for the research. This concludes that with technology, advancement, changing lifestyle has not only made people open minded, somewhere it has restricted the person in the four walls. We might have windows with huge size, but it remains useless if we don't even know the person living next to us.

Keywords: openings, ornamentation, carvings

Introduction

The doors and doorways provide access from the outside into the interior of a building as well as passage between interior spaces. A window is a puncture in a wall which helps us connect with the outside world .Window and doors are not merely used for transition but they add a lot more value than this. From ancient times, when women were not allowed to move out of their house frequently, the windows (jharokas) played a very vital role in their lives. Women would peep into those jharokas and look at the activities happening outside in the world. In olden times, the jharokas were also used for ventilation purpose because they would allow the cool breeze to enter the house and keep the atmosphere cool. Also in summer the matka's (earthen pots) were kept outside in the jharokas which would keep the drinking water cool throughout the day. Also women would peep into the windows and get alert about who is entering the house.

The intricate carving, designs, fenestration which represents the great Indian Mughal Architecture of19th century, represents culture in today's era.

The intricate carvings, design pattern on fenestrations in the wada's during 19th century added not only to aesthetics but functions as well. Those carvings on the walls act as articulation without compromising it's function. The jaali carvings for ventilation which keeps the space lit, without entering the glare.The brackets supporting the balcony, the type of balcony railings. Unfortunately this legacy cannot be identified in today's architectural style.

The windows and doors contribute in making a space lit, they act as interaction element in a building. Women talk standing in their balcony or a window to the woman on the other side .But the value of window or an opening changes according to its placement in a building also the type of building.

For eg- A window in a room of resort situated on a hill, will add more value because it adds a view to the visitor or the person who own for that time being. A box window in a room of a kid who sits in it and study or amuses to look outside will have different experience.

However, whatever the placement of a window is in a structure the most important thing is its function.

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Titles of tables

Table 5- 19th century

Built - 1857
Location : Tilak road, Pune

Ram Bhavan

Sr. No.	Aspects		Description
1	Light Quality		The mansion is located on the main road at tilak road. The façade faces in the north-east direction. All the openings are also in the north-east direction. The structures shares common wall from the adjacent side. The neighbouring structures are residential apartments and commercial complexes.
2	Ventilation		The living room has two doors and two windows. It gets the maximum light due to its positioning in the direction of north-east light.
3	Sizes		Double Door – 0.8mX2m Double door Window – 0.75mX1.75m Ventilation window – 0.8mX0.4m
4	Material		The material used is purely wood. Not only door and door frames are made of wood, the façade is also made up of wood.
5	Opening Mechanism		The doors and windows open outside the living room. The ventilation window above the door and window opens upside.
6	Shading Devices		As such no shading devices were used. The balcony extension above every floor was used as shading device.
7	Contribution to streetscape		The structure among the whole street is the only structure of 19th century with such intricate carvings still existing. The structure stands bright among the street as all the nearby structures are either transformed into commercial or rebuilt.
8	Ornamentation		This mansion from 19th century had the maximum ornamentation in terms of carvings on the wood of the balcony.

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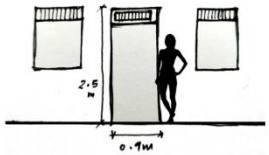
Table 6- 20thcentury

Built - 1929 R.S. Gokhale Mansion
Location – Laxmi Road, Pune

Sr. No.	Aspects		Description
1	Light Quality		The Mansion faces towards west side, the openings are also in the west direction. Because of low rise structures near-by the mansion gets the maximum light during day time.
2	Ventilation		In the living room of size 4Mx6M, it consists of two windows and one door on the front façade of the first floor. Also the door has a ventilation window above opening in the balcony.
3	Sizes		Door sizes - 0.9mX2.1m Ventilation window (above door) – 0.9mX0.5m Window size – 0.7mx1.5m
4	Material		Door frames – wooden Grills in balcony – iron Grills frame work – wooden Fenestration – wooden intricate design
5	Opening Mechanism		The double doors opens outside the living rooms, that is, the door opens inside the balcony. The doors of the window opens inside the living room.
6	Shading Devices		The balcony is the extension of the living room. The balcony is covered with Mangalore tiles. The balcony has a roof of G.I. sheets and Mangalore tile.
7	Contribution to streetscape		The mansion is slightly away from the main road and hence there is less traffic noise and is located at calm place. The street is purely residential with less traffic. The structure is of 20th century and the area has few more structures from the same century, which compliments each other.
8	Ornamentation		The ornamentation for this mansion is not something attached to it, instead it is carved into the stone wall itself. Like the ventilation window of stone material on the front facade.

The mansion share common wall from both the sides. The special feature that attracts this mansion is the roof profile and the balcony hanging. The balcony overhang to the footpath and it is also shaded from the top. The balcony is 1m in width, spacious enough to accommodate chair and to have high tea. The residents like to sit during morning hours as there is no traffic noise at that time of the day. The living room of the mansion is the space where the residents spend most of their time.

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Table 7- 20th century

Built - 1935 Mama Mansion
Location – Guruwar peth, Pune

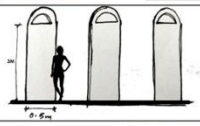
Sr. No.	Aspects		Description
1	Light Quality		The Mansion faces towards south east side, the openings of living are in south east direction. Because of low rise structures near-by the mansion gets the maximum light during day time.
2	Ventilation		In the living room of 4.5mX5m, it has 3 door openings of 0.8mX2m. The doors further opens in the balcony of size 4.5mX1m. The living room does not contain any window in the front façade i.e. in north-west direction.
3	Sizes		Door size – 0.8mX5m Arch(above the door) – 0.5m dia
4	Material		Door frames – wooden • Teak wood from Assam Grills in balcony – iron Grills frame work – wooden Fenestration – wooden intricate design Stained colourful glass for the arches
5	Opening Mechanism		The double doors opens outside the living rooms, that is, the door opens inside the balcony.
6	Shading Devices		Overhangs for the balcony. The balcony itself has a roof of the immediate floor above.
7	Contribution to streetscape		The mansion is located at the corner of the street. The street adjacent to the mansion is 3m in width. With the new structures emerging nearby, the mansion is adding an old textures to the busy street.
8	Ornamentation		The brackets supporting the balcony.

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Table 8- 21st century

Built - 2000 Vrindavan
Location – Shukrawar peth, Pune

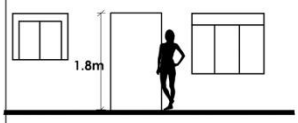
Sr. No.	Aspects		Description
1	Light Quality		The bunglow faces towards north-east direction. The living room openings are on three sides i.e. south-east, north-east and north-west. The living room gets maximum light during the day time. The surrounding near the bungalow is fully residential with maximum of G+4 structures.
2	Ventilation		ventilation window. Also it has got the extended balcony like in old structures. The balcony is attached to the bedroom.
3	Sizes		Door size – 1.2mX2.1m Window – 2.4mX1.5m
4	Material		The frame of doors and windows are made of wood. Glass for window is used. Iron grills for window.
5	Opening Mechanism		Double door opens outside the house. The double doors of windows also opens outside the house.
6	Shading Devices		For main door – pergola is used as shading device. And for windows chajjas are provided. For the windows on ground floor, individual chajjas are gives and for first floor the chajja run all along the edge.
7	Contribution to streetscape		**The bungalow is surrounded by residential buildings of ground and ground+1 structures only. This is the only bungalow there made with stone work, which stands attracted in the street elevation.**
8	Ornamentation		**The ornamentation is in jaali form. Different floral pattern for jaali is used in the balcony covering for ventIlation purpose as well.**

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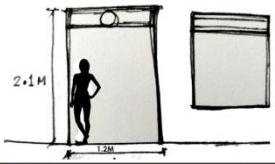
Table 9- 21st century

Built - 2002 Nath
Location – Erandwane, Pune

Sr. No.	Aspects		Description
1	Light Quality		The bunglow faces towards west directions. It is an corner oriented bungalow on the, so it gets a privilege of clear opening from three sides as the three sides are along the roads. The bunglow has openings on all the four sides.
2	Ventilation		No other elements for ventilation is used. Like in other structures there were ventilation windows above the door or under a window but in 20th century structures no such windows can be seen.
3	Sizes		The sizes are double then of the 19th century structures. Main door size – 1.2mX2.1m Balcony door size – 1.8mX2.1m Window size – 1.2mX1.8m
4	Material		• The material used for window Aluminium frame, glass, iron grills • Material used for door Stained glass, plywood for door & door frame
5	Opening Mechanism		Windows have sliding mechanism Main door is single door which opens inside the living room. The door for lawn opens outside the door. Also this door is double door of width 1.8m.
6	Shading Devices		No shading devices were used. **The ground floor windows were covered with the extension of floor slab above and the windows on the first floor were shaded by the parapet exteding.**
7	Contribution to streetscape		**The bungalow is located in residential area on a busy street, therefore there is constant movement of vehicles .Adjacent to bungalow is a 5m wide road. The bungalow is surrounded by highrise residential appartments.**
8	Ornamentation		Ornamentation is the glass on the doors. The colourful stained glass are used on the doors. The glass has some drawing or a colourful scenery for decoration purpose.

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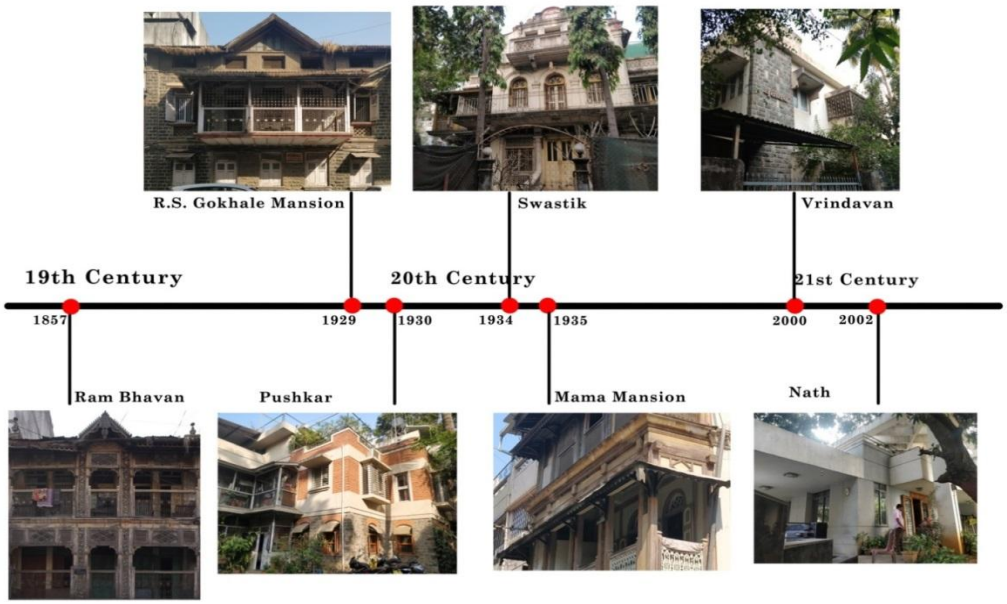

Figure 10- The above picture displays the change in elevations due to openings from 19th to 21st century.

The different examples selected from different areas from the city shows the changes in the opening typologies. In the example of structure from 19th century, there are maximum openings on the front façade followed by intricate carvings done on the wood as fenestration. The structure from 20th century, Gokhale mansion has a balcony extension which is the main feature of the mansion. It is a covered balcony where the residents sit and enjoy tea. In this mansion the carvings are done on the stone wall. The carvings on the wall also serves the function of ventilation. The other structure, Mama mansion is again similar to the 18th century structure, it has the same type of balcony and eaves. Both of their opening's construction is done with wood and the grills used are of iron.

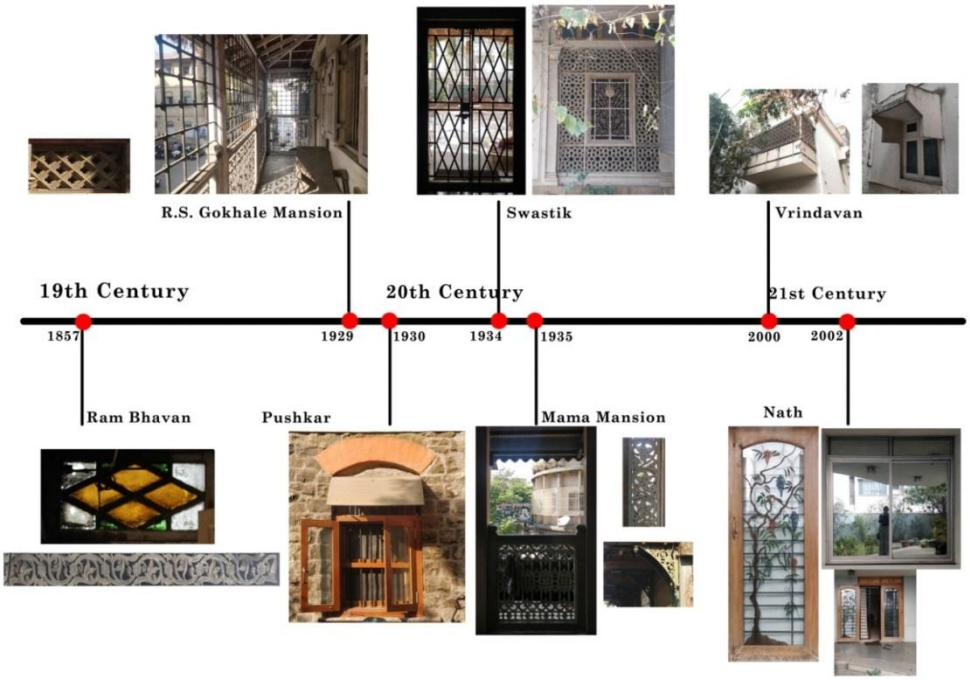

Figure 11- The above pictures shows the changes in the window pattern of living rooms from 19th to 21st century.

Analysis & Results

1. The change in material used for construction. Earlier teak wood and other wood were used for making frames, doors and windows.
2. The ventilation window above the doors and windows have vanished. There is no such window through which women can peep into, without coming into notice of the visitor or somebody passing by.
3. The ornamentation and fenestrations which includes intricate carvings on stone wall and wood also vanished.
4. The emergence of stained glass for doors and windows in 21st century.
5. Double door windows now replaced with aluminium sliding doors.
6. The peep holes and the doorbells have replaced the use of knocking on the door with and jharokas. The spaces around these openings remains dead.

Acknowledgements

Any research conducted, requires guidance from an expert, support from friends and family and also confidence in oneself. This research was also impossible without the guidance of my expert guide Ar. Mrunalini Anekar, who was a constant support, who guided me at every stage. Constantly helped me in improving and made me realize that I can complete this report. My heartfelt gratitude towards my guide for guiding me and teaching me every aspect through which this research could be completed. I also thank my friends for helping me conduct certain documentation required for the research and VIT's PVP College Of Architecture for giving me the opportunity to conduct this research.

Street Food: How It Affects the Street Character

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Abstract : Food is one of the basic principles that man needs for sustenance. Throughout the history of mankind, this need has been known to be integrated into the social, cultural and the economic levels of society. Food has also been the starter for many socio- economic and cultural phenomena. One such phenomenon is the development of street foods in shaping the culture of the cities. Each city has its own distinct street foodscape which does affect the built and unbuilt environs in the city. This factor affects many aspects of an urban setting like footfall, traffic flow, management of services, etc. The street has been an integral part of urban activities since many decades. One of the main activities that define a bustling street in an urban context is the street food vending. This activity has evolved in the city of Pune as Khau – Galli or Food Streets. The character of these streets is very different than others as they employ various systems for their functioning and their users vary in numbers and types. However, due to the urbanization of the city, the streets are losing favour due to issues of congestion and hygiene amongst the few. Though Khau – Galli caters to large strata of society, they may get demolished in the new urban wave of development. This study aims to analyse the working and perception of these streets and their character on various user groups and finding how can these streets be maintained, absorbed and retained in urban city by proposing basic guidelines for an ultimate urban Khau Galli.

Keywords: Street food, street character, street function, urban design

Introduction

Food has also been the driving force of many revolutions in history and also the starter for many socio- economic and cultural phenomena. One such phenomenon is the development of street foods in shaping the culture of cities. Each city has its own distinct street foodscape which affects the built and unbuilt environs in the city.The streets where there is an excessive sale of these foods have evolved to be "Khau – Gallis" in the city of Pune. These streets are well known for the food sold in that specific street. Examples of these famous streets in the city can be the East Street in Camp where we mostly see Mughal or non- vegetarian food being serveddue to pre dominance of Muslim and Christian culture or the ones in Peth areas of the city where we mostly see stalls and eateries serving traditional Maharashtrian snacks. Also these streets have added to the street character as well as to the built character of surrounding buildings. They act as a landmark in themselves and for the area surrounding it.

The need for this research came through recent occurrences of mass demolition of street food stalls in the city in the name of road widening and facilitating the development. Along with the earlier problems, the concern amongst masses regarding the hygiene of food being served in stalls also added to the problems faced by the Khau Gallis. As food connects majority of the people, these active spines of city should not disappear and there needs to be a formal study as to how these streets add to the social, economic and functional value in the lifestyle of the masses.

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Methodology

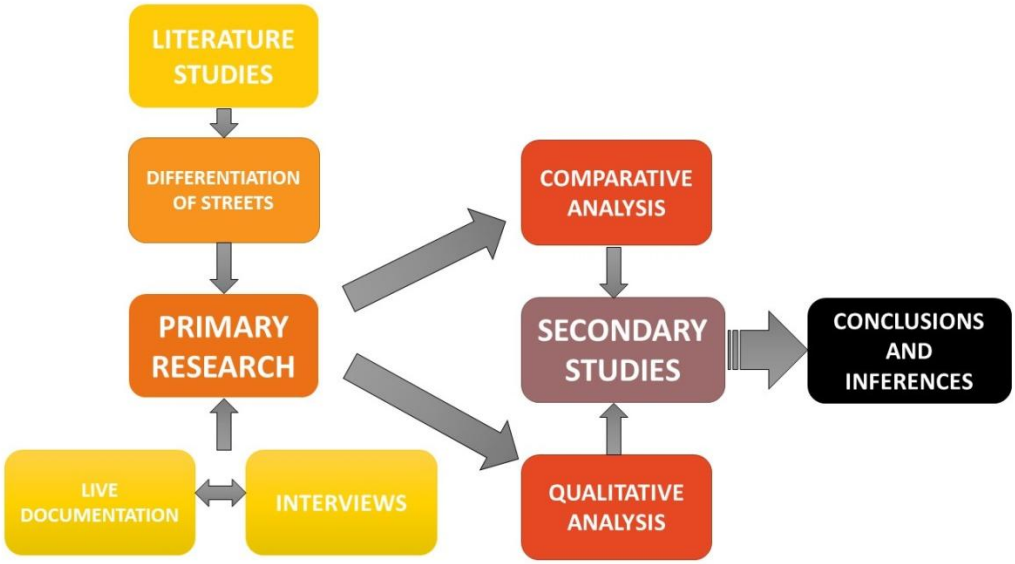

Figure 12 : Methodology.

The Types Of Food Streets: Anchor Activities

The Khau Gallis in Pune have evolved according to the needs of people, potential of business and the ease of setting up the food stalls along with many other factors like flow of traffic, geographical location, etc.

Despite the various types of streets, the common link between them is that the streets start developing due a certain anchor activity in the area. This activity is generally the one which generates the foot fall during the development of the Khau Galli. The activity can vary like work, recreation, religious hotspot, etc but the anchor point plays a crucial role in determining the character of the street.

THE TYPES OF FOOD STREETS: TIME OF DEVELOPMENT

The food streets in Pune have been there since many decades. The streets developed in various timelines also vary in character as they have to abide by the recent laws and the needs of the people. Thus, studying the streets in various timelines is also important to have a comprehensive analysis.

Selected Streets

The following streets in Pune City have been selected for study.

1. Sarasbaug Khau Galli – Adjacent to Sarasbaug garden near Swargate.
2. Dnyana Prabodhini Khau Galli – Street near Dnyana Prabodhini School.
3. Goel Ganga Khau Galli – Developed by Goel Ganga Group as a part of housing society.

The streets have been selected after applying the following criteria-

Time of development –

1. Sarasbaug – The street gained popularity in 1990's
2. Dnyana Prabodhini – The street gained popularity in 2000.
3. Goel Ganga – The street gained popularity in 2010.

Street loading pattern –

1. Sarasbaug – Doubly loaded street with pedestrian circulation during working hours.
2. Dnyana Prabodhini – Doubly loaded street with mixed circulation during working hours.
3. Goel Ganga – Singly loaded with a buffer zone and separate pedestrian and vehicular circulation.

Street character –

1. Sarasbaug – Eateries with temporary structures and sit outs.
2. Dnyana Prabodhini – Permanent eateries along with roadside stalls without sit outs.
3. Goel Ganga – Mixture of both permanent and temporary establishments with sit out spaces.

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The following images show the street along with selected length highlighted. The colors represent:

- Orange – Circulation corridor.
- Brown – Permanent establishments and eateries.
- Yellow – Temporary establishments and stalls.

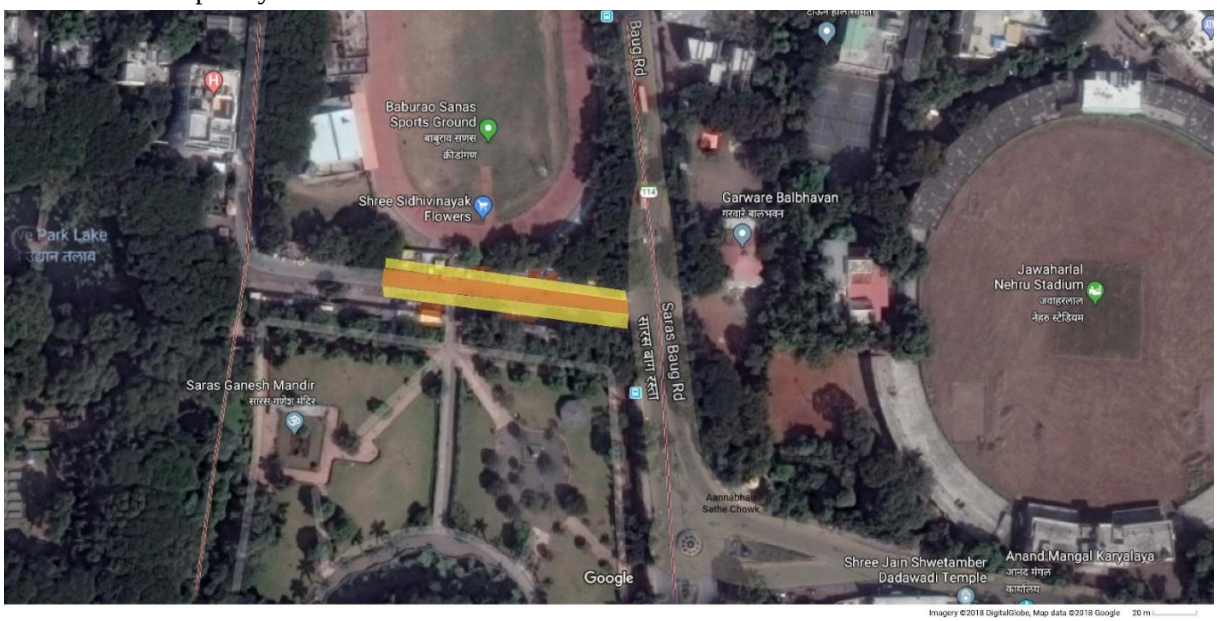

Image 1 : Sarasbaug Khau Galli with selected street length.

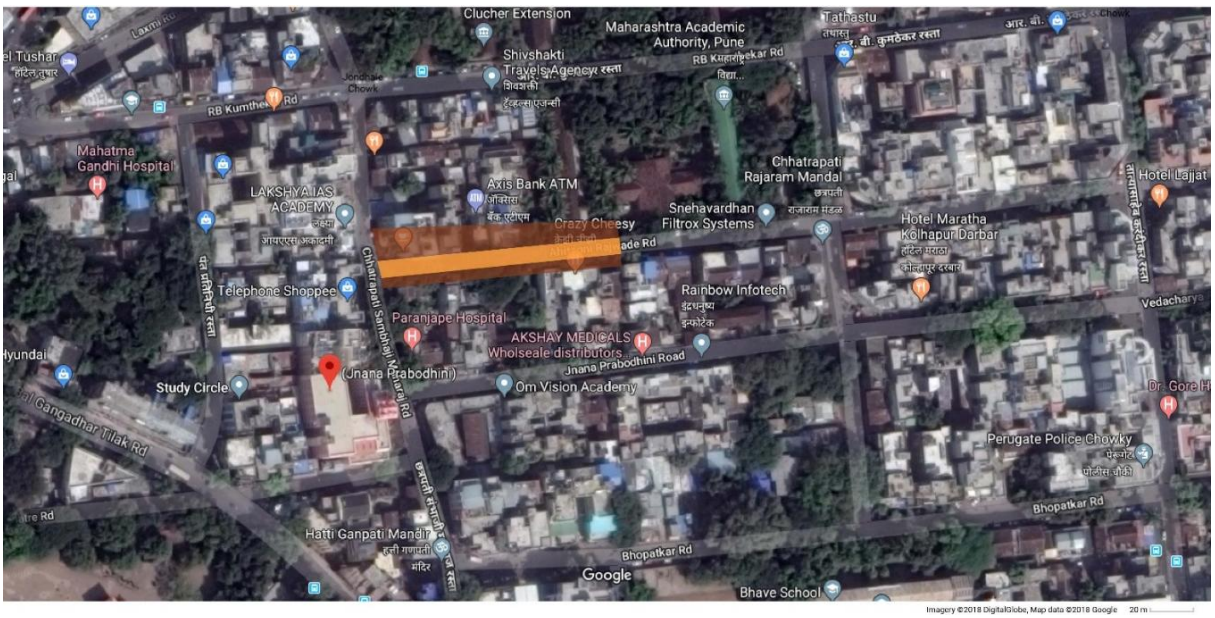

Image 2: Jnana Prabodhini Khau Galli with selected street length.

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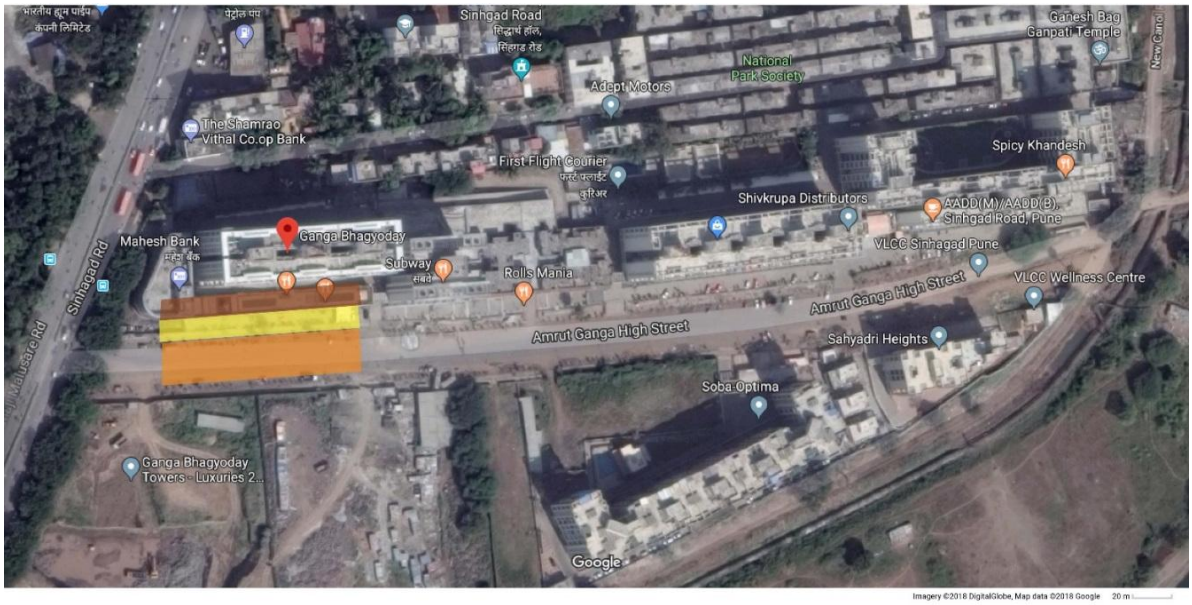

Image 3: Goel Ganga Khau Galli with selected street lLIVE CASE STUDIES

Sarasbaug Khau Galli

The Khau galli arose in the area due to the anchor activity of Sarasbaug garden and the Peshwe energy park. It is one of the most famous food streets in Pune. The food served here is primarily fast food along with paan and chai tapris. The stalls are temporary structures made of tin sheets and bamboo or steel framing.

Drawings and Imagery

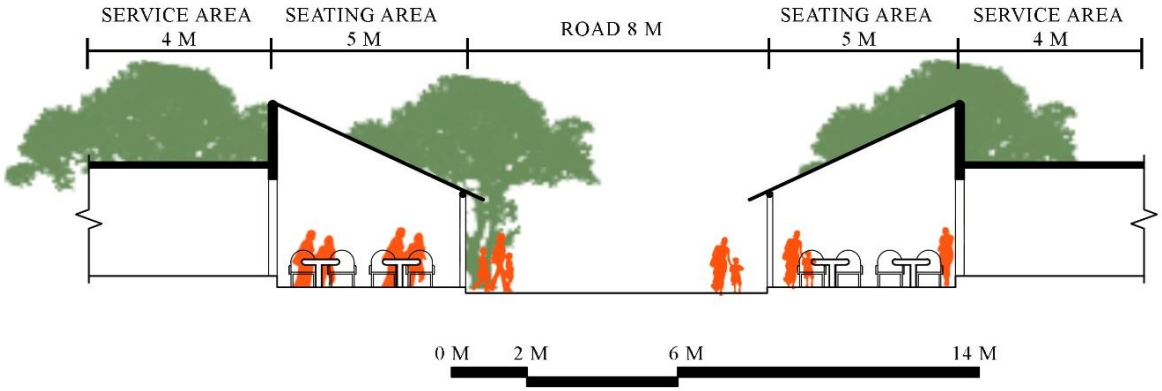

Figure 13 : Cross section - Sarasbaug Khau Galli

Image 4: Sarasbaug Street Elevation

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Image 5 : Sarasbaug Khau Galli

Character

1. During the day the street is not crowded at all but the services like loading of material and waste disposal keep happening throughout the day.
2. There is no fixed pattern for loading of raw material and disposal of waste for all establishments which sometimes interferes with the food vending activities.
3. The stalls have temporary sit out arrangement which is semi open.
4. As the food items sold are repeated, there is competition amongst vendors to attract customers. Other activities like horse rides and fair games attracts a larger footfall.
5. Vehicular traffic cannot enter easily into the street during peak hours as the street is narrow and packed with people.
6. Informal rickshaw stand and a nearby bus stop provide easy connectivity.

Jnana Prabodhini Khau Galli

Introduction

This Khau galli arose in the area due to a boom in educational institutes that opened after the Jnana Prabodhini School was established. As the number of institutes and students increased, hostels sprung up in the surroundings and then eateries opened up shortly afterwards. The food street now has a lot of eateries on both sides of the road which are permanent structures. The services like water supply and electricity as well as sewage disposal is provided by Municipal Corporation for the built up eateries.

Drawings and Imagery

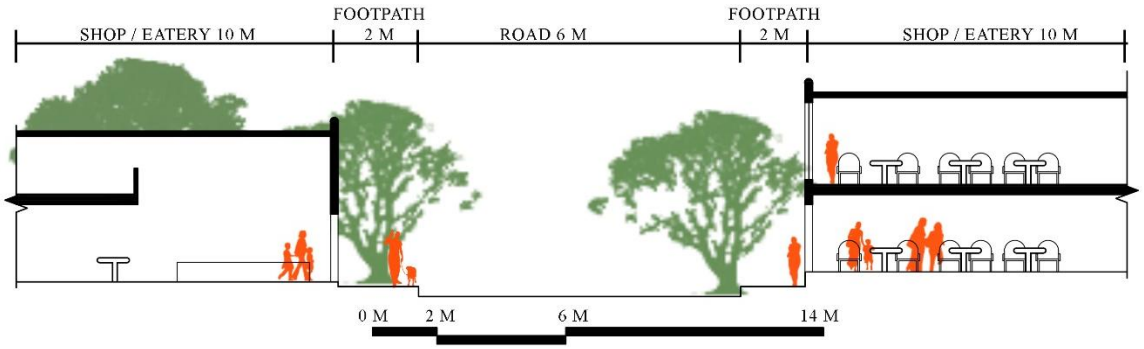

Figure 14 : Cross section through Jnana Prabodhini Khau Galli

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Image 6 : Jnana Prabodhini Street Elevation

Image 7 : Jnana Prabodhini Khau Galli

Character

1. The street is moderately crowded throughout the day and even in the evenings.
2. The footfall remains constant throughout the day as there are user groups.
3. As there is a variety in food options that are served here, most eateries don't have to compete with each other to attract customers.
4. There is no space for sit outs for eateries as they directly open to the road. The seating is provided by some outlets inside their space or the people stand on the footpath or sits on parked vehicles outside the eateries. This adds to the character of the space.
5. There is a set pattern for loading of raw material and disposal of waste for the eateries which does not interfere with the food vending activity.
6. The street infrastructure like footpaths, parking spaces falls short of accommodating the footfall coming at peak hours.

Goel Ganga Khau Galli

Introduction

The khau galli has been a recent development as a part of housing society at Sinhagad Road. The food street is not like a typical khau galli which has food vending on both side of the road but is situated along one side of a wide road and has both built eateries and small temporary food vending establishments. The street is visited by people in the evenings who want to spend some time outside but want to stay away from heavy traffic. A lot of variety in the food sold and even the scale of establishments can be seen.

Drawings and Imagery

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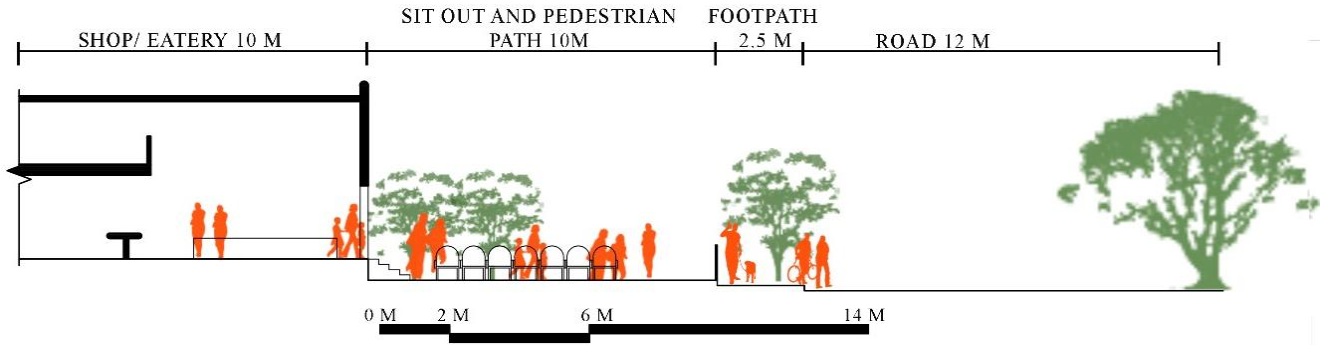

Figure 15 : Cross section through Goel Ganga Khau Galli.

Image 8 : Goel Ganga Street Elevation.

Image 9 : Goel Ganga Khau Galli.

Character

1. The street has high footfall in the evenings and most of the shops are closed during the day.
2. The buffer space acts as the most active spine of the streets and lends major character to the khau galli.
3. The buffer is lined by trees on the road side which provides shade and freshness to the street.
4. There is no efficient street lighting provided but the mutual lighting of the shop fronts keeps the darkness away from the street.
5. There is no proper provision for sanitation like public toilets and public waste bins.
6. The loading of goods and garbage disposal happens in the morning and the specific time has been decided by all shops which avoids chaos during peak hours.

Interviews

The interviews were conducted for both the stakeholders of the khau galli the consumers and the providers. The consumers include the group of people who visit the khau galli whereas, the providers include the group of people who sell food in the khau galli.

The interviews were conducted for these groups as-

1. Consumers group

The method of interview for these people was through a quick quiz on the site itself. This facilitated a narrowed input and thus, this input could be easily translated into overall vote.

2. Providers group

The method of interview for these people was through a conversational interview on the site during non-peak hours of work. This enabled to enlist their experiences accurately so as to know their side of trade.

Consumer Group interview

How often do you visit the Khau Galli?

1. What do you like the most about the space?
2. How do you rate the following on a scale of 1 to 5,
- Service speed
- Seating Arrangement
- Hygiene / Food Quality
- Environment / Atmosphere
- Cleanliness of the street
3. What other Public Infrastructure would you like over here?
4. From what distance or place have you come from?

Provider Group interview

1. What is the peak time and rush experience?
2. What is the system employed for garbage disposal and loading of raw materials?
3. How do you think the Infrastructure can be changed?
4. What are the positive and negative aspects form the point of view of business in the Khau galli?

Based on the interviews following inferences can be drawn up-

Sarasbaug Khau Galli-

Positive aspects

1. The location of Khau galli attracts a lot of customers on daily basis.
2. Open sit out means that there is no crowding inside.
3. Active operation in evening gives a lot of time for preparation in morning.

Negative aspects

1. The problem of mosquitos.
2. Same food items on sale means loss in business.
3. The need to carry in goods means we have to pay extra to boys who carry in the load.

Jnana Prabodhini Khau Galli-

Positive aspects

1. The location of Khau galli attracts a lot of customers on daily basis.
2. There is constant source of income as there is fixed clientele due to the coaching institutes.
3. No large restaurants are there which gives everyone an equal chance of business.

Negative aspects

1. The space in each shop is less to accommodate all customers at rush hours.
2. As the shop fronts are all closed off, there is no good ventilation available.
3. The shops are narrow so the customers feel congested.

Goel Ganga Khau Galli-

Positive aspects

1. The location of Khau galli attracts a lot of customers on daily basis.
2. The open sit outs means that a lot of people are accommodated in each shop.
3. As there is a pedestrian street, people walk through and choose the eateries.

Negative aspects

1. There is no public infrastructure like toilets and garbage bins.
2. Nuisance of road side vendors.
3. Competition with big restaurants.

Literarture Review

After conducting the live case studies and the interviews, the next aspect to be studied is how have these urban spaces for food evolved over time?

Carolyn Steel is an architect, lecturer and writer. A director of Cullum and Nightingale Architects, she was a Rome scholar, has written for architectural press, and presented on the BBCs One foot in the past. (Steel, 2008)

After viewing her TED talk on the topic How to feed the cities, I read her book Hungry City: How food shapes our lives. In the book Steel discusses how food affects the urban setting on various levels such as the city, the stores, the households and even on a personal level at a family table. The literature review mainly focusses on one of the topics in the book named Market and Supermarket.

Market and supermarket

The shopping centre which can do more than fulfil practical shopping needs, the one that will afford an opportunity for cultural, social, civic and recreational activities will reap the greatest benefits.

Victor Gruen (Victor Gruen, 1960)

Any evolved urban space like a traditional market or a food street not only offers facilities like super market does but also offers an experience. These evolved urban spaces have been there at the location for a long period of time. As place and people change together, there are associations formed over time. These associations and perceptions between time, place and people make up the experience.

These spaces of community in an urban scenario are not only about the activities and systems required to complete the activities. Celebration of each activity is more important. For example, the process of buying food in a food mall is pretty simple, go to the counter, take a token and wait in queue to take your food. But, in case of a food street, the same activity is celebrated in the following way. The Customer goes to the shop or the stall, discusses what is the best thing to buy for his requirements, if the customer is regular then there is an added idle talk between the both, the customer sees the vendor preparing the food and then he takes the food. Such small interactions cannot be celebrated in a mall or other establishments where efficiency and mass production is given priority over the interactions and exchanges as they happen in a food street. The chaos of these spaces give them a character and atmosphere which is different than conventional malls and restaurants.

Power to transform lives: These urban spaces also have a unique ability. Due to the attachments and experiences they offer to every person associated with the space, the people invest their lives into these food streets or markets. The lives of people especially the provider group consisting of vendors and service givers gets attached in the activities and space of these markets.

As markets were the main congregational spaces, they also were the ceremonial spaces in the city. Celebrations and ceremonies have food as an integral part of proceedings and thus, markets also became the grounds for celebrations of festivals, ceremonies, etc. As they got importance through other ancillary activities, markets also gained popularity in political and cultural aspects. INFERENCES

Sarasbaug khau galli

Presence of Sarasbaug and Peshwe garden developed a khau galli whose anchor activity is recreation. Hence, the environment or the feel of the khau galli is also that of a recreational space. Even though there is chaos it does not cause any problems but instead add to the character of streets.

Other activities like fair rides and horse rides along with a small shopping stalls add to the footfall and give other purpose to the street. The street should be more organized and there needs to be proper systems for loading of material and garbage disposal to be developed.

As the stalls do not have a permanent built status, there is haphazard arrangement of stalls which pose a danger of fire and increases risks in calamities. Last but not the least is the control of vehicular entry into the street at peak hours. The entry of vehicles should be not allowed during peak hours so as to utilize the road space as pedestrian passage optimally.

Jnana Prabodhini khau galli

The Khau Galli specializes in serving quick snacks that can be had in a short period of time suitable for people who came to eat out during small breaks in lectures. Many customers visit the khau galli regularly which has developed their relations with khau galli and the fellow customers.

As almost all eateries are built up and have narrow shop fronts, there is a problem of sufficient ventilation inside and this impacts negatively on the overall experience of the street. The seating arrangement for some eateries is done in their own space which is not sufficient. Remaining eateries don't provide the seating but people stand up outside the eateries itself on the footpath causing congestion on footpath forcing the people to walk on the road.

The public infrastructure in the street is poorly lacking. There are no seating spaces available or any buffer spaces where the crowd can gather away from the road. Also other infrastructure elements like garbage bins and a public toilet is also missing. This adds to the discomfort of people, especially women. Parking for four wheelers cannot be accommodated in small parking lots that are available on the street or the surrounding areas.

Goel Ganga street

This khau galli came up as a part of the development of a housing society. It was a new introduction and has not evolved over a time period. As it lies close to a major transit road and adjacent to a connector road, the street enjoys moderate to heavy footfall throughout the week.

The unique aspect of this khau galli that increased its popularity is that it has an open buffer zone in between the road and eateries. It is used by shops as sit outs according to the width of their shop fronts as well a pedestrian zone before the footpath. The buffer also gives space for informal vendors to set up shop which adds to the liveliness of the street. This system also works as it offers the people a unidirectional way of circulation.

The next important thing for the good footfall and increase in popularity of the street is that the street has a mix of shops based on scale, the goods they sell and also according to the time of operation which attract more people because then they can perform more than one activities in the same space.

Conclusions

After drawing out the inferences, following conclusions can be drawn which may be basic guidelines for a Khau Galli to be an effective urban insert.

Now, this urban space should not only attract people and generate business for the traders but should also-

1. Be a place of celebration.
2. Provide social, cultural and recreational activities.
3. Provide a living to the economically weaker sections of the society.
4. Be affordable and versatile.
5. Be a breathing space in neighborhood.
6. Keep traditions of age old Khau Gallis alive.
7. Blend in the surrounding atmosphere or environment of the neighbourhood.

Guidelines

To fulfil all the above pointers of how this space should be, guidelines in these basic parameters needs to be formulated.

1. Economy.
2. Space.
3. Infrastructures.
4. Systems.
5. Environment.

Economy

1. To mitigate the competition between food stalls and to increase the variety of options, there should be no repeating of main food items in more than 10 % of small and medium food stalls. This may or may not apply to restaurants having a capacity of more than 50 seats depending on the scenario.
2. There should also be variety in the areas of shops available for sale at the development so as to mix in the scale of outlets. Not more than 20% of shops of same areas can be grouped together. This is to promote the mix of crowds and increase in footfall.

Space

1. The shop frontage should minimum be 4.5m so as to have proper ventilation. If the ratio of width to depth of a shop goes beyond 2.5, then provisions for cross ventilation to be made. Provisions for mechanical ventilations to be made for all depth to width ratio greater than 1.5
2. No shop should be given more than 3 storeys. Internal staircase to be planned accordingly with a connection of all storeys to an emergency fire staircase.
3. A buffer zone to be designed of at least 12m width which should accommodate the open space program having but not limited to sit outs, green areas, informal vending areas, hawker zones, exhibition spaces and a pure pedestrian circulation area of minimum 2.5 m width.

Infrastructure

1. The khau galli should have one each: bus stop, rickshaw stand and a car and private bus drop off point.
2. Public toilets for men, women and handicapped should be provided considering the maximum footfall at peak hours. These toilets can be in form of one block if the length of street is less than 200m but should be divided and spread over the length of the street for street length more than 200m.
3. Garbage collection bins having provisions of wet and dry waste along with a separate compartment for food waste to be provided in common in two to three food shops.
4. Hand wash areas to be provided at intervals of 50m along with drinking water counters.

Systems

1. Systems for garbage collection should include formulation of time period for collection of garbage common to all stalls with pre designed garbage collection points. Garbage drop off points can also be created. Proper segregation and disposal according to the nature of garbage to be conducted.
2. Systems for loading of raw material should include formulation of time period for loading of materials into shops by tempo. Buffer zone to be designed such that selective entry of tempos during fixed time period be allowed.
3. Passive ventilation and lighting systems should be encouraged. Fuel requirements for food stalls to be provided by natural gas pipeline running throughout the street. Some connections for piped gas can also be leased out to the informal vendors.

Environment

1. To make the street livelier, open exhibition spaces which will be rented out for open art exhibitions or performances must be included in design. These spaces must form 10% of the area of buffer zone.

2. The peak hours in khau galli need to be decided during which no shops can be closed without permission of the management authorities. To do this the response of people to the space can be studied and the peak hours could be determined.

3. The amount and location for advertising signages for each shop should be fixed and pre decided. The signage can also have some common elements of design so as to distinguish yet tie up all the shops in the street.

With these guidelines a new form of Khau Gallis can be evolved which will retain, maintain and absorb the original urban passageways of food, culture and life.

Acknowledgements

I would like to thank Ir. Reshu Gupta, Ar. Narendra Dengle and Mr. Raja Dikshit for giving me invaluable advice and whose insights added more meaning to this paper.

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Biophilic Workspaces Comfortable Workplaces

Ruchi Khumbani

Abstract : What makes work feel good? For modern organizations and their people, it's about much more than the end goal of productivity and profit. How we gain meaning, a sense of well-being and of purpose in the workplace is just as vital, not only to feel good but to perform effectively too. The work environment has always been recognized as essential to employee well-being and performance. It's no coincidence that the most modern employers now take a different view, designing environments to help people thrive, collaborate and be creative. Being connected to nature and the outside world is a big part of that, and research is struggling to keep pace with the best practice that organizations are adopting to make that connection happen at work. A term first coined by social psychologist Erich Fromm in 1964 and later put into use byBiologist E.O. Wilson in 1984, 'biophilia' is defined from the Greek root meaning love of nature(Browning et al., 2012). At its base, the concept of biophilia is straightforward and explains that humans are innately drawn to associate with natural systems and processes. This is a directresult of how humans evolved. So by mimicking these natural environments within the workplace, can we create workspaces that are imbued with positive emotional experiences? It is often the case that we don't take enough time to immerse ourselves in nature, or appreciate the living systems that exist everywhere around us, making it vital for us to incorporate nature into our day-to-day environments. One such example is of 'Hinjewadi': Pune's IT Hub, with workplaces & thousands of companies with employees. The research paper focuses on studying contrasting scenarios of workplaces in Pune affecting people psychology and behavior with or without biophilic designed campuses. How nature act as de-stressing element in monotonous workplaces. Focusing on observing phenomena of Human nature, Nature & Architecture.

Keywords: Biophilia, workplaces, psychology, monotonous

Introduction

The interaction between an individual and their work environment can be a crucial determinant of both an employee's success and happiness in his or her role. Increasingly, employers and employees themselves are engaging in this debate about a more comprehensive view of work and the role it plays in our lives, as are governments and societies with the growth of projects measuring national well-being across the world. A connection with the natural world is a big part of that discussion however we frame it – escaping the concrete jungle, achieving a better level of balance or simply being in a space that is enjoyable.

The concept of biophilia[2][3][4][5] highlights an innate connection between humans and nature, which more recently has been recognized as a key consideration when designing and developing workspaces. The idea of incorporating nature into the built environment through biophilic design is less often seen as a luxury in the modern workplace, but rather as a sound economic investment into employees' health, well-being and performance. In today's contemporary built environment, people are increasinglyisolated from the beneficial experience of natural systems and processes. Yet it is often natural settings that people find particularly appealing and aesthetically pleasing.

The 'Biophilia Hypothesis' suggests that there is an instinctive bond between human beings and other living systems. It literally means a love of nature, and suggests an ingrained affinity between humans and the natural world. Therefore, biophilic design is a response to this human need and works to re-establish this contact with nature in the built environment. Ultimately, biophilic design is the theory, science and practice of bringing buildings to life and aims to continue the individual's connection with nature in the environments that we live and work in every day.

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14 PATTERNS		•	STRESS REDUCTION	COGNITIVE PERFORMANCE	EMOTION, MOOD & PREFERENCE
NATURE IN THE SPACE	Visual Connection with Nature	• • •	**Lowered blood pressure and heart rate** (Brown, Barton & Gladwell, 2013; van den Berg, Hartig, & Staats, 2007; Tsunetsugu & Miyazaki, 2005)	**Improved mental engagement/ attentiveness** (Biederman & Vessel, 2006)	**Positively impacted attitude and overall happiness** (Barton & Pretty, 2010)
	Non-Visual Connection with Nature	• •	**Reduced systolic blood pressure and stress hormones** (Park, Tsunetsugu, Kasetani et al., 2009; Hartig, Evans, Jamner et al., 2003; Orsega-Smith, Mowen, Payne et al., 2004; Ulrich, Simons, Losito et al., 1991)	**Positively impacted cognitive performance** (Mehta, Zhu & Cheema, 2012; Ljungberg, Neely, & Lundström, 2004)	**Perceived improvements in mental health and tranquility** (Li, Kobayashi, Inagaki et al., 2012; Jahncke, et al., 2011; Tsunetsugu, Park, & Miyazaki, 2010; Kim, Ren, & Fielding, 2007; Stigsdotter & Grahn, 2003)
	Non-Rhythmic Sensory Stimuli	• •	**Positively impacted heart rate, systolic blood pressure and sympathetic nervous system activity** (Li, 2009; Park et al, 2008; Kahn et al., 2008; Beauchamp, et al., 2003; Ulrich et al., 1991)	**Observed and quantified behavioral measures of attention and exploration** (Windhager et al., 2011)	
	Thermal & Airflow Variability	• •	**Positively impacted comfort, well-being and productivity** (Heerwagen, 2006; Tham & Willem, 2005; Wigö, 2005)	**Positively impacted concentration** (Hartig et al., 2003; Hartig et al., 1991; R. Kaplan & Kaplan, 1989)	**Improved perception of temporal and spatial pleasure (alliesthesia)** (Parkinson, de Dear & Candido, 2012; Zhang, Arens, Huizenga & Han, 2010; Arens, Zhang & Huizenga, 2006; Zhang, 2003; de Dear & Brager, 2002; Heschong, 1979)
	Presence of Water	• •	**Reduced stress, increased feelings of tranquility, lower heart rate and blood pressure** (Alvarsson, Wiens, & Nilsson, 2010; Pheasant, Fisher, Watts et al., 2010; Biederman & Vessel, 2006)	**Improved concentration and memory restoration** (Alvarsson et al., 2010; Biederman & Vessel, 2006) **Enhanced perception and psychological responsiveness** (Alvarsson et al., 2010; Hunter et al., 2010)	**Observed preferences and positive emotional responses** (Windhager, 2011; Barton & Pretty, 2010; White, Smith, Humphryes et al., 2010; Karmanov & Hamel, 2008; Biederman & Vessel, 2006; Heerwagen & Orians, 1993; Ruso & Atzwanger, 2003; Ulrich, 1983)
	Dynamic & Diffuse Light	• •	**Positively impacted circadian system functioning** (Figueiro, Brons, Plitnick et al., 2011; Beckett & Roden, 2009) **Increased visual comfort** (Elyezadi, 2012; Kim & Kim, 2007)		
	Connection with Natural Systems				**Enhanced positive health responses; Shifted perception of environment** (Kellert et al., 2008)
NATURAL ANALOGUES	Biomorphic Forms & Patterns	•			**Observed view preference** (Vessel, 2012; Joye, 2007)
	Material Connection with Nature			**Decreased diastolic blood pressure** (Tsunetsugu, Miyazaki & Sato, 2007) **Improved creative performance** (Lichtenfeld et al., 2012)	**Improved comfort** (Tsunetsugu, Miyazaki & Sato 2007)
	Complexity & Order	• •	**Positively impacted perceptual and physiological stress responses** (Salingaros, 2012; Joye, 2007; Taylor, 2006; S. Kaplan, 1988)		**Observed view preference** (Salingaros, 2012; Hägerhäll, Laike, Taylor et al., 2008; Hägerhäll, Purcella, & Taylor, 2004; Taylor, 2006)
NATURE OF THE SPACE	Prospect	• • •	**Reduced stress** (Grahn & Stigsdotter, 2010)	**Reduced boredom, irritation, fatigue** (Clearwater & Coss, 1991)	**Improved comfort and perceived safety** (Herzog & Bryce, 2007; Wang & Taylor, 2006; Petherick, 2000)
	Refuge	• • •		**Improved concentration, attention and perception of safety** (Grahn & Stigsdotter, 2010; Wang & Taylor, 2006; Petherick, 2000; Ulrich et al., 1993)	
	Mystery	• •			**Induced strong pleasure response** (Biederman, 2011; Salimpoor, Benovoy, Larcher et al., 2011; Ikemi, 2005; Blood & Zatorre, 2001)
	Risk/Peril	•			**Resulted in strong dopamine or pleasure responses** (Kohno et al., 2013; Wang & Tsien, 2011; Zald et al., 2008)

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Table 1: Observed Psychological effect.[5]

It is noted that this discord is largely due to a lack of greenery and, in particular, a visual absence of plants. Thiscan be improved by incorporating elements of nature into these environments, by creating parks, offering views ofnature through windows, and the presence of potted plants.More recently, there has been an increasing amount of research focusing on biophilia in the context of theworkplace, looking specifically into the interaction between the design of the workplace and employee outcomes.However, despite evidence that shows people benefit from being connected with nature, it is concerning that abiophilic approach to the design of work environments is not placed higher on the global corporate agenda.

The findings from case study emphasize the dramatic impact that even simple changes to incorporate nature in the workplace canhave on how employees feel when they come to work, and how happy, creative and productive they feel when theyare working. This might encourage organizations to consider these effects and take action to incorporate biophilicdesign practices into the workspace. While the primary focus of this paper is to understand employee behavior, psychology in and around nature into the workplace can elicit positive emotions.

Research Methodology

The research conducted was of an aim to study parameters affecting de-stressing space. 50% of a human life is comprised of working hours. Average Indian person spends 12-14 hours of a day at work. Then why don't we think it is important to create a healthy and happy workspace.
The research conducted was in form of live case study at Tata Technologies Pvt. Ltd. campus in Hinjewadi, Pune. IT companies are more susceptible to monotonous work environments and hours.
Same chair, same table, same computer, same work, how will one be motivated and productive all the time? Keeping in mind such parameters what should be the role of distressing space? How presence of nature in vicinity helps people psychologically and in behavioral patterns in usage of indoor and outdoor space etc. To decode all those factors methods of non-participatory observations, cognitive mapping, interviews and visual methods (photos) was used.
Every human environmental space is driven by various tangible and intangible layers like Tangible being the five human senses touch, see, hear, feel, taste. In this specific case of workspaces the factors of study are wind, light, visual connection, sound, color, micro-climate etc. The intangible being task to complete, stress, physical movement, emotions etc.

Analysis And Discussion

The analysis was done on basis of conducting observation of spaces and people during their working and non-working hours. The office runs in 3 shifts with inlet of people at 8-10 am, 4-6pm & night shifts. This led to understanding how natural setting in the vicinity acted upon differently by the employee during mid breaks, attending calls, discussions, announcements etc.The case study is in a IT campus in Hinjewadi, Pune with campus with G+2 storey buildings and 4 pockets of courtyard within the spread of office.
'The courtyards are like heart.' said an employee. The scale and proportion of each courtyard determined the type of activities as observed. The hierarchy of spaces from outdoor to indoor is courtyard then passages then lobby then indoor passages then rooms and work stations. With every step an employee moves indoor the connectivity from courtyard reduces. Hence, during long working hours mind and body requires a breath of fresh air which enables a person to move out which gets connected to the green space.
The immediate movement path is via passages which enable visual connect and used by people to walk and talk. Nature as de- stressing; the sound of birds, rustling leaves, the shadow of trees, insects, the warmth of sunshine and seating enable people to move in and out of their workstation.
Occasionally, fruits and flowers become the highlights for few months. All the temporary and non-temporary changes in and around rigid setting reduces monotony and helps in refreshes mind.

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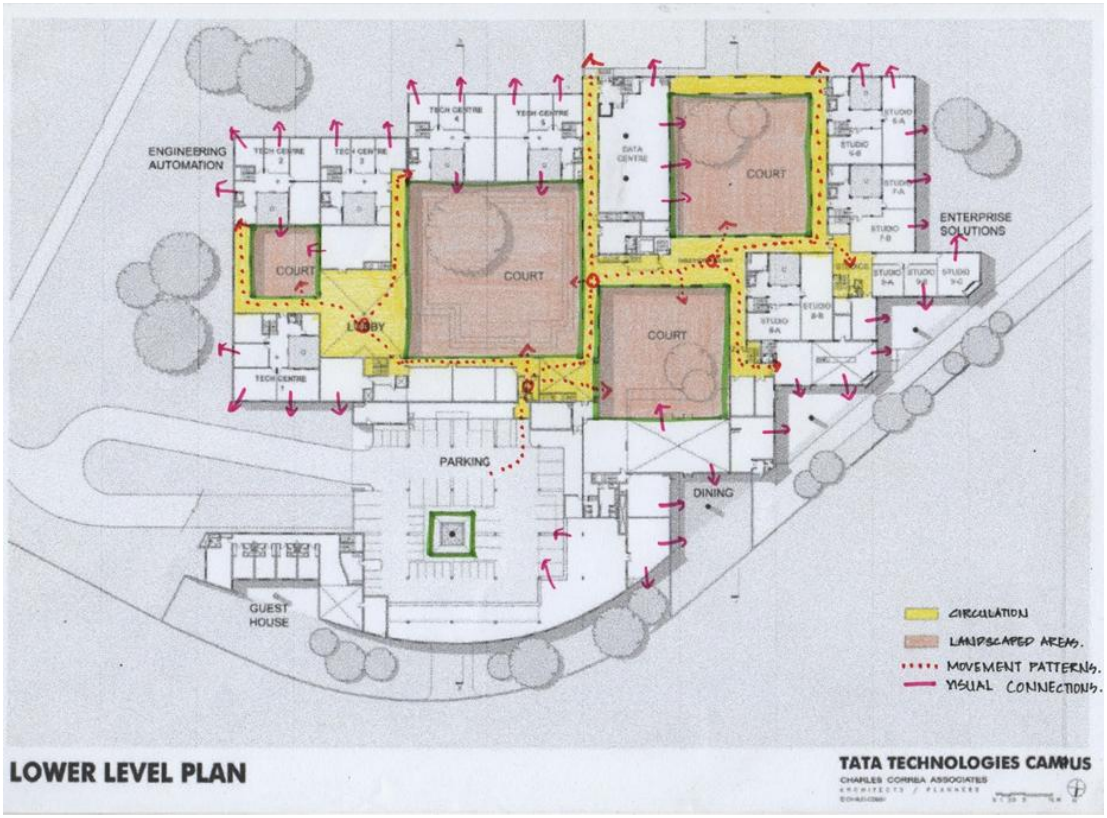

Figure 1: Lower level plan with movement of people, visual scope of nature and landscape spaces

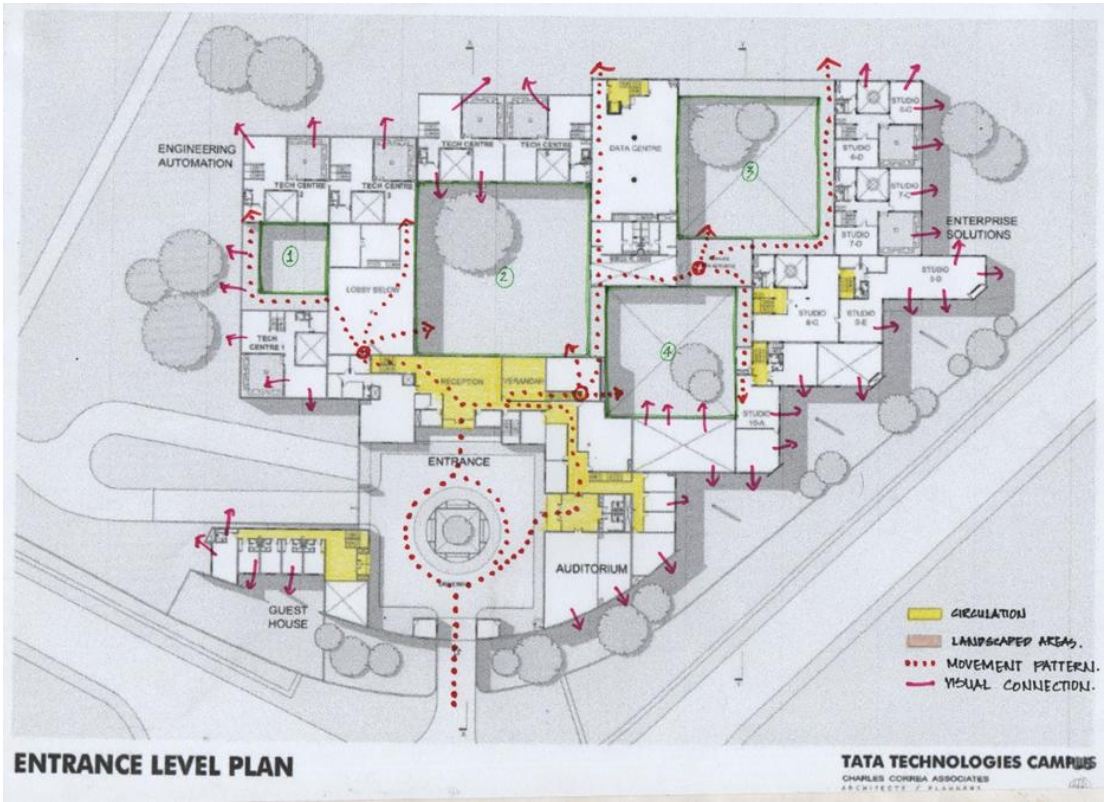

Figure 2: Captions to be placed below the pictures. Ensure that the caption clearly describes what you want the reader to see in the picture

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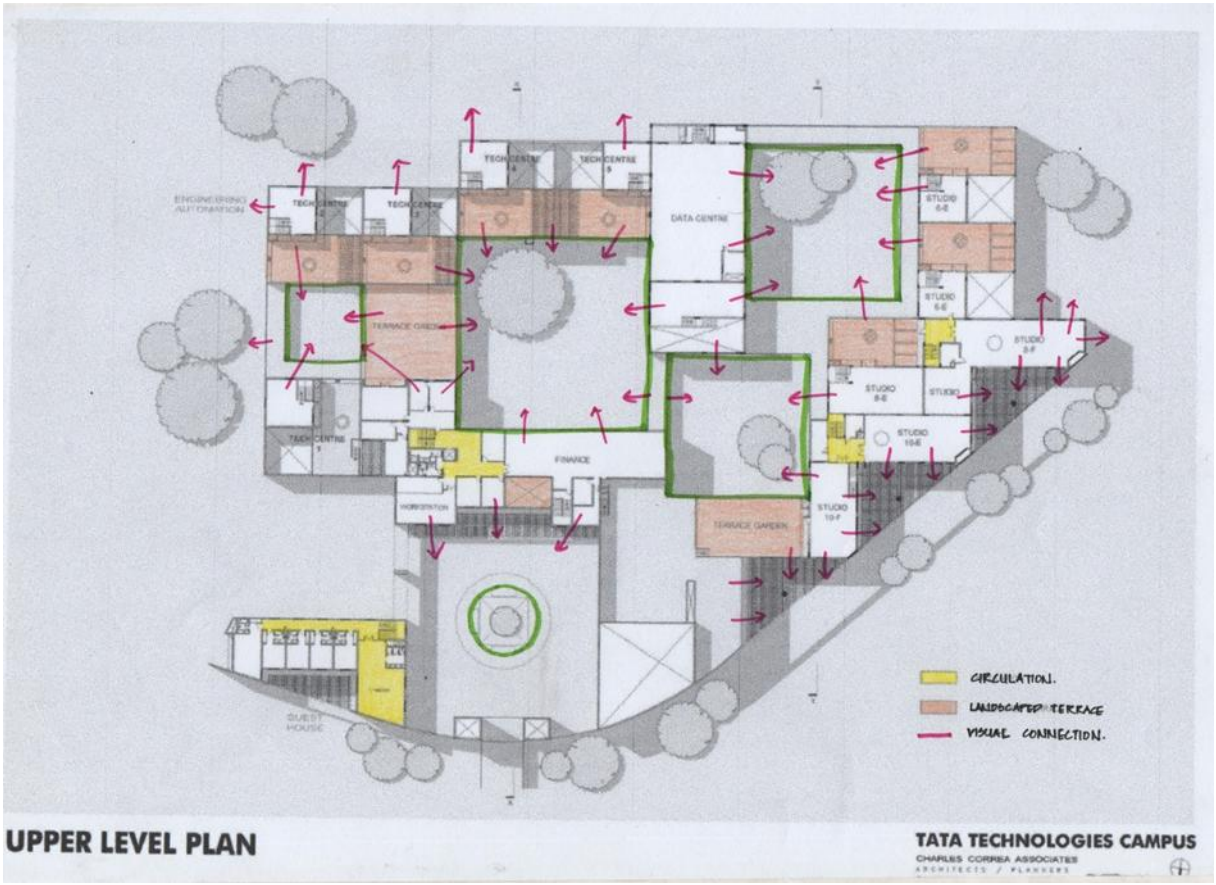

Figure 3: Upper level plan showing visual scope from cabins and open spaces

The case study conducted during various time slots led to following common observations:

Courtyard 1- used for sun basking during winter months (Nov-Jan), discussions and attending phone calls, clicking group pictures due to orange color wall.
Courtyard 2-attending phone calls, visual connection to almost every corner of the campus, campus announcements and celebrations, eating tiffin's.
Courtyard 3- to sit secluded from the crowd, sun basking, attend phone calls, clicking pictures, reading and relaxing activities etc.
Courtyard 4- spill over from canteen/mess used during tea breaks, lunch breaks and evening snacks as seating and eatery courtyard , informal gatherings of different employees working in different departments, eating tiffin's, attending phone calls.

Incorporating natural elements into the built environment not only reflects the aesthetic benefits of the outside world, it provides a rich environment for individuals that encourages interaction. The study showed that people exposed to natural elements are more energized by their surroundings, feel less stressed and have improved attention spans. Recently, white papers such as 'The Economics of Biophilia' have also demonstrated that using natural materials and evoking nature within a workspace are not extravagances, but a way to increase profits and make hard cost-savings.In the same way, the impact of a green window view in a work environment also poses many benefits.[1]
Interview conducted shows positive psychological well-beingwas greater amongst employees who had a window view of natural elements such as trees or green landscapes, over those who had views of nearby buildings, dead wall or no window at all. Analysis has shown that people with a view of natural elements such as trees, water or countryside reported greater levels of well-being than those with views of buildings, roads and construction sites. Further to this, those with a window view that regularly sees nature, were found to have the greatest levels of well-being overall. However, it may not always be feasible to provide each employee with outdoor views. In these

cases, sample demanded that those who do work in a windowless office should have a workspace that contains visual décor, dominated by materials or colors with natural elements to replace the reduced or complete lack of nature contact.

The campus of TATA Technology was designed by Charles Correa in 2003. The following pictures help us in studying the changing and evolving nature of Nature inside the campus. The usage of courtyards by the employees during not working hours. The changing spatial organization and its character.

THEN NOW

Photo 1: Central courtyard with shade controlling micro environment and climate for de-stressing.

Photo 3: Central courtyard (courtyard 2) used by people for relaxing during intermediate breaks.

THEN NOW

Photo 4: Cabin windows and passages opening up into central courtyard (courtyard 2)

Photo 5: Courtyard 3 with less hustle and people around used for relaxation.

Figure 4: Connectivity with outdoor spaces from offices inside.

The conclusion from consistence of people working in this campus helped in stating that nature has played a role in changing and framing minds in de-stressing. However, it was also observed that potted plants were initial contributors for change in behaviour or attraction but became a mode of commodity later. Human minds are playful and require change at every moment, presence of nature at this campus enabled changes with shadows, sound, growth, sunlight which contribute in different type of spatial experience at each time of the day, month and year. People's physical and mental pace reduces looking at the inorganic and unplanned courtyard which slows down the process of movement, thinking and hence act as de-stressing.

Ultimately, it is more about restoring our connectionto nature than it is about adopting a new methodology for designingthe built environment. Its accomplishment will therefore, require afundamental shift in human consciousness that leads to a new ethicof responsibility for caring for the earth and our relationship to it.[2]

The heart of this challenge is a modern world that has forgotten in so many ways how much our physical, mental and even spiritualhealth and wellbeing continue to rely on the quality of our relationship to nature. The promise of biophilic design will, therefore,require a new realization indoors or outdoors – of how much we still depend onbeneficial contact with nature to be healthy, productive and whole.This change will require an ethic of responsibility for the naturalworld motivated not by the desire to save nature, but by a profound realization of our own self-interest. In the long-run, we will sustainonly those things, whether buildings or species, that we are convinced contribute to a better and more fulfilling existence.

Acknowledgement

I would like to take this opportunity to express my deepest gratitude towards all the people whose timely support & guidance has made this research paper possible in the way it is.

I would like to appreciate D Y Patil School of Architecture for introducing such approaches in academics inculcating writing and thinking skills in students. I would like to thank Ar. Niranjan Garde for his valuable assistance and insights leading to writing this research paper. My sincere thanks to my fellow classmates and peers

for enlightening me on ideas and refinements whenever and wherever required during this research paper writing process.

The research paper would not have been formulated without the permissions given by TATA Technologies Pvt Ltd, Pune in studying and experiencing the work environments for the people and by the people. I would also like to thank the Director Ar. Prof. Prasanna Desai and Jitendra Pitaliya for making us available purchased online library sources. Last but not the least thanking librarian of PVPCOA and Charles Correa Archives for sharing their valuable information and drawings.

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Tribal Construction Techniques in Western Maharashtra

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Abstract : Tribal communities in Maharashtra have developed their own techniques in response to the regional climatic context. Hundreds of years of experience, self learning and traditional wisdom have led to the development of tribal construction techniques. Tribal architecture has been developed using locally available material, so as to achieve better living conditions which suites the context. It is necessary to understand the relationship of construction technique with region. In Maharashtra state, tribal people mainly resides in the forest ranges of Sahyadri, Satpuda and Gondwana. Around 10% of population in Maharashtra state is tribal.It is important to bring in light, the tribal construction techniques to promote their architectural style.The aim of this paper isto study tribal settlement, their construction techniques and use of locally available materials. The objectives of this paper are to study the impact of culture and climate on architectural style and to study the construction traditional technique. The scope of study is based upon construction techniques of tribal settlements. The study is limited only upto western part of Maharashtra. Data collection about the construction techniques and use of materials is based upon the observation and the interaction with the tribal communities. This paper highlights the traditional construction techniques which are still in use and suitable for tribal areas. This paper explains how the local materials are being used and what are the advantages and disadvantages of using tribal construction techniques. This article also provides the basic principles of construction techniques while designing for tribal communities. This study can be helpful for the modern designers.

Keywords: Tribal construction techniques, local material, limitations of technique, context

Introduction

In all over the world, in any part of the globe, from prehistoric period till the date, complex layers of social stratification and their cultural diversity are reflected in the urban form of the settlement. The cause of this influence lies in the unique and diverse socio-cultural roots, which represent nothing but the 'Traditions' of that area. India is one of the parts of Asian continent where impact of these diverse socio-cultural patterns is reflected in housing texture, but nowadays people do not pay attention whether the construction technique they are using suits the surrounding environment or not. There are many tribal villages which use construction techniques which are most suitable for their surrounding conditions.Tribal architecture is a category of architecture based on the local needs, construction materials and reflecting localtraditions. Primary objective of this paper is to produce a consolidated and comprehensive guide that explores the materials and technology used in tribal areas. However the paper is limited only for the tribes in western part of Maharashtra. Further intend of this paper is to analyze the benefits and limitations of the techniques.Data collection about the construction techniques and use of materials is based upon the observation and the interaction with the tribal communities.

Tribes in Maharashtra

In Maharashtra state, tribal mainly resides in the forest ranges of Sahyadri, Satpuda and Gondwana. Around 10% of population in Maharashtra state is tribal. Bhils are considered to be amongst the oldest tribes. They live in isolation, go for hunting and fishing. Their livelihoods basically depend on animals.

Area of study

Tribal settlements in northern Western Ghats have been studied for the paper. Climate of this region is classified as tropical climate. The maximum temperature is 41 C and the minimum temperature is 4 C. The average rainfall is

460 mm. It comes under high rainfall zone.Theconstruction techniques which are identified in the region use locally available resources, agricultural waste andtraditional skills.

Materials

1. Karvi: - Karvi is a bush mostly used as a building material by tribal people in Western Ghats and south Gujarat. Stems of Karvi plant are used in internal and external panel walls, as battens in the lofts and the roofs. Karvi is protected from moisture by applying mud and cow dung plaster.

Figure1: Karvi wall before plastering

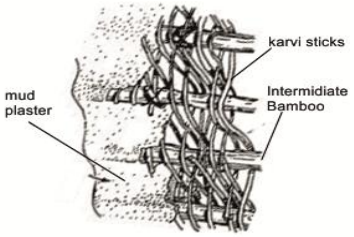

Figure2: Karvi sticks weaved to the intermediate bamboo

Wood**: -** Generally tribal people select wood from mature trees. The preferred species are teak, babul, khair. They cut wood and bamboo in the month of Bhadrapada i.e. September and keep it in water for few weeks. Some people add rock salt in the water before seasoning. Traditionally they use wood in log form after seasoning and drying.

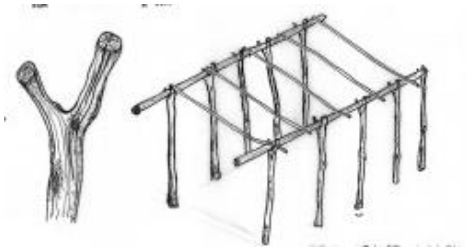

Figure3: wooden logs used as framing materials

2. Mud**: -** Mud is majorly used for flooring, plastering and as a mortar. It is usually obtained from red soil, yellow soil or murum. Black soil is avoided. To improve soils plasticity, heap of soil is kept wet with water for nearly two to seven days. Also sometimes finely cut straw is also used to improve its plasticity.

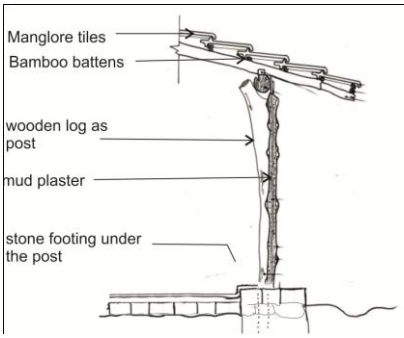

Figure4: Section of Karvi wall

Case-study – I (Karvi construction technique)

Construction process

1. Foundation: -The house has no foundation except the pits for the posts. The foundation of the posts is dug upto 1.5m depth. Wooden log is then fixed in the pit surrounded by random rubble stones. While repairing or rebuilding the house, they reuse the posts by removing their rotten part that was lying in the ground.

2. Plinth**: -**The plinth is constructed of random rubble masonry with mud as a binder material. The plinth is above ground by 150 to 200mm and it is extended from wall by nearly 300 mm. It protects the Karvi from dampness rising from the ground as well as from the splashing water that falls from the roof. On the slopes of the hill, they raise the plinths to a required height by stepping, rather than levelling by digging the ground. The high plinths have dry rubble masonry retaining wall, which allow drainage of ground / subsoil water during monsoon.

3. Flooring: - For flooring red or yellow soil is preferred, black cotton soil is avoided. Soil is screened and aggregates and stones are removed. Water is added to the soil to make thoroughly mixed mud. The area to be floored is first filled with stone, then mud is spread on the stone bed. Mud is compacted and smoothened by wooden implement. The layer of cow-dung is applied on the floor by hand or broom. In the area for the animals, the floor has a slope of nearly 1:7 for drainage.

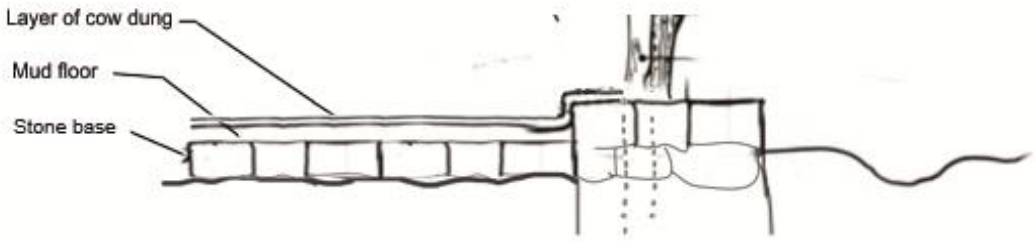

Figure5: Section of mud flooring on stone base

4. Walls:-The house has a frame structure of wooden posts firmly placed in the ground, and wooden beams, and curtain walls of Karvi panels. The wooden frame supports the roof, attic, and wall panels. Horizontal bamboos are tied to the wooden post by rope at a distance of 600 to 800 centre to centre. Karvi sticks are weaved with those bamboos. A mixture of mud and cow dung is applied in ratio 2:1 on the both sides of wall. For plastering mixture of mud and cow dung is applied in ratio 1:4.

Figure6: unplastered Karvi wall

Figure7:plastered Karvi wall

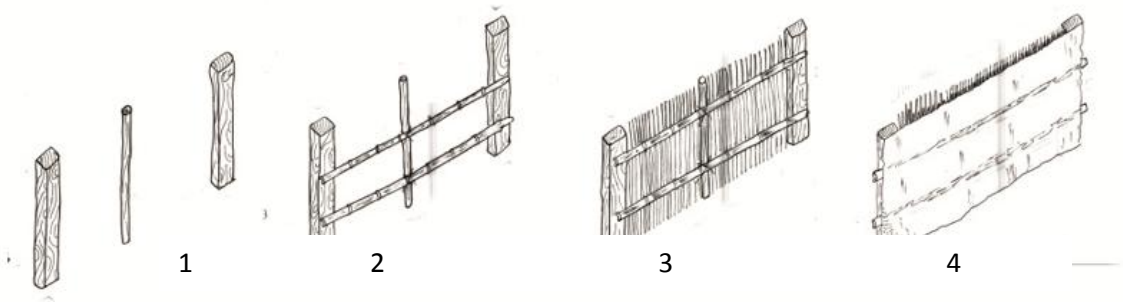

Figure8: process of construction of Karvi wall

When Karvi is not available, they use stalks of Jowar. It grows to 2.0 to 2.5 m. height. Thickness of wall is generally 150 to 200 mm.

Figure9: Portion of wall kept unplastered for ventilation

5. Openings:-The house has generally one main door and a very few houses have rear door also. The door shutters are made of wood with wooden pivots made out of styles of the shutter.At top level of the wall, a clear space 15mm to 25 mm near the eaves is without plaster. It brings in the filtered and reflected light from the tropical sun. It provide cross ventilation even while wind direction changes during the day and night, and during different seasons. It also prevents direct exposure of cold or hot winds at a body level. Also to bring in light and ventilation for kitchen

one or two Mangalore tiles are removed and the gap is covered with plastic. In the area for the animals, a hole in the wall at floor level for the disposal of urine and washed out dung that drains either to kitchen garden or to a compost pit.

6. Roof:-They commonly use paddy straw for thatch roof. There is a layer of teak leaves over bamboo or Karvi battens, over which they spread and tie 150 to 250mm thick thatch. The slope of the roof is at 30 degrees angle. They replace paddy straw every year. The old thatch goes to farm as manure. Besides thatch, nowadays the tribal use half-round-country roofing tiles, Mangalore tiles, asbestos cement sheets. Mangalore tiles or cement sheets require less maintenance as compared to thatch; hence they are used over thatch.

Figure 10: Mangalore tiles used as a roofing material

Case-study – 2 (cob wall construction technique)

Foundation:-Trench of about 1.2m is dug -filled up with stone and mud as a binder. Random rubble masonry of the foundation is continued up to 0.60m to 0.90m above ground level and then construction of mud wall started.

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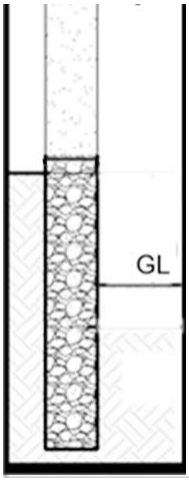

Figure 11: foundation for cob wall construction

1. Mud Flooring- The area to be floored is first filled with Mud taken out of trenches is then pressed and finished with Final layer of cow dung and mud slurry.In the area for the animals, the floor has a slope of nearly 1:7 for drainage.
2. Wall: - Composition- dung, rice husk and mud in the ratio of 1:1:4. Constructed in layers of height 300 to 450 mm one after another. The thickness of wall is generally 350 to 400 mm.

A mixture of cow dung and mud is used in the ratio 1:2 for 2mm thick plastering .

Figure 12: Kitchen platform made using cob

Figure 13:shelves in the wall

3. Openings: -openings are made of timber. They are of a lower width and height. The frame is fixed within the mud wall. Timber lintels swells when comes in contact with water results in damaging the structure.(refer fig. 14, fig. 15, fig. 16)

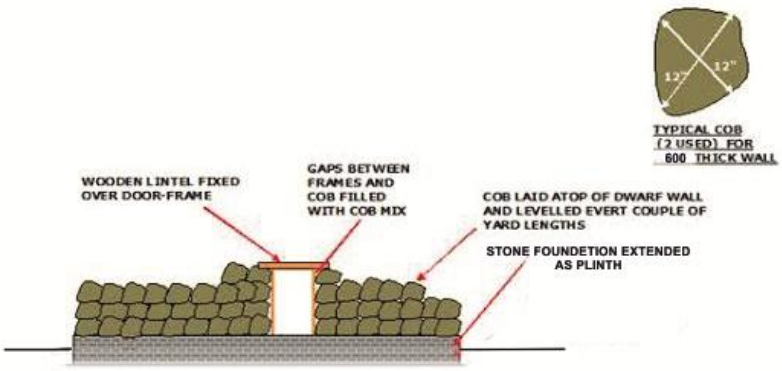

Figure 14: partly finished cob front wall showing door frame fitted with lintel

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Figure 15:Door frame fixed in the wall

Figure 16:damage due to swelling of timber

Figure 17:Mangalore tiles used as roofing material

4. Roof: - Pitch roof supported by timber truss and country tile. Tie beam and wooden rafters were used as main supporting members. The slope of the roof is 30 degrees. One or two tiles are replaced with plastic to bring in light.(Ref fig. 17)

Inferences

After doing the study of the selected villages it is observed that:-

- Though Karvi wall technique is frame and panel wall construction technique, it has limitations of length because of limitation to the length of sticks; hence it is generally used only for small houses of area about 10 to 12 sq m.
- Cob wall construction technique is load bearing. It is used for houses of area about 46 to 60 sq m. The limitation for the cob wall is the thickness of wall.
- Both the mud construction techniques had been extensively used from hundreds of years and the structure is still standing .The craft or skill of construction is being transferred from generation to generation hence it is socially sustainable.
- The agricultural waste has been used as a binder for mud, thus utilizes the locally available resources hence environment friendly.
- As the cow dung is used, it keeps rats, mice away from the structure. It also keep away mosquitoes and insects.

Conclusion

The tribal construction techniques are evolved out of social needs, response to the climate, availability ofresources, and thus the local craftsmanship, which are all the important elements contributing to overall tribal architecture.

The construction techniques developed are time tested and proven best for the particular climate. There are certain constraints and limitations of mud but those can be overcome.

Thus the study has given an overview of the tribal construction techniques prevailing in western Maharashtra region, whichis suitable to climate, place and to the community.

Due to the newer materials in the market and the mentality of copying the modern concept of construction is deteriorating the beautiful rural fabric. Hence to revive this architecture is the need of the hour.Here our role starts as an architect - the concept of sustainability and eco friendly architecture can be introduced by designing certain modules as per the requirements and can be introduce to them at rural as well as urban level. Lot many well known architects are experimenting with mud in modern context.

Acknowledgements

I wish to acknowledge the help provided by Professor Parag Narkhede to guide me for conducting this research. I would like to express my very great appreciation to the villagers as the respondents, who gave their valuable time and knowledge for the research.

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The Architectural Style of Making Craft Beer

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Abstract : ***A brewery is a dedicated building for the making of beer, though it can be made at home, and has been for much of beer's history. The place at which beer is commercially made is either called a brewery or a beer house, where distinct sets of brewing equipment are called a plan. The commercial brewing of beer has taken place since at least 2500BC. Brewing was initially a cottage industry, with production taking place at home; by the ninth century monasteries and farms would produce beer on a larger scale, selling the excess; and by the 11th and 12th centuries larger, dedicated breweries with eight to ten workers were being built. Early breweries were almost always built on multiple stories, with equipment on higher floors used earlier in the production process, so that gravity could assist with the transfer of product from one stage to the next. This layout often is preserved in breweries today, but mechanical pumps allow more flexibility in brewery design. Early breweries typically used large copper vats in the brew house, and fermentation and packing took place in lined wooden containers. Such breweries were common until the Industrial Revolution, when better materials became available, and scientific advances led to a better understanding of the brewing process.There is a lot of development on these lines seen in the western countries. However, this study and growth lacks in our country, thereby, creating a need for a study in this area.Brewing, as of now, is only practiced on a homely basis in India. There are very few brewing companies in India. The growth of this industry depends on the awareness created about brewing. The paper introduces the process of beer making, and the machinery required for the same. The research therefore would address the architectural intricacies of this section of the Food and Beverages Industry, making it a wholesome directory or a starting point for people who intend to study this process. This paper is aimed at studying the process of brewing of beer, the machinery and the technologies involved, and thereby develop spaces to cater to the same. My goal through this research is to design a state of the art brewery open to public .Thereby, creating awareness about brewing as a profession and encouraging startups. The scope of this research is the architectural implications of beer making and understanding the entire process involved in the same.***

Keywords : Architectural Style, Making Craft Beer

Introduction

History of Beer in India

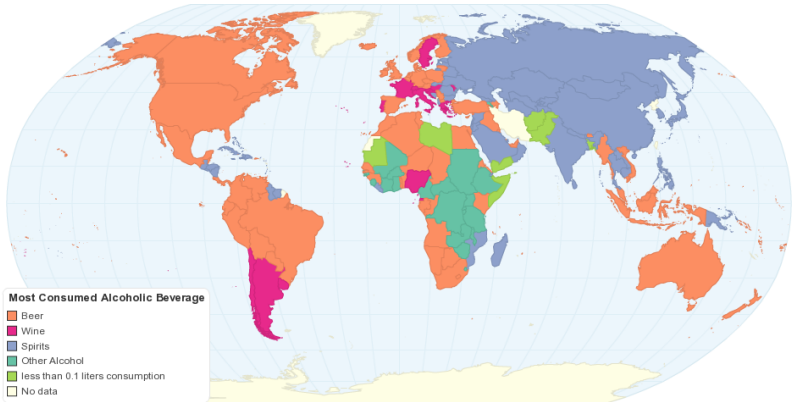

Figure 16 Most Consumed Alcoholic Beverage

Modern brewing began for India in the early days of the British Empire – the mid-1700s. The demand for beer in the hot Indian climate by the British administrators and the troops was so great that it led to the creation of a

completely new style of beer by George Hodgson in his London Brewery – India Pale Ale also known as IPA. IPA is a strong, highly hopped ale designed to survive the five month ocean voyage to India without spoiling. India Pale Ale was shipped with every voyage for over a century and became very popular in Britain and North America.

In the late 1820s, Edward Dyer moved from England to set up the first brewery in India at Kasauli (later incorporated as Dyer Breweries in 1855) in the Himalaya Mountains, near Shimla, producing Asia's first beer called Lion. The Brewery was soon shifted to nearby Solan (close to the British summer capital Shimla), as there was an abundant supply of fresh spring water there. The Kasauli brewery site was converted to a distillery which Mohan Meakin Ltd. still operates. Dyer set up more breweries at Shimla, Murree, Rawalpindi and Mandalay.

Another entrepreneur, H G Meakin, moved to India and bought the old Shimla and Solan Breweries from Edward Dyer and added more at Ranikhet, Dalhousie, Chakrata, Darjeeling and Kirkee. In 1937, when Burma was separated from India, the company was reconstructed with its Indian assets as Dyer Meakin Breweries, a public company on the London Stock Exchange. Following independence, in 1949 N. N. Mohan took over management of the company and the name was changed to Mohan Meakin Ltd. The company continues to produce beer across India to this day and Lion is still available in northern India. Lion was changed from an IPA to a Lager in the 1960s, when due to East European influence, most brewers in India switched from brewing Ales to brewing Lagers.

Today no brewer in India makes India Pale Ale. All Indian beers are either Lagers (5% alcohol – such as Australian Lager) or strong Lagers (8% alcohol – such as popular MAX super strong beer). International Breweries Pvt. Ltd. have recently announced an intention to work with Mohan Meakin Ltd. to produce and launch an India Pale Ale called Indian IPA from India's first brewery at Solan. Kingfisher, Kings, and Belo are popular Indian Beer brands.

In various parts of north-eastern India, traditional rice beer is quite popular. Several festivals feature this nutritious, quite intoxicating, drink as part of the celebrations. The rice is fermented in vats that are sometimes buried underground. Elephants are known to attack villages, with the primary agenda of raiding these vats and having a good time generally. Following one such raid in north-eastern India, a police officer in Dumka was quoted in the press as saying: "Tribals who love rice beer brew the liquor at home. Elephants too are fond of this beer. Often it is found that, attracted by the strong smell of the liquor, wild elephants tear down the tribal houses where the brew is stored."

Indian Beer Market in Figures

Under our estimate based on regional statistics data, in 2014-15 financial year beer market in India has grown by 6% to 22.3 million hl (or to 286 million cases). On the one hand, this growth rate is twice faster as compared to the previous year, on the other hand, it is twice slower than the average rate over the last 10 years.

Uneven dynamics of the beer market in 2011 and 2012 as well as higher growth rates in 2014 and 2015 reflect changes in the factual growth dynamics of GNP. The last years demonstrated that the beer market has switched from riot growth to jump growth, depending on the combination of inner factors.

Who drinks Beer in India

India is the second most populous country in the world. It is the home to 1.287 billion people, or 18% of the population on our planet, and by 2022 it is expected to be the most populated country. (http://www.countrydetail.com/top-10-countries-with-highest-population-hit-list/)

"From 1.28 billion, remove approximately 600 million people who are below the poverty line, as they barely have food to eat, forget liquor. That's half the population. From the remaining 600 million, remove 400 million who are below the drinking age. That leaves you with 200 million. From that, remove women (100 million), as women in India don't drink beer. They may have alcohol, but very few drink beer. That means only a 100 million are actually drinking beer in this country.

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Therefore, even with a light drinking audience India became the second largest world consumer of alcohol, with a share of about 45% if you count it in pure alcohol, and this share will grow. India already drinks more than U.S.A. and Russia combined.
Although in India, there is little tradition of beer consumption, it can be formed in youth. (https://journal.beer/2015/10/01/analysis-of-beer-market-in-india-journal-beer-3-2015/)

Case Studies

Independence Brewing Co.

Pune

Studio Lotus Architects
Independence Brewing Company aims at bringing craft beer enthusiasts and unprecedented level of quality and variety of craft beers in India. Brewing is the production of beer by steeping a starch source (commonly cereal grain, the most popular of which is barley) in water and fermenting the resulting sweet liquid with yeast. It may be done in a brewery by a commercial brewer, at home by a home brewer, or by a variety of traditional methods such as communally by the indigenous people in Brazil when making cauim.
This buzzing microbrewery situated in Pune, Maharashtra, is one of its kind because of its bold and attractive interiors and the visibility and transparency that it offers to the visitors.
Every design is based on design as well as functionality. For a place to function smoothly the zoning of the different areas plays a very important role. The planning of this brewery is done in such a way that the areas which need direct connection physically, have that functionally as well as visually. And the areas that do not need direct connection physically are still connected visually. Because of this sensitive design no area is completely detached from the other.
The concept of having an in-house brewery and a live bar with a restaurant that works very well for this microbrewery.
Well segregated areas with easy circulation make the place functionally and visibly attractive.
Structurally sound structure comprising of 2 types of columns:

- 0.9m x 0.9m wide columns which are treated as feature walls to hide the bulkiness of the huge columns.
- 0.45m x 0.45m wide columns to support the ancillary areas and the service areas.

The columns cover a span of almost 12m – 15m and hence don't stand as an obstruction in the indoors.
It comprises of a 600 square feet brewery on display, 600 square feet of outhouse services and kitchen, 3800 square feet of indoor front of house spaces as well as two split levelled outdoor areas of about 1500 square feet. Conceived with the brewery and a larger island bar anchoring the whole experience, the bar extends into the outdoor space and allows for a seamless indoor outdoor space. Placement of the brew house and the bar naturally divides and creates multiple zones to accommodate different experiences. The levels built in to support the service movement of the brewery were integrated to create lines of sight from the more intimate zones and towards the flexible performance area. Thus, zones were visually connected to the core spaces. The brew house was pulled into the double height volume to create a dramatic presence and the function glass divide was converted into an iconic articulated façade for the brew house.

The Brewing Process followed by the Brewery
The basic ingredients of beer are water and a fermentable starch source such as malted barley. Most beer is fermented with a brewer's yeast and flavored with hops.

Steps in the brewing process include malting, milling, mashing, lautering, boiling, fermenting, conditioning, filtering and packaging. A mixture of starch sources may be used, with a secondary saccharide, such as maize (corn), rice, or sugar, often termed an adjunct, especially when used as a lower-cost substitute for malted barley.
Beer is composed mostly of water. Regions have water with different mineral components; as a result, different regions were originally better suited to making certain types of beer, thus giving them a regional character.
The starch source in beer provides the fermentable material and is a key determinant of the strength and flavor of the beer. The most common starch source used in beer is malted grain. Grain is malted by soaking it in water, allowing it to begin germination, and then drying the partially germinated grain in a kiln. Malting grain produces enzymes that will allow conversion from starches in the grain into fermentable sugars during the mash process. (http://studiolotus.in/independence-brewing-co-pune/)

Table 10 SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
• Double Height • Segregation of areas • Maintained temperature for different processing areas • Simplified pipeline system • Inter-connection of equipment	• Cramped area • Inadequate storage areas	• Expansion in terms of process areas • Increase in the volume of production	• Spillage of liquid from machines • Damage due to excess heat in the room • Blockage of pipelines

Sula Vineyard & Sula Beyond

Nashik

Sula Vineyards or 'Sula' is a winery and vineyard in the Nashik region of western India. After the launch of its first vines in 2000, Sula expanded from its original 30 acre family estate to approximately 1800 acres across Nashik and the state of Karnataka.

Facilities

- **Tours and Tastings** are conducted throughout the year.
- The harvest and crush season runs from January to March, during which the **Grape Stomping** activity is conducted.
- Little Italy and Soma are the two **Restaurants** here.
- The **Gift Shop**, the **Bottle Shop** which stocks exclusive brands which can be bought only at the winery.
- The **Tasting Room** facing the vineyards and backwaters of the Ganagapur Dam.

Background

Sula Vineyard is named after the owner's mother – 'Sulabha'. The land was originally experimented with crops such as mangoes, roses, teak wood and table grapes before realizing that Nashik's climate and temperature were well-suited for growing wine grapes. Today, Nashik is known as the 'Wine Capital of India' and is the home to almost 50 wineries.

Sula Beyond – India's first Vineyard Resort

The resort has beautiful wine themed rooms, named after different grape varietals or Sula Wines. As part of their tourism venture, Sula operates a tasting room, 2 restaurants, a 35 room resort and an amphitheater at their Nashik estate.
Sula's grapes come from their vineyards as well as from contract farmers across the region. The company's viticulture team trains and educates these farmers on best practices. In 2015, Sula announced a price increase of

10% for its contract farmers in order to support the farmers through unpredictable changes in weather as well as to meet the increasing demand for wine in India. (https://www.youtube.com/watch?v=QBjSFboOlvg ; https://www.boozebay.com/delhi-nct/drinks/sula-dindori-reserve-shiraz-wine/)

Sustainability

As per their "grow good wine with minimal environmental impact", Sula has undertaken the following sustainable practices at their winery:

- Drip Irrigation (60% of winery's annual water requirement)
- Rainwater Harvesting
- Vermicomposting (Accounts for nearly 40% of their fertilizers)
- Solar Energy and Skylights

Merits

- Efficient use of negative spaces
- Central courtyard supports evaporative cooling and hence keeps the surrounding areas cool.
- Each room provides a comforting view of either the hills or the lake. Service staircases are provided separately.
- Every block of the vineyard or the resort was connected by a green element.
- The roofing material (puff insulated sheets) provides comfort from the outside weather.

Demerits

- The villas provided are at quite a distance from the resort and since no cooking facility was provided at the villas, coming all the way to the restaurant for food caused inconvenience.
- No in-house laundry provided
- The capacity of the resort is only 70-80 people which does not meet the demand.

Related Features

- Large number of wineries to visit
- Famous wines
- Winery group tours
- Lots to see and do
- Opportunities for outdoor recreation
- Special shops or markets selling local farm products

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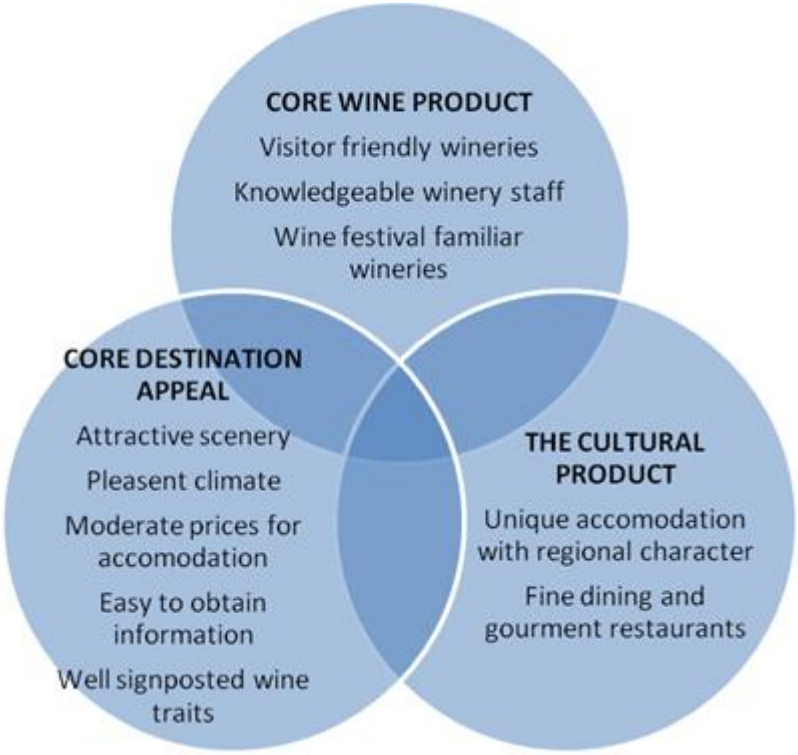


Table 11 SWOT Analysis

Strengths	Weaknesses	Opportunities	Threats
• Fastest growing market in the Wine Industry (30% p.a. growth rate) • Good climate for grape growing • Women/Youth see health and sophistication in wine.	• Drinking age (42% of the population) is 25 years of age. • Poor awareness of wine and infrastructure • Wine has an elite taste	• Large domestic markets with increasing disposable income • Increased tourism • Population changing lifestyle accepting new trends • Export potential to the rest of the world	• Whiskey is a preferred alcohol beverage • Advertising is banned for alcohol • Very limited crown as it has an elite taste

Pearl Brewery Redevelopment

Texas

Client: Silver Ventures

Project Size
Master Plan – 26 acres
Phase 1 – 67,000 square feet
Phase 2 – 18,000 square feet
Phase 3 – 96,000 square feet

Background
Once the largest brewery in Texas, Pearl Brewery closed its doors in 1985. After 15 years lying derelict, the creative re-imagining of this 26-acre brownfield site and its neglected historic structures has drawn in a rich mix of

new residents, local businesses, retail and non-profits, emphasizing community, conservation and local economic development.

For over a decade, Pearl's design has transformed the brewery into a new community meeting ground where visionary private development and public space have produced a vibrant culinary and cultural destination. Pearl's redevelopment seeks to cultivate a meaningful urban experience around the historic brew-house through a phased renovation scheme and the adaptive reuse of many existing buildings. The strategic positioning of vehicular parking created a pedestrian-focused development symbiotic with the urbanism reflective of downtown San Antonio.

The design of the internal infrastructure has been carefully scaled and detailed. Street widths were reduced to 24 feet with no curb to encourage pedestrian movement. To maintain the industrial character of the site, elements of the brew house interior were salvaged and reused including machinery footings which became bollards and beer vats which became water cisterns.

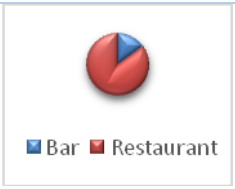
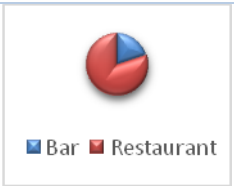
As the first mixed-use building at the Pearl, Full Goods Warehouse was the incubator for the subsequent phases of development. The 67,000 square feet LEED Gold Building is a modern re-telling of the building's industrial part as a brewery warehouse (filled bottles = full goods). The original one-story building was adapted to include two floors that maximized density and provided live-work spaces for local businesses. The successful leasing of the live-work, office, retail and restaurant spaces encouraged the developer to move forward with future phases, creating a series of mixed-use buildings throughout the district.

The Pearl Brewery Redevelopment is a sustainable destination that maintained its iconic identity, upholding the legacy of the historic brewery while radically re-purposing key components of the complex. The completion of the first three phases, most significant the adaptive reuse of Full Goods Warehouse, have ignited the planning and development of adjacent neighborhoods with the intentional focus on nurturing local business and residential life.

Inherent in the project's vision is a vibrant pedestrian oriented community that reflects the unique character and culture of San Antonio. (https://architizer.com/projects/pearl-brewery-redevelopment-master-plan/ ; https://www.idaconference.org/program/)

Comparative Data Analysis of Case Studies

	Independence Brewing & Co.	**Sula Vineyards & Sula Beyond**	**Pearl Brewery Redevelopment**
Accessibility & Approach	The location doesn't suit the purpose, no context to site.	Easy approach road with service access and pedestrian walkways.	The location forms a brew-city of its own.
Position of Brewery/Winery	Transparency in design is one of the major aspects that help to attract people.	Winery is placed separately, hence misses the connect between the guests and the process of making the wine. Transparency is missing.	Since it forms a city the manufacturing unit is located away from the actual restaurant, hence no transparency in design.
Story	Does not depict a story.	Depicts a story of its own.	Follows a story.
Services	No provision of service road separately. Well segregated and zoned out services internally.	Service roads have been provided with loading and unloading stations. Well segregated services.	Well segregated services internally.
Seating Capacity	Indoor as well as outdoor deck seating fulfil the demand.	The resort can hold 70-80 people at a time, which makes it difficult to meet the demand.	Linear seating providing the view of the street through the glass façade.

Bar		Centrally located	
Circulation	15%	18%	15%
Height Requirements	Double heighted structure throughout gives a complex volume, making it a comfortable space.	The manufacturing unit meets the double height requirement.	Fulfils height requirement in processing areas and manufacturing units.
Inferences	Transparency in design is an important factor to attract people as well as make sure that the purpose of the design is served.	The site should be such that it complements the context as well as forms a city of its own.	Services should be segregated in such a way that all the service zones are located together and ease out the functionality of the spaces.

Conclusion

Brewery

- A brewery mean be different things to different people. To customers, that means clean, comfortable spaces to stand on line to fill growlers and sit and sip from pint glasses.
- Pieces of duct work are running in the right location, out of the manufacturing area, and not running through the tasting room where people are tasting the beer.
- Know your brand

Concept & Story

Aside from great beer, it's important to have a compelling story. Why are you brewing your beer? How did you get your start? Why does your beer (and your story) matter? This idea needs to align with your overall concept – that is, a collection of ideas including your business model, brewery atmosphere and pricing.

Location & Collaboration

Location used to be a great way for new breweries to differentiate, but again, with more and more new brewers opening up shop, it'll be harder to hang your hat on your geography. The exception may be in hyper-local partnerships with local farmers and producers, coffee roasters and other breweries. (https://craftbeerbrandingguide.com/concretely-positioning-brewery/)

Services

It may sound old-fashioned but if your tasting room is not staffed well, people won't want to come back. If your delivery drivers are rude, don't clean tap lines, or drive recklessly, people won't want to support you. Service can still be a great differentiator, particularly if paired with another unique brand attribute.

Branding

And finally, everything we've discussed above has to be directly aligned with your branding, that is, the visual design of your identity, packaging, responsive website, and brewery space. (https://craftbeerbrandingguide.com/concretely-positioning-brewery/)

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Sustainable Landscape Planning Parameters for Campus Planning

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Abstract : ***Parameters for sustainable Landscape development in campus are essential. It is needed to avoid the impact of concrete jungles on environment. The co-ordination between the open spaces (landscape) and built form of campuses, the passive and active spaces. The sustainable techniques for composed landscape campus planning are essential as well as the vertical and horizontal landscape design and also interior landscaping in building. The sustainable landscaping is essential in today's era for sustain a pollution free and healthy earth environment. In old days the people are plants some trees around the house and at the entrance of the house for getting the fresh air but now a days because of the less space and increasing concrete jungles peoples are suffering from many pollution problems for reducing this problems we need to design a sustainable landscape planning. For the future problems minimizing we can take sustainable landscape planning solution. The literature study and the direct interview method is used for the complete this study, And how to design a sustainable landscaping in campus is showing through the case studies. This study helps us for making a healthier, fresh, pleasant and economical environment. Due to this study issues like pollution, urbanization effects are we take in control by creating a proper landscaping. This study is deriving the sustainable development parameters of the landscape. This study gives the parameters for achieve the pollution free environment, the principle of the sustainable landscape design achieved and give the guidelines for the sustainable campus planning and for making the aesthetically pleasant. This study presents information on the sustainable parameters of landscaping in campus helpful for architects, engineers, and designers.***

Keywords: Sustainability, Landscape, Parameters, Benefits

Introduction

Urbanites, who are living under the pressure of constructed surroundings, are lacking each and every day green lands such as parks, gardens, etc; where they can actually take a clean breath. Therefore, they ought to continue their daily lives between constructions, buildings and pavements which at the same time keep them away from nature. Actually, certain subjects such as the future of natural resources and their protection, environmental problems and global climate changes do increase the sensitivity to "green" in constructed areas which also directs the studies on creating urban areas with natural ambient conditions. Plants play an important role in today's cities where the rampant urban development is causing many problems such as pollution, increased air temperature, lack of green space and excessive energy consumption.

The built form and open space relation plays an important role for making the spaces as interesting and comfortable as possible. The active spaces and passive spaces composition is also matters in the campus. The vertical gardening saves the horizontal space. Interior landscaping is also a part of the sustainable landscape planning. The sustainable landscape planning parameters are helpful for achieve a good relation between the spaces and the people at the time of designing the campuses.

Aim

To study the sustainable development parameters of landscape in campus planning.

Objectives

- To study the relation between the landscape (open space) and built form of campuses
- To study the passive and active spaces
- To study a sustainable techniques for campus planning
- To study the vertical and horizontal landscape design

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- To study the interior landscaping in the building

Scope

The landscape design is very important and the achievement of sustainable development in today's era we have to consider the many parameters. The landscape design is the very vast it has many branches, like ecological development, economical development, eco-friendly development and only for aesthetical purpose.

Limitation

This study is limited to the relation of landscape (open space) and built form, active and passive spaces. Techniques of sustainable landscape planning in campus and the vertical, horizontal landscape design as well as interior landscaping in building.

Need of the Topic

In today's era there is a need of developing a landscape plan in conjunction with the architectural drawings. The landscaping reduces the pollution and gives us healthy environment. The landscaping is important for everyone who lives on the earth. The landscaping is a part of our sustainable environment. In old days landscaping is used for getting a fresh air and healthy environment, but now days due the urbanisation environment losses its good values. For maintaining the values of environment we need to design a sustainable landscape. According to my observation cities from all around the world are suffering from one major effect of development i.e. pollution. People complain about lack of green Areas, Pollutions are rising, fresh water level is going down and food crises are coming up. A solution is needed to provide lungs of green space to urban areas or concrete jungles.Landscapes have expressive aesthetic, natural, and cultural qualities that are perceived and valued by people. Awareness of the sustainable landscape planning is needed for designing the campuses.

Methodology

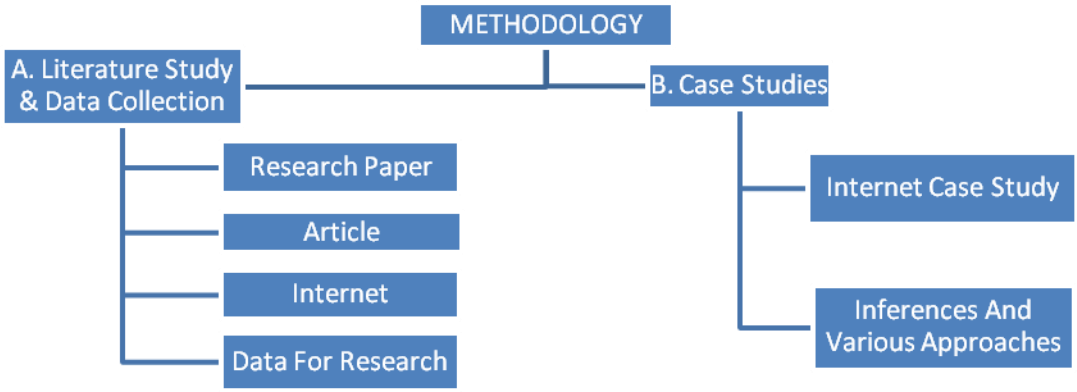

Chart 1 – Methodology

A. Literature Study

1. Relation between built forms and open spaces

Figure 17Roman Forum, Open and built spaces connections

People live outdoors as well as inside the building; therefore the outdoor environment should be as pleasant and comfortable as possible.The building and the open spaces can be related to one another and organized into coherent patterns of form and space. The spaces between buildings should stimulate the human senses.The quality of each space, whether large, small, high, low, wide or narrow, has observable characteristics which can be related to human reactions and feelings.Spaces can be consciously designed to produce specific feelings within the user. A large urban spa ce tends to create a grandiose feeling, with man becoming small and insignificant- in awe of the space. The people are the important element; the spaces should be scaled for their use.

2. Sustainable techniques for composed campus planning:

Figure 18 Vertical Landscaping

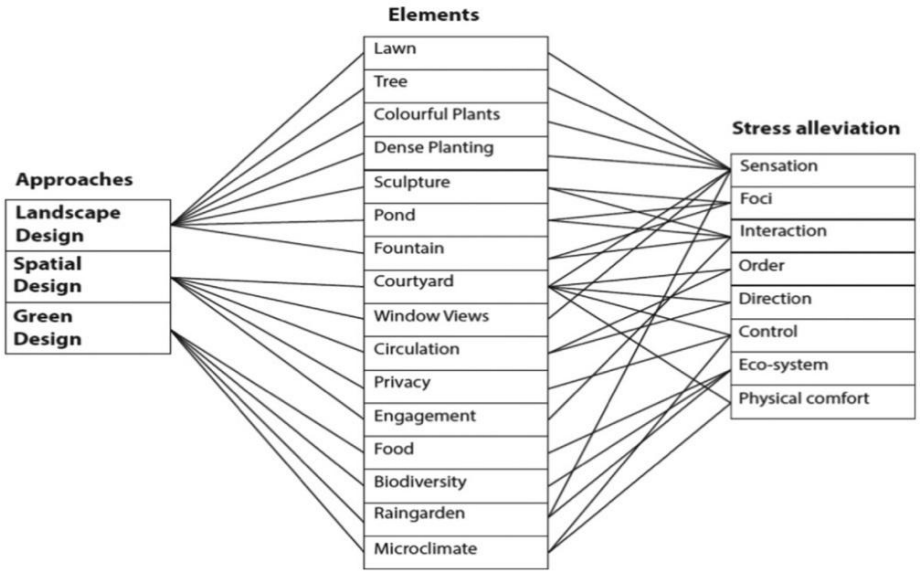

Chart 2 Elements of Sustainable Landscape Development

3. Passive and active spaces:

Passive open space- Passive open space is any open space not utilized for pedestrian circulation purposes and any planned lakes within the Campus Master Plan. E.g. natural areas, fields, lakes and jurisdictional wetlands.Any space utilized for structured or unstructured recreation or athletic activity will be classified as active creation open space. E.g. Included within this category are baseball/softball, basketball, volleyball, racquetball, track fields, tennis courts, swimming pool and multipurpose fields.

4. Vertical and horizontal landscaping:

Vertical garden's have been defined a new perspective to the modern construction culture, has been application of the garden to a building facade or to a wall surface as a notion.Application of the plant to the vertical surfaces make contributions to urban ecology due to its functions such as aesthetical and visual values as well as protection of the buildings, habilitating the climate effects for human beings, enhancing the environmental aspects and reducing certain ambient problems. Horizontal landscape increases value of balconies & terraces.

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Figure 19 Interior Landscaping

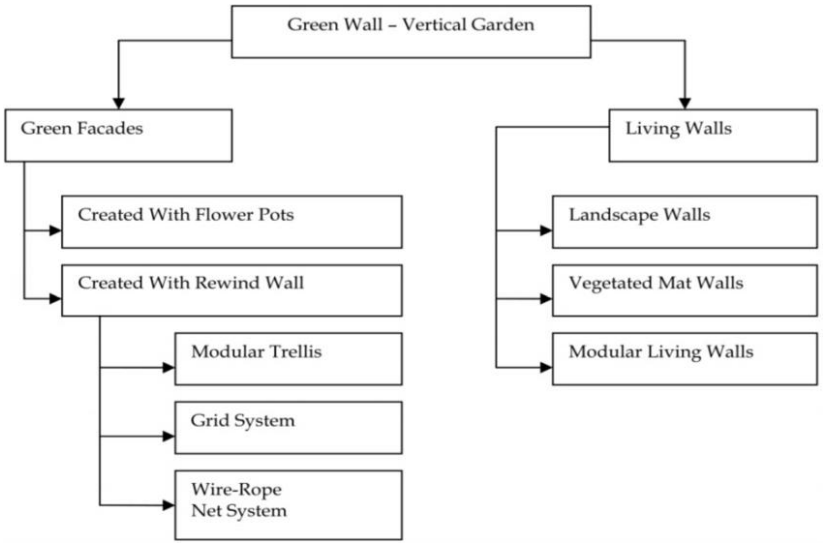

Chart 3 Classification of Vertical Garden

5. Interior landscaping in the building:

For creating beautiful sites, indoor landscaping provides physical and mental health benefits. The reason plants and trees are important to our ecosystem is because they remove carbon dioxide and produce oxygen rich air. Adding plantscapes to your interior enhances your indoor air quality by increasing humidity and keeping the air temperature down.

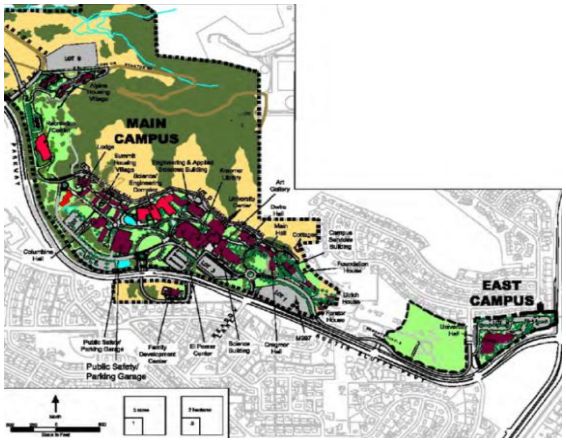

Figure 20 UCCS Campus Map

B. Case Studies:

1. UCCS Campus: (University of Colorado at Colorado Springs)

The design goal for the UCCS campus is for its visitors and campus family to feel they have entered a hillside town where people have come to learn about wondrous things. This town is made up of several neighborhoods called

"villages". The passive landscape in this campus is an arroyo cuts through the land on the North campus. The native range land meets the bluff.

The sustainability is measured by ten criteria of building: land use, site ecology, community design and connections, water use, site ecology, community design & connections, water use , energy performance, energy security, materials and construction, light and air, bioclimatic design and long-life/loose-fit.

Figure 21 UTK Campus Map

2. UTK Campus: (The University Of Tennessee Knoxville)

The design goal of the UTK campus is protect and preserve existing mature heritage trees, recognizing their ability to create memorable landscapes. The site buildings are used topography and other resources to enhance the campus landscape. The site connections are well designed in this campus. And sustainable landscape principles are also used.

Strom water management, irrigation systems, green roofs, protecting steep slopes and erosion - prone areas, minimize dependence on polluting chemical fertilizers this sustainable landscape principles are implemented.

Observations and Inferences

A. Literature study:

Table 1Literature study

No	Method	Inferences
A.	**Literature study**	
1	Research Papers	The different issues and solution on that are mentioned in the research papers. And different techniques are mentioned in that for sustainable landscape design. Vertical landscaping, horizontal landscaping, interior landscape, garden cities importance.
2	Article	The sustainable design parameters are mentioned in the article, relation between open and built spaces. The passive and active spaces role. Sustainable techniques for campus planning.
3	Internet	The different techniques of vertical and horizontal landscaping, interior landscaping.

B. Case Study:

Table 2Case study

No	Case study/Parameters	Inferences
1.	**UCCS Campus**	
i.	Concept	The Hillside Town, which is made up Sport Village, Residential Village, Academic Village
i.	Circulation	Pedestrian Ways, Bicycle Trails, Roadways
i.	Passive Spaces	Natural Vegetation, Treeless Prairie, Mountains, Grassy Land
v.	Active Spaces	Public Plazas, Access Drives Focal Activity Areas, Courtyards, Entrances, Landscaped Parking Lot.
v.	Technique	Land use, site ecology, community design and connection, water use, energy performance, energy security, material and construction, light and air, bioclimatic design.
i.	Human Psychology	The design goal for the UCCS campus is for its visitors and campus family to feel they have entered a hillside town where people have come to learn about wondrous things.
2.	**UTK Campus**	
i.	Concept	Providing comfortable transitions between human-scaled spaces and tall campus buildings, framing and screening views, and reinforcing corridors.
i.	Circulation	Roadways, Pedestrian pathways
i.	Passive Spaces	River, Distant hills
v.	Active Spaces	Gateways and entrances, plazas, quadrangles, pedestrian malls, great lawns, streetscapes, surface parking, spaces between and behind buildings
v.	Technique	Environmentally appropriate construction methods and materials, storm water management, protect and maintain the natural resources present on site, create a healthier ecosystem.
i.	Human Psychology	Peaceful, comfortable, pleasant, healthy campus is designed.

Conclusions

The essential concept of the sustainable campus design, is helpful us for maintaining the balance in environment. The open and built form relation is very important because the every feeling of the people is depends on the surrounding environment. The children mostly like the open green spaces than the built forms, so the sustainable campus design is essential. Passive and active spaces means the natural landscape areas and the designed landscape areas are plays an important role in the sustainable landscape planning. The vertical gardening is not just aesthetics; it can help to cool and insulate buildings, reducing the need and price for air-conditioning also. The growing plants in the building help to purify air and improve air quality as well as and add some eco breeze to centrally cooled offices/houses/school at the same time. The awareness for the sustainable landscape planning is necessary at the time of designing the campuses. The sustainable landscape is the necessity of the today's era.

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Adaptive Healing Center: Exploring Therapeutic Architecture and its Integration in Addiction Rehabilitation

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Abstract : Unlike in the past, addiction rehabilitation now endeavors to provide emotional support along with medical care, rather than aiming at removal of physical dependency on substance. Programs like cognitive therapies and meditation are new treatment trend. These, together with the newly evolved medications, have brought about the changing role of de addiction centers as a place for healing and learning in recent years. Although many voluntary institutions do not possess the dehumanized atmosphere as in compulsory centers, there are few architectural attempts which relate spatial quality to the de addiction programs and respond to the more precise needs of young addicts in relation to the surroundings. Also, relationships with nature and site features are often denied by rigid and insensitive site planning and architectural design. This dissertation explores therapeutic architecture and the integration of addiction rehabilitation into an urban environment within a rural context which is provided by nature and its various elements which create fluid, visually connected and congregational spaces to help the patients to come out of depression, socialize and induce recovery. A healing retreat that comprises of Halfway houses which engages with its surrounding community, fostering various levels of controlled interaction between patient and public. The design uses 'nature as therapy through architecture' with the implementation of various concepts, which includes a raised therapeutic platform, perimeter planters, tangible and intangible spiritual spaces that appeals to human senses, serving as a rural filter. This project also explores the role of Architectural technology with cognitive therapy and ultimately introduces the concept of a highly localized adaptive material that allows individual patient control and to filter the interactive visual relationship between individual and inhabitants (patients). The **modern healing facilities have been designed to house apparatus for healing but not to be healing.**

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instruments in themselves. Architecture should be considered just as significant as the treatments that it houses.

Introduction

Adaptive Healing Center is a Center for the processes of medical or psycho therapeutic treatment, for dependency on psychoactive substances such as prescription drugs, and street drugs such as cocaine, heroin or amphetamines.

Alcoholics and drug addicts are almost invariably found to suffer from general inability to adjust to the norms of the family and society. This exposes them not only to health hazards but also psychological and legal problems. Consequently, they isolate themselves or worse, the society treats them like an outcast. The rehab campus process aims to rehabilitate them as balanced and well- adjusted members of the society, who are at peace with themselves and their surroundings.

The role of therapeutic architecture

Figure 1 – Image indicating Nature as therapy

The 21th century, with its rapid technological advancements and the fast-paced evolution of medical

The term therapeutic architecture has evolved into a recognized concept as a reaction against the austerity of modern treatment facilities. This concept embodies the vision of well-designed architectural spaces that encourage healing and human wellbeing.[1]

The concept does not propose that the architecture itself has the ability to heal, but that the architectural manipulation of space can provide the platform for other natural factors like sound, light, color, privacy, views, and even smell to promote a healing environment that effects the physical and psychological healing of patients.

science in combination with the architectural focus primarily on functionality and rationality has in many cases resulted in our inhumane "healing" environments.[2]

Addiction

There is a lot of debate and controversy when people talk about addiction and what it actually is and what it means to be an addict. Some people including many treatment centers say that addiction is a disease that the individual cannot control on their own and therefore need outside treatment.

There is also another group of people who do not believe in the idea that addiction is a disease and that it is not curable. They see addiction as more of a choice that the individual makes.

The topic about what addiction is and why some people have it and others do not is a very sensitive issue and there are a lot of biased opinions. Scientifically addiction has been described in a medically unbiased way,

"Thanks to four decades of NIH (National Institution of Health)-sponsored research there is a new foundation for the treatment of addiction. This science now suggests that addiction is best considered a chronic illness. As in other chronic illnesses, a still incompletely understood combination of genetic and environmental risk factors combined with risky personal behavior particularly repeated drug use itself-produce the chronic illness of addiction.

Most scientists agree that the genetic, brain and behavioral changes associated with addiction do not appear to be completely reversible- like other chronic illnesses most cases of severe addiction can be managed, but not cured, with continuing care."

Many curious questions arise from this research. If addiction is something that can be managed but not cured then can a person with this chronic illness of substance use ever be fully happy? Will their bodies always crave some type of substance and without that substance, are they living a so-called normal life? What kind of treatment can help these individuals? Why are the relapses rates for substance abuse so high and what will it take in order to get those rates to decline?

Drug Addiction

Drug addiction is a chronic, relapsing disease, characterized by compulsive drug seeking and use, and by neurochemical and molecular changes in the brain.
Drug addiction is becoming a major health problem in India with some estimates indicating that as many as 15 million people in India became addicts by the end of 2004.

The study of The International Journal of Indian Psychology- Drug Addiction: Current Trends and Management, Jyotika Singh, Pradeep Kumar Gupta, Oct-Dec, 2017- has highlighted the rising trend in drug addiction in India and highlights the causes of drug abuse, and describes the treatment and prevention of drug abuse and addiction for proper management of the problem. The paper begins with description of pattern of substance use and substance use related syndrome that are divided as Substance intoxication, Tolerance, Dependence and Withdrawalsyndrome.

While the focus of the study is based on management of the problems due to substance abuse, it also briefs about Mental and behavioral disorders due to psychoactive substance use and describes four pattern of substance use – acute intoxication, harmful use, dependence syndrome, and withdrawal state. The number of drugs that are briefed in the study are broadly be classified into Depressants, Narcotics, Stimulants and Hallucinogens moving from Mild, Moderate, and Severe.

Treatments and Interventions

According to a study by Department of Community, Rural and Gaeltacht Affairs, **Drug Addiction Treatment and Rehabilitation,** John Buckley, March 2009, "Addiction to illicit drugs frequently results in significant harm to the drug users, to their families and communities, and to society as a whole. Treatment is difficult because of the nature of addiction and because of the many adverse ways in which habitual drug use may affect an individual's life." Studies in the past have categorized
treatments into 4 basic different groups- Pharmacological Treatment, Behavioral Treatment, Holistic Recovery & Innovative Therapies and Psychosocial Treatment- which widespread in the community of Rehabilitations program and treatment fundamentals.

1. PharmacologicalTreatment

Medications are given to control the withdrawal symptoms just after stopping drugs

- Alcohol: Diazepam andlorazepam
- Opioid: Buprenorphine or clonidineCannabis,
- inhalants: diazepam/lorazepam

Detoxification

Process by which an alcohol or drug dependent person is helped to stop the use of the substance in a supervised manner withdrawal symptom and the attendant risks are minimized.
Detoxification is the first step towards the treatment.

Principles of Clinical Management of Withdrawal

They are summarized as the four S's:

1. Sedation (orsubstitution)
2. Symptomaticrelief
3. Supplements
4. Supportiveenvironment

2. BehavioralTreatment

Behavioral treatment approaches include:

2.A Cognitive BehaviorTherapy

This approach addresses the interaction between thoughts, behavior, and emotions. It recognizes that these are linked and dysfunction in one area indicates dysfunction in the other. The benefit of using this approach to therapy is that change can begin in any of these areas, and naturally lead to change in the others.

2.B Cognitive AnalyticTherapy

This approach takes Cognitive Behaviour Therapy a step further by considering root causes to unhealthy thoughts, emotions, and behaviour patterns. When addressing the underlying cause of issues that have led to self-medication, longer lasting results occur.

2.C Motivational EnhancementTherapy

MET is based on the premise that individuals in treatment have a sincere desire to stop the cycle of unhealthy behaviour and change their lives for the better.

It’s normal to feel fear when faced with uncertainty in the future, and these fears are explored and individuals are given the time and support to process them, they are able to move forward willingly.

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2.D FamilyTherapy

Individuals who abuse substances often find themselves increasingly isolated from their families. Family focused interventions address the unhealthy communication patterns that have developed over time. Guests and their family members here, learn about some of the toxic and unproductive ways in which they interact. This allows them to develop the insight necessary to minimize old behaviour patterns and strengthen the family unit.

2.E MedicationManagement

At de-addiction Centers medication management is supervised by a licensed psychiatrist and advanced nurse practitioner. These services are designed to complement the treatment process by managing distressing symptoms that often trigger substance use, such as insomnia, anxiety, and depression.

2.F IndividualTherapy

Individual therapy is provided to all guest regardless of level of care at least once per week for 60 minutes. This allows guests to have one on one time with their primary therapist to engage in further exploration of their personal story.

2.G GroupTherapy

Participating in therapy with a group of strangers can sound uncomfortable at first, but the group is an essential part of treatment for good reason. Within thecon ext of group therapy, patients develop a level of acceptance and understanding that has been missing from their daily lives. Regular connection with others who are struggling with similar issues provides perspective and accountability for group members. Rehabilitation Centers offers several types of groups including psychoeducation, process, medical education, holistic therapy, and expressive groups.

3. Holistic Recovery & InnovativeTherapies

Holistic Recovery: engages and sustain the entire individual - including physical (biological), emotional (psychological), intellectual and social aspects, to recover your overall health and wellness.
Innovative Therapies: They include- Biometric Stress Management, Hypnotherapy,

Animal Assisted Therapy (AAT) and Music Therapy. These treatments are personalized, non-invasive, and target core brain functions such as Thinking, Feeling, Emotions, Sleep and Self-Regulation.

4. PsychosocialTreatment

Psychosocial Treatment mainly focuses on relapse prevention.

Relapse

- The one who is getting treatment for drugs or alcohol problem slips back or starts using the substance again.
- Relapse does not mean that you would not get well, it is a part of the gettingwell.

lapse

- Lapse is the first episode of drug use after one stop taking thedrug.

Cope with Craving

- Craving is like a wave it builds up reaches a peak and then comes down. The wave may last from a few minutes to a fewhours
- Recognize craving triggers and avoidthem

Identify the triggers

Internal triggers like Boredom, frustration, loneliness, anxiety etc.

External triggers like Arguments, bars, other people drinking, company etc.

AIM

The aim of this research is

- to study the design and core structure an Adaptive Healing Center for recovery from addictions by understanding the phycological behavior ofperson.
- to explore spaces which bring the occupants closer to life by creating **therapeutic** effects in architecture within the environment that is provided in urban context; which will sieve the inner self and widen up perspective for the outsideworld.

Objective

- To attempt to study fluid, visually connected and congregational spaces to help the patients to come out of depression, socialize and recoversecurely.
- To explore the design of a campus that engages with its surrounding community, fostering various levels of controlled interaction between patient andpublic.

Scope & Limitations

Adaptive Healing Centre would be one of the free-standing established Rehab Centre on outskirts of the city.
Facilities such as residential stay during training, vocational activities, various therapies, advice and counselling with holistic approach in a warm and supportive setting. Providing professional, individualized care to meet the needs of addicts and their families which would enhance their confidence to adjust in society and help them understand vital role of human life.
Limiting the number of users.

The study is restricted to De-Addiction/Rehab only.

Exploring nature as therapy through architecture CASE STUDIES

The theory of biophilia suggests that humans have an innate preference to connect with the natural world. This, in combination with experiments undertaken by Ulrich and various other scientists, suggest that the integration of our natural surroundings into our living areas can induce healing and positive emotional changes, which have an indirect impact on stress levels and physical and emotional well- being.[3]

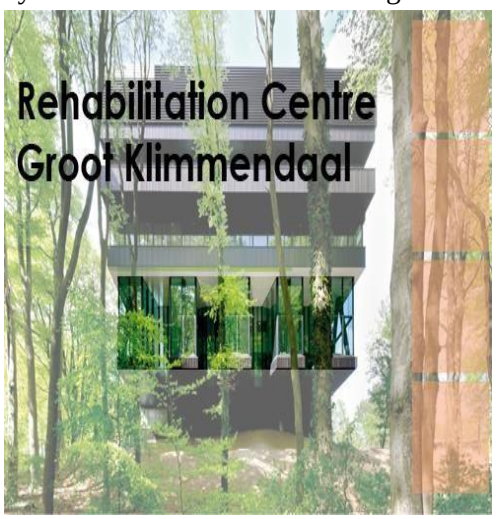

Figure 2- Rehabilitation Centre Groot Klimmendaal design by Koen van Velsen - within a natural context

Ulrich suggests four probable reasons for the beneficial effects provided by nature. One, we associate nature with physical activity which evidently stimulates health. Two, socializing is also in most cases directly linked with nature, for example walking or sitting on a bench in a park with afriend. Three, nature provides a temporary escape from our everyday reality. The fourth possibility is that nature itself has a significant influence on the mind. Bearing this in mind, do these social and physical activities alone contribute to healing and well-being or do people gain extra benefits from engaging in these activities in a natural environment?[4]

Ulrich also introduces the concept of 'framing of views', engaging patients with specific elements like a water feature or a tree in the landscape, which allows for a moment of self-awareness, that serves as a distraction from pain and suffering. This concept also generates comfort and relaxation, which allows a patient to heal faster by creating the perception of an environment, where patients view the external world rather than being viewed by others, thereby moving away from the inherent qualities ofinstitutionalisation.[5]

Figure 3- Rehabilitation Centre Groot Klimmendaal design by Koen van Velsen – the power of window

The Groot Klimmendaal Rehabilitation Centre, designed by Koen van Velsen brings together transparency, diversity, continuity, the play of light and shadow, color psychology and the experience of nature into a stimulating revalidationcentre.

The building maintains a transparent connection with its natural surroundings, blending interior and exterior and maintaining a strong natural presence throughout the building; which allows patients to rejuvenate even while walking. Light wells and atriums are used in combination to bring natural light in and to create visual connections between levels. The interior also includes subtle interplays of color in combination with natural and artificial lighting to enliven the space.

Understanding the stimulation of the human senses

Our physical surroundings have a direct effect on our emotions and reactions that essentially contribute to the process of healing within a space. Pallasmaa explains how;

"all the senses, including vision, are extensions of the tactile sense; the senses are specializations of skin tissue and all sensory experiences are modes of touching and thus related to tactility. Our contact with the world takes place at the boundary line of the self, through specialized parts of our enveloping membrane"[8]

The process of healing is permitted by specific

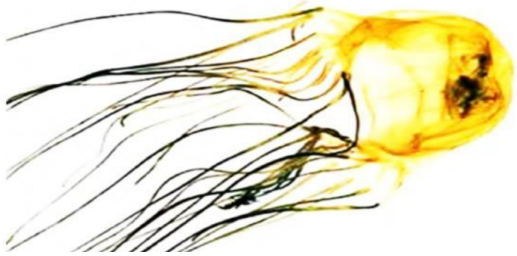

Figure 4 – the Moon jellyfish that functions through an autonomous network of senses allowing it to communicate a deep connection with its environment. brain molecules formulating our 'internal perception', through a combination of signals that enable our senses to perceive our environment. Our emotional reactions to our surrounding unconsciously stimulate our immune systems that essentially improve the process of healing.[9]

Our world perception is formulated by nerve chemicals that control our mood balance, while information received through the human senses ultimately formulates an image of our perception of place. Our mood and health is an unconscious result of our perception of place as our environment changes, so does our emotional response to it.[10]

Effects of Light, shadow and color psychology

Natural light and the sun's rays are recognized as elements capable of promoting healing and thus should form an integral part of the design of buildings constructed specifically for rehabilitation. Benedetti has proved that patients exposed to an amplified concentration of natural sunlight perceive less stress, require less medication and even experience less pain. Sunlight can also be perceived as a form of psychological motivation in its utilization in the creation of a healthy, therapeuticenvironment.[11]

Figure 5 - Rehabilitation Centre Groot Klimmendaal design by Koen van Velsen – passage play of light and color contrast

The balance or imbalance of a space can so easily be altered through the play of light and always in combination with forms, colors and natural elements. The quality of light can be manipulated and adapted to ultimately create the ability of transcending individuals into an alternate state of consciousness that could essentially be recollected in memory, after its lived experience.[12]

Color psychology has also been identified as a tool capable of improving human behavior, moods and emotions.[13] Dalke has discovered that both architecture and color have the ability to visually

stimulate patients and the surrounding society; this can provoke and elevate positive or negative emotions.
These emotions are triggered through our mental perceptions of colors in relation to the association of these colors with certain past personal events or cultural beliefs. Society's emotional response to color is based on shared psychological associations of certain emotions to certain colours.[14] Architecture should integrate the power of color into modern healing environments to evoke and stimulate certain emotional responses and use it as a tool to manipulate and control the experience of space as desired.

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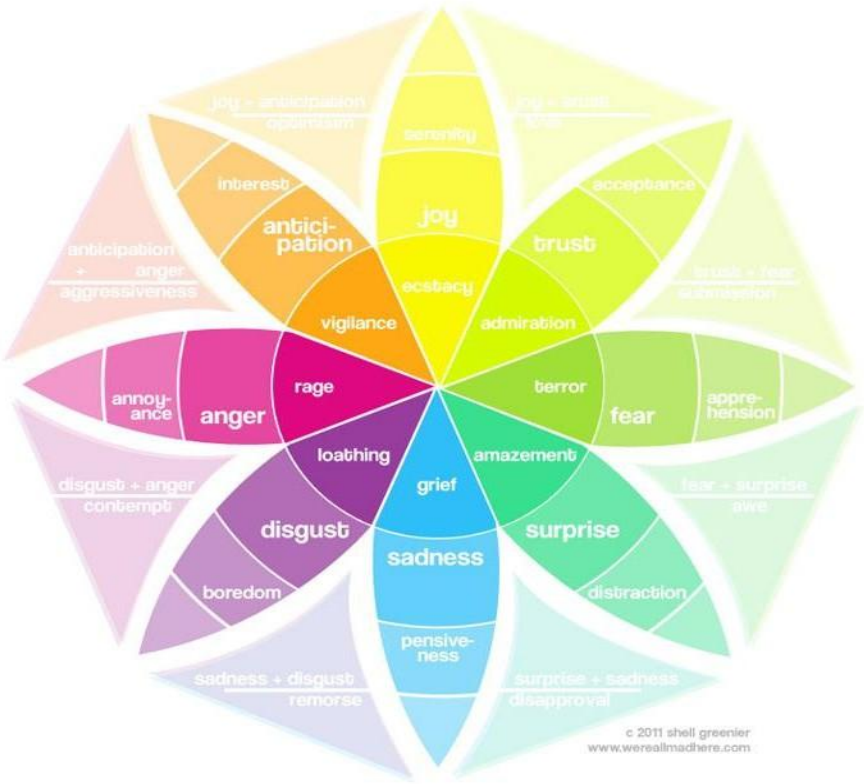

Figure 6 – Color wheel of emotional psychology

Another live Case study of Alpha Healing Center located in Baroda is designed by Art and Architecture, Baroda is widely recognized as one of the most effective inpatient drug and alcohol rehabilitation centers in Gujarat, India. At Alpha Healing Center, they offer state-of-the- art evidence-based treatments and holistic healing to create a unique recovery experience for individuals struggling with alcohol, drug and other addictions. Completed in 2017, this center takes care of behavioral treatment, holistic recovery, residential care programs (RCP), detoxification programs and family programs. In addition to these healing processes it also tailors contemporary facilities and serene environment for a warm and evident recovery.

Figure 7 – Alpha Healing Center, site plan

The rehabilitation runs a well-structured weekly schedule which provides a well-rounded and comprehensive approach to addiction recovery which encompasses the entire body and mind to increase chances of long-term

health and recovery. The admin is made very lively with water body, greenery and bell sounds, which enhances the quality of the space.

Figure 8 – Alpha Healing Center- Approach to the campus (above), Water body and lighting of Admin (below)

Practices like Holistic therapies -massage, yoga, music, art, breath-work, meditation and more are taken care of. Other than these, facilities such as library, gymnasium, indoor sports zone, relaxing deck, swimming are also focused on with a regular schematic schedule.

Figure 9 – Alpha Healing Center- Music Therapy room

Conclusion

This research demonstrates study through the introduction of an integrated community rehabilitation center that can achieve a healing environment. As such, it is essential that architectural design addresses how this environment can have a positive impact on patients' recovery. This paper began by examine the relationship between the body of treatment and architecture in order to comprehend how to movement heightens patients' sensorial experience within health environments.

The main part of study was to explore the therapeutic effects in an Addiction Rehabilitation which demonstrated through the implementation of the 'nature as therapy through architecture concept', where the examples of design uses a raised therapeutic platform to elevate patients healing level. In the above case studies the centers are a coming together of both complexity and simplicity with attention for physical, practical and social details. Transparency, continuity, layering, diversity, the play of light and shadow and the experience of nature are all ingredients of this stimulating environment.

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Factors Affecting Architecture of an Administrative Building

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Abstract : The administrative building is the type of the building which represents the image of the government body and expresses the power of its authority. Its architecture plays an important role to define identity of the society at country, state or district level. Also the organizational structure of such buildings is the important part of their design. There are various tangible and intangible factors affecting the architecture of such buildings. The administrative architecture involves the accommodation of the work spaces and at the same time it acts as medium of communication and production of meaning. This paper presents the study of factors which influence the architecture of the administrative buildings as there is need to understand the role of the administrative architecture and whether the building represent the identity of the government or not . The study will be limited to the medium scale administrative buildings like municipal complex or collector office, etc. It will include the identification of factors and analysis of the same. So the influential factors that should be considered during the designing process are identified. These findings of the survey are analysed and analysed data is reported to conclude on the significance of these factors. It will state which factors have major role in governing administrative architecture. This study will be helpful or contribute to the present or future modifications in the design of the admin buildings considering the required significance level for the various deciding factors.

Keywords: (administrative building, organizational structure, identity of government)

Introduction

The administrative buildings represent considerable value as being fixed assets for all organizations.
Their design should have consideration of representing the authority or power and at the same time it should facilitate the good interconnection between functions as well as activities of staff and visitors. This is vital because administrative buildings are often treated as an icon to promote the city. Hence the location, functionality, circulation, form and style become an important factors to be studied to understand administrative architecture. These factors are categorized as context, organizational structure and character defining elements of the building depending upon their purpose of consideration. These factors are identified through various literature and articles. To understand how they are implemented and how much significance they hold the existing and proposed administrative buildings are studied. The analysis of the cases is based on the above factors which conclude on their significance. This study can help us to understand how to express the importance of the administrative buildings through character defining elements while achieving better functionality and spaces.

Case 1: The District Collector Office

It is the 'Collector Office' building of the city which is an administrative headquarter of the district. It is constructed in 2017 which is located in the hot dry climatic zone. Collector office is designed on the existing site, which was meant to replace the cluster of number of small and old structures.

Figure 22: Aerial view of the building

Figure 23: Front side of the building

Figure 24: Side view of the building

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Location **-**It is located at the major junction of the highways in the core of the city and surrounding of it has number of such administrative buildings. Placement of the building signifies its presence as it has good visibility from all the sides.

Figure 4: Location map

Figure 5: Site plan

Organizational Structure

1.Functionality- It is five storied building accommodatingall the departments in two wings A and B, wing C which is fifth floor along with the three storied separate parking building with grand central plaza connecting the all three. Functional planning of the building is based upon the interconnectivity of all the departments with the consideration of large number of visitors. Service areas are planned in each wing. All wingsare connected by bridges and skywalks. Open spaces and sitting areas are designed as buffer to cater to visitors.

2.Circulation- The office building has sufficient number of staircase and lifts. The passages are wide and naturally ventilated. For the horizontal movement on the upper floors skywalks are designed. Open spaces, courtyards, intermediate sittings cater as pause points.

Figure 6: Zoning plan

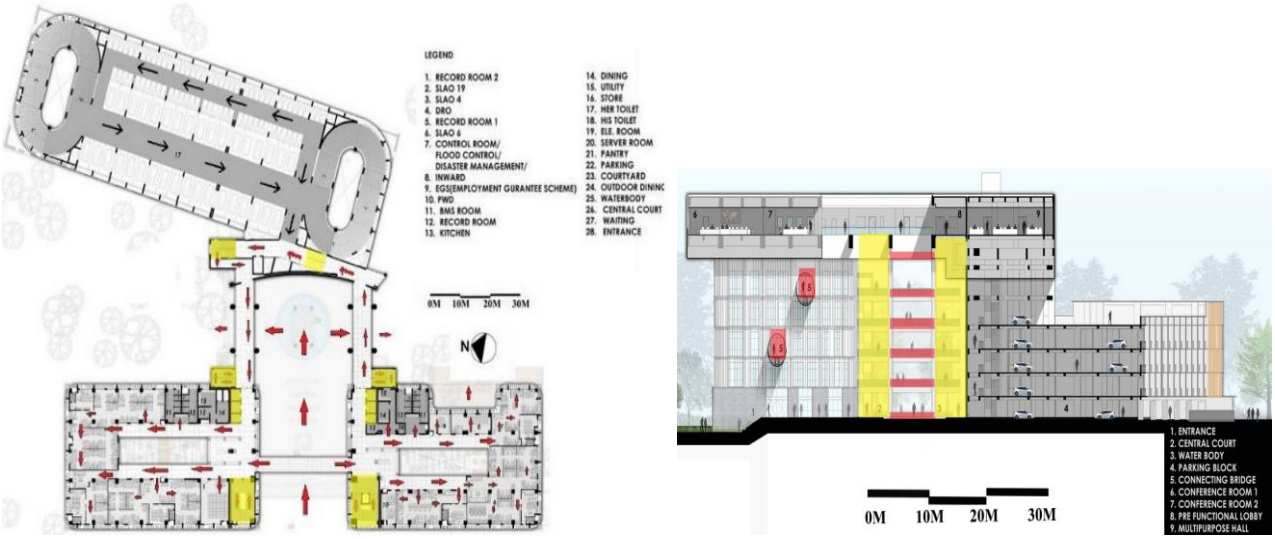

Figure 7,8: Horizontal movement pattern in plan; vertical movement pattern in section

3.Spaces-The building has grand welcoming plaza provided with the roof at the topmost floor. It has heritage structure erected in the center of the plaza. This is of the monumental scale designed with the water body and the passages of the wings, skywalks overlook this plaza. Envisioned with grandness building is better ventilated and better lit with natural light.

Figure9: Grand central plaza

Figure10: Monumental open spaces

Character Defining Elements

1.Form and Style- The building is designed with the consideration of urban context. Its contemporary form is achieved with advanced techniques and material and elements like skywalks, louvered façade, etc.The use of old stone from existing building and due importance given to the old porch holding national emblem above it retains the memory of old collector office.

2.Materials- The materials used are both traditional and modern materials. Stone masonry used at the ground floor forms the strong visual base. Above it, the office building rises with the vertical fins, made of galvanized iron creating tropical skin on the façade and responding to the context and tropical clime of the city. The opaque sunroof on last floor helps the natural light enter inside.

Case 2: ZillaParishad Building

Location- It is located in the urban area having tropical climate in the core of the citywhich accommodates all the public welfare departments along with conference halls, auditorium, assembly hall. Surrounding of the building is consist of commercial and institutional buildings. Though it is located at junction of the roads, primary entrance to the site is not clearly visible

Figure11: Location map

Organizational Structure

1.Functionality-It is basement+ 6 storied building.The segregation of the spaces as per functions in this building is worked out by segregating functions as per the need of privacy. The separation of the formal activities and public activities is achieved by providing all the public welfare departments on lower floors and all the offices and conference rooms on upper floors. Separate cores as means of access are provided for visitors and staff. Functions are decoded using color codes for formal and public activities

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Figure 12: Zoning diagram

2.Circulation- The circulation pattern is symmetrical for both the wings because of its symmetrical shape. Separate staircases are provided for the staff and public. Lifts have access only for the floors from 3rd floor onwards. So vertical movement become difficult for disabled people. Width of the passages is less and insufficient amount of natural light is in the cores.

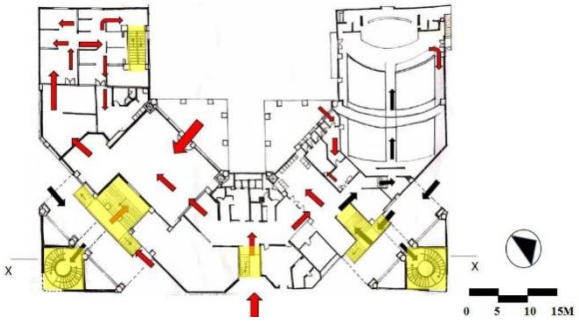


Figure 13: Horizontal movement pattern

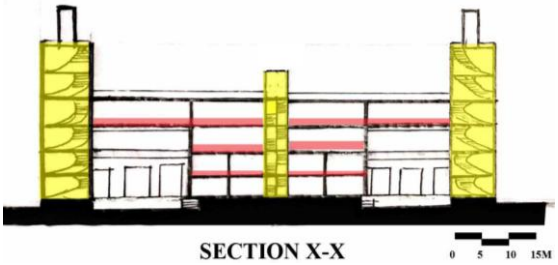
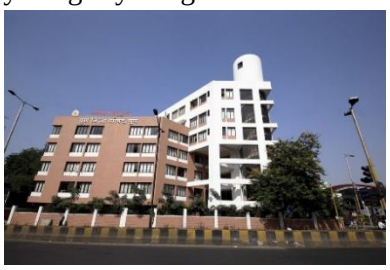


Figure 14: Vertical movement pattern

3.Spaces- The building is designed as U shape and symmetrical in form. The U shape provides privacy to the central space from three sides. The entrance is stepped and grandeur. Double height interior spaces such as waiting foyer signify the grandness. The voids are created within building by providing inbuilt terraces on fourth floor.



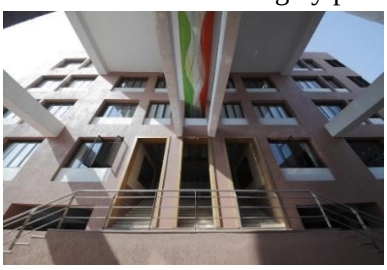


Figure 15,16,17: Exterior view; stepped entrance and double height foyer; service core on the corner covered with glass.

Character Defining Elements

1.Form and Style- The form of the building is symmetrical and unique as upper floors are elevated by columns. Voids are created inbuilt form providing whole building as a single unit. There is lack of natural light and ventilation inside of the building. Variation in heights and colours define the function of the spaces. The two towers coming up from the corner symbolizes power.

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Figure 18: Front view of the building

2.Materials- The materials used is concrete and glass. Glass is used in the towers of staircases and for the windows. Materials help to relate the building façade to the surrounding buildings in terms of context and aesthetics.

Case 3: Municipal Corporation Building

Location- The site is located in the suburban area. The site given was having narrow access road dividing the tight odd shaped plot area. Hence the internal road of access is widened including frontal arrival space in the road right of the way.

Organizational Structure

1.Functionality-It is two storied building with lower level having entries on either side for public and central entrance for the senior staff. Proximity to all the functions and spaces is equal and which is maintained by providing all the offices along central lobby. All important offices are provided on the upper floor for private formal activities. Small courtyards in each wing functions as a buffer zones.

Figure 19: Front view of the building

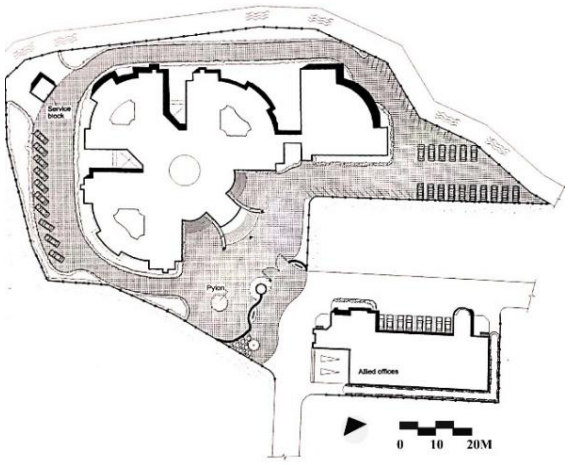

Figure20: Zoning diagram **Figure21: Siteplan**

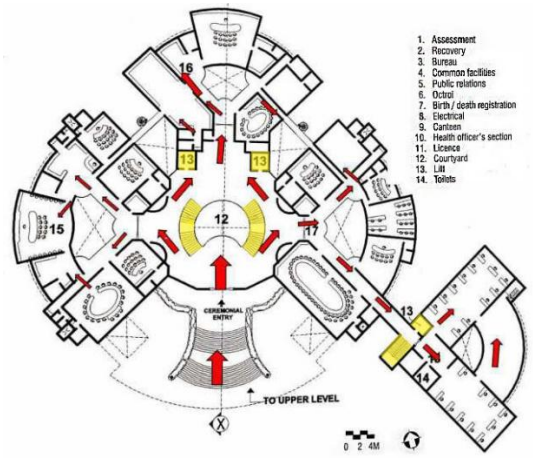

Figure22: Horizontal movement pattern

2.Circulation- The movement of staff and general public is segregated by providing different means of access. Lifts, staircases, services are easily accessible.

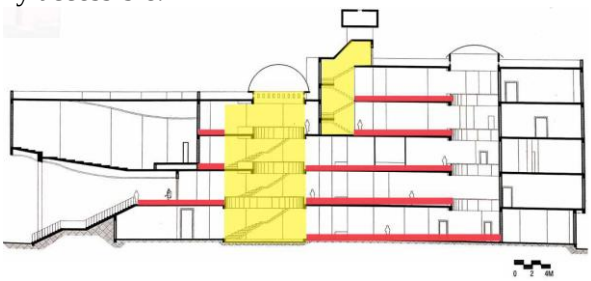

Figure23: Vertical movement pattern

Character Defining Elements

1.Form and Style- The form of the main building is compact. The curvilinear façade softens the building. The curvilinear forms and rectaguloid elements create balance within the form.

2.Materials-The material to be used is brickwork. Exposed brick work relates the old terms in context of traditional material.

3.Spaces-The spaces within the building are compact. The wings are consist of 'L' shaped clerical staff area joined by a curved supervisory staff area and a green central courtyards. Main entrance is flanked and conveys a welcome gesture. Jetting out stepped auditorium at second level serves as a porch.

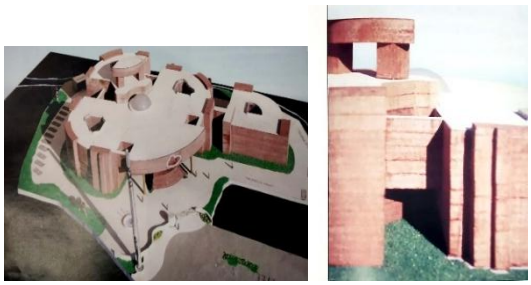

Figure24,25: Aerial view; floating form over green area

Table 1 Comparative analysis.

Factors	Subfactors	Case 1	Case 2	Case 3
Organizational structure	Functionality	All the service areas, public spaces are functionally located.	Strong interconnectivity	Proximity to each functional space is equal
	Circulation	Sufficient and naturally ventilated circulatory areas are	Lack of natural light in cores No provision of universal access	Sufficient amount of light and ventilation.

		provided.		Provision of universal access
	Spaces	Double height spaces and monumental scale Buffer zones or pause points are created at appropriate locations.	Double height space only at entrance, intermediate scale Intermediate buffer zones are not sufficient.	No double height spaces or monumental scale Small scale buffer zones are created.
Character defining elements	Form and Style	Contemporary rigid form	Variation in form i.e. use of linear, curved and chamfered edges	Curvilinear form
	Materials	Concrete,stone, galvanized iron, glass.	Concrete, glass	Bricks- exposed brickwork

Inference

As the administrative buildings accommodates all the publicdepartments along with some restricted zones, the public and formal activities are segregated by designing separate access for public and staff and important persons but interconnectivity of these spaces and functions should be strong and easy for the visitor's comfort. Also the admin buildings need not to always follow traditional form, style or materials. They can be defined by relating their functions and spaces. Monumentality and power can be signified with scale, form, use of modern technology for construction. Because now days, context of the urban or suburban areas, economy also play major role in overall designing process.

Conclusion

The factor that has major significance in the architecture of the administrative building is the organizational structure of the building which defines the correlation of functions of the building with the spaces within building followed by movement flow of general public and staff. The form, aesthetics, materials have become secondary aspects of the admin building as per changing forms of the administrative buildings.

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Streetscapes: Designing Because People Matter

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Abstract : The street, usually a paved public thoroughfare in a built environment is more than just a path or route for vehicles and goods through varied forms of transport. A street can play diverse roles in different cities, cultures and communities. Streets, are those public spaces where people involve in various activities. Streets are the lifelines of neighbourhoods, markets, community gathering spots and much more. Streets have a social impact, increasing conviviality through events, accidental meeting and socializing. They even offer health benefits by encouraging people to slow down the pace of life and spend more time outdoors. Streets, therefore, establish a basic frame through which residents and visitors alike, can get a feel of the city. The term 'Streetscape' refers to the natural and built fabric of the street. It defines the design quality of the street and its visual effect. A streetscape that is well-designed, well-maintained and looks inviting is likely to encourage people to live in that locality. Attractive and functional streetscapes increase not only the quality of life of residents but also help to boost both demand and the value of property while stimulating local economic activity. Traditionally, streets in India have been the public spaces around which the public life has revolved. They form the in-between space that negotiates between the private and the public realm. Indian streets encompass a huge range of activities from worship and business to political protests and marriage and funeral processions. Streets are put to a myriad of uses such as walking, cycling, walking pets, street art, sorting of newspapers and items for distribution, business spill over and hawking, festivals and performances, decoration, processions and protests, street events and hanging out. Streets in India therefore provide the space to eat, work, sleep, move, celebrate and worship. They are a mirror of the local culture. The report seeks to provide a deeper understanding of urban Indian streets through the following stages of study:

1. Identify and document the activities taking place on streets of the city for various categories of users

2. Identify, through case studies, the main principles that should be considered to develop safe and attractive streetscapes to allow for a multi-modal experience for all users.

The report hopes to formulate a set of guidelines for design of urban Indian streets as public spaces to make them people friendly, vibrant and safe at all times for all users.

Keywords: Streetscape, shared public spaces, sample guidelines

Introduction

Streetscape is a term that refers to, or is used to describe the natural and built fabric of the street, and is defined as the design quality of the street and its visual effect.' Originally the word 'street' simply meant a paved road. Pedestrian streets, alleys, city-centre streets are some examples of streets. The concept 'Streetscape' recognizes that a street is a public place where people are able to engage in various activities. Streetscapes can significantly affect how people identify and interact with their communities. Streetscapes and their visual experiences largely influence public places where people interact, and ultimately help to define a community's aesthetic quality, economic activity, health, and sustainability. Streetscapes form an important and functional part of our culture. They affect how we move about and our experiences while doing so. They can substantially help to reduce automobile traffic, stimulate local economic activity, improve public health and draw more residents and visitors to a community.

As towns increasingly compete with one another to attract investment, the presence of good public spaces and friendly streets becomes a vital business and marketing tool. Companies and businesses are naturally interested in

locations that are well-designed and offer well-managed public places which in turn would attract customers, employees and services.A well designed and maintained streetscape will display:

1. a wide economic impact, increasing footfall within town centres.
2. a social impact, increasing conviviality through events, accidental meeting and socializing
3. health benefits, encouraging people to spend time outdoors.

Indian cities are slowly taking steps to improve the quality of life for its citizens. With the 'Smart Cities Mission' encouraging the improvement of non-motorised and public transport infrastructure, cities across India are now gearing up for developing networks of complete streets.

Aim

The aim of this research project is to study the efforts made towards creating complete streets and identify and suggest guidelines for the development of vibrant street spaces in the city of Pune, as an important aspect of place making within the larger framework of the smart cities mission. Pune has set a target of over twice the Corporation's own budget and has gone over and beyond the Smart City proposal. Pune has, of late been working with a focus to improve its pedestrian and cycling environment by redesigning its arterial roads as 'Complete Streets'.

Complete Streets are those:

- that cater to all user groups
- are designed with wide and continuous footpaths,
- have safe pedestrian crossings,
- provide separate cycle tracks where applicable,
- have conveniently placed bus stops,
- have clearly designated on-street parking,
- provide organised street vending and
- have properly-scaled carriageways.

Objectives

The paper seeks to achieve the aim of suggesting guidelines through the following method:

1. Identify and list the activities taking place on streets of the city for various categories of users
2. Identify, through case studies, the main principles that should be considered to develop safe and attractive streetscape to cater to the above requirements.
3. Formulate a set of sample guidelines for the development of a complete street.

The background: Uses of streets

Traditionally streets in India have been the public spaces around which the public life has revolved. They have been the in-between space that negotiates between the private and the public. Streets encompass a huge range of activities from worship and business to political protests and marriage and funeral processions. Indian streets therefore provide the space to eat, work, sleep, move, celebrate and worship. The citizens and the community put streets to a myriad of uses such as walking, cycling, walking pets, street art, sorting of newspapers and items for distribution, business spill-over and hawking, festivals and performances, decoration, processions and protests, street events and hanging out.

However, over time, our streets have come to function less as social gathering spaces and market areas, and more as conduits for an ever-increasing volume of traffic. The last couple of decades have been focused on designing for through-movement and vehicle priorities on our streets. Thus street environments in Indian cities have increasingly become unattractive for pedestrians, both while travelling along the street, or simply using the street as a place for social or economic activities.

There is therefore, a need to conduct a study of good practices and encourage the formulation and implementation of sample guidelines for the development of complete streets in Indian cities.

Case Study 1: ITI Road and D. P. Road Aundh, Pune
Location: Aundh, Pune,
Architect: Ar.Prasanna Desai
Theme: An equitable distribution of road space for better quality of life.
The 'pedestrian plaza' on ITI road in Aundh is a buzz of activity on any evening. Youngsters visit the shops, restaurants and utilities located nearby while large numbers of people, of all ages including the elderly sit on the benches and seating alcoves around the trees, observing street activities and chatting well into the night. Occasional hawkers, walking or sitting nearby, can be found selling anything from seasonal fruit to an evening savory. Incorporation of pedestrian needs was one of the main features of the design. The street has been designed as a 'public space' for universal access. It tries to allow people to relax and socialize, while at the same time, create variety. The numerous existing trees that line the stretch have been fundamentally incorporated in the design, with care taken to demarcate soft areas around them to allow for growth, and the perimeter forming seating. In addition, benches have also been provided along the footpath, complementing the shops and making the stretch more vibrant. Art installations, including the attractive casing that has been used to cover up the junction boxes, spruce up the space.

Figure 1 and 2: Street as a 'public space' for relaxation and interaction

The large number of trees that line the entire stretch, were existing at the time and have been successfully incorporated in the design. Care was taken to design soft areas around the trees to allow for growth. Seating was designed around the tree base to resemble the traditional "paar" (a seat under a tree). Additional benches, provided along the footpath, compliment the shops to make the stretch more vibrant. Art installations, made from municipal waste, placed along the footpath include attractive casing, designed to cover the junction boxes and spruce up the space

Design directions:
1. Continuous one level footpath
2. Provision for Tactile tile network
3. Safe road crossing
4. Provision of ramps for easy movement
5. Safe pedestrian movements at junctions.
6. Accessibility for shopping trolleys and prams.

The ITI road has proved beyond doubt that citizens will respect, appreciate and use facilities sensibly, when provided. The entire walkway of almost 400m is at one level, without even a single point where pedestrians are required to negotiate level differences. It has encouraged local residents to not only gather in the evenings, but also to leave their cars at home to walk to the nearby facilities.

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Case Study 2: Church street, Bangalore

Location : Shanthala Nagar, Ashok Nagar, Bengaluru.

Architect: Ar.Naresh Narasimhan.

One of the busiest streets in the Central Business District of Bangalore in India, Church street is a 750-meter long stretch of road going from Brigade road to St. Marks road. It is also known as a 'tourist hotspot' being one of the major revenue generating areas of the city and a popular New Years' Eve celebration destination. This busy road in the central business district houses offices, restaurants and pubs and is also quite popular among shoppers.

Figure 3 and 4: Church Street: cobble stone lined carriageway with utility ducts on either side

Church Street, a legacy of the British period, was marked with potholes, broken pavements, leaking manholes, muck piles and overflowing drains. Open urinals and illegally parked vehicles encroached into the carriageway. Heavy traffic gave rise to chaos and congestion, leaving absolutely no walking space for pedestrians. In 2017, the redevelopment work on Church Streetwas an effort to revamp one of the busiest central spots in the city and make it pedestrian friendly. The project included widening the pavements, creating a uniform carriageway through the stretch, provision of adequate pedestrian-crossing facilities, beautification, landscaping of footpath and junctions and provision of street furniture. The 750m long Church Street is the first street in the city to be paved from granite cobblestones to bring in the local flavour.

Design directions

1. The road has been given a 5.5-metre-wide granite cobble stone lined carriageway with utility ducts on either side.
2. The cobblestones were laid in a 'Kasuti' pattern (a traditional form of folk embroidery practiced in the state of Karnataka)to reflect Karnataka's cultural heritage.
3. The width of the pavement varies from 2.5metres to 4.0 metres.
4. The entire stretch of road is lined by 56 LED streetlights,
5. The street has nine parking bays that can accommodate as many as 32 cars and about 200 two wheelers.
6. Cables and power lines now run underground along the shoulder of the revamped street, alongside new pipelines for water and sewage.
7. Chambers have been created underground for WiFi installations so that pedestrians can surf on the go.
8. Pedestrian benches have been added in places where there are trees and the stretch is wide.
9. A dash of greenery will soon be added to all the stones and concrete.
10. A private firm has also come forward to provide free sounds to play recorded music.

Principles of Streetscape Design

Streetscapes affect how citizens move around and the experiences they have while doing it. They can become an important and functional part of the urban culture. There are several types of streetscapes, both small as well as large. Large scale streetscapes are those addressing the 'mobility corridors' which are the major arterial roads of the city, the 'feeder streets' which feed the mobility corridors and the 'through traffic streets' which connect to the suburbs of the city and the mobility corridors. Small scale streetscapes, are the ones that generally address the neighbourhood streets which allow for a multi-modal experience, for residents and visitors.

There are several important points that must be considered when designing the streetscape with a focus on the pedestrian neighbourhood streets.

1. Mobility: Larger roads can include a mobility zone for vehicle movement. The mobility zone for private and public vehicles could be either physically separated from the slow pedestrian zone or there could be an implied separation.The vehicular mobility zone may include a separately earmarked cycle track if the speed difference between cyclists and motor vehicles is high.

2. **Safety of the pedestrians** is a critical concern. Streets must be safe for all users. Every street must have a slow zone where the pedestrians are given priority. The separation of the vehicles is important, however, well-marked pedestrian crossings and parking spaces, properly accessible spaces and curbs all contribute to the safety of the users.

3. Pedestrian accessibility: All streets need to have continuous footpaths or safe shared space with minimal grade differences and adequate clear width for pedestrian through movement. The design of footpaths must allow for safe movement between vehicles and sidewalks. Design features for universal access must be a prime consideration.

4. **Views from the street** to buildings, businesses, or points of interest are extremely important and must be maintained, especially in retail areas. Views and sightlines are critical to the success of businesses which line the streets.

5. **Liveability:**There must be an emphasis on gathering spaces which provide places to linger, sit and interact along the street. Elements such as tree lines, landscaping, and furniture enhance a street's slow zone etc.

6. **Sensitivity to local context:** Street design should factor in local street activities, patterns of pedestrian movement, and nearby land uses.The streetscape must create a unique sense of place and help to establish an identity by demonstrating a sensitivity to local context through use of local materials, signage, lighting, landscaping, public art etc.

7. **Landscaping is critical to creating an image**. However, when landscaping, the designer should use low landscaping below the users' line of sight or landscaping at a height that is above the users' line of sight. Most low landscaping should be a maximum of 450mm to 600mm tall. Any trees or upper level landscape should be maintained at 2000mm or above. The space between 600mm and 2000mm should be kept clear of landscape elements.

8. **Provision of flexible use zones** provides opportunities to create more parking or more gathering areas as the season demands. Outdoor café seating, street festivals, parades and events, street markets, street vendors, musical performances, public art displays etc. can be provisionally created as and when required.

Elements of Streetscape Design

All the functional and decorative elements that are erected, placed, laid, planted or suspended within a public or shared urban space are known as streetscape elements. They may include the essential elements of service infrastructure, useful public utilities and amenities, traffic signs and signals, advertising signs and decorations, street lights, street trees, potted plants, and other horticultural elements and general public furniture, with an emphasis on gathering areas or public spaces.

1. Sidewalks: Sidewalks should comprise of, a 'pedestrian zone' nearest to the facade for building access and window shopping and, whenever there is sufficient width, an 'amenity zone' nearest to the curb for trees, plantings, street furnishings and cafe seating. Sidewalks should have superior finishes such as paver blocks, tactiles for universal access, coloured stamped concrete, etc. on pedestrian focussed, mixed-use streets.

2. Curbs & curb ramps: Curbs and curb ramps should be placed at all crosswalks and should align with similar curb ramps across the street. Curb ramp materials should be the same as those that are used for sidewalks. 'Curb-less' conditions may also be acceptable, at certain places, to cater to special situations such as street fairs or festivals.

3. **Street lighting:**Street Lighting, an essential part of streetscape design, functions as an element to unify other streetscape items such as trees, benches and paving. It should be located at the same distance from the street edge along the length of the entire street. The style should integrate and complement the architectural vocabulary of the area. Fixtures should blend in with surroundings, should be waterproof and light should be shielded so as not to impair a pedestrian's vision or vehicular traffic.

4. **Seating, benches & bus shelters:**Seating, benches and bus shelters should be grouped together as much as possible. They should be designed and placed appropriately, at busier pedestrian nodes or gathering places, to provide an amenity to the public. Seating and benches can be integrated within permanent planter edges. Care should be taken to ensure that they do not obstruct views for vehicles, sidewalks for pedestrians, or signs and displays for businesses.
5. **Fountains:**Should be located in key public areas such as street corners where they help attract attention and draw in pedestrians. They should allow for ample pedestrian circulation on all sides and may be designed to encourage 'sitting' along the edges or interaction from the public via choreographed movement. They serve the additional function of suitably modifying the microclimate of the place.
6. **Public art:**Should be 'accessible' physically and intellectually. It should tie to the history of the area or tell a story significant to the city. If possible, it should be created by a local source or public participation so as to develop a bond and create a sense of ownership. Art may include water, seating, planting, decorative architectural elements or plaza space as part of the design.
7. Tree grates: Should be used wherever a tree is placed within a high traffic area. The design of grates should allow for the growth of tree and should be made of factory painted, ductile iron.
8. **Planting pots and planters:**These can be used in addition to landscape planting areas. They serve to compliment the surrounding streetscape by adding colour and variety. They can be placed at any suitable place where pedestrian or vehicular traffic is not disturbed. They may even function as a separation between pedestrians and vehicles
9. **Trash receptacles:**Trash receptacles should be located conveniently for pedestrian use and service access in significant areas and gathering places. They should be permanently attached to deter vandalism and have sealed bottoms with sufficient tops to keep contents dry during monsoon and out of direct pedestrian view.
10. **Bollards:** Thedesign of bollards should blend with and aesthetically complement the overall streetscape. Bollards should be setback from curbs to allow un-obstructed opening of parked car doors. Bollards may be chained or cabled together to ensure pedestrian safety or define areas for public functions.

Conclusion and design Guidelines

If streetscapes are safe and inviting to pedestrians, people are more likely to walk which can help reduce automobile traffic, improve public health and attract residents and visitors to a community.

The following design guidelines can be considered essential for good streetscape design:

1. Unencumbered public movement: clear segregation of vehicular and pedestrian zones, demarcation of lanes for slow and fast, motorised and non-motorised traffic
2. Safety and Security: provisions for safe universal access
3. Public facilities: adequate and easily accessible
4. Street comfort: facilities for relaxing, socializing and maybe just watching
5. Promoting cycling: Identified cycle tracks
6. Enjoyable Walking: Easy, unhampered pedestrian movement
7. Storm water drainage/purification
8. Rainwater harvesting
9. Accessible utilities: for ease of maintenance without need of digging up the street.
10. Enhanced economic activity: Provisions for flexible use spaces for vending and seasonal activities
11. Enchanting eco system: to create a memory and impart identity to the place.

An inviting streetscape is likely to encourage people to live in that locality. Attractive and functional streetscapes increase not only the quality of life of residents but also help to increase demand, boost the value of property and stimulate local economic activity.

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What makes a hospice comfortable?

Susmita Patil

Abstract : End of life care is for the terminally ill patients i.e. the patients who are in their last months or years of their life. End of life care includes physical and emotional support for the patients and their families. The aim of End of life care is to provide comfort and control pain and other symptoms of the terminal disease. End of life may include hospice care, palliative care and supportive care. A hospice is a physical setting for patients with terminal illness in which the active treatment for curing the disease is stopped to provide comfort to the patients at the end of their life. Hospice emphasizes on symptom control and attention to the psychological needs of the patients. Thus the framework of a hospice care can be categorized into four major parts such as, Pain, Symptom control, Psychological issues, Spiritual or existential issues. The belief of hospice care is that everyone has a right to die pain free and with dignity. For the comfort of terminally ill patient the environment they are staying in is as important as the care which is given to them by their caretakers at the hospice. In this research paper I'm studying about the factors which affect the comfort level of terminally ill patients in the hospice. The factors such as open spaces, lighting, green areas, area per person are studied. For this research paper I did a live case study of a hospice located in Loutolim, Goa and an internet case study of a hospice located inMarathahalli, Bangalore. The various factors were studied and compared between the two hospices and analyzed. The aim of this study was to understand the relationship between the physical environment and the patients and which will lead to answer my concern about what makes a hospice comfortable?

Keyword: Hospice, Comfort, End of Life care, Dignity

Introduction

The final event in every person's life is death i.e. the end of life. Although one cannot be aware of it. But for the people who are terminally ill it is difficult to accept the fact that they have a certain number of months or years left of their lives. Terminal illness is an incurable disease that cannot be treated and results in the death of the patient.

End of life care is given to the terminally ill patients. End of life care includes physical, emotional, social and spiritual support for the terminally ill patients as well as their families. The aim of end of life care is to control the pain and provide comfort to the patients. The types of End of life care are palliative care, support care and hospice care.

Palliative care: World Health Organisation has defined palliative care as "the active total care of patients whose disease is not responsive to curative treatment. Control of pain, of other symptoms and of psychological, social and spiritual problems, is paramount. The goal of palliative care is achievement of the best quality of life for patients and their families"(WHO, 2009).

The primary goal of palliative care is the relief of distressing the symptoms. When the patient is free from pain and symptoms like breathing difficulty, nausea and vomiting, cough etc., the patient can attend to their other needs.In Hospice care, the active treatment of the patients is withdrawn to provide comfort and dignity at the end of life. Entrance into hospice care marks withdrawal of active medical intervention and curing fatal conditions, to instead provide "a dignified, comfortable death for the terminally-ill and to care for the patient and family together"(Rhymes, 1990)

Numerous studies have found out that strong social support helps the quality of life of hospice care patients and individuals with social support have been found to cope better with pain (Rosenfeld, et al., 1996).In this research paper, I present findings from interviews with 5 individuals including patients and nurses of the hospice and comparing the findings with internet case studies.

Literature Review

India is a developing country and a challenging country for the developing end of life care. The population of India is over 1 billion. Of which vast numbers of people live in rural impoverishment, with poor access to nutrition and health facilities.

It is difficult to assess the exact requirement for palliative or hospice care because of inadequate disease registration and the cultural stigma attached to major diseases like cancer and HIV/AIDS. According to National Institute of Cancer Prevention and Research (NICPR) estimated number of people living with the disease is around 2.25 million and total deaths in 2018 are 7,84,821.(A., 2009) Risk of dying from cancer before the age of 75 years is 7.34% in males and 6.28% in females.(R, et al., 2012) Cancers of oral cavity and lungs account for over 25% of cancer deaths in males and cancer of breast and oral cavity account for 25% cancers in females (Anon., 2001.).

Over the past 20 years, increases in the aging population and prevalence of advanced cancer are common. Together with China, the country has the second largest population in the world. In India, it is estimated that one million new cases of cancer occur each year, with over 80% presenting at stage III and IV. (D, et al., 2000) The need of palliative care in India is increasing.

Palliative care and Hospice

Palliative Care is given at any stage of illness, often offered concomitantly with curative treatments.

Hospice care is palliative care however it is given to the patients who have an illness that is certified as terminal (life expectancy < 6 months). In India, there are not any definite eligibility criteria for the patients to take hospice care. Hospice care is provided as home care as well as in a nursing home or hospital inpatient units. The goal is to provide comfort and quality of life as well as to avoid aggressive care at the end of life.(MP, et al., 2015 September) Hospice care provides patients to have death with dignity at home, thus providing comfortable environment and to reduce the suffering causing from the terminal illness. Hospice care focuses on the caregivers and family members as well to provide support to them in the difficult times. Respite care is given to the caretakers and family members. Respite represents a category of services that provide an alternative care arrangement so that the family caregiver can have time away from care responsibilities. Caregivers may use respite time to rest, attend to personal needs (Zarit, et al., 1998).There is a study currently underway at the Cancer Center of Tata Memorial Hospital, Mumbai, evaluating the effectiveness and applicability of Respite model of Palliative Care(Ghoshal, et al., 2017).

Table 1: Compares palliative care and hospice care

PALLIATIVE CARE	HOSPICE
• Used at any stage during course of illness	• Palliative by nature, in patients with life expectancy <6 months
• Treatments are not limited	• Curative treatment is no longer beneficial. Treatments limited, focused on comfort
• Multidisciplinary, team based care	• Multidisciplinary
• Inpatient/ Outpatient	• Inpatient/ Nursing facilities/ Home based
• Standard Medicare Part B	• Medicare hospice benefit

Table 1: Difference between Palliative care and Hospice

Global Timeline of Palliative Care Development

During the 12th -20th centuries, the word "hospice" meant a place of rest for travellers or pilgrims. The modern "hospice movement" began in 1967 with the establishment of St. Christopher's Hospice in the UK by Dr. Cicely Saunders. Interestingly, she was originally a medical social worker, then trained as a Registered Nurse and finally advanced her career to become a physician. Being involved in the care of terminally ill patients, she lectured widely, wrote various articles on this subject and was a pioneer in the field of Palliative Medicine. The St. Christopher's Hospice, when opened for service, had inpatient facilities for 54 patients with a 16 bed residential wing for elderly patients and a planned bereavement service. Home care started two years later. (Cicely Saunders, 2001 Sep)

The concept of Palliative Care was established in North America when Dr. Balfour Mount founded the Palliative Care Service in the Royal Victoria Hospital, Montreal.(Cicely Saunders, 2002 Sep) Inspired by Dr. Cicely

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Saunders, the first Hospice in the US was founded in 1974, the Connecticut Hospice in Branford, Connecticut, by Florence Wald, Dean of Yale School of Nursing along with two paediatricians and a chaplain.(Anon., n.d.) In 1987, the quarterly "Hospice Bulletin" was released which quickly came into international circulation.(Cicely Saunders, 2002 Sep) With further spread of palliative care worldwide, it was observed that "All world cultures have traditional strengths that can contribute to the success of a palliative care programme". (C & R., 1997) In 2006, Hospice and Palliative Medicine was recognized as a subspecialty by the American Board of Medical Specialties. However, as of 2010 there is an acute shortage of Hospice and Palliative Care physicians in the US, the gap estimated to be around 6000-18,000 physicians.(D, 2010 Dec)Palliative care in India is a relatively new concept having developed only over the past 30 years, compared to 50 years in the developed nations. The Government of India initiated a National Cancer Control Programme in 1975 (MR & S., 1999 Spring), modified in 1984, to make pain relief one of the basic services to be provided at the primary health care level. The first Hospice facility in India, based on the traditional western model of an inpatient hospice, the Shanti Avedna Ashram, was opened in Mumbai in 1986. The WHO also helped form the Indian Association of Palliative Care (IAPC) in 1994 with predominantly anaesthetists from all over India as the initial founding members, as they were the ones most commonly involved in pain management. (MR., 2015)

Figure 1 shows the timeline of Palliative Care development in the world and in India.

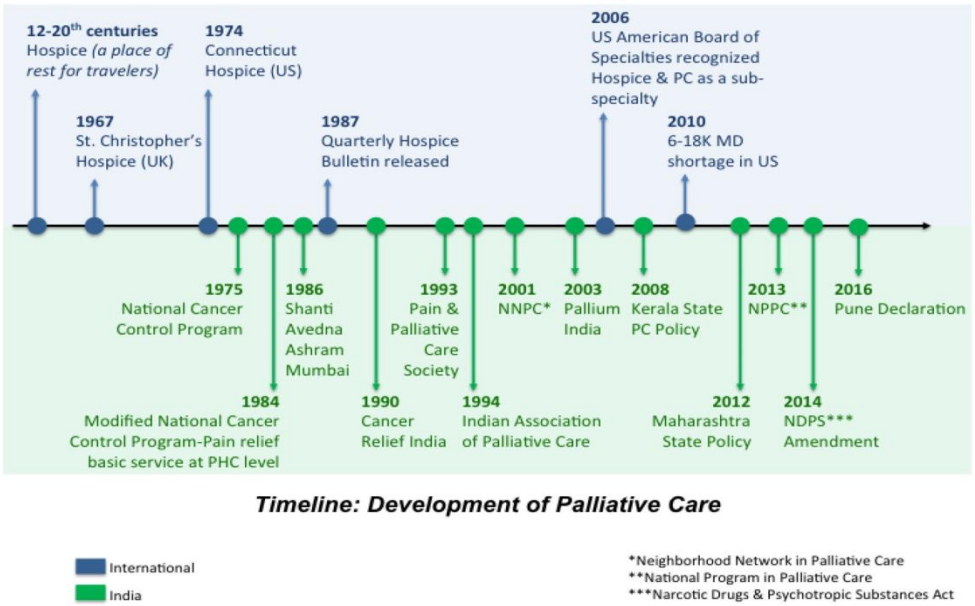

Figure 23: Timeline of palliative care development

Palliative Care in India - Current Scenario

Currently, there are over 908 Palliative Care centers in India, which are accessible to a mere 1% of a population of over 1.2 billion people. India is a nation which has the worst of both worlds'communicable diseases and infections are still rampant and there has been an exponential rise in the prevalence of chronic lifestyle diseases and cancer. It is estimated that 5.4 million people a year are in need of Palliative Care in India.(SS, et al., 2015) However, these services, apart from being inadequate for such a large population, are mostly concentrated in large cities and regional Cancer Centers. Palliative Care services in Kerala, however, are more far-reaching with 841 centers out of the 908 located in this state. (Anon., 2012 Nov)

Neighbourhood Network in Palliative Care, Kerala

In 2001, the Neighbourhood Network in Palliative Care (NNPC) was established in Kerala. The tradition of Social Activism inspired the setting up of community-owned units in rural areas with the support of medical and nursing teams from The Pain and Palliative Care Society (PPCS), funded mostly by the local community.In this program, volunteers from the local community are trained to identify the symptoms and psychosocial issues of chronically ill patients of their areas and to intervene with the help of a network of trained professionals. Covering a population of

over 12 million, the NNPC is probably the largest community-owned Palliative Care network in the world.(SK & D, 2007) The NNPC now operates in all 14 districts of Kerala through a network of 230 clinics/units comprising of 60 full-time physicians, 150 staff nurses, 200 auxiliary nurses and over 10,000 trained volunteers. Each unit has around 400 patients under their care at any given time, with the network as a whole seeing over 2500 patients per week.(Kumar & Numpeli, 2005)

Research Methods

1.1 Exploratory Case Study:

To study the factors which make a hospice comfortable a live case study will be done and a book case study. The factors such as open spaces, accessibility, and area per person will be studied. For the live case study, the Hospice chosen is located in Loutolim, Goa and for the internet case study; the hospice chosen is located in Bangalore. In both the case studies, the factors which are studied are as follows:Planning of different spaces according to their functions, Location of Open spaces/ Recreational spaces, Ratio of Area of Open spaces to the Built Space, Percentage of green area, Location of the hospice, Availability of transportation/nearest bus stop, Area per person

1.2 Interviews and Systematic Observations:

The purpose with the interviews is to explore the experiences of the patients as well as the caretakers. The interviews were unstructured interviews as to establish comfort with the participant.

The purpose is to see how the patients interact with the spaces around them. Their relationship between the wards and open spaces were observed.

Analysis & Results

Live Case study: The Shanti Avedna Sadan is India's first Hospice, an institution that takes care of the advanced terminally ill patients. It is located in Loutolim, Goa. The nearest bus stop is at 750 m from the hospice. The total site area is 4500 sq.m and the total built up is around 1800 sq.m.

The hospice is located in a densely forest area away from the city. But the hospice is near the national highway. Therefore the access to the hospice is through the national highway. There is open space at the entrance where the patients come for a walk. There is Doctor's cabin with reception and waiting area for the family members to sit. There are two common wards for the patients, one female ward and one male ward. There are private wards also. The kitchen and nurses' quarters are located at the backside of the hospice away from the wards. The laundry room and service areas are at the end of the hospice. There are small courtyards in between to get light and air ventilation. Percentage of green area to the built area is 60%. The hospice has 40 bed facilities for the patients. Area per patient is around 9 sq m per person. Unstructured interview was taken with the patients and the nurses working there. With the help interviews and systematic observation it was observed that patients sat in the courtyards to relax as the greenery calmed them. As some of the patients were bed ridden they could not walk and when asked it was observed that the greenery outside of the window made them feel relaxed.

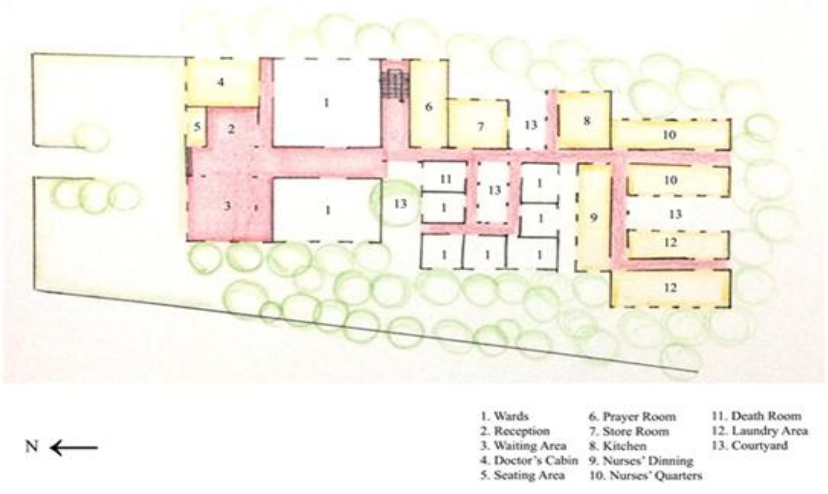

Figure 2: Site Plan of Shanti Avedna SadanInternet case study

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Internet Case Study: Karunashraya meaning 'Abode of Compassion' a non- profitable organization. It was inspected as a registered charitable trust by the Indian Cancer Society (Karnataka Chapter) and Rotary Bangalore Indiranagar to provide free professional palliative care for advanced stage cancer patients who are beyond cure. This organization help patients live without pain and in dignity and peace till their journey's end. They have been offering in-patient care since 1999 and home care since 1995 in Marathahalli, Bangalore.

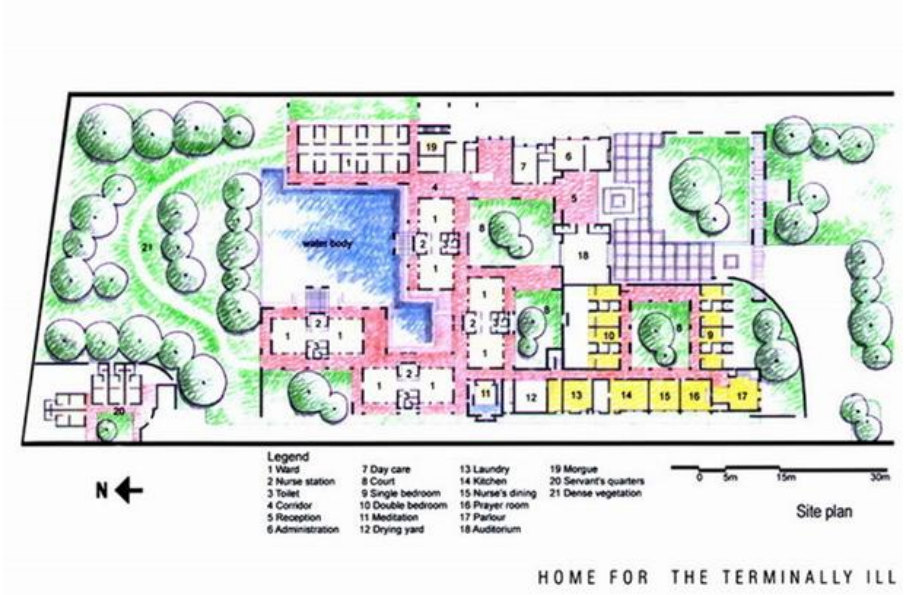

Figure 3: Site Plan of Karunashraya Hospice

The nearest bus stop is in 40 m. The building is situated in 8200 sq m. Area plot and the total build up area is 3400 sq m. Karunashraya accepts only 55 bed in patients. The entrance drive way to the parking is shaded by several trees. The Parking for visitors can accommodate up to 8 cars and open space for bikes. The south entrance of building has large front courtyard with the parking space for the staffs. The entry towards the building is designed elegantly with the stone structure, creepers and flowers. There are several open courtyards which are accessible by the patients. The courtyards are well maintained with plants, trees and benches are provided to sit and relax. The ambience of the hospice is kept simple and grey without any loud colors. This is done for the psychological comfort of the patients staying there. The patient wards are located around the water body and all the service areas like kitchen; nurses' quarters are located in one zone. The building is designed as to get natural lighting and ventilation. A 100 seat auditorium is provided for conferences and training. The patients can relax with a view of greenery and water body. Percentage of green area to the built area is 58 %. Area per patient is 8.7 sq m.

Figure 4: Bird's eye view of the Karunashraya Hospice Figure 5:The relaxation area involves a pool on one side.

Conclusion

Palliative care in India is a relatively new concept having developed only over the past 30 years and due to lack of knowledge about the diseases and ignorance towards the diseases the hospice care is still unknown to many people. Yet there are organizations which are trying to increase this awareness towards hospice care. By comparing the two case studies, it is observed that open spaces play a very important role in hospice design. In both the hospices, the percentage of open spaces is more than that of built spaces. As the patients spend most of their time in the wards,

provision of a water body or landscaped area can help them to relax. Area per patient is also around 9 sq m per person. Hence the hospice should not be too crowded and every patient must have enough space. Spiritual spaces like prayer rooms support the patients' spiritual needs. As for the nurses working in the hospice there should be a provision of open space dedicated for them.

Acknowledgements

I would like to thank the staff and patients at Shanti Avedna Ashram for providing an opportunity to observe their hospice care system and I would like to thank my Research Guide Ar. Meghana Kulkarni who guided and helped the research.

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Identification of Preferred Parameters of Residential Play Areas at Pune

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Abstract : In recent years, children cannot be seen frequently in open play areas in residential premises. They are isolated from the natural environment. They do not play in the play area of their residential complexes; rather they use to play in the passages of the complex or anywhere else in the premises. Children have become accustomed to playing computer games and it has resulted in reduced physical activity, while physical activity is considered to be necessary for natural growth and physical and mental development of children. There are various elements which impacts on the play area. The research is being performed in the three residential premises in Pune city. The research is concerned with the quality of life in these areas, especially from the perspective of the vulnerable users, like elderly and children. The research methodology adopted is divided in three phases such as a structured observation checklist of parameters which should be considered while designing the play areas, an interview questionnaire, prepared to ask parents perceptions about the play areas and the activity mapping of their premises. The observations enable an insight of spatial use according to "category of activity" and "age group". The interrelationship between the standard parameters and existing situation in the play areas in the premises are identified by the observations and parent's perception. The anatomy of collected data signifies the preferred parameters of residential play areas. This study aims to find out the impacts of various elements and the preferred parameters of residential play areas at Pune. Also this study aims to reveal the parameters of play area design and offering a guide, so that it can give an idea for the new designs.

Keywords: Children, Open play area, Residential premises, Parameters, Structured observation

Introduction

Play should be at the heart of children's everyday lives and experiences throughout childhood. Over the past decades, a global vision of considering children and their rights in all aspects of their lives has raised. Children cannot be seen frequently in open area in residential spaces. They are secluded from the natural environment. Providing attractive open spaces in neighborhood level for children become a serious concern of residential designers and architects.

The term "open Space" was probably used for the first time in the year 1833. Open spaces are considered as an outdoor area that provides an opportunity of spontaneous activity, movement, or visual exploration for many people.

Many times we observe that, children do not play in the play area of their residential premises; rather they use to play in the passages or anywhere else in the premises. There are various elements which impacts on the play area. Not only the design and quality of material but also there are various elements which impacts on the selection of play area. Those impacts do not considered by the designers at the time of designing. The aim of the research presented in this paper was to find out the important aspects and parameters of the play area which helps in designing a better residential play area for children. The objectives of the studies are to identify the parameters of children play area, to identify the preferred play areas in residential premises and to analyze the interrelationship of preferred play area with parameters of standard play area. The result will be useful to the designers and architects to design standard residential play area.

Methodology

This study was aims to identify the preferred parameters of residential play area. At first, parameters of the children play area of age group 5 to 9 years (junior children) were identified from the secondary resources. The next step

was choosing the research data collection instrument, case studies and respondents. The research was limited to residential premises in Wakad, Pune area. Three residential premises were selected as the case study of the open play areas in the premises. These three residential premises were, Atlanta II, Park Titanium and Akshar Elementa. These three premises were studied by structured observation with the help of checklist. Each premise was studied for two days; any working day and weekend. Further for the activity mapping each premise was observed thrice a day; in morning at 8am–10am, in afternoon 1pm-3pm and in evening 6pm-8pm and accordingly readings were noted. These activity mapping was done with the help of plan of the respective premise and which shows the active areas in the premise where the children plays for long time. By the analysis of observation checklist and activity mapping a questionnaire was prepared and was asked to the parents (as respondents) in the respective premise. The 45 respondents were selected. Parent's perceptions and responses were collated and summarized. The analysis was done through content analysis and the results are encapsulated. The interrelationship between the standard parameters and existing situation was done by the identification and observation of the selected premises.

Observations and findings

The process of observation of premises was done with help of structured observation checklist. The checklist contains the standard parameters of play areas and their sub-parameters, selected residential premises and the norms of the play area. The observation checklist is as follows:

Table 1 Checklist

Sr.No	Standard Parameter	Atlanta Ii	Park Titanium	Akshar Elementa	If Not
1.	ENTRY				
	i. The location to the play area located properly while designing	X	✓	✓	The play area must be located near all the wings.
	ii. The entrance of the play area is universally accessible	✓	✓	✓	The entrance of the play area should universally accessible to all.
	iii. The play area designed by the safe ground material	✓	✓	✓	The play area should be designed with safe ground material like rubber mulch, poured rubber and rubber tiles, artificial grass, sand , natural grass etc.
2.	ACCESSIBILITY				
	i. The pathways and pavements are non-slippery having even pavement surface	✓	✓	✓	The pathways and pavements should be non-slippery and even paved for running and walking.
	ii. Concrete walk and paved area for wheeled toys	✓	✓	✓	The concrete walk and paved area should be provided for riding the bicycles, wheel toys, etc.
3.	ZONES				
	i. Sandpit zones	X	✓	✓	According to the norms, these all zones should be provided in the play area.
	ii. Green zone	✓	✓	✓	
	iii. Playing equipment zone	✓	✓	✓	
	iv. Playground	✓	✓	✓	
4.	FACILITIES				
	i. The following play equipment provided in play area;				These are the basic equipment which helps in the physical development of children for that this equipment should be provided.
	▪ Swings	✓	✓	✓	
	▪ Slides	✓	✓	✓	
	▪ Sand box	X	✓	✓	

	▪ Mountain climber	X	X	✓	
	▪ Play sculpture	X	X	✓	
	ii. Open area for free play	✓	✓	✓	Play area must include the free play area for children to play group games, e.g. Hide and sick, Rat-A-Tat etc.
	iii. Benches with shelter for parents	✓	✓	✓	The benches for parents should be provided.
5.	SAFETY				
	i. Provision made for first aid	X	✓	✓	In case of accident the play area must have provision of first aid.
	ii. The area near playing equipment free of things which can harm children in case they fall down	✓	✓	✓	The play area must be free from harmful things.

Further for the activity mapping the three premises were observed thrice a day for two days for each premise.

1. **Atlanta II**- As we entered in the premise there were green zone and an open free play zone was provided at the centre of the premise. The play equipment zone was little far away from wing A and B. The equipment zone was near to the Wing C. The play areas were too small. Visited this premise on Monday (working day), by the observation it is concluded that the free play area was more active, in afternoon and evening time than other play area in the premise. Also on Saturday (weekend), by the observation it is concluded that the free play area was active in morning, afternoon and evening times. Due to small play areas, children were playing in the lobbies of their wings also.

2. **Park Titanium-** As we entered in the premise there were children's play area at the centre of the site, which is accessible for all wings. Visited this site on Tuesday (working day), by the observation it is concluded that the whole play area was active, in evening time. Also on Saturday (weekend) visited the premise and by the observation it is concluded that the free play area was active in afternoon time and the play equipment zone was active in evening time. Also the sandpit zone was active place in evening time.

3. **Akshar Elementa-** This premise is specially designed with the attractive play areas. In this premise the sandpit zone with slides and play sculpture is at the one side and the play equipment zone and free play area is at other side. Visited this premise on Friday (working day), by the observation it is concluded that both the play areas were most active in afternoon and evening time. On Saturday (weekend) by the observation it is concluded that both the play areas are active in morning, afternoon and evening times.

After the activity mapping an interview session was held with the parents for obtaining their opinions and perception about the play areas of their premise. The total respondents were 45 from all three residential premises. A questionnaire was prepared to ask parents about the play areas.

Table 2 Coding and content analyzing the frequency of responses

Examples of responses from interview with parents	Sub-themes	Total N=45
Children should play in the equipment zone	Play zone	30 (75%)
Children should play in the sandpit zone	Play zone	25 (56%)
Did not allow children to play outside the premise	Safety	36 (80%)
Parents are always with their child while playing	Safety	40 (90%)
Play area is small, many children are playing at same place	Size	15 (33%)

There are two separate open spaces that located far from each other	Facility location	10 (21%)
There should be shade for some play areas during Monsoon season	Facility	5 (11%)
Access to the play areas are safe and easy	Pathways	25 (56%)
Do not allow child to play in sandpit zone, because they put sand in their mouth (age 5-6)	Safety	10 (20%)
Play area in premise is very attractive, children love to play in the play area	View	40 (90%)

By analyzing the perceptions and opinion of parents from above table, the result showed by the interrelationship between the standard parameters of play area mentioned in observation checklist (Table 1) and the existing design of the play area. From the interrelationship it is concluded that the standard parameters and existing design of the play areas are similar.

Conclusion

Quality of residential open spaces, as conducting, plays an important role in the children's lives. It is important to give importance to play areas and open spaces while designing the residential premises. Paying attention to residential open spaces as one of the structural elements of designing premises in a way that formation of texture and volume in designing residential spaces is performed based on open spaces. Functional specification of spaces may affect quantity and quality of attracting children for attending and interacting in these spaces. The paper aims to identify the preferred parameters of play area in the residential premises. The description of selected residential premises shows that, the architectural design of the play areas in premise and basic parameters which content the free play zone, playgrounds, equipment zone, sandpit zone etc. are as similar as the standard parameters of the play areas. By analyzing the interrelationship the results are concluded. Also by the interrelationship between the parameters of standard play area and parent's perceptions the result is concluded.

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Interpretation of Philosophy on Built Form

Sampanna Sawant

Abstract: Interpretation of philosophies have always effected the built form in architecture. Memorial can make us travel back to the era of the influential personality. Memorial should speak to its context and which can enhance the society with knowledge of motivational life of personality. This research aims to interpretation of philosophies of influential personalities in memorial. By method of observing and critical analysis of philosophy of influential personalities and how the are interpreted in memorials through built form can give us an idea of how it affects psychologically on end users. Also activity mapping will find helpful to make interpretations All though India being traditional and religious country there are very few memorials which belong to persons philosophy. The memorials with only walls and slab seems to be boring where as structures influenced with philosophies have great impact on society. This can be studied by the method of observing different cases such as Sabarmati ashram, Osho ashram etc , i.e Charles Correa has depicted Gandhiji's philosophy through different design aspects such as his philosophies of sustainability through locally available materials, simplicity through simple square village like planning , humbleness through less height , etc. This research can be helpful to built and use it as recreational place for the city, can also help new generation inspired with the life of these great personalities.

Keywords : Interpretation, Buddha, Mahatma Gandhi, philosophy .

Introduction :

Interpretation of any thought or concept in a built form is always a challenging thing for an architect. But whenever an architect is successful in doing so the structure turns out to be a Very lively structure. The same structure attracts more attention of society and also has a psychological impact on society. So such structure should be encouraged for the betterment of society. Memorials are the built form which memorises us about the great personalities in past. Memorials if are interpreted with the philosophies of these personalities form a stepping stone to the past where people can interact with the past heroes through built form. So I felt it necessary to study how philosophies of these influential personalities can be interpreted in a built form.

AIM: To find how philosophy of an influential person is interpreted in the built form.
Objectives:1) To study philosophy of a person.
2) To study philosophy behind built form
3) To study how philosophy is interpreted in built form.

Research Questions:1)How building elements are related to philosophy?
2) How philosophy effects the built form?
Scope, Limitations: The interpretation of philosophy of influential person on built form. i.e: Mahatma Gandhi, Osho, Buddha.
Literature Review: Research paper on philosophy of influential personalities and articles written on them.
Research Methodology:

Objective 3and 2: Secondary sources/observation
Objective 1: literature review.
Qualitative research on people activity when they visit to the memorial by doing activity mapping for relation between built form and people and the locality.
Methods Of Data Collection : Case study, research papers, articles ,etc.

Why A Memorial?

A memorial is an object which serves as a focus for the memory of something, usually a deceased person or an event. Popular forms of memorials include landmark objects or art objects such as sculptures, statues or fountains and parks. Memorials link us to the past incidences, are stepping stones from present to past and guide us to future .The word memorial derives from the Latin word ‘, memor’ which means ‘mindful”. Memorials are the built form which reminds us about the memories of these influential personalities. Memorials guides young generation to bright future by reminding them of these influential personalities. Memorials are a practical way of Perpetuating these memories and providing a focal point for society. Memorials if designed well can Shape up the society.

Typology Of Memorial:
Author describes as memorial can divided in various way.
He interprets as memorials is made for the politician, artist or social worker. In that case statue or monument is made to memorize them. Or some road, park, building, trust name is given after their name he also interpret memorial made for the group of the person in that
Case museum or monument is made to memorize them. Or some road, park building, trust
Name is giving after their name he also interpret memorial made for the group of the person
In that case museum or some recreational space or park to get more and more foot fall. Also
The philosophy varies according to the various memorial. He stated the philosophy of the memorial which constructed due to some incident like wars, natural
Calamities. Example to the world is of Vietnam veteran war memorial.

Live Case Study:

1)Sabarmati Ashram, Ahmedabad ….Ar. Charles Correa
The site on the Sabarmati river bank is part of the larger ashram complex and is integrated into its gardens five interior rooms contain the collection of the museum. The rooms are enclosed by brick walls and wooden louvered screens. All five rooms are part of the 6m square module. Correa’s subtle changes of the enclosure allow for variety in the module
‘slighting ’, temperature , and visual permeability. A square, uncovered shallow pool is
Located between the five rooms.

Design Of Ashram:The main concept is that each building group circulation pattern creates pathway along which the visitors progresses towards the centrality of the water court.

Arrangement:

1) Five interior rooms contain the collection of the museum
2) All 5 rooms are part of 6mt square module.
3) A square, uncovered shallow pool is located in between five pools.

Correa placed five distinctly programmed interior spaces within the asymmetrical grid plan. The plan of the museum has also been compared to village house in India’s banni region.

Instead of a single volume,the houses consist of five huts each with a different function, which surround to make a courtyard. The inhabitants walk back and fourth across the outside space to use that different rooms.

Section Roofplan

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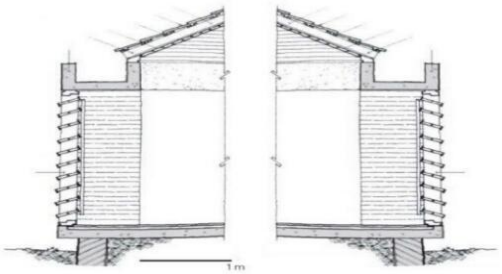
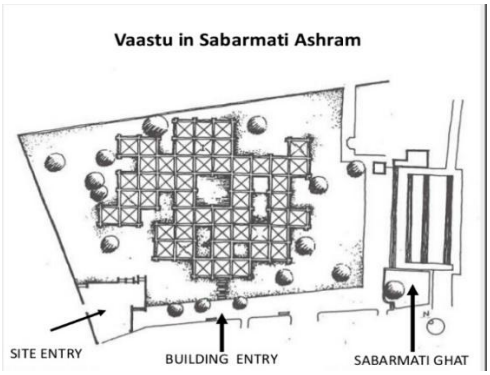




Construction:

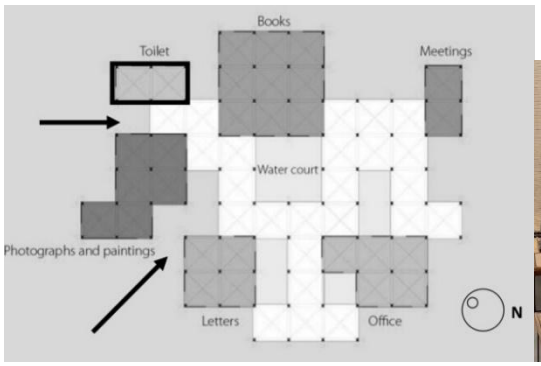
- The materials used in the construction are similar to the other buildings in the ashram :tiled roof, brick wall ,stone floors and wooden doors.
- The only additions are the RCC channels which act as beams and as rainfall conduits and which permit additional construction to be added in future.
- No glass windows are used anywhere in the building; light and ventilation being provided by openable wooden louvers.

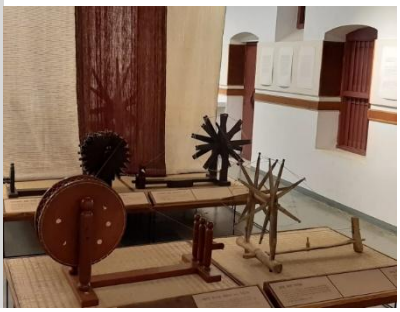
- **How can we relate Gandhiji to built form?**

1 . Gandhiji s simple living is depicted by the modular simplicity of the structure is continued in the use of basic materials: stone floors, brick walls, wooden doors and louvered windows devoid of glass, and riled roofs.

2. The units are grouped in a consciously asymmetric manner to be analogous to the Indian village with its pathways.

3. The placing of charkha,wooden interior also depicts living of Gandhiji.





Plan

sr.no	**Philosophy**	**Its interpretation**
1.	Humbleness	Through short height of structure
2.	Sustainable living	Use of locally available material
3.	Ahimsa	Interpreting peace in structure
4.	Satya	_
5.	Secularism	Openness in structure
6.	simplicity	Through simple square plan.

Observation:

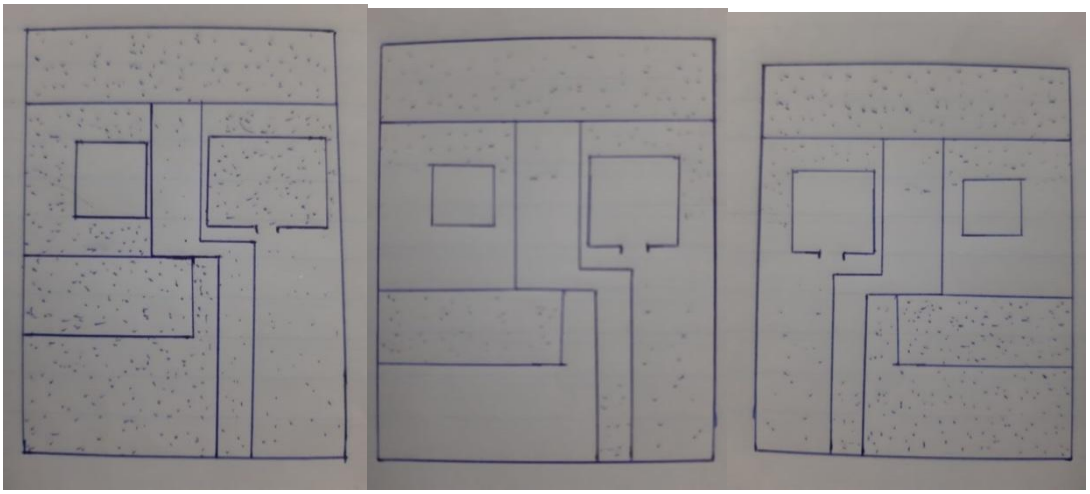
1. Gandhijis philosophy has been successfully interpreted in built form.
2. Built form helps visitors to understand Gandhiji easily.

2) Kasturba Gandhi Samadhi, Pune

The agakhan palace pune is a national monument of India's freedom movement. Following the launch of quit india movement in 1942, Gandhi, his wife Kasturba, his secretary mahadevbhai and Kasturba passed away while in captivity at the agakhan palace and their Samadhi's are located in the campus. Situated near the river mula, the palace is a simple memorial to Gandhi and his life.

The management of the museum, samadhi's and the palace campus was transferred to the Gandhi memorial society in 1980. The society has been trying to make this place a living memorial to ba and bapu by organizing a number of activities throughout the year. The Samadhi is designed by architect Charles correa.

Activity Mapping:



1)**Morning time, Moderate Footfall Activities like yoga, Meditation Is conducted there.**

2)During afternoon time, there is less foot fall.

3)during evening time,footfall Is very high. Activities like open Exhibition of hand craft and paper Product.

There is very high footfall during the Gandhi Jayanti and Kasturba Jayanti. The Samadhi and her visionary platform of desi product. The Samadhi interpret the living of Kasturba Gandhi and her visionary

Platform of desi product. The memorial depicts the glow of the space where the various activities takes place and which interpret the philosophy of the Kasturba Gandhi.

Observation**:**AR. CharlesCorrea has tried to interpret the philosophy of Kasturba Gandhi by creating spaces, through images, through small scripts, etc. Built form may not go hand in hand with

The philosophy of Kasturba Gandhi. Built form consist of arches, multi storied, etc. which dosen't go with ba's philosophy but he has tried to interpret her philosophy by different elements.

Bookcase Study:

1) Franklin D. Roosevelt Four Freedoms Park:

Franklin D. Roosevelt Four Freedoms Park is a singular experience in New York City designed by renowned architect Louis I. Kahn. A New York State Park and a landmark on Roosevelt Island, the Park opened in 2012 and

celebrates the Four Freedoms championed by President Franklin D. Roosevelt in his seminal 1941 speech—freedom of speech, freedom of religion, freedom from want and freedom from fear.

According to architect a monument should be a room and a garden, that's all…" Why a room and a garden? He choose this as a starting point because the garden is, somehow, of a personal nature, its own way of controlling nature. And the room the principle of architecture.

Architect was working with perspective and geometry, almost like the ancient Egyptians. All visual corridors leading directly to the head, whether you're in the green zone or on the road at an angle. That precision, almost militant in its design, is a metaphor for the role as commander in chief Roosevelt through World War II and the social causes during the Great Depression. At the climax, the monument itself is a simplified version, the homeless, a Greek temple of granite.

ViewPLAN

OBSERVATION:

In the dasarrollo design, Kahn makes perfect use of the triangular shape of the park facilities and in the use of what might be called a "forced perspective" to draw and focus the viewer's gaze towards the Roosevelt head on the threshold of the "living". In the design lies a naval theme, a nod, perhaps, to love and connection that Roosevelt had with the sea, taking advantage of the excellent location of place. Park design is symmetrical, and the drawings are designed for their development from a centre line, as is usual in naval architecture.

2) Fo Guang Shan Buddha Memorial Center, Tapei :

Previously known as the Buddha Memorial Center, is a Mahayana Buddhist cultural, religious and educational museum located in Dashu District, Kaohsiung, Taiwan. The museum is affiliated with Fo Guang Shan, one of Taiwan's largest Buddhist organizations. The museum houses one of the tooth relics of Sakyamuni Buddha, the founder of the Buddhist faith.

Objectives of the Buddha Museum

To present Buddhism through arts and culture

To present Buddhism through motion pictures and movies

To present Buddhism through humanistic dimensions

To present Buddhism through international dynamics.

Observation :

Front hall : he Front Hall is flanked by the Gate of Perfect Ease and the Gate of Liberation. The lion and elephant, both accompanied by smaller cubs, welcome guests from either side of the doors. The elephant on the right, measuring five-meter tall and six-meter long, symbolizes the conception of Prince Siddhartha who entered the womb of his mother on a white elephant. The lion on the left has the same measurements and represents the Buddha's roar of teachings. Inside, visitors can borrow wheelchairs and baby-strollers from the Information Desk.

There are restaurants and a buffet, all so visitors can rest their feet or grab something to eat. A Starbucks can also be found here, which was included to make visitors feel more at ease.

EIGHT PAGOGAD (view)

View of the Fo Guang Big Buddha and eight pagodas from the 2nd floor of the Front Hall

There are eight pagodas, each representing different ideas or precepts.

1) One teaching refers to Humanistic Buddhism.
2) The two assemblies refer to both the monastic and lay assemblies.
3) The Three Goodness refers to the wholesome deeds of the body, speech, and mind.
4) The four givings refer to Giving Others Confidence, Giving Others Joy, Giving Others Hope, and Giving Others Convenience.

5) The five harmonies refer to "personal harmony achieved through joy, interpersonal harmony achieved through respect, family harmony achieved through deference, social harmony achieved through cooperation, and world harmony achieved through peace
6) The pagoda is named after the Six Perfections, namely giving, ethics, patience, diligence, meditation, and wisdom.
7) The seven admonishments refer to admonishing drugs, pornography, violence, stealing, gambling, alcohol, and harsh words.
8) The Eightfold Path includes the eight elements that leads a person to liberation: right view, right understanding, right speech, right action, right livelihood, right effort, right mindfulness, and right concentration.

Observations:

In above case studies architects have successfully interpreted philosophies of influential persons in built form.

Case Study 1: Sabarmati ashram,

Architect has interpreted Gandhiji's philosophy by simple square planning for his simplicity, less height of structure for his humbleness, locally available material for his sustainable living, secularism with openness in structure.

Casestudy 2: Kasturba Gandhi ashram

Architect has interpreted ba's philosophy by introducing her photos, her statue, small scripts on her, etc. He has not interpreted her philosophy in built form but through adding external element in built form.

Casestudy 3: Four freedom park

Kahn focuses on the viewers gaze towards the Roosevelt head on the threshold of the living. Also ex-president connection with sea can be noticed.

Casestudy 4: Fo guang shan buddha

Eight pagodas refers to the different philosophies of buddha and use as different spaces which can be connected to the buddha's philosophies.

Conclusion:

Memorial can be used as information centres for society. Here people can study rich history of our country and develop into a intellectual society. The memorial should depict the philosophy of influential personality through its built form. This type of memorial with interpretation of philosophy of influential person can make it easy to understand that personality well, than introducing images, statues or script. Such built form of memorials should be encouraged. To make aware our society about our countries rich historic background. Background of our Indian culture, teachings, philosophies, freedom struggle etc. Such memorials can guide us to bright future my making us study such great personalities. Western countries show their history, culture with pride. We also should make efforts to show these great people and our history with pride. Japan has turned remains of Hiroshima and Nagasaki after they got bombarded with atomic bombs into the memorials. So we can definitely showcase our freedom struggle, our great king chatrapati shivaji through memorials. No sky touching big budget statues are required for showcasing their great work. Memorials with interpretation of philosophies can attract tourists form foreign and led to economic growth of our country and showcase our great leaders and great Indian culture on global platform.

Comparative Analysis of RCC and Steel Framed Structures: A Case of Pune

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Abstract : Steel is the most popular framing material by a considerable margin for multi-storied buildings, the use of steel in India as compared to other countries is less, as India is developing country. Steel has come a long way from a default option for industrial structures to an essential building material that lends itself to a variety of uses, the evolution of the use of this material has indeed been remarkable. While the use of structural steel is growing, tall building technology is still in its infancy in the country and India lags behind in adopting structural steel due to over dependency on concrete. As the demand of concrete is increasing immensely, it is necessary to look for the possibility of steel structure. People in country like India it has been a mindset that only R.C.C building is long life, durable and can withstand any force. Steel frames are more expensive but allows architects and structural engineers more leeway in the arrangement of design elements and are less time consuming to construct. Whereas RCC structures are less expensive and easily available but is more time consuming. The present scenario in India, particularly in metro cities has restricted the horizontal growth, which led to the vertical growth for building construction. As Pune is a fast-developing metropolitan city and the demand of construction is huge, hence finding out the best suitable material and method for construction is very important. This paper includes comparative study of G+6 commercial RCC and steel framed structures with respect to strength, stability, material consumption and cost comparison of RCC and steel framed structures. This paper concludes by proposing a suitable structural system which is more economical and less time consuming with respect to Pune region.

Keywords: Steel construction, RCC structures, Construction time, Cost.

Aim: To compare RCC and Steel framed structures and suggest a suitable structural system for economical and fast construction.

Objective:

- To study steel as a material for replacement of concrete.
- To study the need for steel as a building material in construction in India.
- To analyze the strength, stability, and construction cost required for steel framed structure for construction of a G+6 commercial building in Pune.

Scope and Limitations

This study focuses on the comparative analysis of RCC and steel framed structures. This paper tries to explain the overall scenario and advantages of steel construction in India. The study will not focus in detail about design and structural analysis of RCC and steel framed structures but instead this paper will focus on advantages of steel construction over RCC regarding various aspects. This will also cover the recent situation of steel construction in the country. And also, the need and scope for steel construction based on the availability and economic factors in cities like Pune.

Introduction

During the recent decades, our society has been continuously experimenting with newer materials and construction alternatives. Sometimes it is to solve a problem, often to derive benefits like monetary savings, occasionally to strive for a greener future or could be to explore a personal thought. In India, Foreign practice like concrete technology which came from Europe is being followed at a large scale after independence. Among such imported

ideas, building with steel is trying to find a place in India today. While it is very common to see a public building with structural steel in U.S. and Europe, it is rarely seen in India with the exception of industries and temporary shades, despite India being Third largest producer of steel in the world.

In Business Excellence and Research Group awards (BERG) held in Singapore last year in 2018, Engineers and Architects took a call and asked to increase the use of steel in Indian Construction Industry. To accelerate the development of commercial and residential complexes, while retaining the indigenous culture appearances, India's massive construction sector must increase the use of structural steel.(Indian construction Industry asked to increase use of steel , 2018)

Major cities like Pune are witnessing immense demographic expansion due to migration from surrounding villages, leading to urban sprawl, housing demand, rise in cost of land. Many citizens all over India migrate to the cities like Pune for better jobs and education. Industries, trade and commerce activities andeducational centers in cities attract floating population from all their surrounding villages and towns. This has caused an expansion of the cities in all directions and all aspects of development. This has also increased the demand for economical and less time-consuming construction. Along with this there is a necessity for efficient and economical construction material. In this case steel can be a good option for construction as Structural steel's ability to be designed, fabricated and erected rapidly shorten the framing system time and provide earlier site access for other works and allow earlier project occupancy.

Steel has the highest strength to weight ratio of any construction material available. Higher floor to floor heights can easily be created using girder slab, staggered truss, and castellated beam construction. Extremely long open spans are possible using steel that would not be possible in concrete. Structural steel can successfully achieve any design the architect and structural engineer can draw from a simple, functional structure to a complex structure. Whether it is a curved slab edge, an unencumbered column-free space or a heavily loaded equipment room, steel can provide an elegant solution. No other framing material like concrete comes close to structural steel's ability to encourage freedom of expression and design creativity. Structural steel is the premier green construction material. Its highrecycling rate exceed those of any other construction material.

Concrete has considerable compressive strength as compared to other materials. Concrete also has great resistance to fire. It can be molded to the desired form and shapes. Concrete is a locally available all over India. Because of its ability to absorb heat, it increases the energy efficiency of buildings and cuts heating/cooling bills. Concrete, on the other hand, is often criticized for being unsustainable because it takes a lot of resources to produce like cement, sand and water. Cement is one of the world's biggest contributors to greenhouse gas emissions which is the main component of concrete. As cement production is bad for the environment, so is concrete production.

Strength and Stability

Concrete is a mixture of cement, sand, gravel and water. It has a relatively high compressive strength, but low tensile strength. Concrete must be reinforced with steel reinforcement for increasing the tensile capacity, ductility and elasticity of the structure. Structural steel is extremely strong, stiff, tough, and ductile; making it one of the leading construction materials used in commercial and industrial building construction all over the world. Reinforced concrete has a compressive strengthof 4,000 psi, and steel of 25,000 psi. Comparing reinforced concrete to structural steel, reinforced concrete does have lesser strength as compared to structural steel. Some reasons for that are:

•Modulus of Elasticity - Concrete has a lesser Youngs modulus than that of steel, Hence, as a material, concrete is a lot weaker than steel. Modulus of elasticity for RCC is 25 KN/m2 and Modulus of elasticity for steel is 210 KN/m2 that means steel has more resistance to being deformed elastically

•Strength to weight ratio - Strength to weight basically compares the strength of a material with its density. Steel has higher strength to weight ratio than concrete. Thus, the dead weight of the steel structure is relatively low. This is primary reason why reinforced concrete is not used in places with space crunch (or where money is not a problem)

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•Homogeneity - Reinforced Concrete is a mixture of cement, sand, aggregates, and reinforcing bars (mostly steel). Structural steel on other hand is a homogeneous factory manufactured material.

Stiffness, strength in both tension and compression and the ability to bend without cracking or breaking are inherent advantages of structural steel. Compared to all other materials, structural steel has the greatest ability to maintain strength and integrity during seismic events. Structural steel framing is not subject to shrinkage or creep under load over time. Even in corrosive environments, applied coatings protect structural steel and add longevity to the building. A durable and nonporous material, steel provides value and a significant return on investment.**(why-steel: www.aisc.org, n.d.)** concrete is good in compressive strength but as it is a brittle material it cannot undergo a large deformation without failing. RCC structures may be subjected to shrinkage or creep underload over time.

Construction Period

Structural steel's ability to be designed, fabricated and erected rapidly shorten the framing system schedule, provide earlier site access for other trades and allow earlier project occupancy. Structural steel is fabricated off-site, meaning that much of the work is done before the steel shows up at the job site, whereas other materials are dependent on-site access and ideal weather conditions before work can proceed.

Structural steel enhances construction productivity because of its ability to be shop fabricated while maintaining tight construction tolerances. Fabricating steel in a shop ensures a high-quality product that can be rapidly erected in the field without incurring excessive change requests. Other field-placed materials will always lag behind steel's productivity curve due to processes such as forming, shoring and cure times or the high labor demands of stick-built construction processes. And unlike other building systems, steel can be rapidly erected even during winter.

Steel's scheduling efficiency translates to cost savings by:

- Reducing the overall critical path by completing the structure sooner
- Reducing general condition costs (labor cost, increased bank interest due to delay, market rate fluctuations) with a shorter construction schedule.
- Increasing revenue from early occupation due to faster construction.

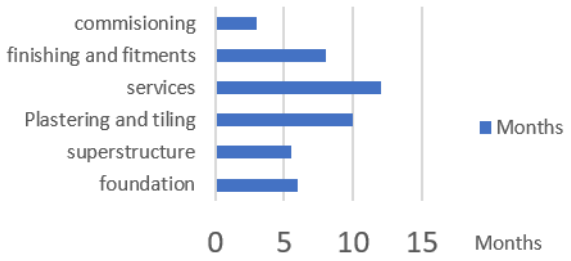

Figure 24: Bar chart for G+6 storey RCC structure framed structure

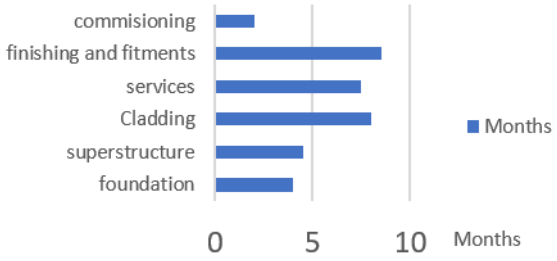

Figure 25: Bar chart for G+6 storey steel

Rising 650-ft. into the sky above downtown Los Angeles, the L.A. Live hotel and residential tower, comprises 1.2 million sq. ft. of floor space, part of a mega mixed-use entertainment complex adjacent to the Los Angeles Convention Center and Staples Center arena. The schedule for the LA Live project was reduced by 2 months by switching to steel framing.(why-steel: www.aisc.org, n.d.)

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Construction Cost

In India, structural steel is more expensive than concrete, because concrete is widely used and locally available material in every region. Even though the material cost is high for steel framing structures it can provide other economic benefits, such as:

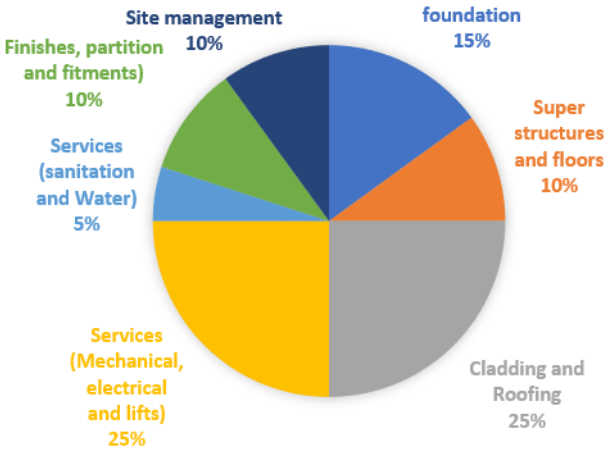

Figure 26: Construction Cost Break Down for Typical Commercial Building in Steel(Steelconstruction.info, n.d.)

- Lower foundation costs since structuralsteel has a higher strength-to-weight ratio than other materials;
- General condition savings since steel framing can be constructed faster, thus reducing labor hours;
- Increased revenue from early occupancy due to faster construction and
- Future cost savings if and when a project will be modified or expanded, since steel framing systems are highly adaptable.(why-steel: www.aisc.org, n.d.)

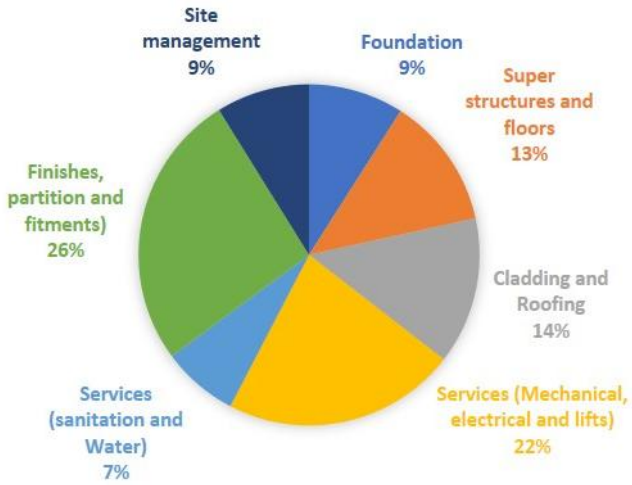

Figure 27: Construction Cost Break Down for Typical Commercial Building in RCC

A large cost benefit to concrete is the fact that its price remains relatively consistent. On the other hand, concrete also requires ongoing maintenance and repairs, meaning added costs throughout its lifetime. Supply-and-demand may also impact the availability of concrete. Even though it can be poured and worked with directly onsite, the process to completion can be lengthy and could accrue higher labor costs.

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As the number of floors rises, cost for concrete structures increases as compared to steel structures as the thickness of structural member increases and high strength concrete and greater amount of reinforcement is needed in concrete structures.

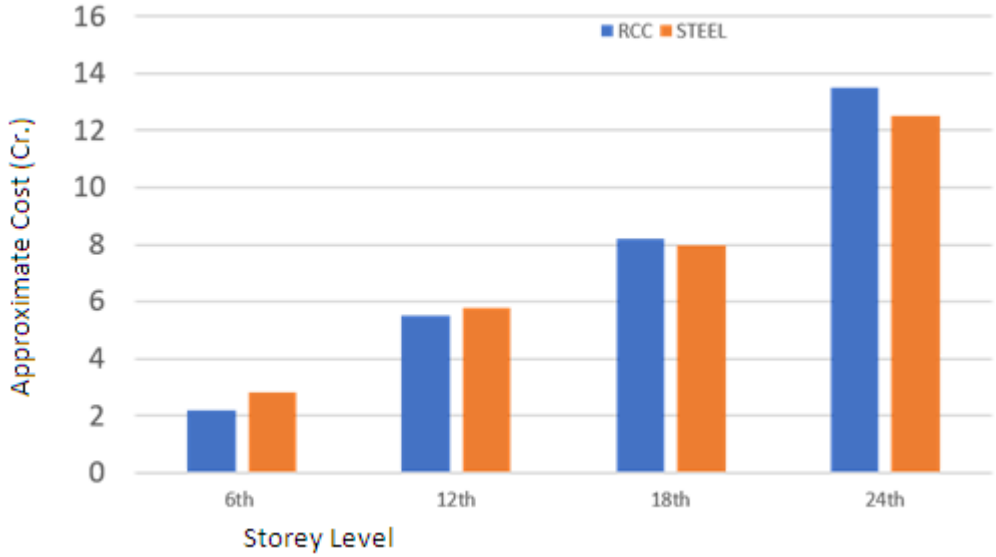

Figure 28: Cost Comparison Between RCC and Steel w.r.t. No. of Floors

Life-Cycle Costs

- **Initial Cost**

Initial cost of concrete structures is less as compared to steel framed structures. A project's upfront cost can be a high hurdle for the developer, but prudent additional investment during initial construction can have a positive impact as the building ages. Understanding the future cost implications of initial construction decisions is advantageous for the owner, and a critical life-cycle analysis helps define the project's return on investment.

- **Routine Maintenance and Restoration Costs**

When comparing structural steel's inspection and maintenance requirements to other structural materials, steel provides reduced costs and exceptional performance throughout the building's life. Depending on the building type, routine maintenance can vary widely. When taking necessary maintenance demands into account, steel provides long-term financial benefits that other materials don't.

Figure 8: Ecstasy Building, Kothrud, Pune

Service Life

The inherent long-term durability and future adaptability of structural steel means that a steel-framed building will be around for as long as the owner desires. The structural steel frame will never be the limiting factor of a building's life span. Structural steel provides the possibility of new life and use beyond its original design more seamlessly than any other material.(why-steel: www.aisc.org, n.d.)

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Figure 29: Volvo Eicher Headquarter, Gurgaon, India

Case Studies:

Volvo Eicher Headquarter, Gurgaon, Haryana (steel Structure)

- Area: 9,972 sqmCommenced on: 2010
- Completed on/by: 2011
- Construction cost of project: 30 crores
- Number of floors: G+6**Ecstasy, Kothrud, Pune (RCC Structure)**
- Area: 1536.4 sqm.
- Commenced on:2016
- Completed on: 2017
- Construction Cost of Project: 3.12 crores
- Number of Floors: G+3

Figure 7: Pictures showing construction phase of the project

The corporate headquarters of the newly formed joint ventures - 'Volvo-Eicher' is designed to be a state-of-the-art steel building for the engineering group which uses the least amount of energy and resources possible in its day to day functioning. The building uses a large proportion of re-used material and an extremely high percentage of easily renewable materials. The building is defined by a unique span free steel structure which is set outside of the main building envelope and designed on the principle of a stabilized cube which is diagonally braced.(Volvo eicher headquarters, Romi Khosla Studios : Indian-architects.com, n.d.)
This is one of commercial buildings in Kothrud, constructed completely in RCC. Lower two floors are used for a clothing brand and upper two floors are used for offices. Glass is used for the façade. The estimated time for this building to complete was 9 months but it took 12 months for completion. The amount spent on the material consumption (cement, sand, steel etc.) is 1.85 cr. Which almost half of the whole project cost.

Conclusion

- Commercial buildings require larger column spacing and more usable/rentable space. Large eye- catching glass facades for displaying products. Greater floor to floor height is the basic requirement of the commercial structure. All of this can be easily achieved by steel structures.

- The time required for constructing a G+6 commercial structure with steel is 8 months whereas to construct the same building in RCC, the time required is twice that of a steel structure which therefore saves time and money and allows earlier project occupancy.
- Initial cost of concrete structures is less as compared to steel framed structures. But there is a decrease in cost of steel due to decrease in construction time, and steel reduces costs and provides exceptional performance throughout the building's life due its low maintenance nature.
- There is more usable floor space area in steel frame structure as compared to RCC. As the thickness of the structural members is more in case of RCC which increases the dead weight and decreases usable carpet area of the building.
- The Approximate cost for constructing a commercial building in Pune of different floor area is as follows:

Table 12: Rates for Construction of Commercial Building in Pune (Construction cost: Pune, 2018).

Sr. No.	Area	Construction cost for RCC	Construction cost for Steel
1.	1sq.m	Rs.23,680.58	Rs.33,152.812(increased by 40%)
2.	(G+2) 1000sq.m	Rs.2,36,80,580	Rs.3,31,52,812(increased by 40%)
3.	(G+6) 3000sq.m	Rs.7,10,41,806	Rs.8,52,50,168(increased by 30%)
4.	(G+12) 6000sq.m	Rs.14,20,83,612	Rs.17,05,00,334(increased by 20%)
5.	(G+18) 9000sq.m	Rs.21,31,25,418	Rs. 20,46,00,401(decreased by 4%)
6.	(G+24) 12,000sq.m	Rs. 28,41,67,246	Rs. 24,15,42,159(decreased by 15%)

In case of Pune, constructing a G+6 steel framed commercial structure may be expensive, but as the number of floors increases steel framed structures can be an affordable choice as the material consumption is less as compared to RCC.

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Evaluating Access in Corporate Offices

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Abstract : The research basically focuses on the physical accessibility which is a part of universal accessibility. The design which enables physically disabled people like wheelchair user, crutches user, pregnant lady, elderly and children is known as a physically accessible design. In India about 3% of the total population i.e. around 2.7 crore people are disabled in one or the other way according to 2016 census. Till date, the Indian government has passed several laws like education laws, family laws, health laws and income tax commissions etc. which include financial concessions or reservations. But they face difficulties in accessing spaces like public parks, theatres etc. Though the universal accessibility is made mandatory in the hospitals and institutes but working spaces which should provide equal opportunity to all, are neglected. Thus this issue needs attention and proper solution. Keeping these in mind, the following paper aims to analyze whether physical access is provided in the present corporate offices with the objective of spreading social awareness and incorporating required modifications through architecture. Thus this research paper attempts to achieve this goal by conducting access audits of corporate offices at city level. The study is limited to medium and small scale corporate offices in Pune and Mumbai. The research has been carried out by access audits of the corporate offices followed by analysis and then inferences for modifications where needed. The expected outcome of the audits is lack of physical accessibility for the disabled with no provision of ramps, elevators, pedestrian pathways etc. The proposed outcome of this result is that it will promote social awareness, scope and opportunities for universal design. More number of disabled friendly buildings, more independence to the physically disabled. Moreover, Universal accessibility not only provides access to the disabled but also contributes to the overall development of the society.

Keywords: Corporate Office, Access Audit, Universal Design, Evaluation.

Introduction

Physical access means access to buildings, public spaces and any other place a person might need to go for work, play, education, business, services etc. It includes things like accessible routes, curb ramps, parking and passenger loading zones, elevators, signage, entrances and restroom accommodations. Whereas, disability is a physical, mental and social impairment or a combination of them which restricts or prevents a person from living a normal life. And, an audit can be defined as an official inspection, survey, study, investigation and examining or a combination of these used for analyzing the present scenario for planning the future action.

In India, about 3% of the total population i.e. around 2.7 crore people are disabled in one or the other way (according to census 2016).Till date, the Indian government has passed several laws like education laws, family laws, health laws, income tax concessions etc. but the physically disabled people face difficulties in accessing the spaces like public parks, theatres etc. which deprives them of the freedom to access. Thus, this issue needs attention and proper solutions for the same.

Although universal accessibility in institutional buildings and hospitals is being executed as per the byelaws, but not even physical accessibility regarding the working spaces like the corporate offices has not been considered yet. Thus, there is a necessity of proper analysis and then provision of accessible measures in the corporate offices.

The aim of this study is to analyze whether physical access is provided in the corporate offices with the objective to study the access routes of corporate offices by observing, surveying and analyzing. Also, to understand the present status of the corporate offices and to create mass awareness for accessibility, which will enable people with disabilities to live independently and participate fully in all the aspects of life.

The scope of the study includes physical accessibility audit and its related analysis of medium scale corporate offices at a city level. The study is limited to medium scale corporate offices in Pune and Mumbai and to the physical accessibility of temporarily as well as permanently physically disabled people which includes wheelchair user, crutches user, optically disabled person, hearing impaired person, pregnant women, elderly and children below 10 years of age.

The study is initiated by observing, surveying and auditing of the corporate offices followed by the related analysis of the findings. After analysis, common or important cases are identified and mentioned followed by inferences for the same.

Access Audit

Empirical Data

The audit has been conducted using ACCESS AUDIT PERFORMA standardized by CPWD, India. Since the complete audits are impossible to accommodate within the word limits of this paper, therefore the aspects and their standards which are considered as the basis of the audit are listed below. The marks are given as per the number of standards that are satisfied.

1. Information and Communication: web accessibility, accessible facilities information, printed service documents like forms, assistance, knowledge of sign language, use of Braille system, assistive technology, adequate lighting etc.
2. Evaluation of the service: Disability sensitization program, trained staff to assist disabled, staff awareness, maintenance of accessibility facilities, plan to improve accessibility, equal opportunity policy, dedicated spaces for the disabled, disability focal person etc.
3. Parking: availability, reserved bays for people with disabilities with required specifications, near location, signage, monitoring of the parking, tactile guidance etc.(Chapter 17 of CPWD Handbook)
4. Alighting: dedicated alighting point with specifications like signposted and step free route etc.(Chapter 17 of CPWD Handbook)
5. Accessible route: connectivity to entrance gate, parking and alighting point; minimum 1200mm wide, barrier free, kerb ramp provision, resting space, wheelchair parking space, signage, adequate lighting etc.(Chapter 1 of CPWD Handbook)
6. Accessible entrance: landing of 1500mmx1500mm, non slippery floor, signage, well illuminated ramp provision etc.(Chapter 7 of CPWD Handbook)
7. Reception and lobby: Identifiable, clear space in front of reception, illuminated, dimention specified, signage, special assistance etc.(Chapter 6 and 11 of CPWD Handbook)
8. Stairs: tread 300mm and riser 150mm, colour contrasting strip at the edge, handrails on the both sides, barrier free, non-slippery surface, well illuminated etc.(Chapter 4 of CPWD Handbook)
9. Ramp: provision of ramp, 1:12 gradient, 1800mm width, landings provided, non-slippery surface, well illuminated etc.(Chapter 2 of CPWD Handbook)
10. Toilets: specified toilets for wheelchair users provided for both the genders separately and with easy accessibility.

Access Audit 1-Mumbai

Figure 30: The entrance to lobby

Figure 2: The corridor

Figure 3: The disabled unfriendly reception

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Figure4: The ramp to the main entrance **Figure 5: Well illuminated staircase** **Figure 6:unfriendly toilet**

Table 1. Table showing the number of standards satisfied with respect to the aspects, by the building audited in access audit 1.

Sr.No.	Aspects	Counts	Remarks
1.	Information and Communication	7/9	Sufficient sources except the sign language assistance
2.	Evaluation of the service	6/11	Lack of disability sensitization program
3.	Parking	4/9	Only for the staff
4.	Alighting	2/3	Lack of tactile guiding path
5.	Accessible route	8/10	No kerb ramp anywhere
6.	Accessible entrance	5/7	landing before the entrance was not provided
7.	Reception and Lobby	9/15	Not wheelchair friendly
8.	Stairs	8/11	Under stair area needs to be cordoned off
9.	Ramp	6/9	Width less than 1800mm
10.	Toilets	0/1	Not provided

Access Audit 2-Mumbai

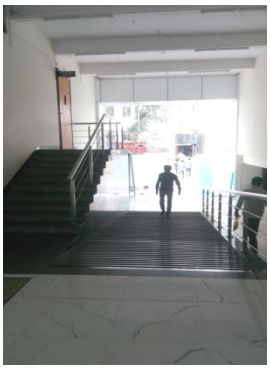
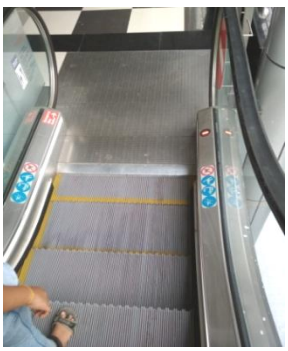

Figure 7: Ramp to the main entrance **Figure 8: The escalator with surface difference** **Figure 9: The audio signal**

Figure 10: the accessible corridor **Figure 11: wheelchair friendly toilet** **Figure 312: non reserved parking**

Table 2. Table showing the number of standards satisfied with respect to the aspects, by the building audited in access audit 2.

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Sr.No.	Aspects	Counts	Remarks
1.	Information and Communication	7/9	Lack of assistive technology
2.	Evaluation of the service	6/11	Staff not trained
3.	Parking	4/9	Only for the staff
4.	Alighting	2/3	Lack of tactile guidance
5.	Accessible route	7/10	No wheelchair parking or resting spaces
6.	Accessible entrance	5/7	No landing provided
7.	Reception and Lobby	7/15	Not disabled friendly
8.	Stairs	11/11	Escalators commonly used
9.	Ramp	6/9	Handrails only on one side
10.	Toilets	1/1	On the 5th floor, far

Access Audit 3-Pune

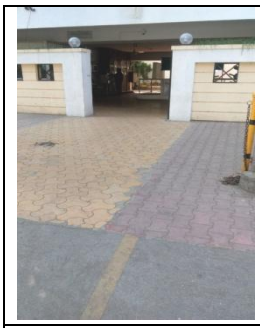

Figure 13: Main entrance ramp with landing

Figure 14: Basement parking ramp

Figure15: Narrow corridor on every floor

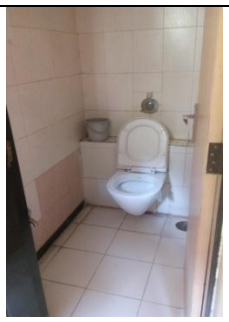

Figure 16: wheelchair unfriendly toilet

Figure 17: Inaccessible entrance to the

Figure 18: Insufficient space in the lobbywaiting lobby on every floor

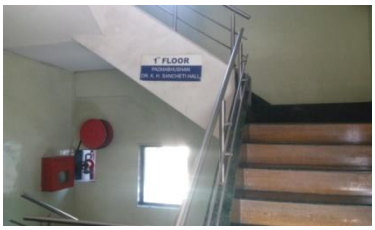

Figure 19: well illuminated staircase

Table 3. Table showing the number of standards satisfied with respect to the aspects, by the building audited in access audit 3.

Sr.No.	Aspects	Counts	Remarks
1.	Information and Communication	7/9	assistive technology absent
2.	Evaluation of the service	5/11	reception is disabled unfriendly
3.	Parking	5/9	for both staff and visitors
4.	Alighting	3/3	Sufficient
5.	Accessible route	8/10	Not barrier free
6.	Accessible entrance	3/7	Entrance not accessible
7.	Reception and Lobby	7/15	Disabled unfriendly
8.	Stairs	6/11	Only well illuminated
9.	Ramp	1/9	Only to access parking
10.	Toilets	0/1	Not provided

Table 4. Table showing relative analysis of the audits and verification for physical accessibility of the buildings.

Sr.No.	Case Studies	Total Counts	Verification
1.	Access Audit 1: Mumbai	55/85	Yes
2.	Access Audit 2: Mumbai	56/85	Yes
3.	Access Audit 3: Pune	45/85	No

Inferences

- It has been observed that universal design in the context of workspaces has not been considered seriously. Some of the corporate offices do have basic facilities like ramps, elevators and toilets but most of them failed to provide or just accommodated for the namesake which cannot be put into use efficiently.
- The audit report discloses that, only one office out of the three has provided a wheelchair friendly toilet for both the genders but that too is difficult for spotting and accessing as it is on the fifth floor of the building.
- Aspects like illumination and alighting has been considered and implemented upon in all the three offices.
- There is a severe need for disabled assistance like signage language interpretation, assistive technologies like Braille system, audio signals at the entrance and disabled friendly reception.
- Passive elements like tactile tiles, landing with minimum dimension 1500mmx1500mm and parking for wheelchair users need to be provided.

Citations

World Bank Group, Chapter 8, section 18

An important need in promoting access for people with disabilities is training of architects, engineers and planners in principles of universal design and accessibility. This would apply to those designing buildings and public spaces, transportation vehicles of different forms, and those involved in approval of development plans. Issues of universal design are beginning to become an area of focus in some educational institutions in India, 10 but to date exposure to either universal or accessible design principles is not a standard element of curricula. Such a direction is anticipated in the Ministry of Urban Affairs guidelines, but these remain to date aspirational statements rather than policy or practice. It will be important in moving towards inclusion of such elements in curriculum that the universal design is seen not only as relevant to people with disabilities, but many others who may have access issues, such as elderly, pregnant women and children.

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Many thanks to Professor Abhijeet Natu for his useful occasional reviews. I am also thankful to my classmates who kept me motivating all the time.

I sincerely want to thank all the respondents for sharing their valuable time and for their willingness to provide me with useful information.

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Minimalism to Achieve Simplicity and its Essential Quality

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Abstract : Simplicity means plain basic or uncomplicated, quality of being simple. It is a law of nature. This simplicity of nature inspires people to live the simple, minimal life. One of the important phases of simplicity in architecture is minimalism. Minimal design and its practitioners aim to use elementary geometric forms without ornamentation or decoration, focusing on a product's aspects of being useful, rather than being aesthetically pleasing. The minimalism movement originated in Japan, for whom, less is more. The 'Minimalist' approach witnessed a clear progress in art, decor and interior design but disappeared with only few architects adhering to it. This paper is therefore divided in three parts; the first is to traces origin, philosophy and design criteria of simplicity. The second part conveys correlation of simplicity with design and elements that should be used in arranging the necessary components of a building to create a basic workable unit. After that, the final section analyzes the work of architects like: Mise Van Der Rohe, Tadao Ando and Alberto Campo Baeza as case study, to understand their architectural efficiency in terms of planning, user experience, unique features and how their works became examples of cleanness and simplicity. By analyzing these case studies the paper states that the concept of minimalism can be widely used in design, promoting to use and produce only what is necessary and conserves the resources and our environment. It can help to shape the future and channelize the methods of using only as much is needed, where simple living becomes the key to life.

Keywords: architecture, simple, minimalist, necessity.

Aim:

To read and interpret the language of 'Minimalism' in architecture to understand which design elements should be used to give a space the character of being 'minimal or simple'.

Objective:

- To study the evolution of simplicity in architecture.
- To study the different theories of various architect to understand their minimal approach.
- To analyze its reflections on the relevant audiences.
- To acknowledge importance of simple over complex.

Scope and limitation:

Minimalism in architecture consists of a wide arena of various types of structures. The basic needs of minimalism arise from the space where the occupant dwells. Hence, the evaluation and analysis of minimalism and simplicity starts from residential architecture. The scope of this paper limits to analysis and study of only residential dwelling units in terms of concept and attitude towards minimalism.

Methodology:

In this research, definition of simplicity and minimalist attitude has been researched through the literature sources and retrospective study. Depending on this, definitions, examples and states have been organized and the Minimalist dwellings have been researched to criticize the similarities and additions to it.

This study incorporates a qualitative methodology, using retrospective analysis to provide the theoretical framework. It mainly focuses on the dwellings, in the frame of Simplicity and relationship between human and space. The examples are selected for analysis is from the residential buildings that are representatives of the architectural characteristics of simplicity. This study is theoretical, analysis and synthesis type research with simplicity housing.

Introduction:

Nowadays, effect of simplicity will be seen in each field of design as Minimalism or reductivism. There is an elegance and beauty in simplicity, as we often experience the most straightforward solution to a problem, or the simplest system, as the most beautiful one. After modern period and evolution of industry, simplicity started to evolve. The work of Mise Van Der Rohe Tadao Ando and Alberto Campo Baeza is a major source of reference for work of minimalism.

Simplification is a way to remove the litter, "doing more with less" as a philosophy to achieve the less clutter in our lives.(Bhairavi, 2014) Minimalist residence understanding can be defined as simple, livable, and functional space organization with minimalist philosophy. Today, Minimalist attitude has been applied in many countries in the world, consequently we can see effect of minimalism in architecture; housing, office and commercial buildings, etc. Simplicity in design calms us and somehow inspires us, not only in architecture but also in other forms of design such aspainting, sculpture, music, literature, cinema, industrial design, web design and poetry to achieve the simplest representation of particular feeling, impression or stimulus. Simplicity has made people to fall in love. Simplicity has power, start our life on constructive and positive manner and most direct and powerful approach ever found.

1. Traces simplicity

1.1. Definition of the Simplicity and minimalism

The term simplicity and connected words are explored in the Oxford dictionary wordbook (2011) and ease theory has been researched.

- Simplicity: (1) The quality of being easy to understand or do.
  (2) The standard or condition of being plain or uncomplicated in kind or design style.
- Simplify : Make (something) simpler to do or understand
- Plain: Easy to perceive or understand; clear. ((OED), 2011)

Simplicity can be defined as clearness in every field of design. Simplification brings understandable results in to the art, in addition to visual clearness, simplicity theory raise level of thinking in art.

1.2. Definition of the minimalism:

- Minimal: minimum amount, quantity, or degree.

Minimalism is not oppose, reduce, or chasing simplicity. It can be limited as decreasing the basic concepts of architecture such as space, light, materials and detail. Minimalism uses least number of colors, textures, shapes, forms and materials, to achieve simplification.

Minimalist attitude, refer to clear excess in the space with the way of 'reduction'. Removing the clutter and unnecessary elements to emphasizes spatial emptiness.

1.3 Beginning of Simplicity in Design and Architecture

In early periods, every civilization had specific features in terms of architecture design, which are related with region, geographical positions and national features of a country. With the transition to the settled life and conceptionof happiness to wherever you reside, developed the civilization and shaped the villages, towns and cities.In early periods, shelter ranks with food and clothing as one of the three basic necessities of life. As is thought, one of the best known architecture which emphasizes simplicity is Japanese Traditional architecture. The most necessary characteristic of Japanese culture is knowing the human and nature relationship and being satisfied with less. Moreover buildings in Roman architecture period, clearly understandable in visual manner, proportional relationships and linkages between all part of dwell have been clearly recognized. In the starting period of modernism, artists were interested with reductionism. Simplicity in Modern architecture, the attitude which developed in the face of ornamentation, wasinstrumental in getting rid of all kinds of elements that prevented the emergence of the essence of architecture, continuity, minimized details, universality, giving respect to the nature and so on. Contemporary simplicity, which is also known as Minimalism, generally has similar features as traditional and modern period. Instead of functional and structural simplicity, minimalism omits all the inessential elements in a dwelling. Simplicity brings plurality and functionality to the Design. One of the basic principles of simplicity is removing inessential elements, bringing usability and servable purpose to the objects and products started in this period.

2. Simplicity Concept in Space

2.1 Definition of Space in Simplicity

Ching (2004) define space as:

Space is a prime ingredient in designer's palette.Space inherits the sensual and aesthetic characteristic of the elements in its field.Behaviors and actions shape the spaces. Space covers life and not be separated from life of occupant.(Ching, April 2014)Creating a space in minimalism can be defined as creating the necessary emptiness for people who live there. Emptiness, gives an existence of objects and people.

2.2 Classification of Space in Simplicity

In this section, classification of Space in Simplicity has been researched in terms of the Interior, Exterior, and Multi Purpose Spaces which have major role in any dwelling unit and its understanding from a Simplicity and Minimalist attitude.

2.2.1. Interior space

Simplicity in interior space can be defined as a place which serves peace, serenity, and comfort and with least effortin life organization without removing the essentials such as heat, light, sound, colour, odour, and the elements of furnishing, human requirements and actions that take place in a space.

2.2.1.1. Space Organization

Environment and spaces that we live in reflect our living style as increasing self sufficiency. The space that organized well according to human behaviors and needs called as simple space organization.

2.2.1.2. Indoor and Outdoor Façade

In Minimalist spaces connection with nature and being a part of nature as much as possible is very important. In a sense, integrity of interior and exterior spaces and their permeability and fluidity has been observed. In minimalism interior and exterior spaces are taken as a whole, nothing is left to coincidence.

2.2.2 Multipurpose Spaces

In Minimalist spaces, multi functionality and multipurpose space feature has been observed. The concept of multipurpose spaces, allow users to do more than one activity at the same time or different times in a single spaces, in a manner of speaking multipurpose spaces can be define as overlapping activities, multi functionality; furthermore it has to answer user needs in same time.

2.2.2.1. Indoor and Outdoor Relationship

Connection between nature and conception of integration between interior and exterior space are very important in Minimalism. Minimalism appears as a belief that achieves the maximum aesthetic in the physical environment with minimum usage of material, being without nature makes minimalism boring and overwhelming.

2.2.2.2. Form

In the minimalist spaces, basic geometric forms, smooth and clear lines with angular forms and functional accessories are preferred to use. Complex and ornamental forms has been rejected.

2.2.3. Interior Space Elements in Simplicity

Interior space element should provide the reflection of spatial emptiness.

Everything needs to be considered together: materials, color, texture, light, etc. to achieve necessary desired atmosphere of the dwelling.

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2.2.3.1. Color and Texture

Minimalist spaces refuse the usage of variety color and texture which tire the eye. More color and texture diversity in space create spatial chaos and occur disturbing effects on man. Usage of natural materials with own color and texture without processing them, that coming directly from nature such as stone, wood, mud and etc.

2.2.3. 2. Material and Detail

Minimalism reflects perfection on details with flawless fine finishes. Perfection gives simplicity plainness, silence and minimalist feeling to the space

2.2.3.3. Furniture

Features of Simple and Minimalist Furniture		
• Fixed Furniture	Fixed furniture allows users to hide and storage objects.	
• Movability	Movable furniture create empty spaces and used for different functions.	
• Modularity	Modularity allows users to carry and change the positions of elements to serve multi function.	
• Pliability	Pliability allows furniture to collected and stored easily.	

Figure 32: different types of furniture(Sözmener, August, 2012)

2.2.3.4. Structure & Construction

If a building is successful in terms of functionality it means its means it is perfectly simple.

2.2.3.5. Openings and Lighting

Lighting allows interior elements to express themselves with simplicity such as form, color, texture, material and detail. Type of lighting and shadows gives richness to the space in terms of design

3. Case studies

3.1. Case study 1

Architect: Mise Van Der Rohe

He believed that "Less is more." His style describe as timeless as minimalist trend never lost validity. Mise Van Der Rohe seeks to prove that simple things do not need ornamentation or formalism. According to him, architecture harmony happens when weadd necessary and remove unnecessary. For him, anything which is not functional cannot be called beautiful.People praise his work, saying he created architecture in its most pure form.

Name of the building: Farnsworth House
Location: Plano, Illinois
Construction date:1946-1950

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Figure 2: Exterior view and entrance

Figure 3: interior view and rendering

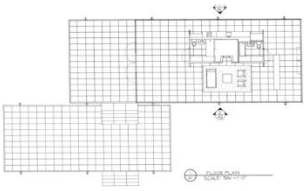
Figure 4: plan of house

3.1. Case study 2

Architect:Tado Ando

The minimalist design is powerfully influenced by the Japanese architect Tado Ando. Creates a building in which light, water; wind and concrete co-exist to perfection. He designs unique spaces, which change constantly, because the sun and wind play important role in their frames. The light has a decisive role in all of his projects. And he use thin concrete walls to create space. The walls are essential element according to him. They divide the space and rearrange the space to create new area. Ando uses basic geometric shape. His trade mark is the round openings, which impale the buildings, letting the sun in the rooms.

Name of the building: Azuma House
Location: Osaka, Japan
Construction date:1976

Figure5: Exterior view And entrance.

Figure 6: Interior view and And entrance.

Figure 7: plan of house rendering.

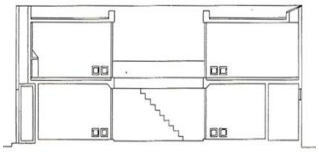
Figure 8: section of house

Alberto Campo Baeza

Alberto Campo Baeza's features of design: control of gravity and dialogue with light.He uses simple shapes and plain expansive surfaces in concrete, glass and white, and lack of ornamentation.

Name of the building: Guerrero House
Location: Cadiz, Spain
Construction date:2005- 2007

Figure 9: Exterior view and entrance

Figure 10: interior view and rendering

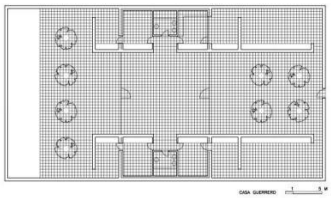
Figure 11: plan of house

Method of analysis

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As a part of the methodology, an analysis table was prepared under 3 main titles; classification of space, interior space elements and functional requirements. These 3 main titles consist of elements and criteria according literature survey.

Table1. Comparative analysis of selective residential housing dwell according to selective parameter(Sözmener, August, 2012)

ANALYSING THE SIMPLICITY CONCEPT IN INDOOR SPACE					
Element		**Criteria**	**Farnsworth House**	**Azuma House**	**Gaspar House**
CLASIFICATION OF SPACE	**INTERIOR SPACE**	Spatial emptiness		✓	✓
		Spatial occupancy	✓		
		Ornamented			
		Unornamented	✓	✓	✓
	SPACE ORGANIZATION	User oriented	✓	✓	✓
		Functional	✓	✓	✓
		Non functional			
		Fluidity in spaces	✓		✓
		Single unit plan	✓		
		Multi unit plan		✓	✓
	MULTIPURPOSE SPACE	Overlapping activities	✓		✓
		Individual activities		✓	✓
	OUTDOOR FAÇADE	Transparency	✓		
		Opacity		✓	✓
		Ornamented			
		Unornamented	✓	✓	✓
	INDOOR AND OUTDOOR RELATIONSHIP	Permeability			✓
		Impermeability	✓	✓	
		Taken as a whole			✓
		Taken separately	✓	✓	
	FORM	Geometric (pure) form	✓	✓	✓
		Transformed form			
		Simple form	✓	✓	✓
		Complex form			
INTERIORSPACEELEMENET	**COLOR**	White color			✓
		Own color of material	✓	✓	
		Variety of color			
		Uniformity of color	✓	✓	✓
	TEXTURE	Natural texture	✓		
		Artificial texture		✓	✓
	MATERIAL	Non processed		✓	
		Natural material (processed)	✓		✓
		Composite material	✓	✓	
	DETAIL	Flawless details	✓		
		Detail-less		✓	✓
	FURNITURE	Fixed	✓	✓	✓
		Movable	✓		
		Modular		✓	
		Pliable	✓		

	FINISHING MATERIAL	Homogeneous	✓	✓	✓
		Plenty			
	STRUCTURE & CONSTRUCTION	Hidden			✓
		Visible	✓	✓	
	OPENINGS	Ventilation		✓	✓
		Circulation	✓	✓	✓
FUNCTIONAL REQIREMENT	**LIGHTING**	Visible			
		Hidden	✓	✓	✓
		Natural	✓	✓	✓
		Artificial	✓	✓	✓
	SMART TECHNOLOGY	Available			
		Unavailable	✓	✓	✓

Analysis:

Here we provide three examples of the minimalist trend applied particular residential work executed by three architects that can be identified under three main titles of the minimalist trend:

Mise ven der rohe- its predecessor

Farnsworth House's Plan is quite minimal, composed of thin steel structures and glass surfaces minimized mass walls. House is quite diverse in terms of spatial concept architect put wet areas in the middle of building thus strengthen effect of fluidly and circulation in building. In this sense, this spatial wealth regarded as favorable in terms of architecture, on the other hand emerges as a factor which impairing the Minimalist approach of building.

Tadao ando- key to nurture of minimalism trend

Azuma House, include all characteristics of Ando's architecture such as; pure concrete, consciously usage of lighting and openings. He consciously use openings and lighting to attract attention, lighting taken from courtyard. According to different time periods in a day all rooms take benefits from lighting. Light create different texture on concrete. Great example of Minimalist dwellings because of its characteristic; create maximum effect in minimum area, different reaction with nature, usage of material without processing it, lighting and shade.

Alberto Campo Baeza- rolemodel of new generation architect.

In Guerrero House,at first appearance white horizontal rectangular box take attraction, on the front facade of the building only opening is entrance door. On the other sides, openings take the natural light inside and create ventilation and circulation between court yard and indoor space In interior organization of the building, spatial emptiness feeling supported with high ceiling which additionally provide airiness feeling to user. Plan organization is quite simple and plain Interior facades also dominated with white color, partly natural and wooden indoor environment emphasize their self.

Findings and Conclusions

Instead of giving importance to visual beauty, minimalism gives importance to object and relationship with object and environment. Designing and creating simple and free spaces, and more usage of natural light have an important role in minimalism.

The request of Simplification everything in a minimalist interior arrangement and returning to the basic objects and elements attracts attention and highlight the functionality with simple and straight lines without ornamentation. The structures were austere and simple until people look at the building and understand the space and its design feature. Simplicity achieve not only by listening to physical qualities of building but also by paying attention to details, people, nature and materials which reveals the abstract quality of something. It is open dialog between building and its surrounding nature.

Lighting stands out as one of the most important element of Minimalism.On façade used purely geometrical forms to present simplicity and emphasized the characteristics of materials and the corresponding structural systems.

Maximum aesthetic in the physical environment with minimum usage of material, being without nature makes minimalism boring and overwhelming. In minimalist spaces usually light and neutral colors preferred which are reflecting the colors of nature Minimalism doesn't mean absence of everything in a space, contrary Minimalism is achieving essence of objects and it is an attitude increase the value of spaces. As a result Minimalism is removing in essential to emphasize the important. simplification attitude on indoor environment has added values to interior space such as; simplicity, freshness, timelessness, silence and serenity

Steve Jobs said "Simple can be harder than complex: you have to work hard to get your thinking clean to make it simple. But it is worth it in the end because once you get there, you can move mountains"(buisness week, 1998)

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Cultural Manifestations in Architecture

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Abstract: Religion of each society is identified through its manifestation such as language, Art and architecture and analysis in the field of religion is related to study of religious manifestation, architecture reflects the culture. People of various community try to follow their norms and maintain their values. Most of people try to preserve their culture and religion through architecture willingly or unwillingly. The research focus on religious influence on architecture and role of people in achieving same. In order to study the same research was conducted in three different regions in Mumbai where people of various community had tried to maintain influence of religion on architecture without any surrounding influence. The community / region selected for same where Dadar Parsi Colony (Zoroastrian) , Khotachiwadi (Portugal Christian) , Bhendi bazaar (Dawoodi Bohras) . Various articles and book study was done to select the parameter of study. Name of article studied (Expressing an architectural identity: Bohra houses of Gujrat by Balikrishna Doshi) while book studied (The traditional dwellings of bohras: Architectural response to culture ethos by Madhavi Desai) which provide justification or proof for live case studies. And which further helps in proving whether religion / community influence architecture.

Keywords: Zoroastrians, Dadar Parsi Colony, Khotachiwadi, Dawoodi Bohras, Bhendi Bazaar.

I – Introduction

Religions are belief systems that relate humanity to spirituality. Religion is a collection of cultural systems, belief systems. Many religions have narratives, symbols, traditions and sacred history which is closely related to human society. Religion and culture are considered to be inseparable phenomenon of society. Religion influence daily life and Architecture. Religion and culture of each society is identified through its manifestations such as language, art and architecture. Hence this papers aims to understand the influence of religion and lifestyle on people of various community living in various region of Mumbai and how they are able to hold on to its own architectural style without any influence of surrounding. The research will study influence of religion on architecture by observing how people try to maintain their identity of culture and religion through their material manifestations of daily life.

The paper will concentrate on three main zones of Mumbai namely; Dadar Parsi Colony (Zoroastrians), Khotachiwadi (Portugal Christians), and Bhendi Bazaar (Dawoodi Bohras). In an attempt observe that architecture is infleucend by religious systems; the above three cases see appropriate. They are better justified because in spite of the rapid growth in Mumbai; these communities manage to hold on to their religiously influenced architectural identity.

Methodology

Studying various research paper as secondary source and hence coming to the topic influence of religion / community on Architecture. In order to obtain parameter for observation and expert interviews while doing case studies in various regions various books and articles where being used as secondary source or book case studies. On bases of parameter selected the location of case study was being finalized and book and article case study help in providing justification for selected parameter and observation. Which also helped in framing questions for interviews.

II - Analytical Study

The three regions of Mumbai selected for the case study were; first being Dadar Parsi Colony mainly focusing on Zoroastrian community in Dadar area of Mumbai. The second one was Bhendi Bazaar of Mumbai mainly focusing

on Dawoodi Bohras. And the third one was the colony or settlement right from East Indian British Colony period that is Khotachiwadi in Girgoan in Mumbai having Portugal Christian community. Just behind the buzz and lights of Chowpatty beach in Mumbai's third southernmost island, Girgaum, is a historical precinct – the village of Khotachi Wadi. In case of first two communities they migrated from Gujarat and settled in various regions of Mumbai and Pune. Hence a touch of Gujrati Architectural style can be observed in both the cases.

There were couple parameters set for the analysis of the selected cases: **1) Architectural Style 2) Architectural Elements 3) Planning of the area 4) Neighborhood 5) Orientation 6) Façade Pattern 7) Symbolism**below

1. Architectural Style

The Dadar Parsi Colony had Gujrati Architectural style influence along with Parsi Architecture. While Bhendi Bazaar had influence of traditional Gujrati Architectural style along with Islamic influence with touch of Rajputi style. As both of the communities migrated to India and settled in Gujrat and then migrate to various region in Mumbai and Pune; hence the Guajarati influence can be witnessed. Khotachiwadi had Goaian Architectural style influence with Portugal context. This colony was present since the rule of East Indian Company. Initially there were many such colonies; today only one Kitachiwadi is remaning.

2. Architectural Elements

Dadar Parsi Colony had winged mythological figure frames at the portal of an Art Deco era building that house a 19th century Zoroastrian Fire temple Agirary (Ramani)(traditional Zoroastrian Architectural style having Persian influence). While Bhendi Bazaar had vernacular use of timber and stone which also show sensitivity to climate as well as culture and cost effective structures (Tipnis). On other hand khotachiwadi had Portuguese Architectural style having Goaian touch and vernacular architectural style which can be seen through low rise houses made of timber and tiled roofs, these charming and colorful structure with open verandahs make for intimate space amidst the urban chaos (James, 2010).

3. Planning of Areas

Mancherji Joshi planned the Dadar Parsi Colony. He took up task of creating affordable housing that encouraged people to move out of plague stricken environs of south Bombay (agairy was developed much later which show it has no effect on development of settlement). Bhendi Bazaar had residential and commercial zone most of the Bohra's migrating from Iran/Persia and settled themselves in areas of Mumbai and Gujarat for good trade opportunity (development can be observed around religious structure each area having its own mosque). While Khoachiwadi had a chapel which was built as a gesture of gratitude to the almighty for having saved all Khotachiwadi's residents from the Bombay plague. A Gaothan or coastal village founded in around 1840 by Khot, a Pathare Prabhu (Hindu Brahmin) who sold his plots of land to the East Indian Christians, Khotachi Wadi was originally home to the resulting two communities. And then in the 1940s and 50s there was an influx of Goans, followed by Marwaris, Gujaratis, Sindhis.

4. Neighbourhood

Dadar Parsi Colony's house windows don't open into public alleys or if in case they did open, the opening had grills and higher sill level. The importance of privacy in case of Parsis can be easily understood through the sense of gated community. Most of the buildings in Dadar Parsi Colony are either owned by Parsis or rented to parsis only, which shows how conservative they are towards their religion. Bhendi Bazaar house windows don't open into public alleys if open provided with jaali to create visual barrier. Social and religious patterns also play an important part in the design of neighborhood or mohallas and in individual dwelling unit. For example: the dawodi bohra tradition of purdah, didn't allow women to be in public eye, and translated itself in separate zenana quarters within havelis – balconies with jaalis – through which women could observe the outside world while remaining out of sight. Social hierarchy in a community maybe noticed through embellishment. For example in Ahmedabad symbols curved out in wood indicated if the household belonged to Hindu or a Muslim family (Tipnis). While Khotachiwadi house window open into public alleys leading to lively neighborhood. As we enter Narrow winding

lanes, centuries old colorful Konkan-Portuguese style architecture, a Catholic chapel with stone benches and street art for decor, chawls, and an eclectic mix of various Indian ethnicities and religions coexisting in harmony. The noise inexplicably got muffled, the colours brighter and the pace more relaxed. Everyone knowing each other, greetings being exchanged. Children playing badminton and cricket. The elderly walking unafraid.

5. Orientation

In case of Dadar Parsi Colony house oriented in direction of maximum entry of sunlight as they worship fire. So they believe that maximum should entry there house which would help them worship god. The Bhendi Bazaar had roads leading to mosques. While Khotachiwadi had roads leading to church or chapel. While Khoachiwadi had a chapel was built as a gesture of gratitude to the almighty for having saved all Khotachiwadi's residents from the Bombay plague (showing there modern approach).

6. Facade Pattern

Dadar Parsi Colony had structures with geometric motif, naturalistic motifs. Bhendi bazaar had structure with geometric and abstract motifs having floral designs. While Khotachiwadi had structure with geometric,abstract motifs.

7. Symbolism

Dadar Parsi Colony had avestian which can be seen on outside wall of each houses and Agairy and bring good luck. Zoroastrian faith is based on teaching of Zoroaster's teaching. The foundation of Zoroastrian ethical system is based on humata (good thoughts), hukhta (good words) and hvarshta (good deeds) and the symbol represents the same. Bhendi Bazaar in which Arabic script can be observed on most of religious structures and houses Bhendi Bazaar have one mosque having enter Quran written on its marble walls. While Khotachiwadi had presence of cross or statue of Mother Mary and Jesus was found embedded on compound wall of houses.

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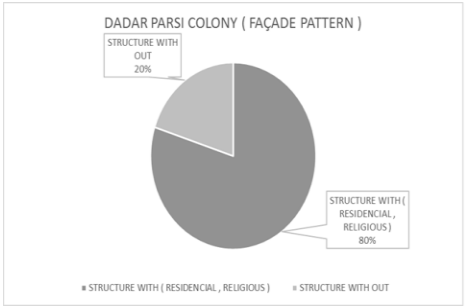
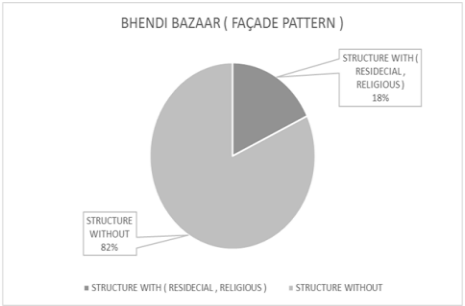
INFLUENCE OF RELIGION ON ARCHITECTURE					
FACTOR	**CASESTUDY 1(LIVE)**	**CASESTUDY 2(LIVE)**	**CASESTUDY 3(LIVE)**	**BOOK CASESTUDY : TRADITIONAL DWELLING OF THE BOHRAS : ARCHITECTURAL RESPONSE TO CULTURAL ETHOS - MADHAVI DESAI**	**ARTICLE CASESTUDY : EXPRESSING AN ARCHITECTURAL IDENTITY : BOHRA HOUSES OF GUJARAT : BALIKRISHNA DOSHI**
	DADAR PARSI COLONY (ZORASTRIANS)	BHENDI BAZAAR (DAWOODI BOHRA)	KHOTACHIADI (PORTGUESE CHIRSTIAN)		
PLANNING	MANCHERJI JOSHI (ENGINEER) TOOK UP TASK OF CREATING AFFORDABLE HOUSING THAT ENCOURGED PEOPLE TO MOVE OUT OF PLAGUE STRICKEN ENVIRONS OF SOUTH BOMBAY (AGAIRY WAS DEVELOP MUCH LATER WHICH SHOW IT HAS NO EFFECT ON DEVELOPMENT SETTLEMENT)	RESIDENTAL AND COMMERCIAL ZONE MOST OF THE BOHRA'S MIGRATING FROM IRAN/PERSIA SETTLE THEMSELVES IN AREAS OF MUMBAI AND GUJARAT FOR GOOD TRADE OPPORTUNITY (DEVELOPMENT CAN BE OBSERVED AROUND RELIGIOUS STRUCTURE EACH AREA HAVING IT'S OWN MOSQUE	CHAPEL WAS BUILT AS A GESTURE OF GRATITUDE TO THE ALMIGHTY FOR HAVING SAVED ALL KHOTACHIWADI'S RESIDENTS FROM THE BOMBAY PLAGUE (SHOWING THERE MODERN APPROACH)	HOUSES GROUPED AROUND A STREET AND THESE FORM MOHOLLA , SEVERAL MOHOLLAS FORM A BOHRAWAD ALSO INCLUDES MOSQUE, A MADRESSA , A JAMAT KHANA	HOUSES GROUPED AROUND A STREET AND THESE FORM MOHOLLA , SEVERAL MOHOLLAS FORM A BOHRAWAD ALSO INCLUDES MOSQUE, A MADRESSA , A JAMAT KHANA
SYMBOLS	AVESTIAN CAN BE SEEN ON OUTSIDE WALL OF EACH HOUSES AND AGAIRY AND BRING GOODLUCK	ARABIC SCRIPT CAN BE OBSERVED ON MOST OF RELIGIOUS STRUCTURES AND HOUSES BHENDI BAZAAR HAVE ONE MOSQUE HAVING ENTER QURAN WRITTEN ON ITS MARBLE WALLS	PRESENCE OF CROSS OR STATUE OF MOTHER MARY AND JESUS WAS FOUND EMBEDDED ON COMPOUND WALL OF HOUSES	ARABIC SCRIPT CAN BE OBSERVED ON MOST OF RELIGIOUS STRUCTURES AND HOUSES BHENDI BAZAAR HAVE ONE MOSQUE HAVING ENTER QURAN WRITTEN ON ITS MARBLE WALLS	ARABIC SCRIPT CAN BE OBSERVED ON MOST OF RELIGIOUS STRUCTURES AND HOUSES BHENDI BAZAAR HAVE ONE MOSQUE HAVING ENTER QURAN WRITTEN ON ITS MARBLE WALLS
ARCHITECTURAL STYLE	ART DÉCO (TRADITIONAL ZORASTRIAN ARCHITECTURAL STYLE HAVING PERSIAN INFLUENCE)	VERNACULAR , ISLAMIC ARCHITECTURE	PORTUGUESE ARCHITECTURE HAVING GOAIAN TOUCH AND VERNACULAR ARCHITECTURE	VERNACULAR , ISLAMIC ARCHITECTURE	VERNACULAR , ISLAMIC ARCHITECTURE
INFLUENCES	GUJARATI ARCHITECTURAL STYLE INFLUENCE ALONG WITH PARSI ARCHITECTURE	INFLUENCES OF TRADITIONAL GUJARATI ARCHITECTURE ON ISLAMIC ARCHITCTURAL STYLE HAVING TOUCH OF RAJPUTI ARCHITECTURAL STYLE	GOAIAN ARCHITECTUAL STYLE INFLUENCED BY PORTUGAL INFLUENCE	INFLUENCES OF TRADITIONAL GUJARATI ARCHITECTURE ON ISLAMIC ARCHITCTURAL STYLE HAVING TOUCH OF RAJPUTI ARCHITECTURAL STYLE RENAISSANCE AND BOROQUE STYLES TO DECORATE SCULPTURAL ELEMENTS , COLUMNS , ETC.	INFLUENCES OF TRADITIONAL GUJARATI ARCHITECTURE ON ISLAMIC ARCHITCTURAL STYLE HAVING TOUCH OF RAJPUTI ARCHITECTURAL STYLE RENAISSANCE AND BOROQUE STYLES TO DECORATE SCULPTURAL ELEMENTS , COLUMNS , ETC.
FAÇADE PATTERN	GEOMATRIC MOTIF , NATURALISTIC MOTIFS	GEOMETRIC AND ABSTRACT MOIFS HAVING FLORAL DESIGNS	GEOMETRIC MOTIFS , ABSTRACT MOTIFS	GEOMETRIC AND ABSTRACT MOIFS HAVING FLORAL DESIGNS	GEOMETRIC AND ABSTRACT MOIFS HAVING FLORAL DESIGNS
NEIGHBOURHOOD	HOUSE WINDOWS DON'T OPEN INTO PUBLIC ALLEYS OR IF OPEN PROVIDED WITH GRILLS AND HIGHER SHILL LEVEL	HOUSE WINDOWS DON'T OPEN INTO PUBLIC ALLEYS IF OPEN PROVIDED WITH JALI TO CREATE VISUAL BARRIER	HOUSE WINDOW OPEN INTO PUBLIC ALLEYS LEADING TO LIVELY NEIGHBOURHOOD	HOUSE WINDOWS DON'T OPEN INTO PUBLIC ALLEYS IF OPEN PROVIDED WITH JALI TO CREATE VISUAL BARRIER	HOUSE WINDOWS DON'T OPEN INTO PUBLIC ALLEYS IF OPEN PROVIDED WITH JALI TO CREATE VISUAL BARRIER
ORIENTATION	HOUSE ORIENTED IN DIRECTION OF MAXIMUM ENTRY OF SUNLIGHT AS THEY WORKSHIP FIRE	ROADS LEADING TO MOSQUES	ROADS LEADING TO CHRUCH OR CHAPEL	ROADS LEADING TO MOSQUES	ROADS LEADING TO MOSQUES





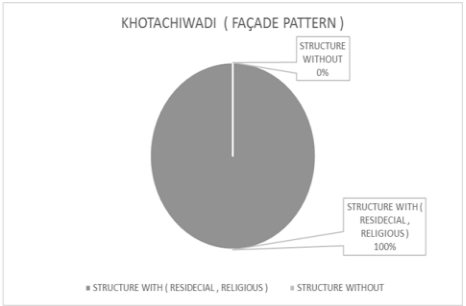


Table 4 1 : Parameter showing influence of religion on Architecture

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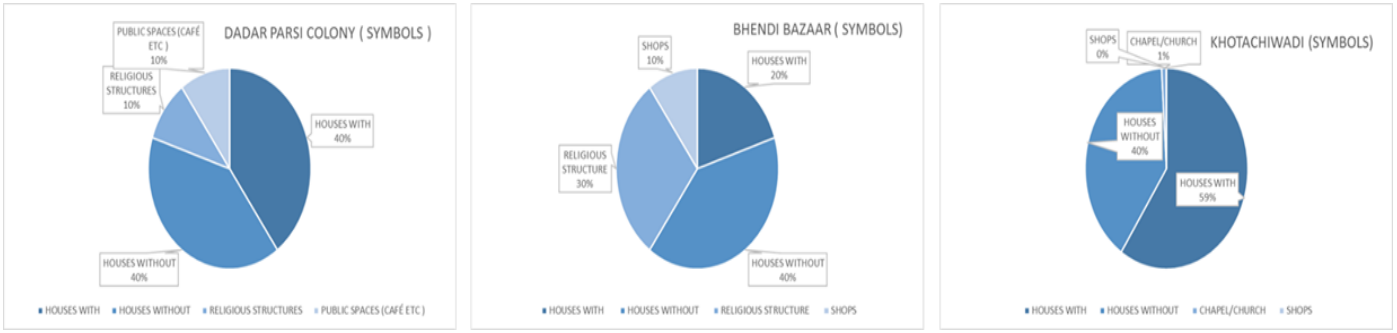

Table 4 2 : Parameter showing influence of religion on Architecture

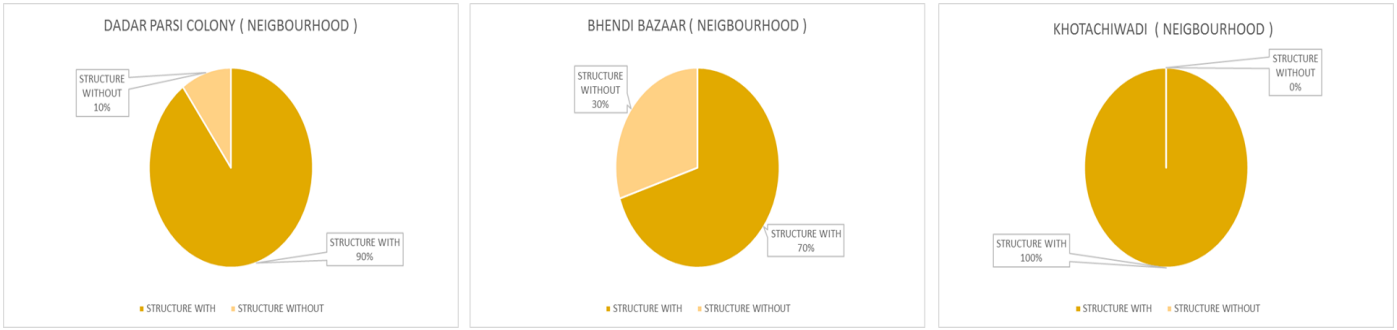

Figure 5 1: Factor: Façade Pattern

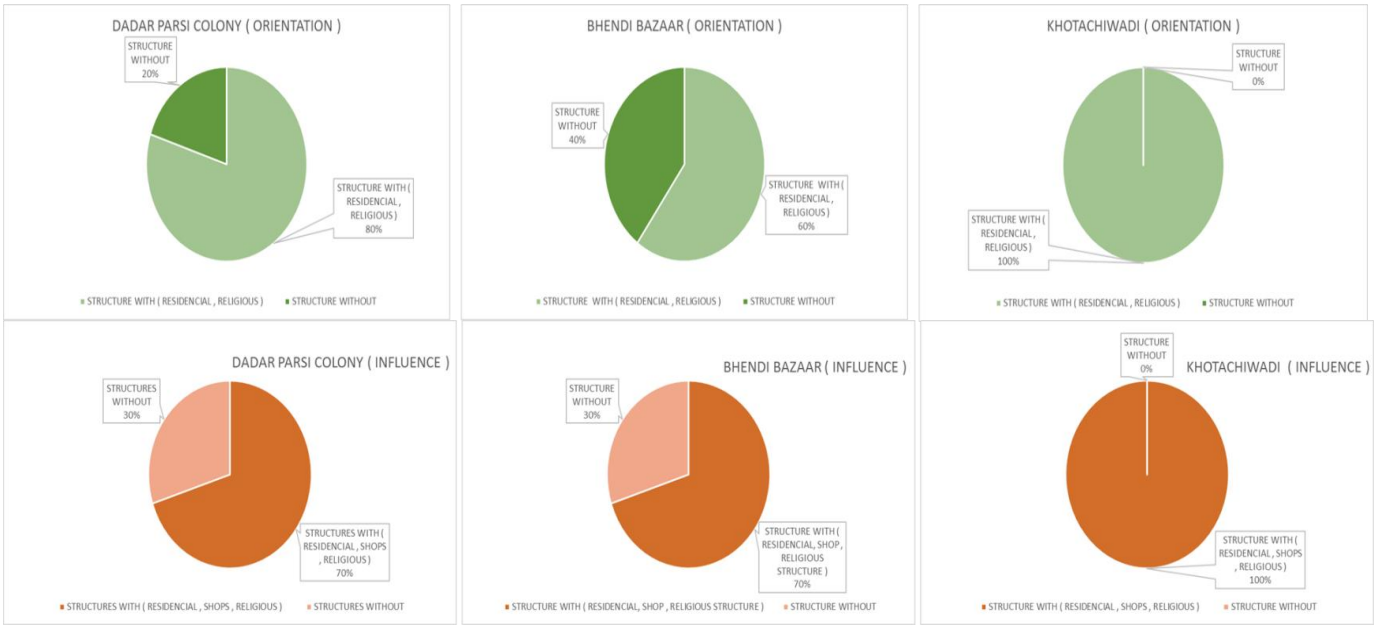

Figure 5 2: Factor: Influences

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III - Conclusion

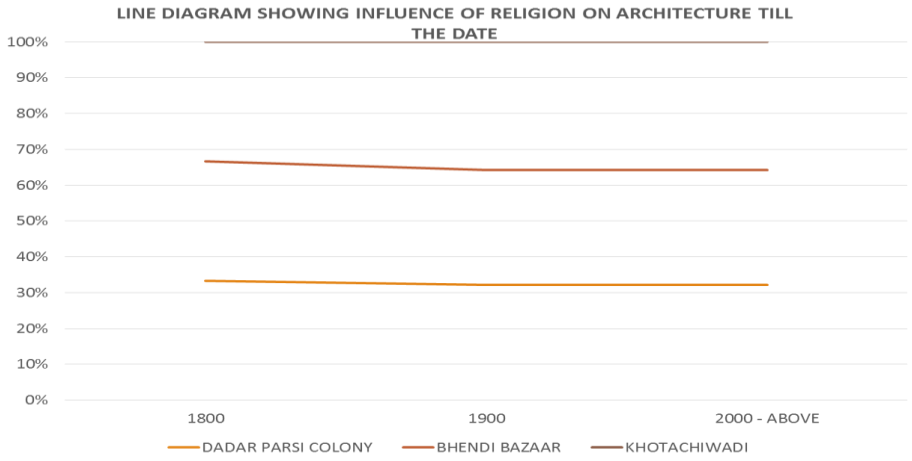

Figure 6 1: Line graph showing influence of religion on Architecture

On basis of observations done and the statistics prepared proves that the influence of religion / community on architecture is indeed witnessed; even when the regions around these settlements are rapidly modernizing. At the same time there are couple redevelopment projects that are on-going in these areas. Considering that the Bhendi Bazaar project for example is undertaken by the heads of the community itself hence they would preserve the architectural style and heritage of the past. Yet one knows that the low rise high density type of settlement will change into high-rise medium density project. With this drastic change how much of the socio-cultural connect, symbolism and will be lost is difficult to say. One has to wait and watch the project unveil itself.

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Life beyond Shelter: Understanding Quality of Life in City Streets

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Abstract : Public space is an essential part that forms the basis of small social interactions that grow into greater interface to larger communities. The appearance and social setup depends on the built structure surrounding it. It not only creates a community in itself but also adds to the quality of life. It is a necessary element in the existence of a community housing environment. Various elements of public spaces like public plazas, pathways, edge connections, nodes connecting various junctions become a part of major open spaces defining pedestrian and vehicular movement. Public spaces differ according to the social, cultural and economic developments. Improper size and poor quality of design are major factors of the current situation whereas semi-public open spaces create a sense of security and personalization of their spaces. However, the mixing traffic of pedestrians, cyclists and vehicles lead to chaos thus creating havoc among each other. Today, these spaces have lost its value due to many factors which include lack of maintenance, improper location and sizes, courtyards used for parking instead of interaction and gathering spaces, etc. Looking at the context of Pune, where development is happening at a very high pace and an aim for the converting the city to a Smart City, the beautification of urban open and green spaces has begun. With the awareness of providing and creating clean, livable environment for and by the involvement of the community, public spaces has regained its importance to a great extent. Components like building heights, orientation of entrances, active frontages, and multi-functional areas enhance or sometimes reduce pedestrian flows across and around public spaces. The purpose of research on the following topic enables me to decide upon the qualitative aspects of public spaces in the city as well as help me understand human dimension, their needs and certain place making factors that influence the usability of such spaces. Public spaces have a great impact during gatherings and festivals, where such spaces are used for commercial and recreational activities thus adding to the flow of people and increase in the economic stability of the area. The methodology so adopted for this kind of research is mapping of various public spaces analysing them through mental maps which indicates their perception and importance to such spaces thus creating an image for the same by drawing attention to the evolving typology of open spaces and strengthening the public space network.

Keywords: Public spaces, quality of life, public space network, mapping.

Introduction

Public space is the primary component of urban fabric. These spaces have a major role in the functioning of city life accommodating a balance between stationary and moving activities around the surrounding built environment.In today's scenario, public spaces are the most neglected part of design and with the increasing demand for residential and commercial projects, these spaces are left deserted due to lack of maintenance and encroachment of the urban slum. Most of these problems arise due to negligence of the residents and awareness regarding the importance of public spaces.A city is an amalgamation of many uses and activities.It is a place where people can live work and play harmoniously.

The cities around the world are getting better at many things but safety on roads is not one of them. Mobility is not just about designing for good connectivity and linkages, but also includes ease of movement, equity, accessibility and security for pedestrians. An urban street consists of large variety of activities and different types of users. In Indian cities, streets act as the major public spaces. Most of the shopping activities as well as social activities take place on streets. Streets with shop fronts, eating joints, hawkers as well as food vendors encourage heavy pedestrian movements. But these activities are unsegregated and unorganized that makes the streets inaccessible

and unsafe for pedestrians. There are many factors that influence the use of public spaces among which the quantitative factors like temperature, relative humidity, activities, user group, etc. qualitative factors like human comfort, scale and proportion, accessibility, visibility, etc. have an important role to play in the urban context. Public spaces are a combination of moving and stationary activities which not only make people interact with each other but also spend time with the space thus determining the amount of time spent sitting and standing in these spaces. Another component of age groups from children to senior citizens who are the stakeholders of these public spaces which also form the user group have a great influence on the usability factor and other social activities of the place. Transition from the built spaces to semi-open and public spaces help in determining levels of pedestrian comfort and social interaction.

Considering Aundh as a context for the case study, the suburb and Gao than areas are in the same locality but the quality of the spaces left between the buildings is declining in both the areas with rapid urbanization and smart city developments. Certain pockets of spaces in Aundhgaon yet create a sense of community interaction and social cohesion between people. Satellite townships with private open spaces have become a growing trend for sustainable cities but do such spaces help in developing interaction and bonding among next neighbours? Can we personalize our own public spaces? Yes, by engaging the local people, creating spaces imparting comfort, enjoyment and safety can change the outlook of such spaces. .Public spaces including courtyards, public parks recreational spaces, footpaths which are now encroached as parking spaces, dead areas, urban slums has developed problems like unemployment, poverty, etc. In between spaces perceived as dead zones take shape into city's landscape changing the overall perspective of the city, such urban pockets turn into potential place making spaces that revive community interaction , creating user-friendly spaces transforming the street life. The objective of public spaces is to understand human dimension, their needs and qualitative aspects that are responsible for making an ideal social interactive space. Certain place making factors like sociability, access and linkages, activities and comfort also influence the usability of such spaces.

They are supporting facilities and infrastructures whose presence greatly influence the housing habits as well as a bind and connect spaces to the surrounding environment. This report also represents the interplay between public spaces and public life when analysed together gives recommendations on strategic development of public spaces.

Literature Review

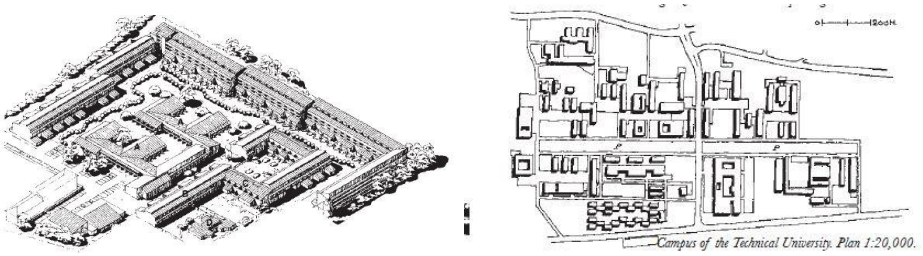

Figure 33- Integration & Segregation at a smaller scale, Copenhagen, Source - (Gehl, 2011)

(Gehl, 2011) The book (Life between Buildings) examines the relationship between patterns of space use especially outdoor activities and other spatial properties of physical environment. A straight forward approach to interpret the changing urban form and their use. The author has also closely documented the existing scenario and performance of urban spaces and analyzing factors that influence the use. The method so adopted was to quantify the levels of pedestrian flows, length of stationary activities, usability frequency and also determining the qualitative factors focusing on the design details. Discussions on the preferable areas for sitting and standing as well as multi-functional open spaces at a human scale with its preferred location helps us understand public spaces contextually and socially.

Concept of Integration & Segregation- case study in demark and Copenhagen

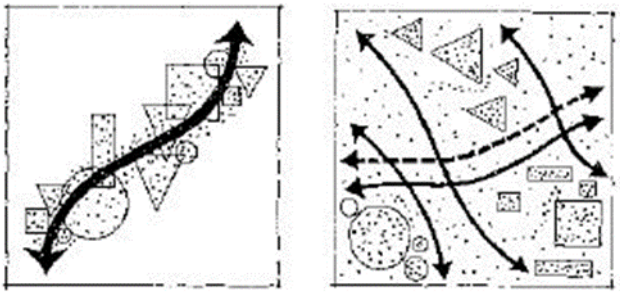

Figure 34- Diagram showing integration and segregation, Source- (Gehl, 2011)

Integration of various activities and functions in and around public spaces allows the people to be involved to function together. People working and living in different buildings using the same public spaces and meet in connection with daily activities. This kind of planning allows for social integration among various societies in the same neighbourhood thus creating a sense of community. On the other hand, the concept of segregation leads to creation of monotonous environment with similar occupation which eventually divides and seperates the people from each other. These single group remain isolated from other groups of the society but the advantage of rational planning, efficient access and better connectivity to different functions makes it an ideal planning module for the developing cities. For a city like Pune, where user groups are of a multi-dimensional nature the concept of integration is ideal and creates more active public spaces around and across the city. The author also states concepts of necessary and optimal social activities. He also examines the spatial properties of public spaces and relates them to the causes of success and failure of the urban planning principles in the city. It analyses the the physical properties of human senses like smell, hearing & seeing, etc. The author also elaborates on the fact that scale of the space with the number of users should be directly proportional otherwise these spaces are left isolated or deserted leading to wastage of potential urban pockets. A vital age group of youngsters form a major user group of public spaces which is why designing for them becomes very crucial in terms of scale, sitting/studying areas, amphitheaters, etc. They are in need of such spaces the most due to the social life they come across which also helps them into better, bold and expressive individuals.

The author put's the discussion forward by understanding series of spatial components like orientation of entrances, building heights, active frontages, etc. which enhance or reduces the pedestrian flows around the public spaces. Lastly, it is also equally important to see and analyse the correlation between static activities and occupancy levels with levels of pedestrian movement determining the quality of public spaces.

(Ar. Bhaghyalaxmi M, 2014) This article describes the case study of Bangalore elaborating on the urban streets and nodes of the city. With the impact on rapid urbanization, streets and nodes are failing to function as public spaces due to lack of amenities, poor design of street scape, etc. This paper attempts to study, analyze and propose certain design interventions that can be adopted with respect to two public realm spaces(Streets and Nodes) addressing different set of user groups, in a commercial and a residential area respectively. It also attempts to study, analyze and propose certain ready-to-build design interventions that can be adopted as urban inserts. The proposed interventions have been demonstrated through two case studies. Both case studies in this paper- street in a commercial zone and nodes in a residential zone fall under the precinct typology of urban design.

Jayanagar. Hub of south Bangalore surrounded by prominent neighbourhoods, is sub-divided into ten parts comprising of residential and commercial areas known as Blocks. The third and fourth blocks are largely commercial blocks with maximum footfall in a planned neighbourhood. Ramanjaneya Nagar, Comparatively a new residential extension in south Bangalore is rapidly developing with many apartments coming up in and around the area. This residential neighborhood is identified for study, analysis and intervention as its vivid topography and elevations, inadequate amenities sparse and haphazard placement of street furniture clearly exhibits the need for urban design interventions. Prototype module- Rigid pavement in concrete and terracotta two kinds of Pavements are proposed Rigid Pavement and Flexible Pavement. Concrete is used for rigid pavement where it requires high

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compressive strength; distribute the load over a relatively wide area. The Proposed Auto stand area has concrete paving with pattern embarked. It is also used in the outer part of the Pedestrian path along the roads.

- **Streets in a commercial area: Selection**

Figure 35 - Selected two streets in Jayanagar 4th Block, Bangalore, Source - (Ar. Bhaghyalaxmi M, 2014)

As a part of street and node developments, proposed design interventions is to develop node as a public space, reorganize street furniture, prototype seating module, etc. Such urban inserts and place-making components change the appearance and aesthetics of the environment adding to the visual quality of space. Examples of such ready to use module is based on user comfort, size and nature to suit Indian streets. Such designed spaces in neighborhood positively can promote social integration. The prototypes aid to create coherent and vibrant streets and nodes by providing visual and physical access. The organization of street furniture not only gives the visual accessibility but also contribute to the free pedestrian movement which is crucial to the Indian city streets and nodes.

Research Methods

Figure 36- Site plan mapping showing concentration of gathering spaces around temples, Source- Author

Research of the topic was mainly to focus on the transition between residential and commercial zones, public spaces that become a part of the built character subject to its usability which changes during different times of the day and also during festivals. Streets between residential zones are mainly used by bicycles, two –wheelers, autos, carts, etc. whereas interface of tempos, cars and buses move along the main commercial areas and nodes adjoining main roads. The internal lanes smaller to the residential street have only two wheeler and pedestrian access. This not only reduces the traffic problems within Gao than settlements but also encourages pedestrian activities and increase safety among its people. The scenario is a bit different during festivals where katas outside houses are used for informal commercial activities and by hawkers due to the increased footfall of people in these days. Footpaths are used by local vendors, courtyards as parking spaces, school grounds for various events, etc. Following are the images which show the movement and use of spaces during different times. The data collected was analysed by using a statistical graph based on the components of open space and their priority, qualitative inferences required while doing the strategic planning such spaces, concluding data from photos and questionnaire

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about an upgradation and enhancement of public space network, basic amenities, improving connectivity and visual quality, etc.

Criteria of sampling – different stakeholders and user group, eg-women and children, commuters and paying guests, residents in and around the area, fishermen, kumbhars, Kushti trainers, etc.

Observation – non- participant (photograph analysis)

The basic data collection was by photograph analysis rating which helped in understanding spatial parameters of the surrounding spaces depending on various parameters and public space network.

The area of study was Aundhgaon where mapping technique and photograph analysis were used to understand existing public space network. Temples formed major nodes in the urban village where people concentration was at a larger scale especially during evening and morning times of the day. An interface of commercial and residential zones generated different ground floor frontages that were used as parking spaces or by vendors in the evening and during festivals also. An observation of narrow lanes and variation in building heights defined various clusters in the same vicinity and also changed the character of public spaces. An interview with the local corporator and sociologist was conducted to understand the need of public spaces where views were mainly focused on improvising the existing spaces such as street furniture, landscaping, road infrastructure for better connectivity. There was a need for resting spaces for the senior citizens near the temples as rightly focused by the sociologist and local people. Different age groups were interviewed in an unstructured manner so that they are not restricted in expressing their views and concerns for the same.

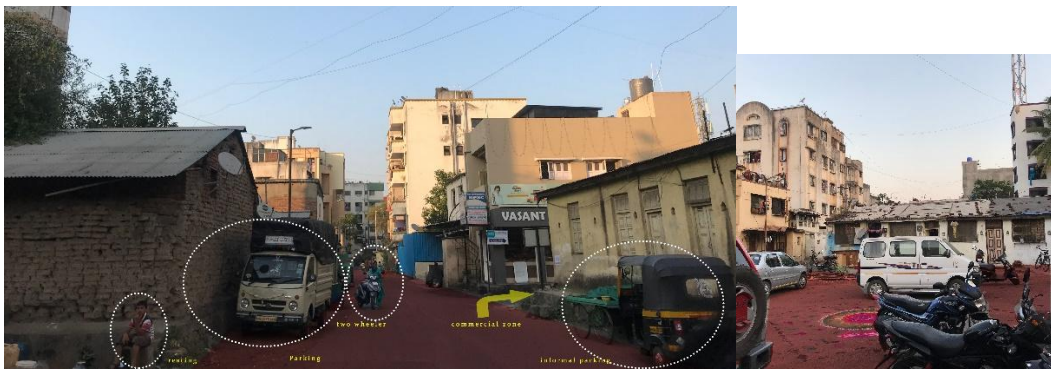

Figure 37& 6 – Public spaces and its components, Source – author

Pointers for questionnaire formulation (Unstructured) -

Way finding, good road network, Time spent such spaces, Choice of route, Visits per day/week, Influence of pathways, footpaths, etc. Definition of its extent, Safety, accessibility, comfort, visibility, Effect of microclimate on the space, Surrounding activities like commercial and retail shops, café, salon, etc. thus affecting footfall, Existing amenities v/s required ones like benches , drinking water, landscape, etc.

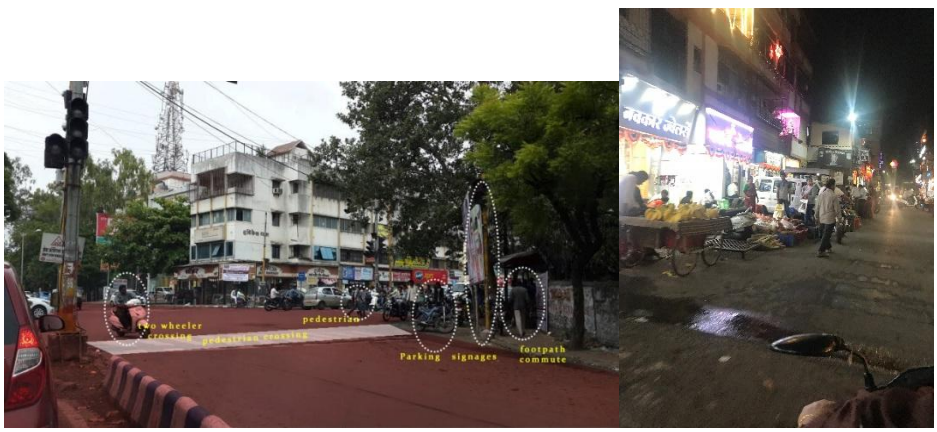

Figure 7 & 8 - Ground Frontages during day and evening, Source - author

Analysis and Results

Smart pedestrian movement is one of the major determining factors for designing a city. Organization and segregation of activities is the key to achieve a walk able street. Well designed and well maintained details make the space visually appealing and encourage walking. The street should be designed in such a way where the activities on the street are well segregated with provision of adequate street furniture and shading on sidewalks. Pedestrian priority signage and way finding signage are provided for increased accessibility and security. Ample amount of landscaping and buffer spaces increases the visual quality of such spaces. Connectivity in terms of public space network should be accessible safely by all age groups and specially abled persons.Projections and setbacks from the building line such as bays and entrances add valuable emphasis and can create usable attractive spaces for the pedestrians. Public spaces integrated with pedestrian pathways facilitate social activities and help in making the space socially sustainable.

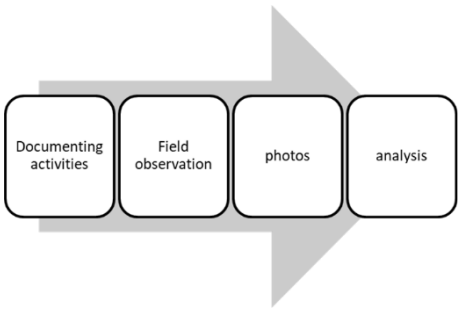

Figure 9 – process of analyzing data

Pedestrian routes should be emphasized using planters or trees. Park lets/ Side walk extensions can be inserted at some places alone the sidewalk where ever there is availability of setback space to make the pedestrian realm socially more active.Every public space in the estate has its characteristics that embedded in every occupants about the image of the public space. The image determined by the pattern and structure of the physical environment which in its development influenced by the social, economic, cultural, institutional, customary and political factors that will ultimately also affect the physical performance. A housing that has no high public image or identity, the community or residents of housing tend to have relatively equal interactions and experience of space in the public space

Discussion and Conclusion

The inevitable socio-economic development which is growing at a higher pace needs to be accommodated for w.r.t the open public spaces of various typologies. Defining certain qualitative guidelines, proposal of strategic development and other design principles can help increase the importance and usability of these spaces. For example, using tactical urbanism as a way of temporary interventions leading to long – term changes. A citizen led approach to place-making will change the perception of such spaces. Active ground frontages with community engagement and other commercial activities will establish interactive indoor –outdoor environment leading to an active neighbourhoods. Accessibility, public space network must be established so that no isolated or unused spaces are left in the same vicinity. Understanding the economic, social and political value of public spaces which differ from place to place but are equally important in establishing social stability and developing the cultural identity of the area. Factors such as pedestrian safety, green pockets, reducing pollution levels increases the efficiency of its network thus increases the footfall and other street activities. Social integration and civilized economy is a neighbourhood where there is a balance between all the above aspects which in turn reduces the cost of public expenditure on urban development. Reduced energy consumption, increased commercial and business value, safety and security, increased ecological diversity together make an ideal and self-sustainable neighbourhood in itself. Such an extension of opportunities for outdoor where everyday activities take place adding to the life between buildings.

Citations

(Architects, 2009)
(Gehl, 2011)
(Ar. Bhaghyalaxmi Met al. 2014)
(Risom, 2015)
(Gehl Architectet al. 2016)
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(Zaharaet al. 2018)

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I'm immensely grateful to Ar. Vijaya Srinivasan for her continuous guidance under the topic with valuable feedbacks, I also thank the PMC Corporation and the sociologist for assistance with explaining the existing scenario and understanding peoples' requirements.

I would also like to show gratitude to the residents of Aundhgaon for sharing their thoughts and concerns with me during the course of this research although any errors are our own and should not tarnish the reputations of these esteemed persons.

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Use of Tactile Materials in Public Places for Easy Accessibility of the Visually Impaired People

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Abstract : Tactile materials are those which utilise your sense of touch to feel and analyse the surroundings. These are used to teach the people who are partially or completely blind. They perceive the world through sensory skills. Touch is the first sense that an individual develops in life. Touch continues to be the primary means of experiencing the world through infancy and well into childhood. Touch plays a major sensory role through life to old age. Children depend on touch for learning about the world including the qualities of temperature, texture, shape, softness, sharpness, elasticity and resilience. These materials vary from natural to synthetic. This mode of instruction bridges over from the known to the unknown, from the concrete to the abstract, and lays a solid foundation for the mind to work upon.This process is termed as kinaesthetics.Tactile materials are used for various purposes in a building it can be used for flooring, ceiling, railing, walls, both for outdoor and indoor purpose. Public places are visited by people of different age group and people with disability. Hence, accessibility is one of the major concern.In the present scenario, tactile indications are not widely used, hence a detailed study regarding the dependence of the visually impaired people on tactile indications and the importance of implementing these in today's living condition is the need of the hour.

Keywords: Tactile materials , sensory , accessibility, public

Introduction

Tactile materials are seen mostly in public places, this helps the visually impaired people to access these places independently. Touch will not only enhance their vision but also will improve their ability to learn. Pairing vision with touch will give the students more information and a fuller view of the object under examination. To gather full information, a low vision student must develop a multi-sensory approach to learning that includes both tactile and visual skills. To function efficiently, all students with limited vision should have goals for developing tactile skills. The development of tactile skills should begin from a very young age and continued throughout the child's education.

Aim-

The aim of this research is to study how tactile materials are used to make accessible design solutions and its need in the circulation spaces for the visually impaired people

Objectives-

a) To study the properties of tactile materials.
b) To study the importance of incorporating tactile materials in architecture for the visually impaired people.
c) To study various accessible design solutions for the visually impaired people.

Research Question

How are tactile materials used to access places by the visually impaired people?

Scope

The research aims at studying the use of tactile materials and various methods incorporated of the same to make the space accessible for the visually impaired people.

Limitation

The research is limited to the school going children of the age group 3yrs -16yrs.

Methodology

Tactile materials are widely used in the public places but the execution of the same is such that it only caters to the aesthetics of the place. To understand the present scenario of the tactile representations and study the scope in the same, case studies were conducted of different public places- A Blind School, Osho Park (a public garden) and a sensory park dedicated to the students with various disabilities. The main idea was to study various ways in which tactile materials are used and to understand the importance assigned to the same in each place and draw a comparison. Public places are visited by people with different disabilities and are meant to serve the society as a whole and not just a section of it, hence these places should be self sufficient enough to guide people.

Literature Review

A touching tale of architecture

(Arrol, 10 January 2001)

Objectives:

- Different types of textures seen in building and is achieved with the help of different materials in the buildings.
- Texture in architecture has various meanings. Broadly two types of textures are seen. Optical textures and tactile textures.
-

Findings:

Optical textures and tactile textures. Optical textures refers to the visual pattern at large scale whereas tactile textures refers to that which can be physically felt with the human hand. Optical texture could be given by the organization of architectural elements such as windows, doors, solids or voids, whereas tactile texture on the other hand could be given by building materials such as concrete, bricks, stone, glass, steel etc. Smooth materials such as glass, etc create a smooth and soft texture whereas rough materials such as stone, brick or concrete, create a rough and hard texture.Material system play a critical role throughout the design process and informs the thinking as places are made. Building and spaces need to become a heightened journey of varying tactile experiences. The goal should be to make spaces that are human-centered and play on all senses. It is very much essential to conceive a building which strives to achieve a lasting aesthetics and efforts should be taken to ensure that this is be achieved by the maximum use of material differences, that can be felt.

Live case study-1

Jormal Periwal Memorial Senior Secondary School for the blind, Delhi

Visual connectivity-The major segregation between the two blocks namely block A and block B is done with the help of a garden and a playground. The segregation is done in such a way that the visual connectivity is not broken.
Interactive space- An open area in front of the canteen is an interactive space with a lot of greenery, flowers etc, this helps them to feel the surroundings with their sensory skills which include touch, smell and their capacity to hear. This enables them to utilize all their sense organs to understand the surroundings through different mediums.

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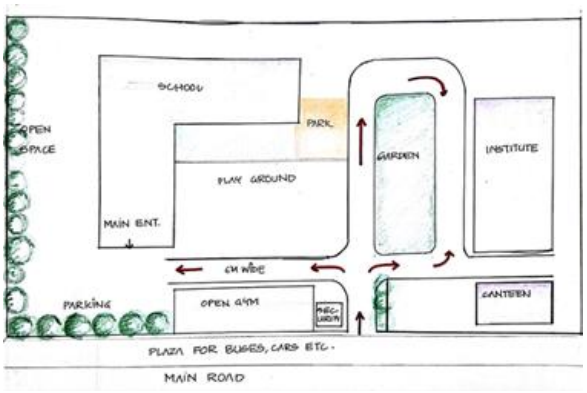

Figure 38 showing the schematic site plan.
Source-.student

Open gym-The open gym is provided right behind the security cabin and in front of the school. This position gives a clear view of the area for the teachers to keep a check on the children and can be easily accessed in case of any emergency. The path leading to this area is also vehicular free. Most importantly the position of the gym is commendable as it receives minimum direct harsh sunrays. This area is properly confined with the help of the fence. 8098588001
In this case safety is taken care of.

Figure 2 showing the open gym which is easily accessed by the children as it is surrounded by a non vehicular zone.
Source-student.

Figure 3 showing the colour and material difference at the edges.
Source-student

Figure 4 showing the use of windows as a medium of counting distance.
Source-student

Figure 5 showing the tactile representations on the floor at the entrance with colour difference.
Source-student.

Visual and Tactile materials- There is a material difference between the playground and the outdoor area. A raised material as curb is used to detect the boundaries. For sighted people, visual difference is the medium and for visually impaired, difference in the surface is the medium. In the roads towards the edge, to mark the boundary, different material is used followed by a curb wall.

Repetition of units-The buildings are of exposed materials and a certain pattern is followed, this helps the children to understand the distance by the repetition of a certain element. In this case the no. of windows can be the basis of

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count and pattern.At the main entrance the ramp, the approaching passage and the junction are provided with different materials. The junction is provided with yellow colour so that partially blind children can use that.

Figure 6 showing the tactile representations on the walls.
Source-student.

Academic zone-Tactile pictures are of academic importance but are not used in the process of indicating spaces through tactile pictures. Inside the school it is kept as any other normal school, this is done so that the children don't get habituated to the special elements that are not seen everywhere. Around the school, various indications are used for the purpose of demarcation of spaces. The use of the demarcations are such that it caters to the all the children with various levels of visibility.

Live case study-2

Osho Park, Koregaon Park, Pune

Use of materials of different sizes and texture

Figure 7 showing the use of materials of different sizes for indication of edges and level changes.
Source-student.

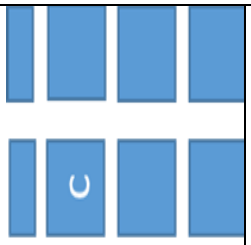

Figure 8 showing the use of different materials for indication of edges and level difference.
Source-student.

Figure 9 showing the representation of the pattern of the tiles used for steps.

Figure 10showing the use of materials of different sizes for indication of edges and level changes.
Source-student.

The use of natural elements in the form of indicators is seen. Stones are used to mark the limits. When the stick strikes the stones, a picture of the same is created in the mind of the person. The square tiles of different shapes are used at different places to evoke different interpretations. A visually impaired person walking through this area will understand the passage by striking the stick on the floor which helps him to read the size and shape, as he approaches the end or a level difference, the change in the shape of the tiles will convey a change.

Use of sound and smell to identify spaces

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Figure 11 showing the water body being used to identify spaces with the help of sound of the flowing water. Source-student.	**Figure 12 showing the trees and plants being used to refer to open areas Source-student.**	**Figure 13 showing bridge and the water body. Source-student**	**Figure 14 showing the trees and plants being used to refer to open areas Source-student.**

Other senses also helps in understanding the surrounding. The use of natural elements here, are in such a way that every sense organ play their partin interpreting the surrounding. Sound of the flowing water helps to identify the nearby water body. When a person approaches a jungle, the chirping of birds and cool atmosphere created by trees helps to identify the area. On approaching this area, the person can feel an open, fresh environment due to the winds flowing, this could have been better if the leaves were fragrant as smell also helps in providing directions and also guiding through pathways.

Live case study-3

Rotary Sensory garden, Pune

Figure 15 showing a tactile wall with various depiction through materials. Source-student	**Figure 16 showing the plan of the garden through materials. Source-student**	**Figure 17 showing different materials being used in the same pathway, to understand the extreme texture at one go. Source-student**	**Figure 18 showing board games on floor. Source-student**

The garden consists of tactile flooring, a sand pit, mini pond, sound instruments including drums and bells, a tactile wall and 66 varieties of plants. At the entrance of the garden a tactile panel wall is seen which has different materials embedded on it, a small plan of the garden is also embedded at the entrance.

Use of textured materials on floors and walls

Children can touch and experience the different textures, describe the various sensations and also investigate which material is hot, cold, soft or hard. As the person approaches the garden through pathways, the use of contrasting textured materials can be felt ranging from soft to hard and smooth to rough. Different kinds of textures on pathway with ceramic, sand, gravel terracotta are used to justify the same. On the other hand, is a play area that is surrounded with different kind of plants which can be recognized by taste, smell or texture. Most of them are scented and some are also edible, for instance mint or tulsi. The play area are also provided with textured materials, the rides and swings are also of different materials for the children to easily differentiate.

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Use of textured materials in the forms of games

Figure 19 showing the play area which is provided with games for though tactile medium.
Source-student

The garden has a game of snake and ladder and a periscope. A magic sound instrument is another interesting component of the garden. The users voice travels from one end of the steel pipe and can be heard on the other end of the pipe. The board games are provided on the ground with tactile representations and these games are shown in such a way that children can actually play on the board. Other games for enhancing the coordination between the brain and hands are also seen. Various instruments that produce sounds like boxes, drums, wind chimes and a bell tree which produces sound when moved is also incorporated. Every step in the garden evokes a different feeling due to the materials used. The walls of the garden are provided with paintings depicting various stories, these can be touched, felt and understood by the children.

Table 1Comparative Analysis of the live case studies

TACTILE FEATURES	JPSSM SCHOOL	OSHO GARDEN	SENSORY GARDEN	INFERENCE
Vertical tactile indications	Such indications were seen in the corridors	Such indications were not seen.	Vertical indications were used for academic purpose and also for indicating spaces.	The indications are seen only in the school but it is necessary to incorporate them in all the public places.
Horizontal tactile indications	Only seen in the school campus and not inside the school	these were the basis for differentiating spaces through different textured material.	These were seen almost every where in the garden. Inbuilt board games and were also seen.	horizontal tactile indications are mostly used.
Colour contrasting elements	Used in the corridors only.	not used at all	It was widely used in every element.	It was seen only in the sensory garden and school, this becomes beneficial for partially sighted people.
Safety measures-railings	Yes	No	Yes	Most of the public buildings lack safety measures.
Elements for other sense organs	Yes	No	Yes, children with any disability, find this garden useful.	Garden that uses other sense organs should be encouraged.
Use of sharp, unfinished	No	Natural materials were seen.	No	Use of sharp objects can affect the confidence of the

objects for indication.				person, hence should be avoided.
Distinct pathways	The pathways were clearly marked and segregated.	The pathways were not distinct.	The pathways were clearly marked and segregated.	Distinct pathways makes the accessibility easy and can be adopted with the help of textured materials.

Conclusion

Tactile indications in the mentioned three places are used for different purposes .The use of tactile indications in the school and sensory park were done in various ways to serve as a guiding tool whereas in Osho park, which is a public park open for all, tactile indications were used for aesthetical purpose mainly and then for guiding disabled people. Incorporation of many such small additions ensures that the design serves all the people visiting the place which include people of all different age groups and also with any disability.

Acknowledgement

I would like to thank Prof. Banani Banerjee, principal, Sinhgad College of Architecture, Pune for giving me this opportunity and providing me with all the necessary facilities. I would also like to pay gratitude to my guide, Ar. Anita Kavethekar for her kind support, valuable inputs and guidance throughout without which this would not have been possible.

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Analysis on Strategies Used For Planning and Space Optimization in Bus Terminus in Urban Areas

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Abstract : Development of city depends on various factors such as lifestyle, standard of living, transportation, infrastructure etc. Transportation is one of the measuring aspect or scale to measure the development of city in urban areas. There are different types of transportation modes such as metro, railway, airplanes, roads etc. Mainly cities or regions or areas are basically connected by roads. So government provides various modes of transport by road which are buses on city level and outside of city level. So bus terminus is one of the major factor of city. To design bus terminus various factors have to be consider such as surrounding, location, roads, amenities, services, vehicular movement, pedestrian movement, accessibility etc. Bus terminus consist of different spaces such as space for terminal staff, space for bus staff and spaces for passengers, service area etc. It is also important that maintain privacy in each space. In bus terminus along with buses, its circulation, its parking other factors/spaces also have to consider such as spaces for hawker's/vendors, parking for outsiders, space for rickshaw, taxi, cycles etc. So while designing passenger area it includes toilets, drinking water, waiting area etc. For terminus staff/bus staff member's rest room, revenue office, toilets, canteen, locker rooms etc. are required. For maintenance and repair of buses emergency service area also required. While design bus terminus barrier free design is also take into consideration for that different signage, audio systems and materials are required to be used. The research paper aims to standardize the design procedure for bus terminus, making it efficient for designers as well for users. The scope of the study is restricted to the bus terminus where buses are only for city level. These study through literature and surveys would help framing a definition for a bus terminus along with its different spaces.

Key words: Transportation, Bus terminus, Different spaces, design procedure.

1. Introduction

City provides various modes of transport which are may be private or government like railway, airplanes, buses, taxi, autorikshaw etc. So it is important to develop such mode of transport according to the city population, needs, lifestyle etc. To reduce traffic, air pollution, sound pollution government provide transportation in form of buses. Buses helps to connect various areas of cities in city level as well as outside of city level. So to promote usage of buses it is important to provide bus terminus with all necessary services and facilities. A bus terminus is a designated place where a bus or coach starts or ends its scheduled route. The terminus is the designated place that a timetable is timed from.So it is important to design attractive bus terminus in every urban area to satisfy users' requirements which also provide economy to government with reducing traffic and pollutions. So the aim of the research paper is to understand design philosophies used for bus terminus and providing solutions related to its location and surrounding. For that following objectives should need to be fulfil like **to study surrounding that affects bus terminus, to understand design problems or issues of bus terminus, to study solutions of the problems and circulation design, to study various design philosophies which are important for bus terminus and find appropriate solutions.**

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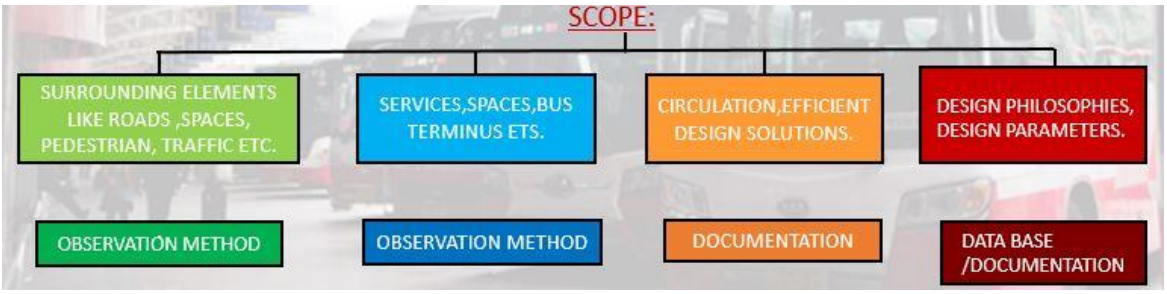

With the objectives and scope there are also some **limitations like climate/seasons of that particular area, time period/festivals etc**. are not considered because it also require certain different points to be studied.

1. The Ukkadam bus terminusis one of the bus terminus which designed by considering every important point.it is located in the southern part of Coimbatore. It serves Tamil Nadu State Transportation Corporation (TNSTC) buses, other Transport Corporations (OTC) buses, and private buses (including tourist buses). Additionally the terminal hosts private mini buses, and night operations for buses plied by private operators and TNSTC. Total site area of 11,452 sq. m. The terminal site is adjacent to a TNSTC depot,

1.1. EXISTING SITEand sits at the edge of an existing natural lake named Periya Kulam. It also has a police station along the main entrance, and a multilevel housing complex on one edge.

Proposal 1	**Proposal 2**
ISBT bus circulation: 2942 sq. m.	ISBT bus circulation: 2933sq. m.
Local terminal bus circulation: 2728 sq. m.	Local terminal bus circulation: 2861sq. m.
Terminal building: 1589 sq. m.	Terminal building: 1124 sq. m.
Freight services: 225.7sq. m.	Freight services: 228.2 sq. m.
Feeder service and private vehicle parking: 364sq. m.	Feeder service and Private vehicle parking: 450 sq. m.
Common vehicular circulation: 1147.3 sq. m.	Common vehicular circulation: 1855 sq. m.
Passenger circulation: 2456 sq. m.	Passenger circulation: 2001 sq. m.

Areas distributed in Bus Terminus

The existing terminal building's ground floor is proposed to be expanded, and a first floor is proposed to accommodate more passenger functions.

The ground floor accommodated

Proposal 1	**Proposal 2**
Administrative office and driver rest room: 660 sq. m.	Administrative office and driver rest room: 687 sq. m.
Concourse Area: 281.1 sq. m.	Concourse Area: 257.6 sq. m.
Toilet block: 25 sq. m.	Toilet block: 25 sq. m.
Commercial/Retail space: 329 sq. m.	Commercial/Retail space: 329 sq. m.

The first floor accommodated

Proposal 1	**Proposal 2**
Railway reservation office: 301 sq. m.	Railway reservation office: 183 sq. m.
Bank and post office: 304 sq. m.	Bank and post office: 45 sq. m.
Toilet block: 25 sq. m.	Toilet block: 25 sq. m.

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Commercial/retail space:329 sq. m.	Commercial/retail space: 329 sq. m.

Circulation in Bus terminal: Proposal 1

The proposed terminal is planned for bus flow of 45 buses per hour for ISBT functions, and 95 for city service.ISBT is provided 2, 7 and 11 bays for offloading, loading and idle parking respectively; local buses are provided 10 common bays.After off-loading, buses shall park in the idle bays (given the average 20 min layover time), while passengers may access various feeder modes (from auto-rickshaw to local buses).Total outdoor bus circulation area is

1.2. CIRCULATION OF BUSES – PROPOSAL 15298 sq. m.The total area provided for private vehicle parking is 246.5 sq. m. Entry for private and freight vehicles is from Palakkad Road through the service road (one-way circulation); exit for all the vehicles is common (from Ukkadam-Sungam bypass road).

Circulation in Bus terminal: Proposal 2

For ISBT terminal, the offloading bays are provided close to the feeder pick up lanes.The idle and loading bays are parallel to Palakkad Road. And, as idle parking bays do not carry passenger load, perpendicular bays ensure efficient spatial design, allowing more space for other functions. For Small ISBT terminal, perpendicular boarding bay arrangement is recommended as they offer compact passenger loading options.For medium sized

1.3. Circulation of Buses-Proposal 2 local bus terminal, perpendicular arrangement of bus parking for loading passengersis recommended (i.e. the local bus bays are parallel to the Palakkad Road).The total outdoor bus circulation area is 6464 sq. m.Total area provided for private vehicle parking is 221.5 sq. m. The entry point for private vehicles and freight vehicles is from Palakkad road through the service road (one way circulation) and the exit for the same is same for all vehicles from Ukkadam-Sungam Bypass road.The total outdoor passenger circulation area is approximately 3043 sq. m.Pedestrian Plaza is proposed near Ukkada-Sangham Bypass road includes landscaped area, hawker space, seating areas, etc. Between the two proposals, the bus and passenger ingress and egress to site vary only marginally, but the bus parking area and freight services are significantly different. The bus bay numbers and passenger functions are common in both designs.

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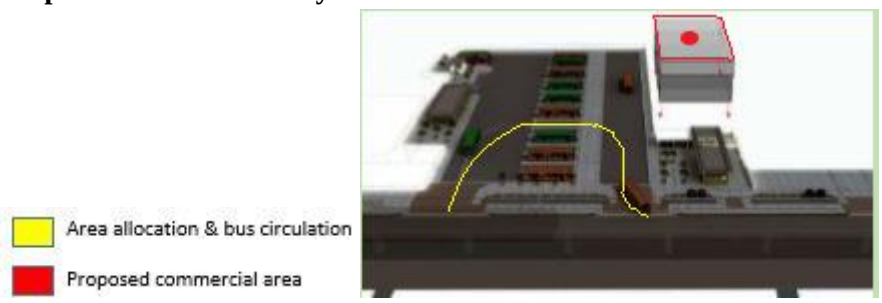
2. Uttam Nagar City Bus Terminus, Delhi

The 2.3 acre Uttam Nagar terminal site is located on Najafgarh Road adjacent to Uttam Nagar East metro station, in Delhi. This local/intra city intermodal bus terminal is managed by Delhi Transport Corporation (DTC). It is centrally located and abuts mixed land; the metro occupies 0.3 of the site's 2.3 acres. 1520 buses, on 33 routes, pass the terminal daily. The bus terminal components (Figure 53) include 16 fixed route bus bays on 30 m long 3 m wide platforms; existing vehicular parking, bus terminal office, the Uttam Nagar metro station, one toilet block, informal parking of feeder modes (such as cycle rickshaw, Gramin Seva, and auto rickshaw).

Uttam Nagar terminal is served by two public bus operators: DTC and DIMTS (cluster buses). Commuters can access the site from three entrances, including one from the private vehicle parking. Feeder mode parking is located outside the site, in the service lane, along the main road. This terminal currently includes a toilet for drivers and passengers, maintained and operated by Sulabh International, and operated as pay-peruse. This terminal's primary concern has to do with the high number of bus stacking i.e. 52, which is almost 4 times the number of bays provided for them. The terminal is overcrowded by buses not due to increased demand, but high layover time (averaging 37.5 mins), close to four times the intended/planned time. To solve the issue, two options for the terminal's upgradation are proposed: static bus bay terminal system and dynamic bus bay

2.1. Existing Siteterminal System.

Proposal 1: Static Bus Bay Terminal



The terminal's northern edge is proposed to be developed as a commuter area; it includes pass office (34 sq. m.), public toilets (51 sq. m.), ATM (10 sq. m.), food kiosks (27 sq. m.), and police booth (17 sq. m.). The area between this commuter block and the service road shall be developed as an open landscaped court (315 sq. m.), with provision for hawking/vending spaces. Above the commuter block, a commercial estate with up to three floors may be developed as retail/office space

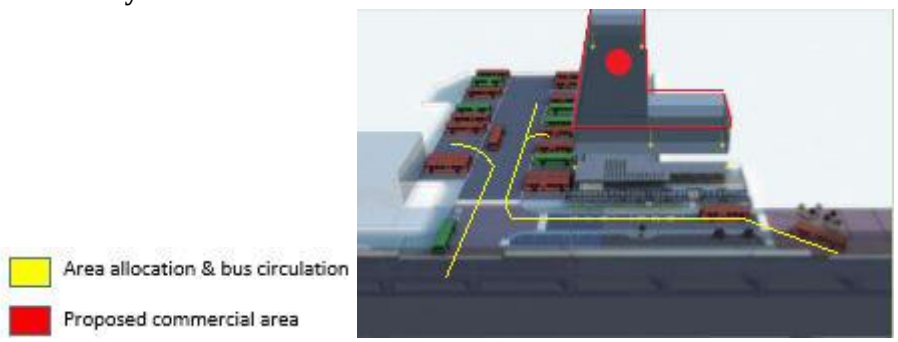
2.2bus Terminus Proposal 1

with a total area of about 1472 sq. m.

The large central area (2000 sq. m.) is proposed to include 18 parallel static bus bays, each 2.25 m wide (with 3.0 m wide bus lane) and 14 m in length, meant to serve as a common bay for idle parking, de-boarding and boarding, for a specific route. Access to these bays is through a single 5 m wide barrier-free pedestrian path.The terminal area shall not include a boundary wall on the edge of Najafgarh Road. It is proposed to be segregated from the service lane through a 5 m wide barrier-free pedestrian path (developed within the terminal site), which will link the metro station entrance and the current metro parking.

2.3 View Of Bus Terminus It will also connect (branching perpendicular to this path) to the bus bay access path.

Proposal 2: Dynamic Bus Bay Terminal



A 4060 sq. m. bus parking area with 52 idle parking bays, is planned on the site's southern half (adjacent to the metro entrance block). The northern half shall be divided into front and back portions. The back shall include a small workshop with four bus parking bays (buses requiring repair), and space for providing staff parking for six bicycles and six two wheelers. The front shall include a single floor building complex, whichwill

2.4 Bus Terminus Proposal 2

house administrative offices including terminal office with pass section (131 sq. m.), toilets for bus and terminal staff (48 sq. m.), rest room and canteen/pantry for bus staff (162 sq. m.), public toilets (51.3 sq. m.), ATM (16.9 sq. m.), and police booth (16.9 sq. m.). In this option, 115 staff members (including bus staff) are expected to be accommodated in the terminal at any point.

The terminal area shall not include a boundary wall facing the Najafgarh Road. It is proposed to be segregated from the service road by an internal (one way) bus access road, for exiting buses. The area between the access road and the proposed single storied office building (14.7 m wide and 643 sq. m. in area) is proposed to be developed as a passenger

2.5.View Of Bus Terminus boarding court. The existing administrative office block is proposed to be dismantled, for a barrier free 7 m wide pedestrian walkway connecting the three boarding platforms (dynamic passenger loading bays) with the metro entrance. The bus entrance leads directly to the bus parking; entering buses shall offload passengers at curb side off-loading bays before parking (in idle parking bays). Then, the bus staff proceeds to the rest rooms/canteen in the administrative office complex, accessible directly from the parking.

3. Pune Station Bus Terminus

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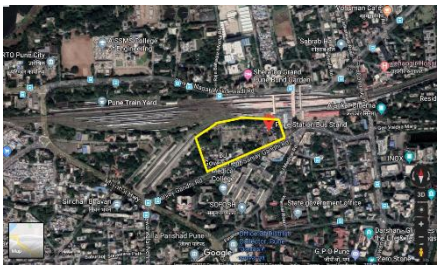
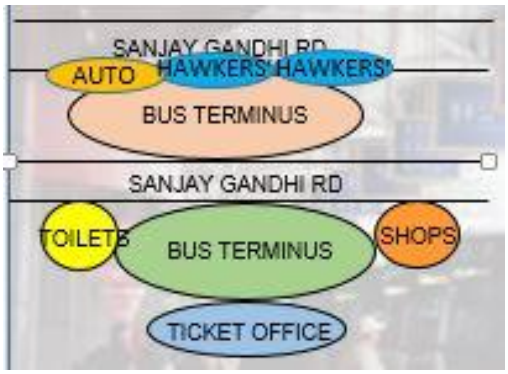


Pune station is located near HH Prince Aga Khan Rd, Agarkar Nagar. While studying bus terminus it is important to know how much percentage of people using what type of transport. Most of the population consist the age group between 15-30 and 30-50. Students, employees of IT sectors, government employees are the daily users of the buses. Bus terminus is near to Pune railway station hence people came fromdifferent cities also prefer bus transport to go various part of city.

3.1 Existing Site



3.2 ZONING

Pune bus terminus is divided into two parts one is city level bus terminus which consist buses which are only operate in different part of city and, the other is used to connect different outskirts parts of Pune and other cities. City level bus terminus including parking bay for buses, drinking water facility for terminus staff, seating for terminus staff etc. Whereas all main facilities like waiting area for passengers, drinking water facility, toilets, timing of buses, signage etc. all important things are provided only in outside city bus terminus. Pedestrian movement is also done through various parts of the area. Sassoon hospital, Pune Railway station, Lodges/Hotels etc. are the main points around the bus terminus. So while studying Bus terminus various problems are came in light like lack of facilities for passengers as well as for terminus staff, Traffic congestion, Lack of space, parking of rickshaw/taxi, spaces taken by hawkers' or vendors etc. Front side of bus terminus is equipped by rickshaw, taxi and hawkers'. So it is important to redesign Pune bus terminus by providing all important amenities/facilities.

3.3. Bus Parking Bay

3.4. Hawkers'/Vendors Space

4. Swargate Bus Terminus

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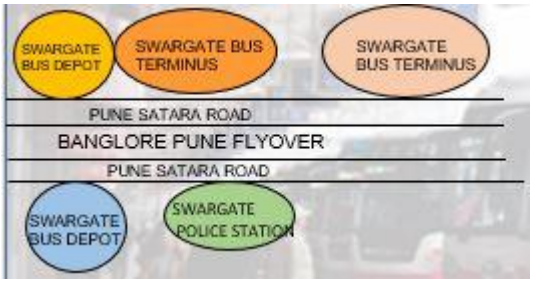

Swargate bus located in Satara Rd. bus workshop/depot, bus terminus for outside city, police station, government offices are around the bus terminus. Swargate bus terminus is equipped with all facilities like toilets for both passengers and staff, canteen, waiting area, rest room, revenue office etc. but it is not in use due to lack of space. As compare to number of buses, users' terminus area is very less, **4.1.ZONING** Buses came from all over city areas and stopped at small bus stop for few minutes. There is no particular time and place for buses and there is no waiting area for passengers. So it become reason of traffic congestion in that area. Hence it is important to redesign Swargate bus terminus with considering all the aspects.

4.2. BUS PARKING BAY **4.3. WAITING AREA** **4.4. ENTRANCE OF BUS TERMINUS**

COMPARATIVE ANALYSIS:

SITE VISITS	Pune Bus Terminus	Swargate Bus Terminus	Inter State & Local Bus Terminal Ukkadam, Coimbatore	City Bus Terminal Uttam Nagar, Delhi
Public Toilets	✗	✓	✓	✓
Waiting Area	✗	✓	✓	✓
Drinking Water	✗	✓	✓	✓
Restroom for staff	✗	✗	✓	✓
Canteen	✗	✓	✓	✓
Ticket office	✗	✓	✓	✓
Information desk	✗	✓	✓	✓
parking	✗	✓	✓	✓
Pedestrian facility	✗	✗	✓	✓
Security	✗	✗	✓	✓
Dormitories, lodges	✗	✓	✓	✓
Control room	✗	✗	✓	✓

Conclusion: So while designing or redesigning bus terminus following points need to be consider: Remove hawkers'/vendors and provide them separate space, separate parking spaces for auto rickshaw, taxi, buses, cars etc. Provide amenities like drinking water, toilets, canteen etc. for passengers and staff, Universal design for that ramps, braille, audio system, Signage at various spaces, subway or flyover for pedestrian etc. are need to be provide.

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Criteria for Selecting Appropriate Planting Material in Hotel Lobby Spaces

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Abstract : The hospitality industry is a highly competitive market in which the first impression counts. Contemporary hotel lobby acts as a social hub of activities and a gathering place for social interactions. There is a trend of incorporating plants in hotel lobbies as an essential element of interior design. Plants transform a plain lobby space into a serene, tranquil, live, captivating environmental lobby space. The study started with a research question," What are the appropriate planting materials used in hotel lobbies and what are the interior landscape criteria for selecting plants in indoor environments considering their physical requirements, their role to produce positive impacts". The study focuses on finding out parameters affecting incorporation of interior plants and variations in plant types, sizes, heights, colours along with its suitability to a particular area of lobby. Case study of hotel lobbies from 2 star to 5 star in different areas of Pune is done along with the face to face interview of hotel managers, receptionists and horticulture people. Questionnaire survey is conducted to understand the present situation from designers and non-designers about the awareness of plants and suitability to Indian climate. This study will help us understand the different planting materials used in hotel lobbies to perform functions like buffering, noise absorption, cleaning air pollutants, removing toxins, increasing ambience, enhancing the atmosphere and the image of a lobby space. It will also help to know which plants are suitable in projecting the quality of lobby spaces. The study will also tell us about maintenance, pruning, watering, disease control techniques used to fulfill interior plants physical requirements like light, temperature and humidity level.

Keywords: Interior Landscape, Planting materials, Hotel Lobby Spaces

Introduction

Necessity of the study:- In recent years, there is a trend to incorporate plants in hotel lobbies as an important element of interior design. This trend has started in USA,UAE,UK a few years back, but it has been just followed by Indian hotel industries now-a-days. Various types of studies have been done to find out the benefits of interior plants. Plants have great impact on people because they clear environmental, acoustical, visual problems. The study is needed to know which plants are used to perform the above functions in hotel lobbies and how are they placed in various parts of hotel lobbies considering their suitability in Indian climate?

Research Question:-What are the appropriate planting materials used in hotel lobbies and what are the criteria for selecting plants in indoor environments considering their physical requirements, their role to produce positive impacts?

Aim:- To study design attributes that affect the incorporation of plants in hotel lobby spaces.

Significance:- Contemporary hotel lobby acts as a social hub of activities and a gathering place for social interactions. Lobby is a first place where it creates impression on visitors. Plants transform a plain lobby space into a serene, tranquil, live, captivating environmental lobby space. Hotel design goes through cycles, and incorporating living plants in the new age lobby is a great way to create a qualitative indoor environmental space.

Scope & Limitations:- In the era of global tourism, the role of interior plants in hotel lobbies cannot be underestimated as more and more visitors are considered.Hotel lobbies can be directly related to interior. Anyone visiting to hotel always search for good ambience. It will be helpful in planning an Ecotel hotel. The study will help for keeping the maintenance of plants and in deciding proper location in natural and artificial environment. This study will focus on hotel lobby spaces in Pune area only.

Objectives

The main objectives areto find out parameters affecting incorporation of interior plants and variations in plant type, size, height, colour along with its suitability to a particular area of lobby, to find out the reasons behind determining the location of plants, to find out which plants do a required function in a particular area of lobby spaces.

Methodology

It is divided into two parts such as secondary method and primary method. Secondary method involved selected 5 papers which has a relevant study. Primary method included three parts such as case studies of 15 hotels in Pune area from 2 star to 5 star, face to face interviews and questionnaire survey.

Secondary Data (Review of Literature):- For studying various aspects of the research, following 5 papers and articles were referred.

- Nature Inspired Interior Landscape(Freeman Kenneth, Ambius White Paper, 2011)
- The lobby as living room: what interior design innovations and products do luxury hotel implement to attract guests to lobby(Brown Roxane, 2011)
- User preference of interior design elements in hotel lobby spaces (Rutkin Kimberly, 2005)
- A study on the user's preference of the plan introducing interior landscape into apartment housing (Cho Sung Woo, Yang Ji Ho, Oh Se Gyu, 2015)
- A palm guide for interior softscaping (Surendranath Rayaprolu, Rahul Nashipudi, 2016)

Conclusion:- The literature reviews helped me to understand the importance of required ambience in hotel lobbies, different factors that affect the incorporation of plants, how are they placed according to its conditions and which plants are preferred and why are they preferred?

Primary data:- The purpose was to find out appropriate planting material used in hotel lobbies. It is conducted through case studies of hotels in Pune, face to face interviews and a questionnaire survey

1. Case study- The survey was carried out in 15 hotels of Pune city as per hotel area and ratings

Case 1: Area Selection - Areas are selected as per their importance to promote the growth of hotels.
Case 2:Selection of hotel- After short listing hotels with respect to the area, their rating is also considered. Rating of the hotel directly or indirectly affects the planting materials.
Case 3: Observing the lobby from the point of view of plants used; location within lobbies; provisions adopted to fulfill their physical requirements such as light, air temperature, humidity; heights, size, colour, base medium used and maintenance done.

2. Face to face Interview- A different set of questions were designed for each category of the respondents who were involved.

- Hotel Managers

a. How do people feel about the plantation done in lobby?
b. How many times do you do maintenance?
c. How do you take care of plants?
d. How do you take care about maintaining their temperature?
e. Why do you prefer palm trees?

- Receptionist

a. How do people feel about the plantation done in lobby?
b. How many times do you require to do maintenance ?
c. Any maintenance problem do you have?

- Horticulture people

a. Which plants are used in the lobby spaces and why?
b. What is the main issue of maintaining them when kept indoors?

3. Questionnaire survey for designers and non-designers-
1. What are the major considerations in selecting the planting materials for interiors of hotels?
2. How difficult is to maintain interior plants?
3. Which are the interior plants used as a sustainable method in Indian climate?(Name only)and Why?
4. In Pune, interior plants are seen very less in hotels, what would be the main reasons?
5. Any other opinions?

Data Analysis

- Characteristics of interior plants

1. Areca Palm: It is perfect to grow in Indian climate and can easily get acclimatized to any environment. It is quite easy to take care of. It has a life span of 10 to 15 years. The plant is useful in filtering xylene and toluene from the air. It also works well as an effective humidifier.
2. Flowering Plants(Roses, Hibiscus, Orchids):They are very easy to maintain and very attractive.
3. English Ivy: It helps in reducing airborne fugal matter particles. It also filters out formaldehyde. It needs bright light to look fresh.
4. Dracaena: It doesn't require direct sunlight. Yellow leaves of this plant are a sign of over-watching or poor drainage. It is required to place near a sheer curtain or a window.
5. Spider Plant: This plant combats benzene, formaldehyde, carbon monoxide.
6. Fern: It grows well in bright spots and can help reduce formaldehyde levels from plywood and foam insulation
7. Weeping Fig: This leafy plant helps against emissions from curtains, carpets or furniture. It requires bright and indirect light. It is required to keep away from direct cold or hot air from doorways. It is a long lasting plant.
8. White Lily: It is a large, space filling plant that can also clean the air.It is ideal in low lighting spaces.

- Case Study in Hotel Deccan Rendezvous

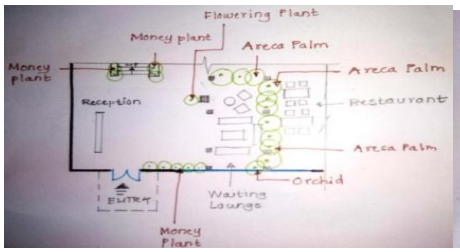

Figure 1: Lobby Plan showing placement of plants in Hotel Deccan Rendezvous

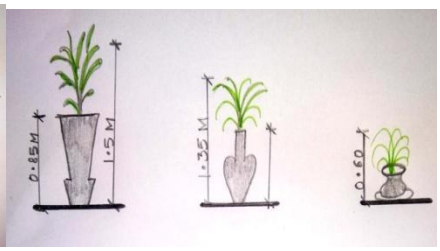

Figure 2: Variations in plant height & medium in Hotel Deccan Rendezvous

Figure 3: Areca Palm used as a buffer in the lobby of hotel Deccan Rendezvous

Figure 4: Areca Palm used as a buffer in the lobby of hotel Deccan Rendezvous

- Case study analysis

Table 1 Planting materials used in Hotels

Sr.No.	Name of the Hotel	Plants used
1	Shivajinagar: Hotel Pride (4 star)	Areca Palm, Chinese Palm, English Ivy, Roses
2	Shivajinagar: Centurian Hotel (4 star)	Roses, Areca Palm, Fig, English Ivy

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3	Shivajinagar: Ambassador hotel (4 star)	Artificial Plants, Areca Palm
4	SB Road: JW Marriott (5 star)	Magenta Pink (Phalaenopsis Orchid)
5	Koregaon Park: Taj Vivanta Blue Diamond(5 star)	N A
6	Koregaon Park: Westin Hotel (5 star)	N A
7	Balewadi: Orchid Hotel (5 star)	Areca Palm, Weeping Fig, Roses,Dracaena
8	Balewadi: Sayaji Hotel (5 star)	Areca Palm, Fig, Spider Plant
9	Pune Station: Hotel Sheraton Grand (5 star)	Areca Palm, Roses, White Lily
10	Ghole Road: Monetta Hotel (3 star)	Areca Palm, Dracaena
11	JM Road: Hotel Swan Inn (2 star)	Areca Palm, Fern
12	Apte Road: Hotel Surya-Deccan Rendezvous (4 star)	Areca Palm, White Lily
13	Apte Road: Ramee Grand (5 star)	N A
14	Apte Road: Shreyas Hotel (2 star)	Bamboo, Areca Palm, Roses, Hibiscus
15	Apte Road: Orbett Hotel (3 star)	Areca Palm, Flower Plants

Table 2 Location of planting materials within lobby spaces

Sr.No.	Name Of The Hotel	Location
1	Shivajinagar: Hotel Pride	Direct approach from Entrance Door, near Windows, on sides of Reception Desks
2	Shivajinagar: Centurian Hotel	Direct approach from Entrance Door, near Windows, on sides of Reception Desks
3	Shivajinagar: Ambassador hotel	Window side
4	SB Road: JW Marriott	Near Lift Block, Direct approach from Entrance Door
5	Koregaon Park: Taj Vivanta Blue Diamond	N A
6	Koregaon Park: Westin Hotel	N A
7	Balewadi: Orchid Hotel	Side Windows of Entrance Door, near Columns
8	Balewadi: Sayaji Hotel	Window side, Waiting Sofas, Entrance Door
9	Pune Station: Hotel Sheraton Grand	Near columns, near Drop off point, on steps
10	Ghole Road: Monetta Hotel	Side Windows of Entrance Door
11	JM Road: Hotel Swan Inn	Window side
12	Apte Road: Hotel Surya-Deccan Rendezvous	Window Side, Partition between Restaurants, behind Waiting Sofas, on Reception Desk
13	Apte Road: Ramee Grand	N A
14	Apte Road: Shreyas Hotel	Sides Of Waiting Sofas, sides of Reception Desks
15	Apte Road: Orbett Hotel	Corner Windows

Inference

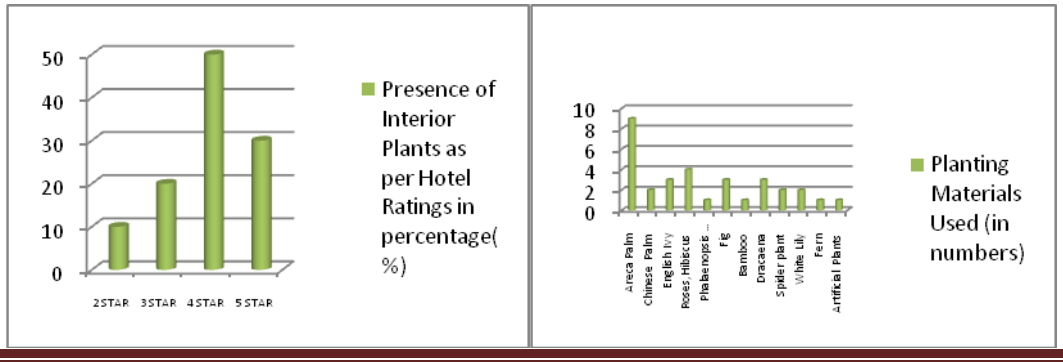

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Figure 5: Presence of interior plants

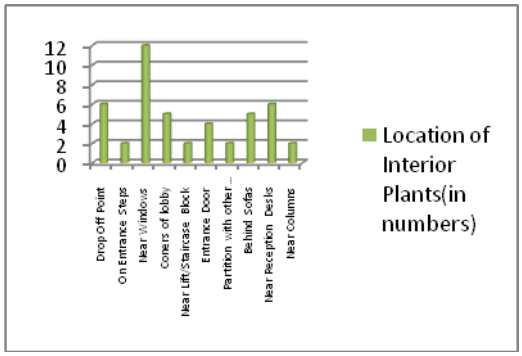


Figure 6: Planting materials used

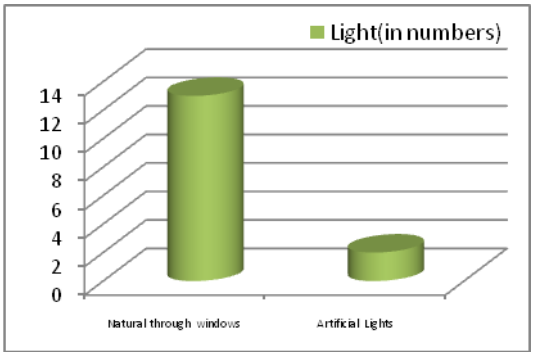


Figure 7: Location of interior plants

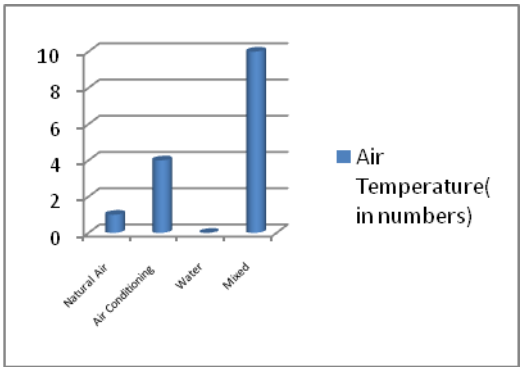


Figure 8: Provision for light

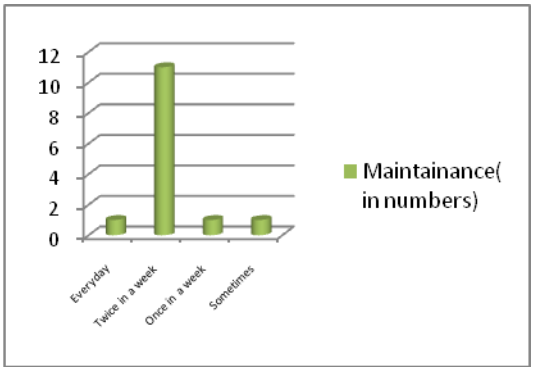
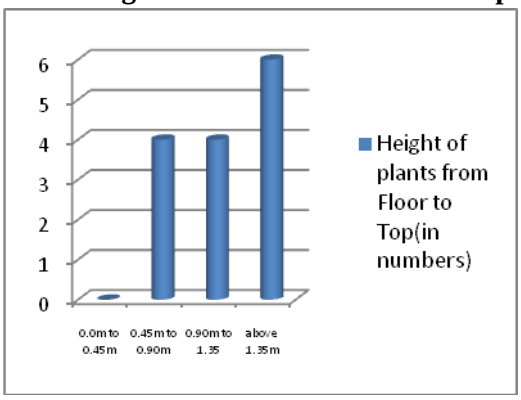


Figure 9: Provision for Air Temperature

Figure 10: Maintenance



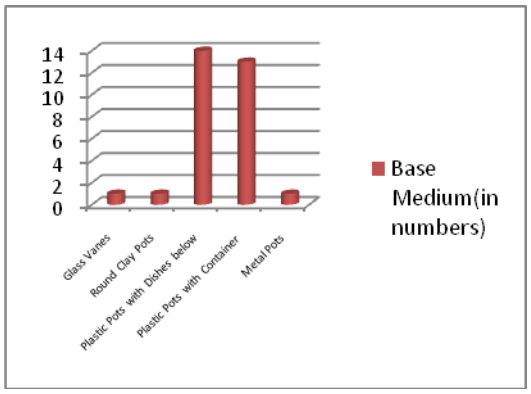


Figure 11: Height of plants

Figure 12: Provision for base medium

Figure 5-Among the case studies done, more plants are seen in 4 star hotels than the 5 star hotels.

Figure 6-Areca Palm is the most used planting material. Flowering plants(roses, hibiscus),chinese fig,dracena, english ivy are also used.

Figure 7-Most of the plants are kept near window side. It is also located near drop off point,near reception desks,behind sofas and near corner windows

Figure 8-Most of the plants get natural light than the artificial light

Figure 9-The air temperature of plants is controlled by mixed method such as air conditioning, natural air and water.

Figure 10-The maintenance of plants is done twice a week.

Figure 11-The height of the plants from floor to top is preferred to be above 1.35 m.

Figure 12-Plastic pots with dishes below & plastic pots with a container are the most preferred base medium for keping plants.

Findings & Conclusion

Summary of findings:- It is seen that Areca Palm is used on a large scale due to easy availability, durability, lifespan, form & colour. It is required to fulfill physical requirements of plants; hence they are preferred to place

near windows. In a controlled environment, regular maintenance of plants is required. Fulfilling plants' physical requirements is very crucial to select appropriate medium in hotels. Its effect on indoor environment, physical requirements, maintenance and pruning are the major considerations in selecting planting materials for lobby spaces. In Pune, plants are seen very less due to maintenance issues and lack of awareness. It seems very difficult to maintain plants as hotel people prefer to use plants which require less light and maintenance as a sustainable method in Indian climate.

Conclusion: - Areca Palm, Flowering plants, English Ivy, Chinese fig, Dracaena are the appropriate planting materials used in hotel lobbies based on criteria such as getting natural light near windows, controlling air temperature through AC, natural air and water; required maintenance twice a week, keeping the height above 1.35m and preferring plastic pots as a base medium, performing functions like buffering, noise absorption, cleaning air pollutants, removing toxins, increasing ambience, enhancing the atmosphere and the image of a lobby space.

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Analysis of Construction and Demolition Wastes in Residential Sector of Pune

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Abstract: Waste generation is increasing and has become a major problem to the health of people and their surrounding environment. Growth in population and change in consumption patterns with increasing demand has increased production of waste generation leading to harmful environment conditions. Wastes are categorized into several types such as commercial waste, solid waste, medical waste and construction waste. Construction industry produces maximum amount of toxic wastes. Wastes generates by all sites which is unavoidable. Pune has been considered as a fast developing city with ongoing construction projects that produce large amount of toxic waste. Different types of the wastes in the construction sites can cause many problems for the society and also environment. With increasing demand for built spaces and scarcity of land, a trend of redevelopment projects is upcoming. Construction and demolition waste management in Pune is subject of concern in construction market so there is need of managing waste. This paper examines present practices of construction and demolition waste of residential project using R.C.C framework and masonry construction in Pune and analyses waste generation and its disposal patterns and proposes appropriate measures through the technique of 4 R's [Recovery, Reuse, Recycle and Reduce].

Keywords: Waste generation, Construction waste, Demolition, Waste management

Introduction

Construction and demolition waste has been defined as 'waste which generates from construction, renovation and demolition activities. Also include excess and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities. The different types of wastes to be generated will include - Excavated materials, Concrete, Tiles, brick, ceramics, asphalt concrete, Plaster, Glass, Metal and steel, Plastics, Wood, asphalt, and Concrete rubbles, etc. Due to the increase in the economic growth after development and redevelopment projects in the country and upcoming rise in the urbanization in the cities has made construction industry to grow drastically, but also environmental impacts from construction and demolition (C & D) waste are increasingly becoming a major problem in urban solid waste management. Environmental issues such as increase in the flood levels due to the illegal disposal of construction and demolition waste into the rivers, resource depletion, shortage of landfill and illegal disposal on hill slopes in the metro cities. The paper deals with current C & D waste issue in residential sector in Pune.

Necessity of construction and demolition waste management:

With the global concern of conservation of energy and natural resources, there is urgent need of implementing Construction and Demolition waste management strategies through technological and design solutions of deconstruction, recycling and reusing and functional development of policy making, administrative and monitoring system for implementation of the same. Development of human resources for implementation of Demolition waste management through awareness and training is another important concern. Demolition work towards exploring newer applications and maximizing use of existing technologies for a sustainable Demolition waste management is need of a time.

Present condition related to Construction and Demolition wastes in India:

Construction by nature is not an eco-friendly activity. Construction reports for nearly 65% of the overall investment in infrastructure and the tendency is growing. Presently, C & D waste generation in India accounts up

to 175 million tonnes annually.In India nearly 50% of Construction & Demolition waste is being re-used and recycled, while the remainder is mostly landfilled. At present, private contractors remove this waste to individual owned, low-lying land for a price, or more frequently, dump it in an unofficial manner along roads or other public land of waste respectively. To address the problem of waste management in the country the government constituted a committee to evolve a road map for the management of waste in India and to propose a policy and scheme for waste management.(TNN, 2016)

Present condition related to construction and demolition wastes in Pune:

Pune is the eight largest metropolis in India with a population of about 30 lakhs. It is rapidly developing and has growth in construction activities it is appropriate to link the generation of construction and demolition with the growth of construction industry and related issues. With construction and demolition wastes becoming a major cause of pollution in water bodies, public spaces, green areas, the Pune Municipal Corporation has decided to set up a processing plant and proper system for collection and disposal of construction and demolition waste. Reuse and recycling norms for this waste will also be inculcated in the sanitation by-laws.Pune generates approximately 250 MT per day of construction and demolition waste from various sources. To address the C&D waste, in Pune

- PMC has prepared a DPR to understand quantity, quality and sources of construction and demolition waste
- Discussion with various shareholders and understanding their concerns.
- Developed separate tenders for collection and transportation as also for processing and disposal of construction and demolition waste
- District administration has already allocated 2 acres of land at Wagholi for construction and demolition waste processing(PMC, n.d.)

Aim:

To scrutinize the present current practices of construction and demolition waste and analyze the disposal pattern in the city of Pune.

Objective:

- To study existing practice done for managing construction and demolition waste.
- To analyze the disposal pattern of construction and demolition waste.
- To focus on waste generated from residential projects and reduce it at source.

Scope and Limitation:

The paper only talks about the disposal in Pune city and it limits to the RCC framework type residential project waste management. It will only contain the study of management pattern and provide appropriate measures through the technique of 4 R's [reduce, reuse, recycle and recovery].

Literature review

Definitions Related to Construction Waste:

Construction and Demolition Waste Construction and demolition (C&D) debris is defined by EPA as the waste material produced in the process of construction, renovation, or demolition of structures (both buildings and roads). In addition, it includes the materials generated as a result of natural disasters. Components of C&D debris include materials such as concrete, asphalt, wood, brick, metals, wallboards and roofing shingles.

Definition of Recycling:

Recycling is the process of collecting and preparing recyclable materials and reusing them in their original form or in manufacturing processes that do not cause the destruction of recyclable materials in a manner that precludes further use. (Gull, 2011)

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Definition of Waste Management:
Waste management is the process involved with waste once it has arisen including site planning, transportation, storage, material handling, on-site operation, segregation, reuse and recycling and final disposal. (Shah, 2015)

Construction waste management hierarchy:

The concept of 4R which refers to reduce, reuse, recycle and recovery particularly in the context of production and consumption is well known today. The best approach to manage construction waste is to minimize it at the source before it becomes problem.

Figure 1: Waste Management Hierarchy

Reduction at the source could be implemented almost throughout the project phase from starting work to ending the projects. Reduction is more on perfect planning of material used on project to reduce the waste produce. **Reuse** method is defined as re-employment of materials to be reuse in the same work or in lower grade work. Materials such as earthworks, concrete, steel, tiles, glass, and wood can be profitably reused in the project. **Recycle** method is defined as utilizing wastes as raw materials in other applications. Recycling can be done successfully and utilized during the construction phase and contractors have to use this cost saving method. A **recovery**technique is a process of generating energy from the waste materials that cannot be reduced, reused and recycled. This technique is a waste – to – energy recovery technique which is recommended universally for conservation of natural resources. (Kamal, 2009)

Components:
(Chini) C&D waste has two components in India:
Major components in C & D waste:
Cement concrete, Bricks, Cement plaster, Steel (from RCC, door/window frames, roofing support, railings of staircase etc.), Rubble, Stone (marble, granite, sand stone), Timber/wood (especially demolition of old buildings)
Minor components in C & D waste:
Conduits (iron, plastic), Pipes (GI, iron, plastic), Electrical fixtures (copper/ aluminum wiring, wooden baton, switches, wire insulation), Panels (wooden, laminated), others (glazed tiles, glass panes).

Construction and demolition waste handling:

In India, contractors play an important role in waste management. Contractual arrangements require that demolition wastes have to be disposed of by the contractor at his cost. In India, services of demolition contractors are taken when an old building is to be demolished due to deterioration of the building or to make way for construction of a new building. According to Technology Information Forecasting and Assessment Council [TIFAC] study,
-Items recovered during demolition are sold in the market at a discount to price of new material.
- Items, that cannot be re-used, are disposed to landfill site.
- Pune municipal corporations has allocated landfill site for C&D waste, while others want to minimize it to prolong useful life of landfill sites.
- Components of C & D wastes are not separated.
- Builders/owners bear the cost of transportation, which at present, ranges between INR 270 to 585 per truckload depending on the distance of demolition site from landfill area.

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- Municipal authorities incur cost of INR 75 to 90 per tons of waste, but presently no charge is levied by them on the owner or builder.
- Even directives don't exist for disposal of waste to landfill areas for waste management in India and hence presently penal action against violators is practically not taken.

Data collection & analysis:

Research Methodology and Data Collection:

Data gathered and compiled during the construction of project. Discussions with General Manager, site engineers, contractor and staff were held to determine some causes of the issues. The projects covered by this study were construction of housing project and demolition of hostel building in Pune as shown in table below:

Table 1: Projects covered in this study.

Project	Project Description	Project Type
1.Housing apartments	Total floors - 22 : 180 Flats	Construction
2.College Hostel	Total floors - 9 : 120 Rooms	Demolition

Waste generation and types of waste generated in project:

Housing apartments approximately generated above 800 tonnes of construction waste for approx. area of 80000 sq.ft which is 10 to 20 Kg/sq.ft and college hostel approximately generated above 500 tonnes of demolition waste for approx. area of 12600 sq.ft which is 40 to 50 Kg/sq.ft. The highest contributor to waste generation is due to demolition of building as on average generating 40 to 50 kg/sq.ft. At present approx. area of construction project is larger it is generating more waste compare to college hostel. Construction and demolition waste generated on the site is disposed too landfill sites.

Types of waste generated in projects:

Figure 2: shows that approximately 315 tonnes of waste generated in construction project was soils and stones (37%). 280 tonnes was aggregates (33%). The majority of the aggregates generated consisted of mixtures of concrete, bricks, and ceramics (88%). 120 tonnes was mixed wastes (14%) and 50 tonnes was non-metallic waste (6%). The majority of non-metallic waste consisted of wood and plastic.

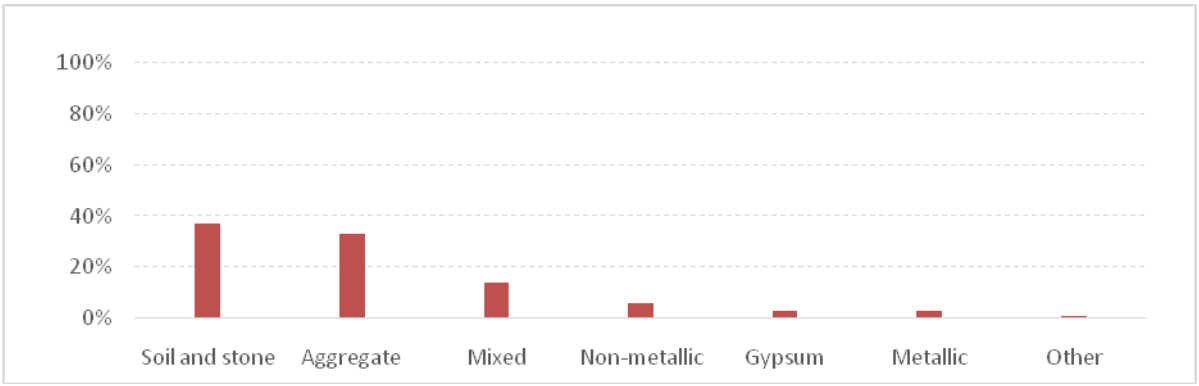

Figure 2: Waste generated in Construction project.

Figure 3: shows that approximately 320 tonnes of waste generated by demolition project was aggregate (62%). The majority of mixture consisted of mixtures of concrete, bricks and ceramics (96%). 115 tonnes was soil and stones (23%). 55 tonnes was metallic waste (10%). The majority of the metallic waste generated was iron and steel (92%).

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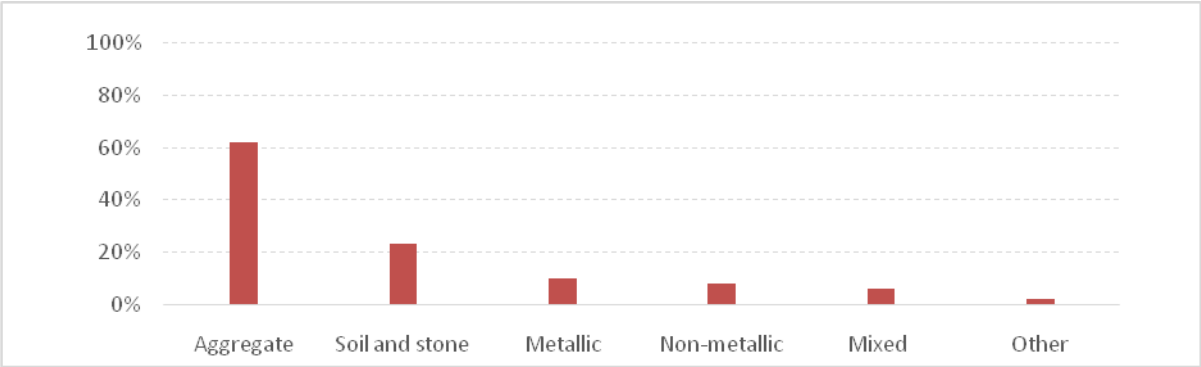

Figure 3: Waste generated by Demolition project.

Responsibility and management provisions of waste in project

Accumulation of construction waste becomes unavoidable due to the quick pace with which materials are being utilized for the construction so in housing project, general managers and contractor's responsibility on disposing construction waste from the site from time to time and in college hostel demolition project, demolition contractor's responsibility on disposing demolition waste from the site.

In these projects there were no provisions for management of waste, construction and demolition waste generated on these sites were disposed to landfill site. Items like glass, tiles, doors, and metallic items such as railings, window bars and reinforcement recovered during demolition are sold by demolition contractor and items that cannot be re-used, are disposed to landfill site.

Conclusions and Recommendations

In Pune, there has been less executed in the field of C & D waste management. Currently there is no system for collection and disposal of C & D waste. If measures to reduce and handle the C & D waste are not taken, it may threat environment. With increase in demand of infrastructure and housing, high rise buildings are coming up this will cause extra burden on solid waste management plans in city. Government should bring policies and laws related to C & D waste management and make mandatory for all construction and demolition activities. Waste generation Figure 2 and figure 3 shows that generation of aggregate in form of concrete, bricks and ceramics is highest contributor to waste generation and soil, sand and gravel are second highest contributor to waste generation. This waste need to be recycled and reused which will reduce the waste from site and there can be profit from recycling or by using on same site will reduce the cost. Following measures are suggested for management of C & D waste.

- 4 R's policy, design for deconstruction and reuse of material from waste should be adopted.
- Construction and demolition debris which consists of concrete, brick, ceramics, soil/sand and gravel should be recycled to manufacture paver blocks.
- Location for C & D waste recycling plants should be developed in the city which can help in minimization of C & D waste.

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Barrier-Free Environment for Handicapped People in Restaurants

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Abstract : This research is about to make people and designers aware about the need of handicapped people while designing a space, especially restaurants. Design is something which is user friendly, meaning universal design which can be easily used by all type of users. It also facilitates independent functioning of individuals, so that they can live life with dignity, self-respect and participate in all activities of life independently. Barriers make an environment unsafe and cause a high level of difficulty to the user. But more importantly barriers cause spaces to be out of reach, denying people the opportunities of participation in various spheres of life. This loss of opportunity is not only a loss for the person but also society's loss which misses out on their contribution. Simply put, a barrier causes exclusion and its removal is necessary for ensuring inclusion and participation of all the society. While designing a restaurant (public building) the design standards used should not create a barrier for the handicapped people. Considering this, these people also have equal rights to see, eat and feel a space. The public places (restaurants) designed are not helping them to overcome their pain and disability. It is neither creating a sense of safety and security nor leisure. This is in turn increasing their hesitation in using a particular building. This research includes case studies, charts, tables, design standards, guidelines and also design parameters for how restaurants can be made barrier-free. Restaurants will be able to use this research proposal to find the appropriate ways to improve consumer's satisfaction and also to increase profits. The study includes only physically challenged especially wheelchair bound people of all age groups. The research includes guidelines for planning, interior design, materials for barrier-free environment. Designing barrier-free spaces will not harm the activities of a normal human being but it will definitely benefit the ones who are disabled. By this we are making them independent, building up their self-confidence and helping them in Overcoming their Disability by Considering Everyone's Ability in Our Designs.

Key words: Disability, Barrier-Free, Restaurants

Introduction

The research topic is about handicapped people, someone who is disabled has an illness, injury or condition that restricts the way they can live, especially by making it difficult for them to move about. While designing any public place especially restaurant where all the users are entertained like children, teenagers, adults, elderly, handicapped, etc. the design principles used should avoid multiple barriers and avoid creating an uncomfortable environment for the user. For any group of user- the size and space for approach and use should be anthropometrically correct, the space should have an equitable use and should be flexible, the design should be simple but effective which is easy to understand regardless of the user's knowledge, experience and language, the space should communicate necessary information effectively to the user, the design should minimize hazards and should not incorporate more physical effort for the user

.**What is Disability?** Disability is a condition or function which limits the person to experience usual day to day activities. Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hamper their full and effective participation in society on an equal basis with others. As per Census 2011, in India, out of the 121 Cr.

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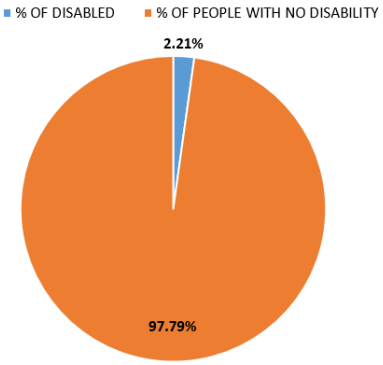

% OF DISABLED PEOPLE IN INDIA

population, about 2.68 Cr persons are 'disabled' which is 2.21% of the

total population. This disability can be-

2.1 TYPES OF DISABILITY

3. Focus on Physically Challenged wheelchair bound People:

A **physical disability** is one that affects the person's mobility. A physical disability may have existed since birth or it could be the result of an accident, illness,infection, disease, degeneration or medical condition.

A person with a physical disability may require some assistance or the use of some sort of **equipment to aid with Mobility**.

4. Anthropometry of Wheelchair bound People:

Anthropometrics is the dimensional data which can be used for guidance when designing facilities and equipment for use by person with a disability. The dimensions of wheelchair bound people are different than others.

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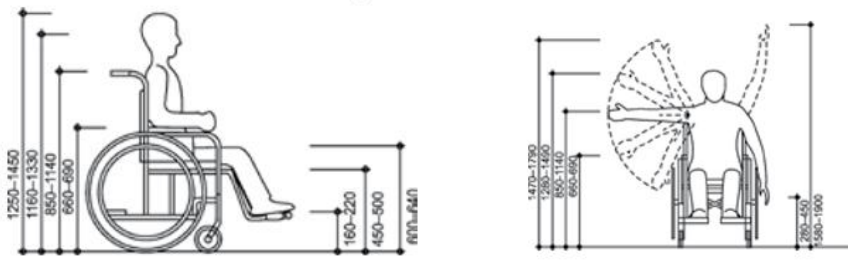
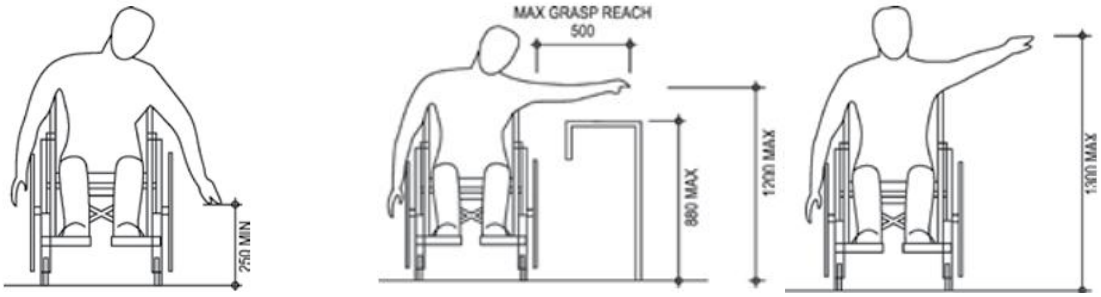
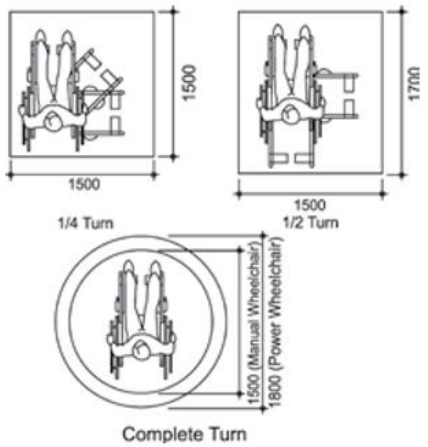


4.1 DIMENSIONS OF PERSON USING WHEELCHAIR

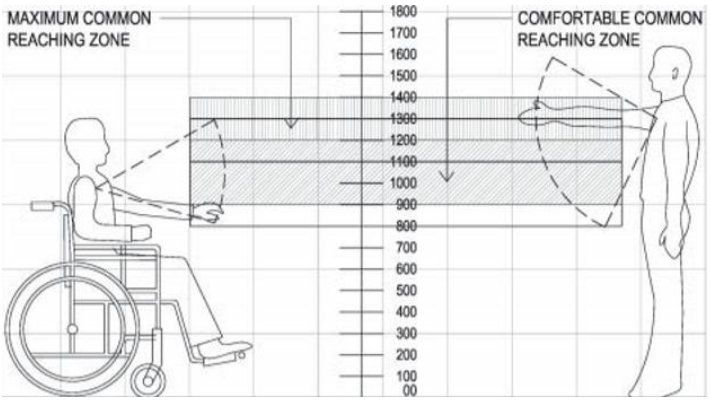
4.2 The maximum forward reach without obstruction is 1200mm from the floor and the minimum forward reach is 400mm from the floor. The maximum forward reach over an obstruction 500mm deep is 1100mm from the floor



4.3 The maximum forward reach without obstruction is 1300mm from the floor and the minimum forward reach is 250mm from the floor. The maximum forward reach over an obstruction 860mm high by 500mm deep is 1200mm from the floor



4.4 Turning dimensions of a wheelchair human



4.5 Common reach zone of a wheelchair user and a healthy

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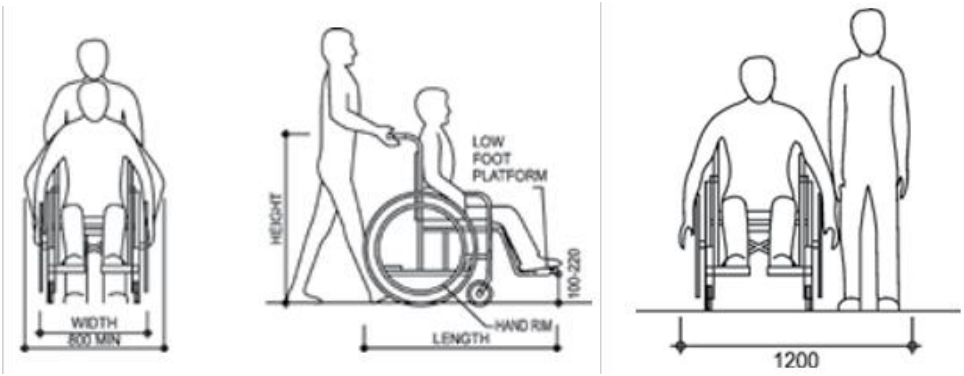
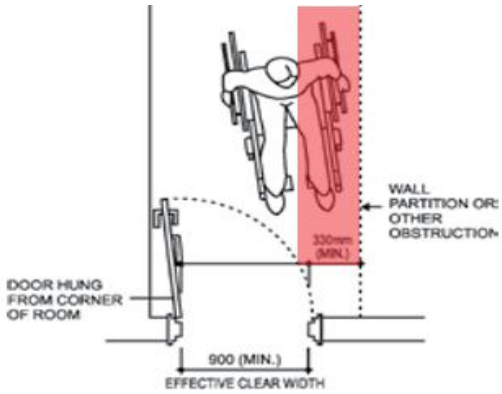
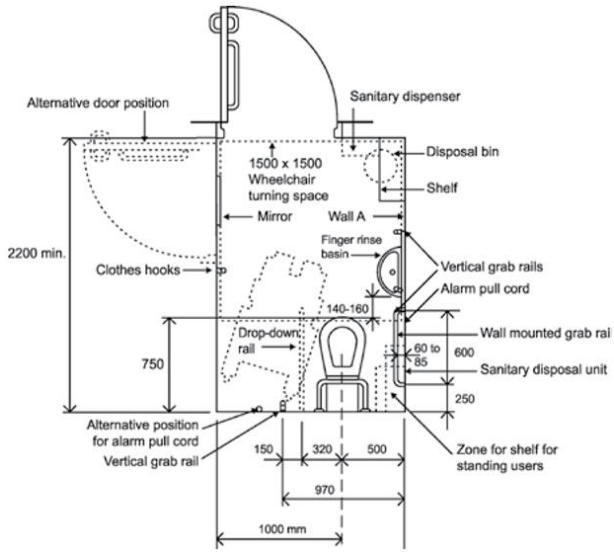


4.6 Dimensions of a wheelchair



The dimensions of a table for a wheelchair user in a restaurant is height should be 800mm, wheelchair seating area should be 760mm



4.7 Door, including one leaf of a pair of double doors, shall have a clear width of not less than 900 mm between the open door and opposite jamb or the other leaf. The unobstructed circulation area adjacent to the door handle on the leading face of a single door shall not be less than 330 mm in width.

5. Case studies, Guidelines and Design Parameters for how these restaurants can be made barrier-free

Restaurant 1: The name of the restaurant is Shivsagar which is located at JM road, Pune. At the entrance there was a **slight level difference between the footpath and the entrance edge.**

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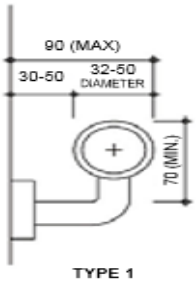
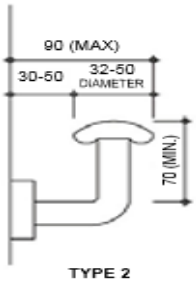
4.8 Toilet dimensions

There is **no separate parking for wheelchair users.** The restaurant consists of outdoor and indoor seating where the **outdoor seating was for the wheelchair user** as well as others. The **outdoor space consists of nine tables**. The **distance between two tables is 650mm** which is very less. The **circulation space for outdoor seating is less i.e. 1000, 1400mm** and for the **indoor seating is 650, 750 and 1000mm.** The flooring is non-slippery tiles of grey colour of smooth and matte finish that

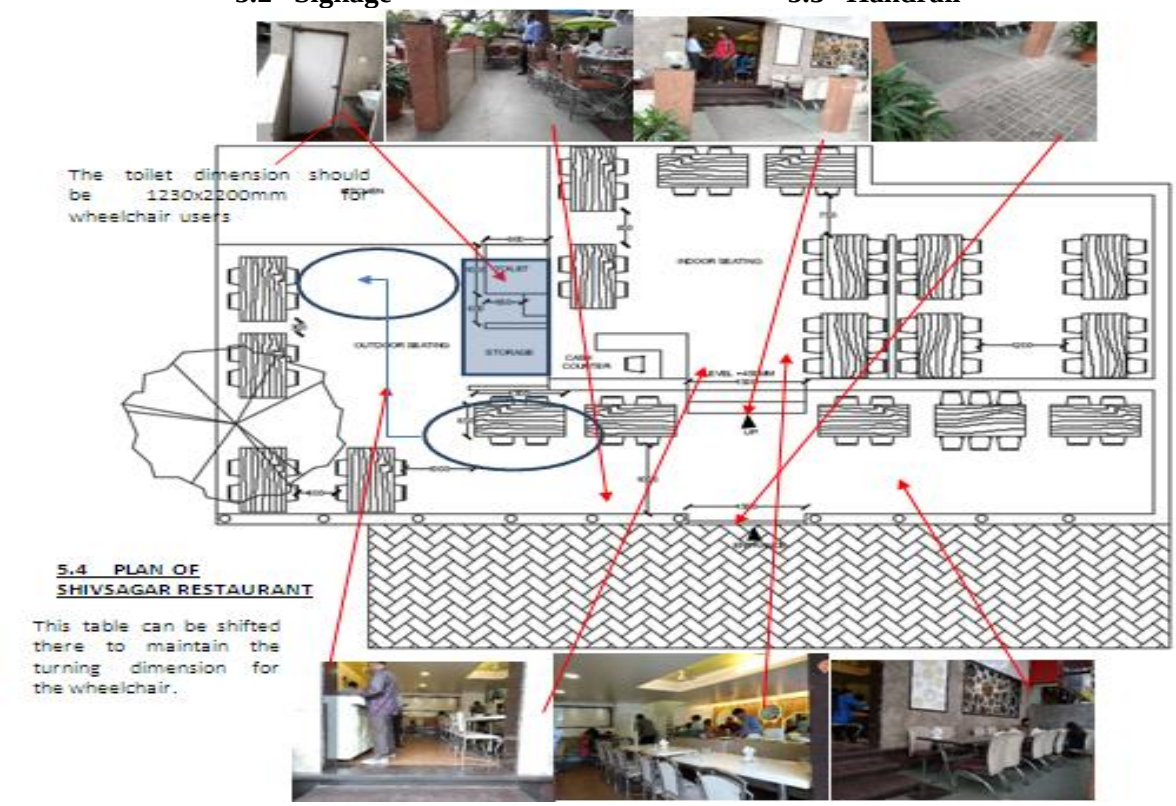
are suitable for the wheelchair users. **No separate toilet for wheelchair user**. The **width of the toilet door is 550mm** which is not suitable. The **toilet size is 900x1000mm** which is not sufficient. There are **no signage**, **lighting is insufficient**. There are **no trained staff members, but they help the wheelchair users.**

5.2 Signage





5.3 Handrail



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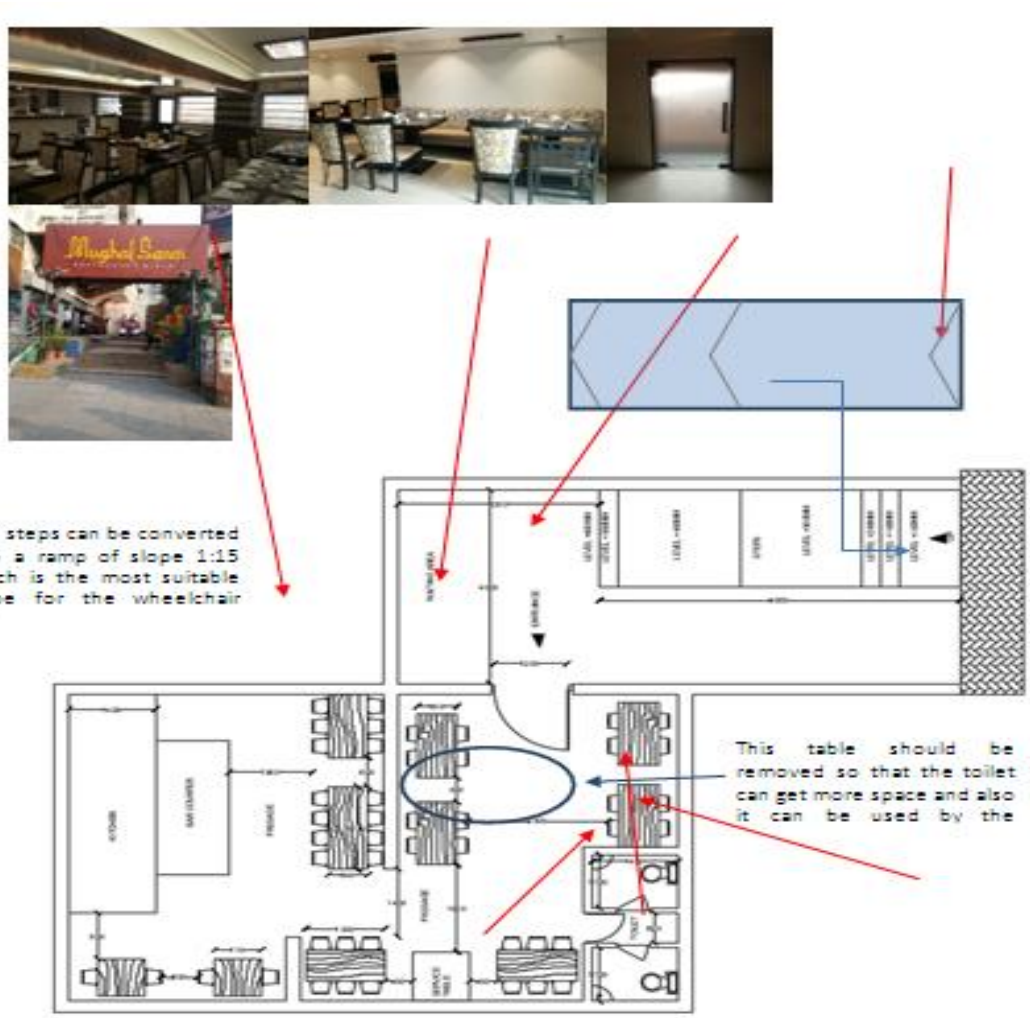
5.4 PLAN OF SHIVSAGAR RESTAURANT

Restaurant 2: The name of the restaurant is Mughal Sarai which is located at JM road, Pune**.** At the **entrance there are steps and no ramp**. There is **no separate parking for the wheelchair users**. There are **ten tables in the restaurant**. The **entrance door was a framed glass door of width 1200mm**. The **distance between two tables is 600mm** which is very less. The **distance between two rows of tables**

5.5 Mughal Sarai Restaurant

is 2300mm which is sufficient. The **width of the passage is 1400mm** which is enough space for the wheelchair to move around. The **flooring is done by using non-slippery white colour tiles which are suitable** for the wheelchair users. **No separate toilet for wheelchair user**. The **width of the toilet door is 600mm** which is not suitable. The **toilet size is 1400x1100mm** which is not sufficient. There are **no signage**,**lighting is sufficient**. There are **no trained staff members, but they help the wheelchair users.**



5.6 PLAN OF MUGHAL SARAI RESTAURANT

6. **Analysis Table:**This table compares the two restaurants on the basis of following factors by referring the standard dimensions and deriving a conclusion.

This table can be shifted there to maintain the turning dimension for the wheelchair.

POINTS TO BE COMPARED	RESTAURANT 1 - SHIVSAGAR	RESTAURANT 2 – MUGHAL SARAI	ANALYSIS
LOCATION	J.M. ROAD, PUNE	J.M. ROAD, PUNE	
RAMP	NO	NO	POOR

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PARKING	NO	NO	POOR
CIRCULATION SPACE	POOR	GOOD	GOOD
ENTRANCE DOOR WIDTH	VERY GOOD	VERY GOOD	EXCELLENT
FURNITURE	GOOD	GOOD	VERY GOOD
FLOORING	VERY GOOD	VERY GOOD	EXCELLENT
TOILETS	POOR	POOR	POOR
SIGNAGE	NO	NO	POOR
LIGHTING	POOR	GOOD	GOOD
TRAINED STAFF	NO	NO	POOR
FREQUENCY OF WHEELCHAIR USERS IN RESTAURANT	POOR	POOR	POOR
PROVISION FOR WHEELCHAIRS IN RESTAURANTS	NO	NO	POOR

7. Conclusion: By comparing the two restaurants, we have arrived to a conclusion that, in both of the restaurants the design standards used while designing restaurant does not consider wheelchair users. In some aspects they have fulfilled the requirements. By this analysis table it is clear that wheelchair users are not considered in the design. Due to such practices these disabled wheelchair bound people hesitate to visit restaurants. This is not only creating barriers but also limiting their participation at such places. By avoiding such barriers we are providing them an equitable platform, place to stand and participate in. With the help of this research I want to make the designers and people aware about the need of Barrier-Free Design in Restaurants and every other building. By referring this paper, restaurants and other public buildings can be made barrier-free.

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Safety of Women on the Streets

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Abstract : Any type of space, regardless of its typology has to be connected by a street or an access road. This road can be a huge street, a small road or a pedestrian track. This access road is accessed by the people who are coming to use this space. But sometimes, there are some factors which make the street unsafe for women. This may happen due to its location, time of the day, visibility, context, street furniture etc. Hence it becomes very crucial to understand that which factors make the street unsafe for women. What exactly are the attributes that encourage unethical behaviour on these streets? If the streets are unsafe for half of the population, then they become under used over the period of time and it also has an adverse effect ontheir daily schedules thus creating a hindrance in their overall development. The aim of this research paper is to find out the qualitative and quantitative aspects of a given street. Then analyzing these streets based on the above mentioned factors. This will tell us if the street is suitable for use or no. These streets can be looked at as more than just means of commute but also a part of public realm. Hence analyzing different streets and establishing factors which makes a street safe of unsafe becomes very important. To analyse the streets if they are safe are not we must first understand peoples' perception of safety. Women can come from various backgrounds, social strata, state of mind and education level. Hence the perception varies very rapidly. Apt questionnaire will help extract accurate data from the stakeholders. After this understanding, we can further start to understand the streets in its various layers. The layers can be location, context, amount of traffic, vegetation, population density, street furniture, activities etc. There can also be a comparison done between various streets where these parameters change and how it affects the safety factor of that street. A human being always feels safe in the company of other human beings. Hence woman always feel safe on any activity induced are. So further we must understand what makes a street woman friendly.

Keywords: (Women, road, parameters, perception)

Introduction

1.1 AIM

The aim of this research paper is to find out the qualitative and quantitative aspects of the streets in selected area which determine if the street is safe or unsafe.

1.2 SCOPE OF THE STUDY AND LIMITATIONS

- A standardized approach cannot be applied to all the areas as dynamics change.
- The feedback of the people can vary due to many factors.
- The understanding of psychological factor is very important in this research
- One has to do the sampling of stakeholders very carefully. As the views can vary in a very large range.
- Even though a stream lined process is formulated to judge the safety of any street, it cannot be applied to every street in different contexts.
- Varying attitudes of people regarding the understanding of the issue itself.

1.3 METHODOLOGY

- Understanding the perception of safety and defining some parameters of safety
- Understanding the role of streets in the city
- Understanding the factors affecting the safety on any street
- Selecting a potential area in Pune city

- Understanding statistics of that area and scale of the problem in that area
- Judging the street according to the set parameters
- Interviewing the stakeholders. The locals and the floating population of that area
- Comparing the streets on the set parameters and understanding the factors that make a street safe or unsafe.
- Drawing generic conclusions about streets
- Drawing area specific conclusions about the streets
- Providing strategies to improve the conditions under various heads

Perception of safety

The meaning of this word is, "the condition of being protected from or unlikely to cause danger, risk or injury". But this word has wider implications in term of lives of people, especially women. For women it is a state of mind where they don't have to alter their behaviour or restrict their actions in order to stay away from any sort of danger. It is a ideal condition where men and women are given equal opportunities in the public spaces of the city. If we truly want to achieve equality, we must understand that both males and females must be given equal 'right to their city'.

- Pune being an urban city is spreading quickly. So the women in the city have to travel around the city for their respective work places or to go a place of their preference. For this, women use different modes of transport like public or private mode of transport. Some of them also walk small distances to get to their work places. To do this without any hindrances, the women see the concept of safety as being able to commute with their preferred mode of transport without worrying about their personal safety. (Jagori, 2011)

When asked 'What according to you can be called as a safe street?' following were the responses that were received from different age groups of women.

- Freedom of movement on the street.
- Freedom to use the infrastructure available on the road
- Freedom to behave in a manner which won't result in any personal harm
- Freedom to travel in their preferred mode of transport
- Time should not decide the behaviour of the women on street

A resident of the area said, "Other pedestrians and a well lit street make me feel safe on a street. Heavy traffic with no pedestrian infrastructure too feels risky"

Streets- Nerves of the city

3.1 Role of Streets In A City

Streets are the nerves of the society which acts as connecting line between any two points. Streets are majorly meant for commuting from one place to another but are used for many more things. Depending upon the width of the road, the components start differing. More and more things like different activities, infrastructure and different uses are added in it.

3.2 Uses of Streets

Streets are not only used as a line of transportation but for many other activities in the daily routine of people. It has many uses according to different needs of the people.

For a middle aged business man, it is a jogging track, for two old friends it is a public space, for kids it is a playground, for a vegetable vender it is a work place and for a community it is an open space. With these uses comes the character of the street.

These functions happen on different streets at different scales. But no street is a standalone street merely used for transportation.

3.3 Features of The Street

According to the hierarchy and the width of the road, it is divided into different part. If we study the road from usable vehicular space, a major part is dedicated to the vehicular movement. Then some part of it might be dedicated to the footpath or a dedicated pedestrian movement track. Some roads also have a dedicated cycle track. After that there is sometimes a buffer zone where seating or a space for commercial activities is there. Then the property of private owners' begins.

Due to all these factors, the landuse and width of the road become very important factors deciding the safety factor of the street.

3.4 Factors Affecting the Safety of A Street

According to the opinion of most, there was an impact of architecture and planning on the perception of safety of women. From the opinions it can be concluded that the factors that affect the safety of road are:-

- **Landuse**- The term landuse refers to the type of building that stands on any particular piece of land. This affects the character of that street, type of traffic generated and the activities that follow.
- **Width-** This affects the density of the traffic generated and also the road section.
- **Street furniture-** Street furniture is a term for objects and pieces of equipment installed along streets and roads for various purposes. This includes benches, traffic barriers, bollards, post boxes, phone booths, street lights, traffic signs, bus stops, taxi stands, public toilets, sculptures, advertisement boards, railings and waste bins. These objects largely affect the behaviour of the people on the streets and shape the character of the street.
- **Tree cover-** This refers to the presence or absence of tree and shrubs on the side of the road or on the divider of the roads. This affects the light penetration and visibility of the street, making it safe or unsafe.
- **Street edge conditions-** This refers to the road section and the things that happen immediately after the vehicle corridor ends. Most of the times the edge is used for parking which makes it difficult for the pedestrians to us it.
- **Social and commercial activities-** Depending on the use of road, some activities are generated on it. Some informal or formal commercial activities happen on the buffer between the road and private property or the footpath. This affects the pedestrian density. The street furniture also has a large effect on the generation of the social activities. Presence of these activities keeps the street live.
- **Light levels-** During day time the light levels on the street aree affected by tree cover and adjacent buildings. During night time the light levels depend on the street lights and the light coming from adjacent shops. If the street lights are not ideal distance (29 m) then dark patches are created between two cones of light, thus making the street dark. Also the type of bulb used and its maintenance play an important role.
- **Type of road-** Width, location and traffic density.
- **Traffic levels (vehicular or pedestrian)-** Number of people using the street for various purposes.
- **Road infrastructure**
- **Road ends**- The junction at which the road joins another road. The safety of the road also depends on this junction.
- **Road finish**

(Jagori, 2011)

Detailed Study of Selected Area in Pune

4.1 Understanding the Area

Kothrud, known as kothrud baug has a mix of different types of housing and commercial buildings. The commercial development is mostly happening on the edges of the main roads and the secondary streets. The residential part has mixed land use type of buildings with a small scale commercial component. Some of the residential parts are gated communities; some are bungalow colonies while some are informal settlements. All these different types and scales of residences co exist peacefully in this area. There is also an interesting cultural mix in this area. People from different religions and backgrounds live in this area.

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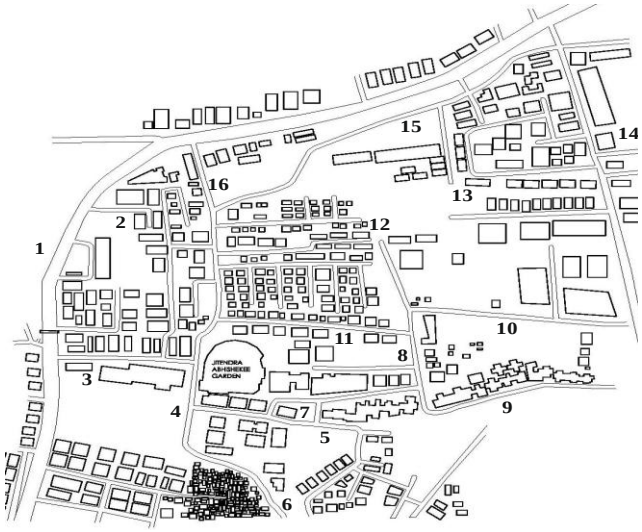

Figure 1- Base map of Kothrud area

If we observe the above roads, the difference in the activities happening can be seen distinctly. The above mentioned factors play a major role in generation of activities and the density of people and vehicles on the street.

4.3 Comparison of Facts

Following table has all the pre defined parameters and safety factor is taken from the interviews. It is the opinion of the women who were interviewed.

Figure 39- Road characteristics table A (R1- R3')

	R1	R2	R3	R3'
LAND USE	Mixed	Residential	Mixed	residential
WIDTH	40m	8m	12m	12m
STREET FURNITURE	no	no	no	no
PEDESTRIAN INFRASTRUCTURE	yes	no	yes	yes
TREE COVER	partial	yes	yes	yes
COMMERCIAL ACTIVITIES	yes	no	yes	no
SOCIAL ACTIVITIES	yes	average	yes	no
LIGHT LEVELS				
TYPE OF ROAD	main road	private	secondary	secondary
TRAFFIC LEVELS	high	low	medium	medium
ROAD INFRASTRUCTURE	yes	no	no	no
STREET EDGE	parking	private property	parking	parking
ROAD ENDS	main road	secondary road	main road	main road
ROAD ENDS	main roads	dead end	secondary road	secondary road
ROAD FINISH	tar	tar	tar	tar
SAFE/ AVERAGE/ UNSAFE				

Figure 40- Road characteristics table B (R4-R6)

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	R4	R5	R5'	R6
LAND USE	none	Residential		Mixed
WIDTH	15 m	10 m	10 m	15 m
STREET FURNITURE	no	yes	yes	yes
PEDESTRIAN INFRASTRUCTURE	no	yes	no	no
TREE COVER	yes	yes	yes	partial
COMMERCIAL ACTIVITIES	no	yes	no	no
SOCIAL ACTIVITIES	no	yes	no	yes
LIGHT LEVELS				
TYPE OF ROAD	tertiary	tertiary	tertiary	secondary
TRAFFIC LEVELS	low	medium	medium	medium
ROAD INFRASTRUCTURE	no	no	no	no
STREET EDGE	compound	parking+ footpath	parking+ footpath	informal residences
ROAD ENDS	secondary rc	tertiary road	tertiary road	tertiary road
ROAD ENDS	tertiary road	tertiary road	tertiary road	tertiary road
ROAD FINISH	tar	tar	tar	tar
SAFE/ AVERAGE/ UNSAFE				

A similar study was done for all the roads marked in the base map of Kothrud. Then the conclusions were drawn accordingly.

Figure 4- Map of Kothrud showing safe and unsafe roads in the area.

Conclusions

Following are the conclusions that can be established from the research:-

- Mixed type of landuse with commercial component opening out on the street is the best scenario for a safe street. This creates movement of people on the road which makes everyone feel safe to walk or travel on it.
- Presence of street furniture and pedestrian infrastructure makes people feel safe on the road as they are away from the vehicular movement.
- Presence of tree cover makes it comfortable for people to travel on it in turn making it active and safe.
- Commercial and social activities encourage movement and communication of the peple on the street and make it safe.
- Uniform light levels prevent dark alleys and visibility on the road makes people feel safe.
- Average traffic levels give the users an impression of active street which make them feel safe on it.

- If the street edges are kept active and not closed off by compound walls then the people feel much safer to use it.

This research was done taking into consideration only the women from a specific stratum of the society living in middle income type of housing. But the women belonging to the lower income groups were not considered. Thus if they are considered the findings may differ upto some level.

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Development of Barrier-Free School Facilities

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Abstract: Education provides a base of development to a country. As per Universal Declaration of Human Rights, education is a fundamental right for all including learners with special educational need. Each child has a desire to go to the school where he/she can learn lessons that are relevant to his life but approximately 59 million children in India have no access to schools. Besides psychological and social barriers the lack of accessible facilities in terms of road infrastructure and transport infrastructure debarred many disabled children from enjoying equal opportunities in education. The school premises as well as the road infrastructure inside the school has to be barrier free so as to ensure accessibility for all including children with special needs It has been observed that in most of the cases the road environment does not take care of this aspect. So there is a need to develop guidelines for barrier free pedestrians infrastructure for successful inclusion for all including children with diverse disabilities. School facilities should allow all students, with or without handicaps, to fulfil their education without hinderance. A prevailing concern in inclusion of special educational needs is lack of access to education for both children and adults with special educational needs. The aim of present study is to find out the problems and strategies to facilitate inclusive education among learners with special educational needs. This study also focuses on current and past scenario of inclusive education for better learning and also it provides a clear insight about the various problems and suggests the strategies to develop better inclusive educational practices for learners with special educational needs. schools must be acquainted with the diverse needs of the students, ensuring quality education through a flexible curriculum, organizational arrangements and teaching strategies. Through proper policy planning and implementation of strategies as well allocation of resources inclusion of learner with special educational needs can overcome all the barriers. Access and equity are the basic requirement for the process of inclusion at different educational levels.

Keywords : People with disabilities; barrier free campus; universal design; campus environment; Student with Disabilities

1.1 Introduction :

The school facility is a place for study and life for students to spend most of the time during the day time. Therefore, it is necessary to maintain schools as a comfortable and well off space for students as well as to secure the health and safety of students. This research paper suggests ways of designing and managing school buildings to improve accessibility for students with disabilities.

The facilities should also act as a base for the local community's lifelong learning experience, and should always be ready to be utilized as an emergency shelter in case of fires or earthquakes. Therefore, moving forward with making school facilities barrier-free is an important challenge.

Major barriers in including the learners with special educational needs are lack services related to early identification and intervention services, negative attitudes of parents and teachers, inadequate teacher training, inflexible curriculum, inadequate assessment procedures.

To prepare the school system for inclusive education, with an intension that all children have the right to attend school in a least restrictive environment and the responsibility of the school is to accommodate differences among learners with special educational needs. To meet the challenges, it is required to ensure access which is relevant and good in quality.

This effort aims to bring about awareness of the issues faced by the physically challenged people when using public buildings and spaces. It also incorporates concerns of the elderly, children and of people facing temporary mobility problems.

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2.1 Need and significance :

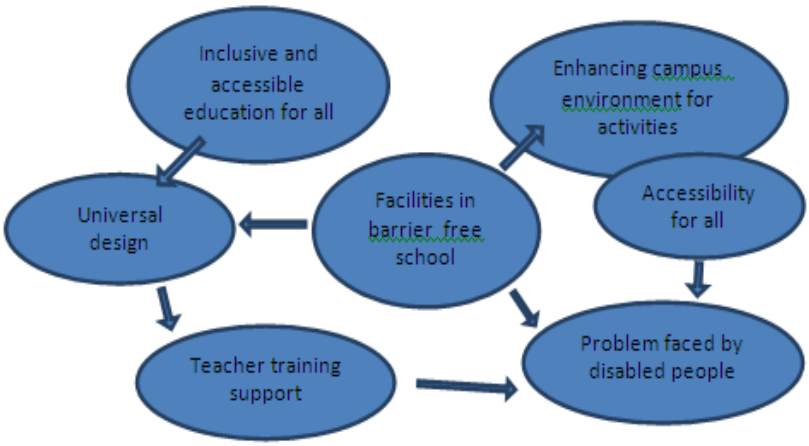
Consideration for handicapped students to spend the time in school safely and smoothly. It is necessary to execute measures corresponding to individual needs in the school facility so that handicapped students can spend the school life safely and smoothly. Measures to consider the handicapped students are also effective as measures for not only the students but also various people such as teachers, parents and neighbours to use facilities safely and smoothly. Differently-enabled people do not think they are isolated from the social network.

2.2 Aim :

The aim of this research paper is improvise the facilities for people with disabilities in built environment.

2.3 Objectives :

1. Understand the type of disabilities and issues and challenges faced by People with disabilities in built environment.
2. Promote a barrier-free campus concept.
3. To improve the facilities in barrier free school.
4. 3.1 Methodology :



Disability encompasses five types, namely wheel-chair users, hearing impairment, visual impairment, physical disabilities, and learning disabilities. Different types of disabilities.

4.1 School Environment :

4.1.1 External School Environment :

4.1.2 Transport Links: Students using public transport, or those who walk or cycle to school should be able to independently use a safe, accessible route. These routes may often be outside the schools grounds. Working with the local authority can help achieve necessary improvements, such as installing appropriate signage, or upgrading pedestrian crossings to include dropped kerbs, audible warnings, and tactile paving.

4.1.3 School Entrance : Circulation areas become very busy at the start and the end of the school day, when students are being dropped off and collected. The design of pedestrian routes and vehicular circulation in set-down and pick-up areas requires careful planning to ensure the health and safety of all users.

Photo by Michael mohan

- Designated pedestrian routes should be clearly separated from vehicular circulation
- Where parents' cars enter the school grounds, vehicular circulation routes should provide for appropriate speed limits and set-down areas designed to avoid congestion, for instance by using a one-way system
- Appropriate signage to clearly designate entrances, drop off areas, and traffic flow
- Designated accessible parking bays and drop-off areas should be provided close to the school entrance for students and staff

- The provision of a dedicated shelter at the accessible parking spaces or designated set-down points to provide shelter from the weather is a desirable feature.

4.1.4 Managing the External Environment :

Responsibilities in the external environment include:

- ensuring that cars do not obstruct pathways or access routes when dropping off students
- maintaining external lighting so that there is adequate light for those entering and leaving the school
- making sure that turning areas at the top of ramps are kept clear for use by wheelchair users

4.2 Internal Circulation :

Circulation refers to the ability to move around a building safely and independently.
Schools typically consist of a large number of similar classrooms with a small number of larger communal facilities, all linked by circulation routes.
Long corridors without distinguishing features should be avoided; instead the school layout and design should assist easy orientation, wayfinding, and movement around the building. Building layouts should be easy to understand for students with intellectual and learning disabilities and for first-time visitors. A building's layout and subsequent travel distances should also meet the needs of users with varying levels of energy or stamina.
Ideally, all horizontal circulation within a school should be level, without steps or ramps.

4.2.1 Wayfinding :

As well as having an entrance that is easy to identify, circulation layouts should be clear and easy to understand. Signage and other means of orientation are invaluable for visitors and new students, particularly people with sensory disabilities. Changes in colour, texture or proportion on circulation routes, as well as landmark features, such as seating or planting, can help people to find their way around a building. Different textures of floor coverings or particular shapes or symbols built into the flooring can be used to signal different types of rooms or other wayfinding information, particularly for people with vision loss. It is important to test proposed designs with building users to avoid any confusing patterns.
Positioning the sign adjacent to the door rather than fixing it directly to it means that the sign will be visible, even if the door is left open. The sign incorporates features, such as visual contrast, and the use of recognisable symbols.
There will be a visual contrast between the timber finish of the door and the surrounding wall. Sign incorporates features such as visual contrast, embossed letters, essay to read text. The internal circulation space in this school has generous width, and there is good visual contrast between the floor and the walls. Coloured wall panels incorporating signage and glazed screens give views to adjoining spaces to help wayfinding and orientation.

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Example of Internal circulation

4.2.2 Provision of toilet facilities :

The minimum accessible toilet provision usually includes providing larger-than-standard-sized cubicles with grabrails in separate sex washrooms for ambulant people with disabilities. It also includes providing separate unisex wheelchair-accessible toilets.

Some students with disabilities may need the toilet immediately on arrival at school, so the travel distance from the entrance to the nearest accessible toilet should be minimised.

Toilet facilities for staff should also include accessible toilets.

- keeping transfer areas in accessible toilets free of obstruction
- ensuring any alarm pull cords are located within 100mm of the floor
- ensuring that somebody will respond to alarms from an accessible toilet
- ensuring toilets used by people with disabilities are kept particularly clean, as some people depend on the WC surfaces for support
- providing sanitary disposal bins that are emptied regularly and positioned within reach of the toilet, but that do not block transfer areas

4.2.3 The Classroom :

The height of the green board is lowered to a child-friendly height of 500mm (lower edge from the floor). This will be easily accessible for teachers of short stature as well. One desk is used by a maximum of 2-3 children and there is adequate space for children using assistive devices. There is a clear space for knees and footrests for wheelchair access to tables workbenches. Matte finish light colours are used for table surfaces to avoid glare.

In multi-storey schools, all classes and teaching facilities for children with locomotor impairments/those using mobility aids are located on the ground floor, or access to upper floors is provided by appropriate ramps or lifts.

4.2.4 Cafeterias :

Other considerations in cafeteria environments:

- Tables should be accessible to wheelchair users
- Aisles should be wide enough to allow students carrying trays to safely pass

Self-service shelves and dispensers for cutlery and condiments should be within reach of wheelchair users and people of small stature.

5.1 Conclusion :

Automatic doors would also make the entrance easier to use.

Accessible parking spaces should be available besides the school entrance. Tactile pavers are important for orientation, direction and warning, in particular for children with visual impairments. While these tiles should ideally be placed throughout a school as a guiding path.

Floor tactile clues: Guiding and warning tiles should have colours which contrast with the surrounding surface (preferably in bright yellow colour) for orientation, direction and warning. Guiding path is a straight continuous line of tiles placed on the floor to guide to a facility/utility and indicates the correct path/ route to follow.

Indoor: A gentle ramp of 1:15 gradient is preferred as it is easier to manoeuvre wheelchairs on a gentle slope. A slope of 1:12 (that is, for every rise of 1 unit height, the length of the ramp is 12 units) is also acceptable

Outdoor: For the first floor and above, 1:15 or 1:20 gradient ramps are advised depending upon the availability of space.

The width of a ramp should not be less than 1200mm. The preferred width is 1800mm to allow two wheelchair users to access a ramp at the same time

Handrails should be at a height of 760mm-900mm and should extend 300mm before and after the first/last step respectively, and in case of a ramp, beyond the top and the bottom of the ramp.

Handrails should be tubular with a diameter of 38-45mm.

The surface of sign should be non-reflective.

All doors to classrooms, halls, canteens, toilets, the pantry, practical labs, and other areas — provide a minimum clear opening of 900mm. = Doors are fitted with lever action locks and tubular D-handles, at a height of 850mm-1100mm from the floor.

The colour of toilet seats/WCs contrast with the colour of walls/ tiles so that children with low vision can easily identify and see the toilets.

Urinals can be accessed without having to walk up a step and there is a chest-support grab bar.Switchboards should be mounted at a height of 450mm-1000mm from the floor to be within the reach of wheelchair users. Light/ fan switches should be at a height of 800 mm-1000mm. Switchboards can be outlined in contrasting colours for children with low vision to be able to identify them on the walls. Vinyl tape/acrylic paint (yellow/black/red) can be used for this purpose. All electric sockets should be with safety shutters, to ensure child safety.

Fire refuge areas which are open to air on at least one side, and are protected with a suitable railing, are identified on the periphery of each floor. The refuge areas should be equipped with flashing bulbs, audio signals and clear signs for children,

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Simplicity in Architecture

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Abstract: Today our homes are full of luxury, our ancestors living in primitive simple huts could scarcely imagine. Works of architecture are limited more by economics than by physics, less by climate than by image, what we can imagine we can build but, what shapes our homes if climate , temperature and precipitation are less relevant than ever in the face of new building technology and materials. This paper aims to understand the need of simple solutions and the need of efficient, sustainable, affordable homes achieved by simple design. Great architects like Geoffrey Bawa, Louis Kahn, Charles Correa, Nari Gandhi always had a simple yet functional solutions using local materials taking the climate into consideration and building an authentic yet efficient building, whereas Zaha Hadid, Norman Foster, Hafeez contractor rely on complex solution no matter the climate, history or topography of any given place. The comparison would be done on the overall design, the planning, materials used and the vision of the architect. Comparing their structures will give us an idea that how problems have been solved by both simple and complex solution and how the approach, initial vision of the architect is very important. This paper concludes by emphasizing on the vision and approach of the architects, their design and orientation and the way the buildings adapts to the change in climate and the need of such simple designs in today's world.

Keywords: Simplicity, Initial approach and vision, Architecture, climate change.

Aim:
This paper aims to understand the need of simple solutions and the need of efficient, sustainable, affordable homes achieved by simple design

Objectives:

- To show how the sense of imageand luxury and need for more have made buildings more complicated, expensive and expensive to maintain.
- To analyze the simply designed structures and to understand how the design works.
- To compare complex and simple structures and to know the difference.

Methodology:
Comparing the works of great architects on the basis of design, orientation, climate and approach will give us an idea that how an architect thinks and what thought process goes behind designing a building. This will not only help us understand the advantages of simple design over complex design but also but also help us understand the importance of these designs in today's world.

Scope and Limitation:
The significance of this paper would be for young architects to identify how simple solutions and design are better over complex designs. Every mans thinking is different, this research paper can give suggestive measures towards simplicity in architecture, but end of the day the individual person has to identify that the problems and the solutions may change from person to person. The other limiting factor is the want for more, in today's world the trend is to build more complex luxury oriented buildings instead of climate oriented simple buildings. It is important that a person looks beyond ones image and luxury.

Introduction:

Today our homes are full of luxury. Works of architecture are limited more by economics than by physics, less by climate than by image. What we can imagine we can build but, what shapes our homes if climate, temperature and precipitation are less relevant than ever in the face of new building technology and materials. Leonardo Da Vinci once said that simplicity is the ultimate sophistication.Simplicity in design somehow calms us and somehow inspires us, not only in architecture but in parallel fields of design. Apple for example has refined its products over the years to such a beautiful simplicity that the products have become collectible items based on their design alone.
The very definition of simplicity lies in this space. It's merely a floor, a roof and glass nothing extraordinary, no add-ons, no decoration. Thinking about every design in such a way is very important for an architect. Simplicity in architecture is nothing but a way the building connects to the audience or the inhabitants, searching for meaning or legibility in a design. An architect should give a simple analog experience in a digital world. It is human nature where all are interested in the tallest, the longest and the biggest but one should look at the bigger picture of honest, sustainable, climate orientated simple building with integrity and values. All of this is difficult to achieve but when a building resonates in a certain way it may have integrity of the structure or the integrity of the form. For example, hospital has many complex mechanisms, machinery and it is frightening for the occupants, but how can we mellow down its complexity in a more simple yet functional way, which will lift the experience of the occupants is very important.Money, time and creative energy are the most important resources while designing the building and how an architect uses these resources is very important and this speaks after the building is constructed, the creative energy of the architect and how he uses these three resources as wisely as possible. For example some of the best buildings in the world are overnight miracles, they have been created very quickly while some of the worst buildings in the world have money thrown at them and they are awful. An architect should be a good listener to identify such problems and should identify the need of the building and respect the process of making. One should strive for quality not for money, money may not always be the most important factor in architecture while quality is just a state of mind and more money can't bring better quality, it doesn't always mean how much money one spends on a building. The thinking towards the building and the approach is very important.
One doesn't relate simplicity with technology, technology is changing day by day, and how one takes it to their advantage is crucial and important. 21st century homes can be technically advance but simple. Designing beyond time, penetrating the public and manifesting the design in a simple way with local materials is important. Building a simple time less structure which goes beyond time should be today's need. We shouldn't construct buildings which are for economics and not for humanities. Many times simplicity begins with a singular geometry; it's about enclosing a space in a beautiful way. It's not always using too much, it's about using what's necessary, it's about functionality of the building without worrying about its form. Once the functionality of the building is achieved the form will follow automatically. (Maverick, 2012)
In today's world the main problem is building complex luxury oriented buildings, influenced by the western world, culture. Heavy use of glass and mechanical machinery has slowly crept into our homes. Air conditioners have become a necessity. The meaning of a well built home has changed to a more luxury and western looking homes. The image of the homes is in the forefront where expensive glass claddings are taking place instead of the authentic climate oriented facades. No one is thinking about the orientation, climate, materials and environment. People are pouring money to satisfy their need for comfort, luxury but comfort and luxury can be achieved by simpler techniques.It is important that we as architect help shape our world to simpler, efficient, comfortable buildings instead of concrete jungles. It is important to refer to the works of great architects and compare their work with complex buildings to understand the parameters on which we can think while designing a simple building.(Bryson, 2018)

Literature:

Hotel Kandalama.

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Figure 1: Pictures of hotel Kandalama, Sri Lanka. (booking.com, 2010)

The Kandalama hotel was built in 1994, by architect Geoffrey Bawa in the Jungles of Sri lanka, located between two world heritages listed sites and overlooking the kandalama reservoir. The hotel was literally carved into the rock face to merge with the jungle, for the vegetation to engulf it. "Architecture Should play to all the senses, the smell of vegetation after rain, the sound of birds and the wind in the trees, the texture of clay floor tiles and rough plaster, these things matters a lot" - Geoffrey Bawa. (booking.com, 2010)

Analysis- Cost: Unknown

Climate: Hot and humid and heavy rainfall zone.

Climate considerations: The hotel is built of stilts to allow for natural rainwater flow through. 80% of the roof is covered with indigenous flora which covers the building on all sides. The infinity pool and the trees help reduce the heat and helping passive cooling.

Materials: Boulders, rough plaster, mud, clay, trees, bamboo used as materials to enhance the feel of the structure and help to merge in its background.

Site considerations: The hotel is built along a rocky mountain edge overlooking the kandalama reservoir. The hotel is designed in such a way that it is sandwiched between the rock and the lake.

Standouts: The architect has used nature to counter the extreme climate. Simple solutions decrease the maintenance cost of the structure.It is the first hotel in the world to get LEED accreditation.

Jatiya sansad bhavan, Shere Bangla.

Figure 2: Pictures of Jatiya Sansad Bhavan, Bangladesh. (wikipidea, 2019)

The national Assembly building was completed in 1982 by Louis Kahn Located in Dhaka. The building is unique in a sconce that it is modernist in principle but the project is deeply rooted in the context, the citizens and country's vernacular Architecture. Kahn's designed called for simplistic use of local materials that will distinctly help in protection against harsh desert climate. Building is not cladded with glass or other more attractive materials but uses its form shape and materials to be unique and functional in a simples yet bolder way. (wikipidea, 2019)

Analysis- Cost: 32 million dollars.

Climate: Hot and dry desert climate with no rainfall.

Climate considerations: The hotel is covered with water bodies form three sides providing Radiant cooling. Light wells help provide light to the inner cores of the structure.

Materials: Kahn's design called for a simplistic use of local material. Concrete without plaster is used to give a bold and prominent look of the structure. Local materials are used for the interiors and attention to details has been given.

Site considerations: The structure is built north facing to counter the harsh sun of the desert. Water body surrounds the hotel to keep it cool in summers.

Standouts: The building is not caddied with glass, metal or other attractive materials. He had a simple approach of using the form, shape and materials to be unique and functional.

Walt Disney concert hall.

Figure 3: Pictures of Walt Disney concert hall, USA. (Burbank, 2005)

The concert hall building was completed in 2003 by architect Frank Gehry in Los Angelis, USA. The building is famous for its image and attracts lots of crowd to it. To make the building attractive and have a prominent face the whole building is covered by shining meal. The hall looks attractive but doesn't have any windows for ventilation at the entrance and the cafes, instead it relays on air conditioning inside. (Chong, 2004)

Analysis- Cost: 110 million dollars.

Climate: Mid-to-hot and mostly dry.

Climate considerations: No climate considerations.

Materials: Metal cladding, R.C.C. structure, Expensive interiors, heavy use of fancy items to make it attractive.

Site considerations: No site considerations.

Standouts: Driver and blinded by the glare and residents across the sheet complain about the reflections. Workers are been sanding down the metal do dull the gloss but has a little effect.Instead of making a complex structure one could have made a simple structure like he Kandalama hotel or the Shere Bangla building which is true to place and has all climate consideration. We as architects should think what we are making and how a small mistake can cause many issues.

Geoffrey Bawas town house.

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Figure 4: Pictures of Bawas town house, Sri Lanka. (Raj, 2006)

The house was built in 1968 by Bawa himself in Colombo. Bawa experimented with lighting effects, induced ventilation and tricks of stenography. The house has traditional simplistic minimal interior and attention to detail has been given to the feel of the materials in the house. The house is a classic which after so many years hasn't faded or doesn't look old. (Raj, 2006)

Analysis- Cost: 42 thousand dollars.

Climate:Hot and humid and heavy rainfall zone.

Climate considerations:The house is naturally ventilated and has sloping roofs for heavy rains. Mud walls and vegetation help cool down the building.

Materials: Mud walls, traditional Sri Lankan windows, wooden minimal interior, sloping roof with clay tiles.Local materials keep the cost down and make the building sustainable.

Site considerations: The structure is built between vegetation and huge trees cover the facades of the structure from all sides.

Standouts: The house is simple yet very functional. The architect has maintained the functional aspect of the house without losing its humble, minimal shape.

Falling Waters by Frank Lloyd Wright.

Figure 5: Pictures of Falling waters, USA. (Glancey, 2001)

Falling waters was built in 1939 on the waterfall at Mill Run, USA. No one has spent a night in the house and the house is just a tourist attraction. A normal house in those days would be a grand two storey timber Cabin. It might stand beside a river, but never on top of one. The ceiling inside the house is at just of 6 ft. and it funny when in 1939 the house costs nearly which was an enormous sum. There are constant leakages in the house and the balcony of 17 ft. overhang has sagged and had to be externally reinforced within 12 years. Today the house is a tourist attraction and has repairs which are expected to cost $11.5 million. (Glancey, 2001)

Analysis- Cost: 155,000 thousand dollars.

Climate:Moderate climate with heavy rainfall.

Climate considerations:No climate considerations.

Materials: Reinforced Concrete, expensive luxurious interiors with up to date facilities.

Site considerations: The structure is located on a waterfall into a dense forest. The house has been designed in a way that it feels as if it is floating over the waterfall.

Standouts: No one ever has spent a night in the house. The house has only 6 feet o space between two floors. It has constant leakages due to heavy rain.

Philip Johnson's glass house.

Figure 6: Pictures of Glass House, Canada. (Lange, 2015)

Built in 1949 by Philip Johnson in new Canada is considered by many as the simplest design and the best example of how one can be minimalist in a way but Simple design doesn't always mean building something just simply without considerations of materials and climate. The house has a flat Roof in a heavy rainfall area so there are leakages. It gets too cold and too warm during winter and summer. It has no privacy, It is difficult to imagine how one can live in such a place if at all one has lived. (Lange, 2015)

Analysis- Cost: 7.7 million dollars.

Climate:Moderate climate with heavy rainfall.

Climate considerations:No climate considerations.

Materials: Glass walls, expensive luxurious interiors with up to date facilities.

Site considerations: The structure is located in the center of a dense forest. The house has been designed to keep its design simple.

Standouts: The house has no privacy. Simplicity doesn't mean that the functionality of the structure has to be lost. Both functionality and simplicity have their equal share in making the design usable.

Conclusion:

Achieving simplicity in a structure is a difficult and needs a good understanding of materials, climate, spaces and experience. The thinking of each individual may change, and the client thinking is equally important. The initial thought process of the architect is equally very important, how the building will turn out is dependent on it. Simplicity is difficult to achieve but once achieved can have a significant impact. It is important that each architect thinks about the environment, context and the surrounding before constructing a structure. The three main resources money, time and creative energy are in the hands of the architect. How skillfully the architect uses them is the most important thing in architecture. The creative energy should govern both time and money. Simplicity may not be achieved easily but one should strive hart to achieve it.

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Regenerative Office Building Biomimicry

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Abstract : In the search of sustainable building design and technology, Biomimicry is an alternative and productive solution. It is a new science that studies nature's models and thereby, emulates these forms, process, systems and strategies to solve human problems, which are often encountered as we seek new ways to design and live sustainably, therefore, for any sustainable building, design need to consider structural efficiency, water efficiency, zero-waste systems and energy supply. Biomimicry is about solutions. This project explores the extent of biomimicry in a regenerative office building and thereby resolving the long-standing paradox of humanity inclination towards exponential demographic and economic growth of that area. Regenerative design, is the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials therefore creating the efficient environment for the entire lifecycle of a building. The building requires the site for its existence. A building can be called regenerative when the production output from the system is greater than the net input of resources into the system. A set of regenerative design principles for building retrofits are proposed to emphasize the positive interactions an existing building can have with its surrounding environment. More specifically, this paper will explore how an energy efficient building retrofit can improve occupant health and wellbeing, and restore and enhance local ecosystems. This dissertation explores the natural processes found in two specific organisms, the Human Body and Pine cones. These processes will be used to influence the design and function of an office building, indoor workstation activities. By mimicking a variety of elements from nature, the final composition, thereby, not only respond to the activities within the building, but also to the surrounding environment. It is intended for this building to relate to both Government buildings near to the site. This project displays how Biomimicry can be used as an integrative architectural design component in order to achieve complete unity between the building, the users, and theenvironment.

Key words Architectural Design, sociopetal Design, Biomimicry.

1. Introduction

Biomimicry from bios, meaning life, and mimesis, meaning to imitate is a new discipline that studies nature's best ideas and then imitates these designs and processes to solve human problems. Studying a leaf to invent a better solar cell is an example, it as "innovation inspired by nature." The core idea is that nature, imaginative by necessity, has already solved many of the problems grappling with. Animals, plants, and microbes are the consummate engineers. They have found what works, what is appropriate, and most important, what lasts here on Earth. This is the real news of Biomimicry: After 3.8 billion years of research and development, failures are fossils, and what surrounds us is the secret to survival Biomimicry is a new science that studies nature's models and then emulates these forms, process, systems, and strategies to solve human problems – sustainably. Biomimicry uses an ecological standard to judge the sustainability of our innovations. After many years of evolution, nature has learned what works and what lasts. [1]
Biomimicry is a new way of viewing and valuing nature. It introduces an era based not on what we can extract from the natural world, but what we can learn from it.

2. Importance of sustainabilty

The concept of sustainability was originally coined in forestry, where it means never harvesting more than what forest yields in new growth. The word Nacchaltigkeit, (German term for sustainability) was first used with this

meaning in 1713. Sustainability is a broad discipline, giving students and graduates insights into most aspects of the human world from business to technology to environment and the social sciences. The core skills with which a graduate leaves college or university are highly sought after, especially in a modern world looking to drastically reduce carbon emissions and discover and develop the technologies of thefuture.

Fig.1 The relation between sustainability and other aspects

The key principle of sustainable development underlying all others is the integration of environmental, social and economic concerns into all aspects of decision making. A "green" building traditionally focus solely on the first part of regenerative architecture. It employs technology as the means of reduction and conservation. The problem is that the structure is seeking to reduce its contribution to Environmental degradation using methodologies and typologies that have been proven they not be the most intelligent and logical solutions for achieving real sustainability. The method ofdesigning and building structures devoid of natural processes and minimal engagement with the environment is still unnatural and illogical.

3. METHOD

This has been expressed by Rodwell [2] in his stand for a new role for architectural conservation to be takenon:Character and appearance have reduced much of the role of the conservation officer and urban designer to that of a theatrical set designer, concerned with morphology and architectural detail when viewed from certain public vantage points, skin-deep, and unrelated to the functions of buildings, to the intangible cultural heritage, and to the human traditions of any given place. This role favors a monochromatic view of what supports pastiche and timidity where replacement or new buildings occur. It places preservation of thedominant above evolutionary enhancement in the future. It ignores continuity of human occupation, activities, andtraditions.

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4. WHAT ISREGENERATIVE…?

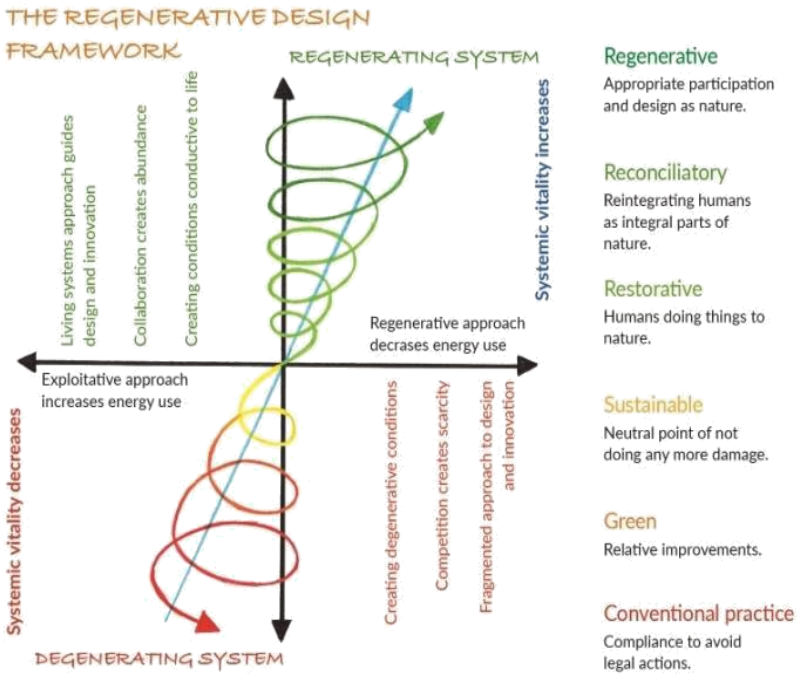


Fig.3 The framework of regenerative design

Regenerative architecture is the practice of engaging the natural world as the medium for, and generator of the architecture. It responds to and utilizes the living and natural systems that exist on a site that become the "building blocks" of the architecture**.** By adopting regenerative architecture, we are answering the question of how we can be truly sustainably in ourbuildings.

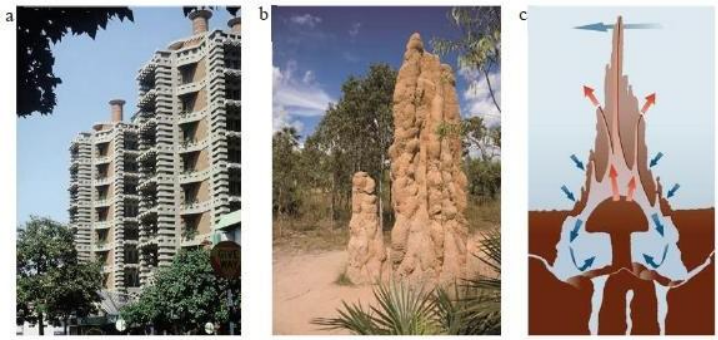
Architecture has the capability of producing all the requirements that we need for life. A structure can produce energy, food, capture water, purify water, produce oxygen, and capture CO2, among other things. A building has the capability of having a positive existence rather than a negative one.

5. Biomimicry Inarchitecture

- Biomimetics is the term used to describe the substances, equipment, mechanism and systems by which humans imitate natural systems anddesigns
- Evolution by natural selection maybe blind, but it has had billions of years of trial and error to figure out efficient and robust ways to dothings.
- Biomimicry operates on the principle that in its 3.8-billion-year history, nature has already found solutions to many problems we are trying tosolve.
- Biomimicry is multi-disciplinary subject involving wide diversity of other domains like architecture, electronics, medicines, biology, chemistry, mathematicsetc.

Biomimicry Three Levels: -

Biomimicry can work on three levels: the organismits behaviors, and the ecosystem. Buildings on the organism level mimic a specific organism. Working on this level alone without mimicking howthe



organism participates in a larger context may not be sufficient to produce a building that integrates well with its environment because an organism always functions and responds to a larger context.

6. Redefining Thedefinition.

Buildings exist as a part of a place/site, which our definition of architecture does not account for. The building requires the site for its existence, but we view them as separate elements. Perhaps we can expand the definition of architecture to "the art or practice of designing and constructing place, through the integration of site and building." This definition is completer and more comprehensive as including the site in architecture is the only way for a building to be "beyond sustainable" or regenerative.

7. AIM

To evaluate the scope of the Regenerative architecture concept in the OFFICE BUILDING. And thereby to analyze how well this concept can integrated be into the urban to sow the seeds for the future and to resolve the long-standing paradox of humanity 's inclination towards exponential demographic and economic growth while inhabiting a planet of limited resource material means.

8. Objective

- To make a building energy efficient, costefficient.
- As it is pollution control office, therefore, the use of artificial based activities should be less as compared to the naturallybased.
- The office building should use locally used materials so that there is lesstransportation.
- The water used for construction can be reused as they have their equipment's to test thequality

of water for further use.

- As it is office building most activities are held indoor, so natural light and ventilations are importantfactors.
- To bio mimic the nature in thebuilding 9. NEED

- Regenerative design, is the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials, and of reducing impacts on human health and the environment for the entire lifecycle of a building. The building requires the site for itsexistence.

- A building can be called regenerative when the production output from the system is greater than the net input of resources into the system. The architecture, in its new definition is producing a surplus of food, more clean water than it consumes, more energy than it consumes, provides richer diversity than was before the structure became a part of thesystem.

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10. Scope

Figure 5. Showing the concept of the green area

With the continuous deterioration of ecology and nature and increase in demand of higher standards of living and better thermal comforts there is a great need of the design that are environment friendly and made in context with nature and that's what a Regenerative design in architecture offers.Table 1: - Table showing the process (methodology) of the research done in this paper

STEP	PROCESS TITLES	STUDY TO BE DONE	ACTIVE EDUCATION METHOD
1.STEP	SUBJECT DESCRIPTION	Description and visual presentations about biomimicry	Description and visual presentation
2.STEP	LITERATURE RESEARCH	Searching biomimicry and biomimicry in architecture	Problem solving
3.STEP	ANALYSIS OF THE RESEARCH	Analysing architectural buildings that have been affected by nature and formed in terms of form, texture, material, function, construction	Analysis Method
4.STEP	INSPECTION AND ARGUMENT	Argument of research and analyses in a lesson with brainstorming method.	Argument Method (Brain Storming)
5.STEP	DESIGN	Inferring from a sea creature that the student chooses after research and design. Taking advantage of certain features of a sea creature, such as form, texture, material, function, and structure, and designing an architectural building.	Analogy Method
6.ADIM	PRESENTATION	Presentation of formed design to other students	Cooperative Method

Using the Regenerative approach in office buildings lead a way to regenerative architecture which can help in thinking beyond the building just being sustainable.

- Energy performance index: Through Regenerative approach we can get an EPI of 35kwh/m or less peryear.
- Air quality: Regenerative building is always fresh and has a healthy environment in thebuilding.
- Rain waterharvesting
- Renewable energy

10.1. Based on the case studies

After studying about Solaris, it can be concluded that it is a better working place compare to other types of building because it doesn't provide a sick building effect which will reduce the efficiency of the workers production. This building is similar to a living breathing structure which can sustain with a minimum usage of power such as electricity. It is all based on the air ventilation designed by architects. The lighting effect was excellent because even though there are lots of shading effects, the amount of lighting was just nice everything is based solely on natural lighting during daytime. [3]

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This snap shot discusses the use of biomimicry (from the Greek: bios meaning life; mimesis meaning imitation) in tshe design of Council House Two (CH2) and what the benefits and final outcomes were.

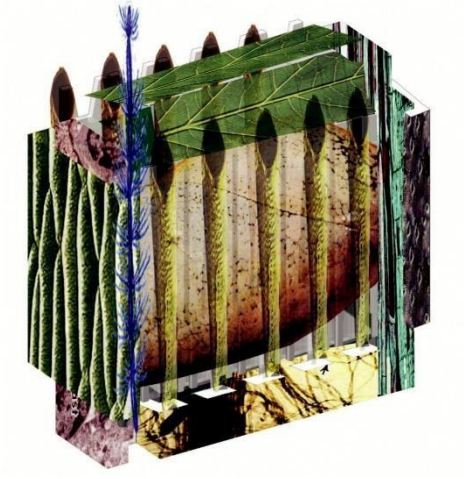

Figure 6. Showing the concept of the biomimicry in building.

- Leaf structure: air cleaning and processing, combined with collecting energy and dissipatingheat.
- Growth plane: roof terrace supporting living plants and grasses for the enjoyment of building inhabitants.
- Bronchia: enclosed duct spaces for delivery of vitalgases.

Figure 7. CH2 building

- Root: network of connections to ground, provision of public services, buttressing to the city plane, sewer mining for non-potablewater.
- Stem: primary core structure and arterial volume providing network of reticulated fluids, gases and nervous system of building for control of cooling, heating andventilation.
- Epidermis: external layer of skin for protection from theelements.
- Dermis: sub-layer of skin composed of enclosed spaces to filter wind, light andsound.
- Antennae: vertical mast carrying vegetation and weather monitoring equipment for control of cooling, heating andventilation.
- Bark: external ventilation module for waste and toilets, with inhabitable external balconies.[4]

10.2 Inference

- Energy efficient design which successfully integrates various elements to achieve thesegoals
- Reduction in greenhouse gasemissions
- A comfortable building for users resulting in reduced sick days and potentially aiding in the retention ofstaff
- Auniquebuildingwhichwillbealandmark,lighthouseprojectandanexampleoftheCouncil's

commitment to the environment

- Education of professionals and public about environmentally and socially responsible design

Conclusion

If conservation is about managing change [5], then the role of heritage professionals is to communicate and facilitate this change with all the stakeholders involved. This should be done on a long-term scale, giving the time for communities to adapt to the change and to consider the benefits for future generations rather than for the present, or near future. ―The resource value of our built heritage is […] a very powerful argument in favors of its conservation—over and above its special architectural or historic interest [6], and as such it should constitute the core of the regeneration process, and not just be a glorifying tool and, even less, a barrier. It means accepting that ―heritage value and significance may be embodied in the uses, meanings and association of a place, in addition to the physical fabric of a place or structure [7], shifting the focus from the micro–fabric, to themacro–context.
Urban regeneration calls for a multidisciplinary approach led by consensus and for thorough knowledge of the values in question, necessitating the involvement of the communities concerned from the inception of the project. Regeneration must be seen as a tool to preserve the diversity and interactions inherent to the city, while at the same time perpetuating its creative process. Cities have to reflect both our time and our history in order to continuously reflect the meanings and values of identity. ―It will mean resisting the pressure to turn our public domains into simulated and pristine imaged environments free of chance encounters and risks that make their experience unique[8].

These kind of nature inspired projects are allowing architects and designers to develop eco performance principles that can be used by industry professionals worldwide to build Biomimicry solutions into their own designs. In fact, under this new order of sustainability, buildings, outdoor art and other manmade structures would function like trees, meadows, flora and fauna, capturing, cleaning and storing rainwater; converting sunlight to energy and carbon dioxide to oxygen; protecting soil from erosion; disseminating seedlings; and eliminating waste. There is need for future young Architects and designers to Create bio-inspired design adaptations that emulate nature's best ideas, so that all futuristic buildings will be sustainable.

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Analysis of Circulation Pattern of Handicap and Mentally Retarded Students in Accessible Schools in Pune

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Abstract: Disability is not an obstacle to success in life. One can achieve anything in spite of having impairment by their will power. Disability also cannot stop learning process of any individual. All users have equal rights to contribute to social activities. The society at large is deprived of the abilities and talents in students with impairments. Circulation refers to the ability to move around a building safely and independently. In our day-today life we observe that disable children feel difficult to access the common circulation spaces in any residential or public building. Thus, schools should be accessible and barrier-free to both able and disable students. There are various elements which impacts on their accessibility. Accessibility problem, which is the result of unconscious structuring of built environment, is the main point of study. The article reports on a case study that explores how a disabled student accesses the common circulation spaces in school. The study aims to analyze the circulation pattern of students in accessible schools. The study area is restricted to three accessible schools in Pune city. When building is examined according to accessibility conditions, the user profile is considered as students with mobility impairments and to provide accessibility for all students is the main target. Observation of parameters to be considered for accessibility from accessibility audit is followed by questionnaire and activity mapping of the school. The analysis of collected data signifies the circulation pattern of students in accessible schools. The paper provides a platform to discover the needs of disable students, based on the type of disabilities. The interpretation of accessible schools moreover raises awareness of architecture's role in (disabled) children's lives insofar it can support or impair human capabilities. A 'Universal design' approach to school design will ensure that the school can be accessed, understood and used.

Keywords: Impairment, Barrier-free, Accessible schools, Universal design, **Circulation pattern**

Introduction:

The circulation pattern of a school is an important planning point that must be got right early in the design stage.Studies on design, disability and phenomenology offer rich insights into how the designed environment is experienced by people with different abilities. Disability is a global concern. It affects individuals everywhere in the world and can happen to anyone at any stage of life. It is stated in the World Health Organization (WHO), that disability is a term to describe 'any restriction or lack (resulting from any impairment) of ability to perform an activity in the manner or within the range considered normal for a human being'.It is obvious that children's with physical disabilities are part of every community. The acceptance and integration of these children's into the school in order to take an active part in the school and live a normal life is important. The aim of the paper is to give guidance on the design of the physical environment in primary school buildings and grounds, so that they are easy for everyone to use, including students with disabilities. The specific objectives of this paper are:

- Define the circulation spaces in schools
- Study the aspects to be considered for accessibility
- Analyze circulation strategy covering all levels from access to the buildings to local circulation spaces
- Present existing accessibility conditions of the accessible schools in Pune

Not only the design and quality of material impacts but also there are various elements which impacts on the design of circulation spaces. The barriers could be in form of restricted access and narrow doorways, steps and staircases. Hence it is mandatory to overtake these problems in designing only. The results will be useful to designers and architects to create a barrier free school accessible to all.

Methodology:

Circulation refers to the ability to move around a building safely and independently. As well as having an entrance that is easy to identify, circulation layouts should be clear and easy to understand. Literature survey and observations on site were used as research methods in this qualitative study. Literature survey was used to reach previous studies like books, journals, articles, reports, and research papers etc., which include applied samples, definitions, and standards about accessibility. Aspects that are to be considered for accessibility were defined from secondary resource. A check list was prepared on the basis of literature to obtain information about the circulation pattern of students in accessible schools. A check list covered parameters such as entrance, ramps, lifts, stairs, corridors, doors, windows, flooring, toilets, signage, boards, etc.

A total of 3 accessible schools selected includes ZEP rehabilitation Centre, Kamayani School, Sai Sanskar School which was studied. The study covered circulation pattern of handicap and mentally retarded students. The circulation pattern in selected accessible schools were defined, observed and analyzed in terms of accessibility by using accessibility standards. While analyzing these buildings, circulation spaces were categorized as horizontal and vertical circulation spaces. Accessibility conditions of circulation spaces and components, its parameters considered from accessibility audit were observed by taking photographs and measuring. By doing the observation of schools, activity mapping was done on plan of schools showing the pattern of circulation. A questionnaire was prepared and the oral interview of staff and helpers of students was taken. By gathering all information from perceptions of staff and helpers, analysis of the data was done and the issues were identified. By doing this finally the standard pattern of circulation in selected accessible schools was summarized.

Types of schools observed:

The schools studied were selected based on their use. A total of 3 schools were observed for handicap and mentally retarded students.

Observations and Findings:

The concept of universal design (UD) has been used widely in a variety of design fields such as landscape design, architecture, engineering, and product design. The selected schools were studied and observed using checklist. A checklist contains the standard facilities to be provided in schools, the schools to be observed and implementation to give a solution if any facility is not provided in any school. A checklist is as follows:

Table 1 An observation checklist for facilities provided in schools

Facility	ZEP Rehabilitation Centre	Kamayani School	Sai Sanskar School	Implementation
Entry/Exit				
Approach to the school well maintained with a level surface				
Entrance without any obstructions				
Ramps provided at level differences between road surface and entrance level		X	X	Ramps should be provided
Emergency exits provided and clearly marked	X		X	Emergency exits should be provided and clearly marked
Ramps				
Ramp next to the stairs	X	X	X	Ramp should be provided at the entrance next to the stairs for

Ramp slope of 1:12 gradient				The slope of ramp should be of 1:12 gradient
Width of the ramp minimum of 1200mm				The width of the ramp should be minimum of 1200mm
Landing of minimum 1500mm x 1500mm				The landing should be of minimum 1500x1500mm
Surface of the ramp non-slippery				The surface of the ramp should be non-slippery
Continuous handrails on both sides of the ramp				Continuous handrails should be provided on both sides of the ramp
Stairs				
Width of the stairs minimum of 1200mm				
Continuous handrails on both sides of stairs				
Step riser 150mm				
Emergency escape stairs	X	X	X	Emergency escape stairs should be provided
Corridors				
Minimum width of corridors at least 1200mm				
Corridorswell lit throughout				
Signage				
Surface of sign non-reflective				Surface of sign should be non-reflective
All signs in text and using pictograms				Signs should both be in text and using pictograms
Signs at a height of 1000mm-1600mm from the floor				Signs should be provided at a height of 1000mm-1600mm
Doors				
Doors be easily opened and closed by children				
Width of door opening at least 900mm				
Boards				
Classrooms having green boards	X			Green boards should be provided in classrooms for clear vision
Height of green board not above than 500mm				The height of green board should not be above than 500mm
Windows				
Height of windows between 600mm (bottom edge) and 1450mm (top edge)				

Flooring				
Flooring of the school anti-skid				
Glazed tiles/marble used for flooring	X	X	X	Glazed tiles/marble should not be used flooring
Drinking Water Units				
Washbasin				
Well maintaineddrinking water area				
An accessible drinking water unit available with one tap at a height of 400mm from the level surface				
Toilets				
Separate toilet cubicles for girls and boys	X			Separate toilet cubicles should be provided for girls and boys
Size of the accessible toilet cubicle a minimum of 2000mm x2200mm				
Washbasin at a height of 700mm-800mm from the floor				
Wall-mounted grab bars	X	X	X	Wall-mounted grab bars should be provided for easy movement
Lifts				
Internal floor space of the lift minimum of 1500mm x 1500mm				The internal floor space of the lift should be min. of 1500mm x1500mm
An audio announcement for opening/closing of the doors and for different floor levels				There should be an audio announcement for opening/closing of the doors and for different floor
A key plan of all the floors inside the lift		1w		The key plan of all floors should be provided inside the lift for easy understanding
Playgrounds				
Leveled playground				Playground should be leveled
Playground having paved pathway with a minimum width of 1800mm, which can be used as a track by wheelchair/crutch/walker users				Playground should have a paved pathway with a minimum width of 1800m
Seating area having space of at least 800x1200mm for wheelchair				Sitting area should have space of at least 800x1200mm for wheelchair users

After the observation of schools activity mapping on plan was done to understand the circulation pattern of students. A physiotherapy room was provided in every school for mental and physical development of child. Further an interview session of staff and helpers was held to gain their perceptions about facilities to be provided in accessible schools and students response to it.The results signifies that students respond to various textures used on walls and flooring to understand the space different.The anatomy of the collected data from staff betrays that the accessibility standards are important in all aspects and need to be provided in schools for easy circulation.

Conclusion:

The importance of barrier-free schools cannot be overemphasized as it guarantees equal access to able and the disable children. The inventories gathered on accessible schools revealed that most schools are designed for considering only mentally retarded students. So it is necessary to consider all types of disabilities while designing any school. School buildings and their surrounding environment should be physically accessible to all potential users. Circulation routes within the buildings should be easy to follow. Routes should be clear even without signs.The study focused on accessibility standards about accessible schools. The results showed the circulation pattern of students in accessible schools in Pune. Accessible schools have important role in learning of disabled students. For the purpose of accessibility, selected schools were analysed according to relation between circulation paths within spaces. As a result of observations on the sites, it was understood that there were several problems about both horizontal and vertical circulation of accessible schools. The paper also providesa platform to explore the need of students especially in the schools based on the type of disabilities that include physical impaired, wheelchair user and mentally retarded.

Acknowledgements:

A very special gratitude to the staff of schools for sharing their time, valuable insights, and also for their proofreading help.Again a heartfelt thanks to institute mentor and teachers who supported in the study by all means and gave me the golden opportunity to do this wonderful research. I came to know about so many new things. Thanks for all your encouragement!

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Usability of Designed Spaces below the Flyover - Pune City

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Abstract: Existence of public spaces in cities is essential for social interactions to take place, fostering sustainable, safe and liveable cities . One of the public spaces that have been usually designed for people's use are the spaces below the flyover . The question is , whether the spaces designed below the flyover are actually been used or not. The aim of this research is to study the spaces below the flyover contributing the neighbourhood environment of the Pune city. From the combination of interviews, observation , mapping and questionnaire survey this research tells about the activity pattern and interactive spaces developed below the flyover of different localities of the Pune city . It also reveals how the spaces under the flyover can be used for the common benefits of the society.

Keywords: Flyover ,neighbourhood environment,activity pattern, interactive spaces

1.Introduction:

The flyover is a structure which joints two or more points which are separated by an accessible route or a man made structure to cut the traffic for faster mode of travelling[1]. Flyovers are built over man made structures such as roads, intersection etc. to prevent congestion, and provide a more convenient way to navigate over the traffic .The space below the flyover are additional space for the people where it is observed that people use the spaces insensitively by throwing garbage and pollute the environment.

Usability is the ease of use and learnability of a human-made object such as a tool or device , itis the degree to which a software can be used by specified consumers to achieve quantified objectives with effectiveness, efficiency, and satisfaction in a quantified context of use.[2]

In the countries like Malaysia, Australia, Singapore, etc the spaces under the flyover are converted into parking lot, gathering place, roof for the socio-economical poor households, praying area,etc. Some had used these spaces for all kind of economic activities such as provision of services like food stalls, repair shops,etc . Best examples are Gelugar Highway and flyover of Penchala link at Jalan Sungai Penchala of Kuala Lumpur.

Inspired from these developed countries, developing country like India also took a step forward. Attempts of recreating the spaces under the flyover of Moolchand and Nizamuddin, Delhi are made. Before recreating, it failed due to poor management, encroachment and garbage. It was neglected before but things are changing due to creative graffit , artworks, sculptures, green belts. They are being used to infuse fresh light into these spaces.8 sculptures of yoga mudras are placed on green carpet of grass which at first were a dumpyard for construction waste. The sculptures and the spaces are creating social health awareness and promoting yoga. The people passing by get inspired by the sculptures and pleased by the graffiti.

Such good places can be put in good use. This spaces must be developed and put in use for the betterment of the society .Some developments of spaces below the flyover are found in the Pune city. Some activities were to attract users f[3]rom the surrounding communities such as developed parking spaces, café, food stalls, recreational activities, green spaces to avoid pollution can be common solutions.

Literature Review

[1]https://en.wikipedia.org/wiki/Flyover

[2]https://en.wikipedia.org/wiki/Usability

Improvise overpass: Study on utilizing spaces below flyover-[4]

In this research paper the author conveys that the leftover spaces specifically underthe flyovers can be create something to the public in the future. Both case studies though different in location and community background, suggest of future activities and uses that could be considered in designing the authorized people. Some activities and uses were found good in order to attract users from surrounding communities. Such as to develop parking space, have cafes, food stalls and recreational activities. However, in order to further understand these possibilities and opportunities that stimulate activities, research on the physical characteristics, and the more complex of community background need to be conducted to fulfill the need of the people surrounding to make sure the uses of that area are the best.

Problems Of Neglected Places Under Bridges: A Case Study Of Yerevan Bridge, Beirut, Lebanon-[5]

(a)Planners and architects should give the existed bridges more concern by adding new functions, rather than structural and transporting. These functions could be economic, social, environmental, or even residential. b) Engineers and architects who work in the municipalities should deal with the neglected places under bridges seriously as dangerous spots with lack of light and air, reemploying them as amusement venues with landscape elements. c) The idea of inhabited bridges can improve the informal/marginalized zones. d) Merging infrastructure with the superstructure of an inhabited bridge requires a full comprehending of project's requirements such as; roads, capacity of vehicles, flow of pedestrians, dimensions, light directions, sustainable features that can be added to give lively actions to users and residents.

Landscape Architecture and Creating Innovative Spaces under Highway Overpasses-[6]

Recent studies in Turkey show that efforts have been made to mak e t h e s p a c e under highway bridges functional. These spaces usually are not taken into consideration during design and planning. The spaces spontaneously acquire an identity based on the users' preferences. Users do not prefer the spaces under highway bridges due to their gloomy and dark atmosphere. Therefore, work should be done to diversify user profiles when designing these spaces. These spaces actually have many uses. Various ideas of design and meaning can be generated for their future use. The height and width of the spaces under the bridges are effective factors in their utilization. Simple planting and randomly or designed parking areas draw attention in these spaces in Turkey. Mostly the creeping or holding plants have been used in these dark, shady and cold areas. In addition, some of these areas have illumination problems.

spaces under the flyovers if there's meet the requiremen

Sr.No	Title	Author	Publisher Or Date Of Publish	Types of Research	Aim	Inference
1	Study on utilizing spaces below flyover.	Md Azree Othuman Mydin.	January 2015	Ground theory research	To understand the spaces below the flyover.	Flyovers can create something to the public future.
2	Problems of neglected places under bridges.	Maged Youssef	September 2017	Quantitative.	To turn the negative spaces in the positive one.	The flyunders should not act as the negative space.

[4].https://www.researchgate.net/publication/285430105_Improvise_overpasses_Study_on_utilizing_spaces_below_flyover

[5]https://www.witpress.com/Secure/elibrary/papers/SDP17/SDP17064FU1.pdf

[6]https://www.researchgate.net/publication/311151366_Landscape_Architecture_and_Creating_Innovative_Spaces_under_Highway_Overpasses

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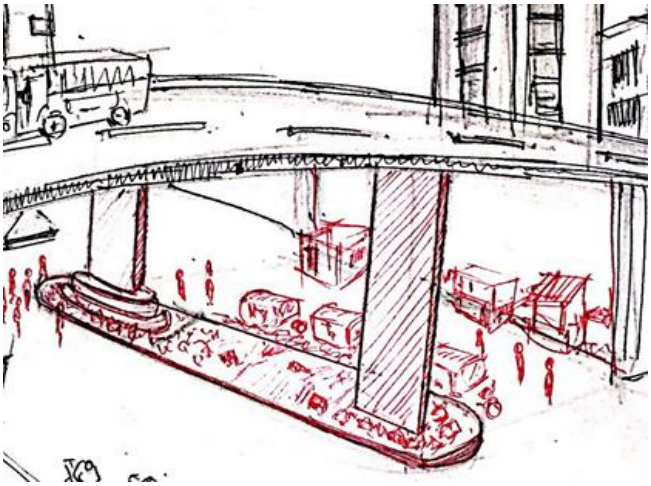
3	Landscape Architecture and creating innovative spaces under highway overpasses.	Yasemin cindik Akinci	November 2016	Ground theory research	To understand how the leftover spaces can be made innovative.	These areas should be given identity and spirit when they are planned and designed.

Methodology-

1. The developed spaces below the flyover of the Pune city, within 10 km radius is identified.
2.The primary data is collected by visiting all the spaces below the flyover.
3. All the activities below the flyover are observed and mapped.
4.Questionnaire is prepared and circulated among the people.

The study will be done on the basis of case study approach wherein 5 flyovers across the city will be studied in detail. The observation shall be analysis through comparative charts.



Case Study 1- Navale Bridge

Police security room/control room is provided. This area has unmanageable traffic so R.T.O have to serves day and night duty, thus room is provided for their comfort. As security room is provided R.T.O gives their 100% duty and there is no scope of crime or illegal activities in this area. Walls are painted giving messages which makes the place more lively.From 6am-9am bus stops at this point. Local public and school going students takes the bus from this place. Seating arrangement (Kattas) (fig-3) are provided for them. There is auto stand next to security room. The autowala use this katas to relax, wait for passengers, eat their tiffins, etc. All the arrangements provided are well used by the people.

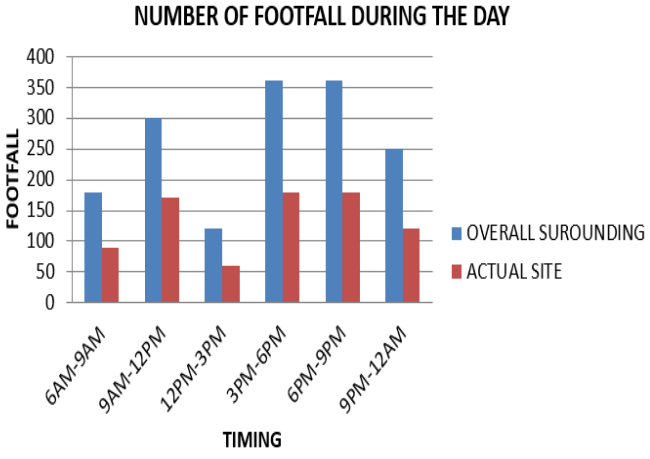


Fig 2-Footfall table

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Fig 3-Seating facilities (Kattas)

CASE STUDY 2.-VADGAON BRIDGE-

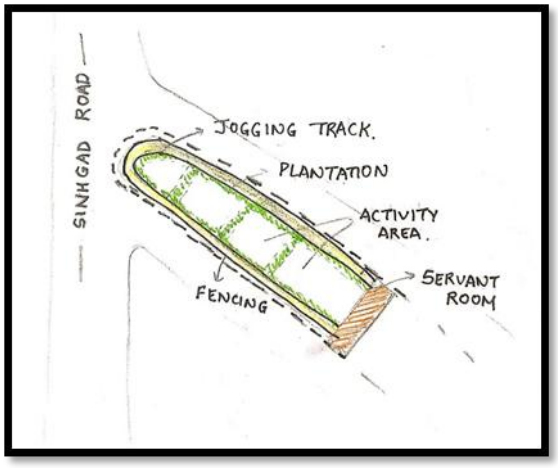

Fig 5-Temple

The garden is developed under the flyover. It is opened from 6am to 10 am and 4pm to 8pm.It has a proper entrance and is guarded by a fencing from all sides. It has jogging track, small worship place, servant quarter, disposal place, exercise equipment, benches, slides for children, etc. This place is used by all age group of people. Elder people mostly use this place for jogging, reading newspaper, morning walk, etc. Younger crowd and youth enjoy playing here, spending time with friends, etc.
This garden plays a major role in the neighboring environment and the society as it helps in connecting people, it basically becomes an interaction spaces for the people living in the surrounding area.

Fig 4-Conceptual Plan done by the author

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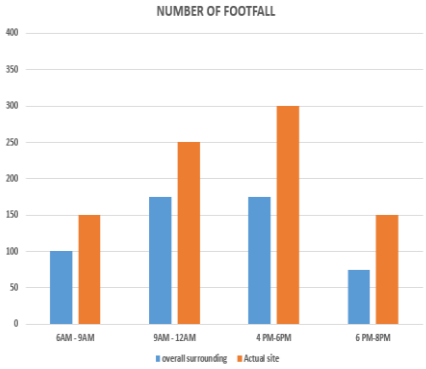

Fig 6- Slides Fig 7-Footfall table

There are commercial complex on both the sides of the flyover. It all requires lot of parking space, thus the space under the flyover is converted in the parking lot. This area is well fenced. This area provides parking for 2 wheeler and 4 wheeler. The space is well used by the people.

Case Study 3- Dhayari Bridge-

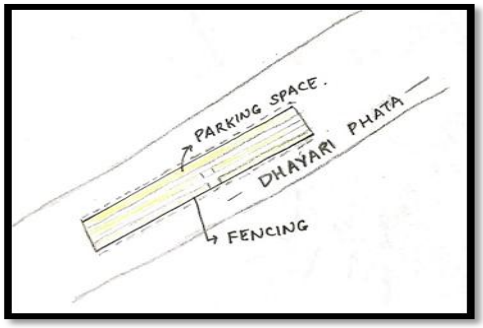

Fig 9- Parking of four wheeler and two wheeler
Fig 8- Conceptual Plan done by the author

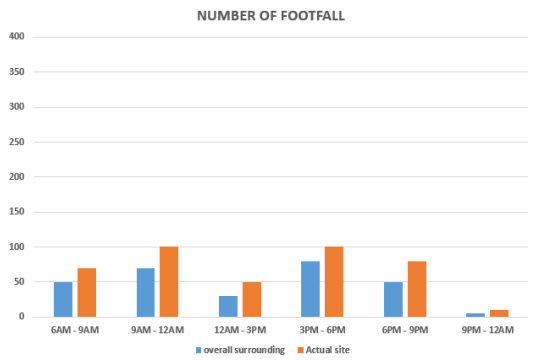

Fig 12-site of Warje bridge

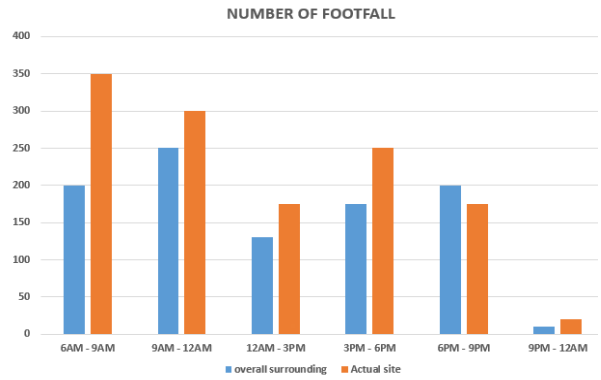

Fig 11-Footfall table for Warje bridge

Fig 10-Footfall table for Dhayari bridge

Fig 12-site of Warje bridge

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Case Study 4-Warje Bridge-(Warje Majur Adda)

It is a place developed by PMC for labours.This project failed as labours don't use the place,instead they go to nearby chowk for employment.The employers don't prefer to come to with a public toilet, people don't use it much.The place as the site is hard to access.(weak connectivity).Even though the place is well developed.

Case Study 5- Z Bridge-

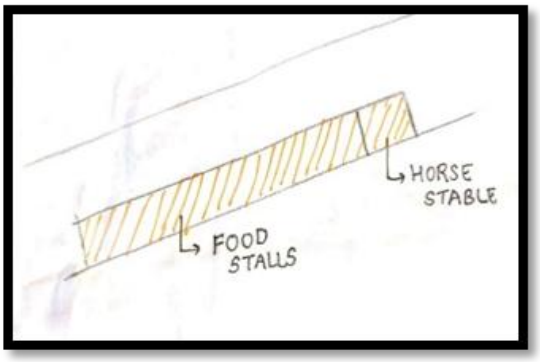

Fig 13- Conceptual Plan

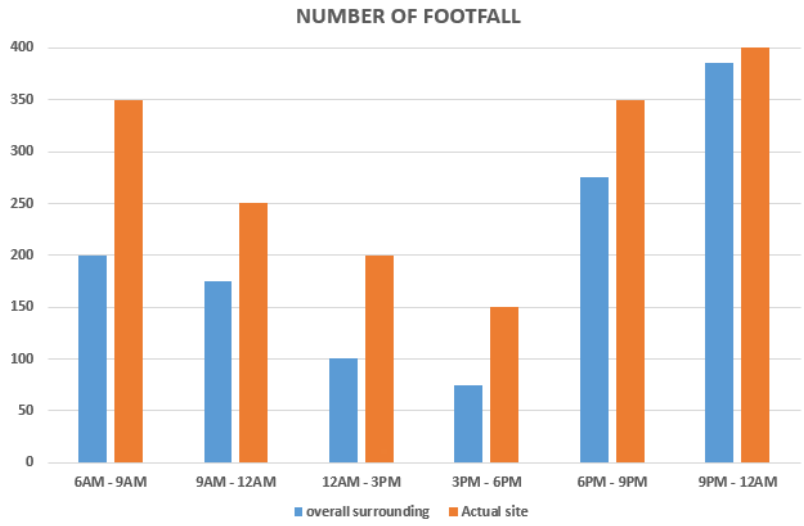

Fig 14-Footfall table for Z bridge

Constructed in the shape of alphabet Z, the bridge was originally named as Kakasaheb Gadgil Bridge. It overlooks the Mutha River and offers a cool ambience to spend a lovely evening. Be it rains; summer or winter the bridge remains a favourite spot in every season.The bridge that attracts people from all walks of life including collegians, office goers and even the elderly coming at the bridge for their dose of fresh air. This occurs during early mornings when the bridge transforms into a jogging or walking track as there are lesser two wheelers at this time. Evenings is the time when most people come to unwind here. Long conversations followed with some munchies like corn and kulfi served at the stalls nearby is a common pastime here. During holidays when circus and amusement parks are held below the bridge, it is quite a sight to watch as passer-by stop and take a peek from above. The stalls under this bridge are open all night so its favourite place for foodie people. There is also a horse stable from where groom book the horse for marriage ritual.

ANALYSIS-

NAME OF BRIDGE	FREQUENCY OF VISIT	FOOTFALL OF VISITORS. (from the observation of the author)			TIME SPENT	PURPOSE	% USE OF SPACE (built up)	COMFORT (Rating out of 10)	TRAFFIC
		MORNING	AFTER NOON	EVENING					
NAVALE BRIDGE	Daily	230	100	200	10-15 mins	Seating place, busstop ,eating, auto stand	60%	7	Heavy traffic
VADGAON BRIDGE	Daily	100	-	175	1 hr or more	Walking, jogging, relaxing, yoga, playing , worship.	40%	9	Flowing Traffic
DHAYARI BRIDGE	Twice or thrice a week	200	130	350	10-15 mins	Parking	20%	8	Flowing Traffic
WARJE MAJUR ADDA	Daily	70	30	50	Half hr	Toilet facility ,seating	20%	5	Flowing traffic
Z -BRIDGE	Once a week	250	200	500	1 hr or more	Food stalls, fair, Circus, Leisure	95%	7	Less traffic

Conclusion-

From the analysis chart, the author conclude that Navale bridge , Vadgaon bridge and Warje majur adda is daily used by the same group of people because of presence of bus stop, autostand, jogging track, toilet facilities. This activities are the part of their daily routine hence this places plays the important role in their life. While Dhayari bridge and Z bridge are visited twice or thrice a week and once a week by the people as the activities here are not based on daily routine. As per the observation of the author the footfall of visitors is much more on the z bridge as compared to other bridge. People usually spend 1 hour or more on Z bridge and Vadgaon bridge while they spend 10 to 15 minutes on Navale bridge and Dhayari bridge. According to the survey, the most liked and developed place is the garden under the Vadgaon bridge. This place helps in connecting people, it basically becomes an interaction space for the people living in the surrounding area. The failed project is of Warje majur adda, the place as the site is hard to access (weak connectivity).

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Response of People to the Development of Taljai Tekdi

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Abstract : The city of Pune gets its identity by various means. One of them is the geographical setting it has got. Pune is blessed with beautiful terrain with rich ecosystem all around in the form of hillocks, which are rightfully called "The lungs of the city". Though, in the process of city development a notable change in their health can be seen . Taljai Tekdi in Sahakarnagar, Pune, is going through the same process. The following research paper aims at understanding how Punekars respond to Taljai tekdi and its development. How is the user being impacted by the development of tekdi as a recreation zone? Is the tekdi relevant as a green space to the city or a public space? Is the use of the Tekdi still majorly focused on health and fitness?. This concern is looked upon in this research paper. The analysis is carried out from the data collected on the basis of visits, photographs and observations. They are recorded in the form of structured interviews and activity mapping in order to understand the activities and preferences of the users coming to Taljai Tekdi. Further from the findings, it is seen and concluded that, the development has invited further more users for various activities. Although the users are seen performing major activities focused on their health and fitness.

Keywords:Development of Tekdi, Developmental Effects, Response to development, Re-creational space.

Introduction

India has vast stores of ecological wealth that provide often unseen but critical benefits to the people and economy of the country (Molnar, 2012). There always are close ties between ecology and the people around it. Unfortunately, many of these ecologically important areas are being noticed, understood in terms of their value, and responded after they start deteriorating. Similarly, the concerns for the "green zones" in an expanding city have been coming up in recent decades. We get to know about it in all means of media. We can see number of concerns in Pune city too.

"Pune city, now home to more than 3.1 million populations and growing at a rapid pace, is increasingly atthe forefront of the most pressing environmental challenges which require governments, public andprivate organizations and individuals to take a fresh perspective at how economic and social activities canbest be organized in the existing urban environment."(Revised City Development Plan for Pune- 2041, 2016)

It is called "Queen of the Deccan". There exist many natural green spaces still in Pune, woven into the city fabric. Pune has been going through development, urbanization, traffic congestions, growth of population, densification, urban sprawl, climate modification,
Hybridization of cultural and economic policies and resultant lifestyles.(Sahastrabudhe, 2011)
The following has its impact on Pune, on its people and its environmental resources. The impact of the rapid development happens on every inch of land. Yet today, we find places to breathe less polluted air and keep ourselves healthy. A major typology in such places are called "*Tekdi*" in Marathi language. *Tekdis* are nothing but the hillocks all around Pune, which are part of the city fabric now. They give a natural experience right in the city. Due to easy access, its ecosystem, flora and fauna, comparatively clean air, and basic infrastructure by government, Tekdis get considerable amount of footfall. Although, such is not the case with all the hillocks in Pune.

Tekdis was once known for its peaceful, safe, visually pleasing, climatically comfortable and culturally rich environs, which now is on the threshold of losing its physical, social and cultural identity. Today, not all of them have the same experience. Some have become invisible in the expanding city, some have safety issues,

maintenance issues, and some are being looked upon for developments. Although, the development on them seems to be overpowering its natural entity. In spite of such conditions, we can see punekars utilizing these spaces for their refreshment and giving it its importance.

Tekdis play a vital role in maintaining the healthy environment of Pune, and a healthy life of punekars. In all Trekkers all over India, considerable percentage is from Pune, because a major contribution in punekars developing adventure spirits is done by Tekdis. Which immediately points towards how Tekdis are, in terms of terrain, and what are the negotiable and non- negotiable components while developing these to keep it lively but still as rich as it is naturally. Development is necessary to keep it safe for people to use. But in what way is more important. "TheArchitects are to make the best of it in terms of liveability"(Sahastrabudhe, 2011). Thus it is important to understand the interests, preferences and use of spaces of these spaces by the users.

Literature review

The highest point in the city is Vetal Hill(800m above mean sea level-(MSL)) whereas the highest point just outside the urbanarea is the Sinhagad Fort (1300 m above MSL).(ARAI). According to the Environmental Status Report Pune comes under the topgreen cities of the country, currently with 23 lakh trees.(Environmental Status Report, 2016-17)The major-forested areas ofthe city include Katraj and Sinhagad valley. The other few areas under tree coverinclude institutions like Pune University, National Defense Academy, PuneCantonment and gardens like the Empress Garden, Sambhaji Baug, Saras Baug etc.Some of the hills in the city covered green areas. Vetal Hill (ARAI Hill) coveredFergusson College Hill and Chaturshringi Hill, Parvati Hill, Baner Hill, Taljai Hill,Law College Hill, Bhamburda Tekdi, Pachgaon Tekdi, VarjeTekdi, Ghorpadi,Wanwadi, Vadgaon Sheri, Kondwa Bk., Kondwa Khurd, Mohamadwadi, Kharadi,Warje (ESR, 2010-2011) are small hills in the city. (Gadgil, 2006)
"The total area under reserved, forest and agriculture as per the landuse distribution of Pune city is 2905ha which 11.91% of the total area is."(Revised City Development Plan for Pune- 2041, 2016)

Table1: List of Projects under Joint Forest Management

Sl.No.	Name of Hillock/ Forest	Area in Acre
1	Bhamburda tekadi	250
2	Pachgaon tekadi	613
3	Varze tekadi	125
4	Ghorpadi	15
5	Wanwadi	110
6	Vadgaon Sheri	8
7	Kondhwa Bk.	361
8	Kondhwa Khurda	60
9	Mohamadwadi	175
10	Kharadi	9
11	Warje	100
	TOTAL	**1826**

Source: ESR, 2010-2011

Conserving, using sustainably and sharing equitably in the benefitsflowing from biodiversity resources have emerged as vital concernsin recent decades.(Gadgil, 2006)The concerns have been coming up from all the news papers, about all the greens and their conditions, misuse by the people around, neglect by the locals, about tree cuttings, hillocks vanishing in construction, poor maintenance of Puneri Tekdis, NGOs actions, new development plans, conflicts on the same, political issues, offensive and criminal activities happening on the hillocks and their safety issues.

Hillocks of Pune play a vital role in the lives of punekars. The concern of tekdis of Pune was strengthened by my personal experiences to a tekdi (Taljai Tekdi) in my area. It could be seen that a lot of new activities are been added with heavy development. A mass of land is seenfinely finished and a lot of people being attracted to it. The

changes and development of the place will surely have impacts happening on the context, environment and finally the Punekars.

In this following paper impacts or effects on peoples interpretation and response to the changes happening are analyzed. Similar enquiries were found, here impacts on environment could be calculated with deal more with botany, geographical research methods, before which it was important to understand how people, the users respond to it.
This research would be necessary in planning green spaces right in the city fabric, in conservation of existing forest ecosystems, the way and method for development around such spaces. To understand till what extent, or percentage a development should happen, in what way and how do we expect the public to respond to it.

Research Methodology

The process of the research is through Quantitative research method. Here, a case study in interest of the paper is done. Although the use, access, neighbourhood, development and context are different, amongst all Tekdis mentioned in List 1, Taljai tekdi is considered as a case study due the footfall, infrastructure, Mixed use, and natural features it has got offer more data to analyse. The data is collected by visiting the site n specific time periods, observations are captured in photos (not for every observations due to rules and regulations on site), notes and calculations.

The Quantitative method of structured interview was first conducted on site of Taljai Tekdi. The stretch from Sahakarnagar road to Taljai till Taljai Mata mandir, most frequently used access is been taken for study as it is majorly used area and most of the development on tekdi has taken place there. The tekdi is active in four hours of morning and evening timings due timing constraints put on entry to Eco-park at the top and newly developed cricket ground. The observations are noted differently for the weekdays and weekend as the footfall is affected by various logistic issues of users. Sorting of Interview is done in order to differentiate the activities related to fitness (Primary purpose of tekdi) and Recreation. To understand the larger picture of activities and compare Fitness and recreational activities, Density of people occupying the place, Land use pattern, data is collected and put as activity mapping. Mapping is done on the Google map image of the selected stretch.

Analysis and Conclusio

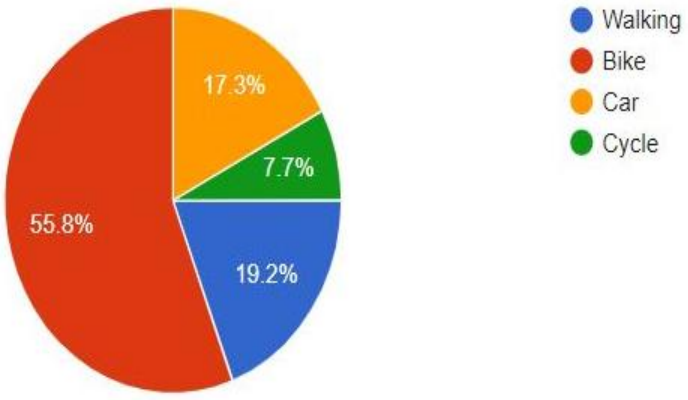

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Image 1: Context of Taljai Tekdi and Stretch of Study

Understanding the context of Taljai tekdi, it is surrounded by urban fabric from all the sides as shown in the Image beside. Major area of the tekdi is under Forest department reserved as green. The rest land around it and the access is learned to be private land. On which newer development is coming up for public use. Being in between the city due to expansion of the city makes it very accessible. Due to development of tar roads it is made further more accessible by vehicles. In the study it is seen as percentage of people visiting Taljai come by vehicles. Yet a considerable amount of people are seen walking to Taljai.

The data collected from the interviews and observations with respect to activities performed on Taljai tekdi has turned out to be contradicting the hypothesis which said that the development has impacted on the interests, activity preferences and the nature of activities. Although, the people tend to perform more recreational activities than Fitness related activities which is the main benefit of having hillocks so right in the city.

The structured interviews where taken on four different times of the week, in order to cover most of the patterns of people coming to Taljai. There were taken on Mornings and evenings of Weekdays as week as weekends. Thus here, the ratio of preferences with respect to time of visit for all the users stays equal.

Diagram 1: Pie chart showing percentage of modes of transport used to reach Taljai.

Mode of transport

Mode of transport makes a difference in the movement pattern of users. Pedestrian users tend to see Taljai as route for activities like walking, jogging and running. Thus, their movement on the tekdi is on the pathways and majorly limited till the Taljai Mata Mandir and the top of the hill. They tend to return from that point, hence it is the last point they go to Taljai. Whereas, for users who come by vehicles, Mata Mandir is the start point as they park their vehicles in front of it. Still the latter is seen performing the same activities in the ecopark.

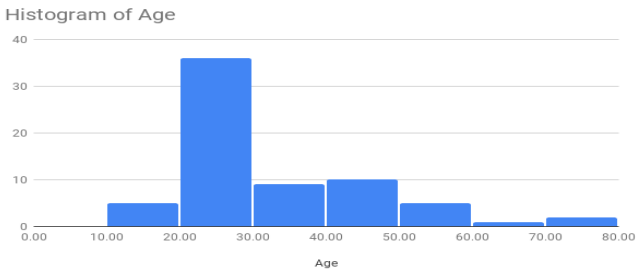
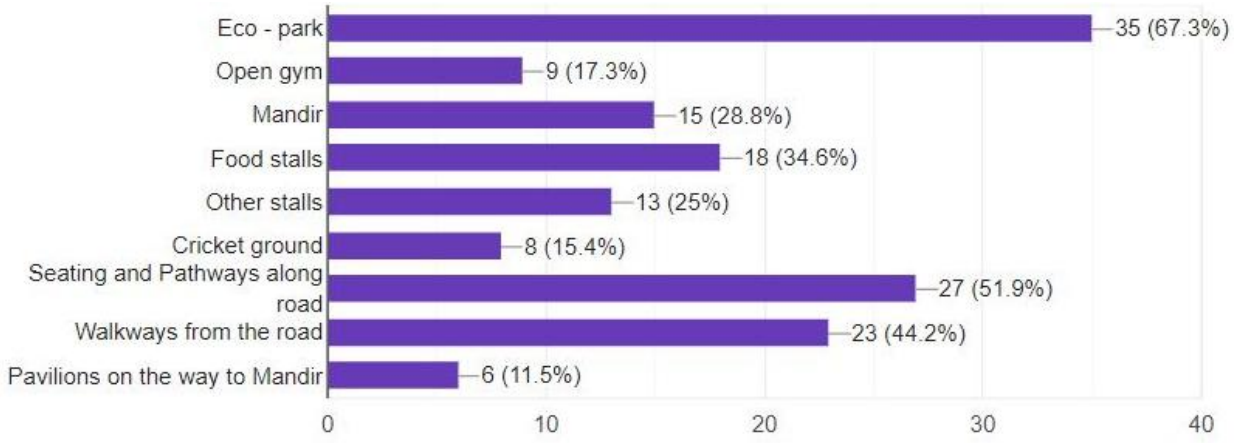


Diagram 2: Graph showing Histogram of Age of samples Taljai

Age

A important part of the study is the age factor. It is important to know people of what age group visit Taljai in order to understand the nature of activities happening on Taljai. The graph beside tell us that the age group ranges from 10 years to 80 years. And the most visiting users group is aged between 21years to 30 years.

Diagram 3: Graph showing percentage of spaces used by the samples Taljai



Count

According to the observations, spaces on Taljai tekdi in the stretch selected for the study are listed as per Diagram no 3 above. The Graph shows the use of spaces done by the sampling of 60 according to the structures interview. Each spaces is used for various activities. These activities can be classified as Fitness oriented and re- creational activities. As per the study, eco-park is the most used space on Taljai where activities like walking, running, jogging, Yoga, exercise, photography take place. Amongst the listed activities, Walking, Jogging, yoga and other types of exercises are the most performing activities in the Eco-park. It is stated as very conducive for healthy breathing and exercising within nature. Thus activities taking place in the eco-park can be classified as fitness oriented activities.

Spaces used next after Eco-park are the "Seatings and Pathways along the road" which again have majorly pedestrian people who come walking or park at the start of the access road and come till Mata Mandir. Seatings are used by cyclists and pedestrians in order to take a pause in between, Meets by the teenager groups,etc. Thus the activities taking place under this space category can be classified under fitness oriented activities.

Similarly analyzing, the activities under Eco-park, Pathways, open gym, Cricket ground can be classified under fitness oriented activities. These spaces witness activities like walking, jogging, running, various types of exercises, sports, meditation. These spaces are the spaces which holds major use. Whereas the rest of the spaces facilitate recreational activities and gets lets attention. Thereby, the studyshows that the tekdi being developed is in use for fitness related activities.The responses to the interviews and the activity mapping showing a larger picture show that the space is majorly use to activities facilitating heath and the development has encouraged a lot more punekars to join the regime.

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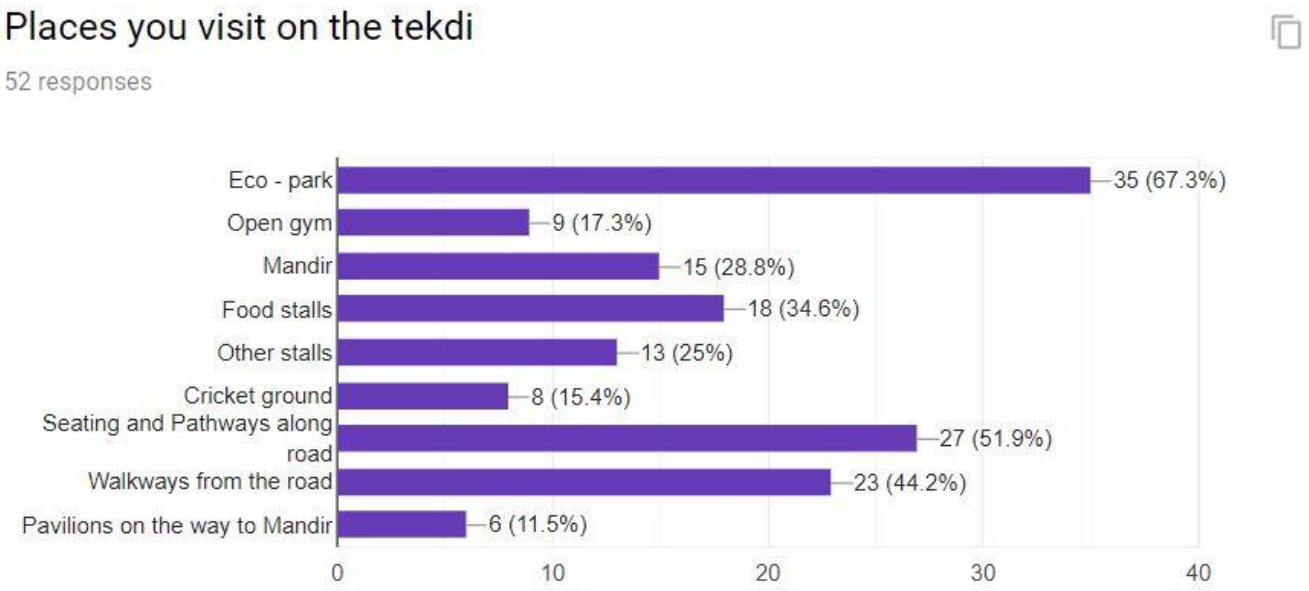

Identifying the Gaps in the Western Ghats Development Programme in Maharashtra

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Abstract : The Western Ghats Hill Ranges run to a length of about 1600 kms., almost parallel to the western coast of Maharashtra starting from the mouth of river Tapti in Dhule district of Maharashtra and ending at Kanyakumari, the southern-most tip of India in Tamil Nadu. The region covers an area of 1.60 lakh sq. kms. supporting a population of 442 lakh (1991 Census). The main problems of the Western Ghats region are the pressure of increasing population on land and vegetation, undesirable agricultural practices etc. These factors have contributed to ecological and environmental problems in the region. The fragile eco-system of the hills has come under severe pressure because of submersion of large areas under river valley projects, damage to areas due to mining, denudation of forest, clear felling of natural forests for raising commercial plantation, soil erosion leading to silting of reservoirs and reduction in their life span and the adverse effects of floods and landslides, encroachment of forest land, etc. An aspect not discussed in the Hill Area Development Programme or Western Ghats Development Programme is natural disasters and how to mitigate its effects on ecology and mankind. Observing the scenario of fatal calamities occurring on hill slopes in the recent past, this study focuses on one such gap identified, disaster management. It talks about the causes, explains the severity of its effects over the environment, and ultimately suggests a few modifications that could be discussed in the upcoming development plan.There should be provisions made in these programmes for spreading awareness of disasters to the people through social programmes explaining the causes and effects of the same and mitigating its adversities.

Keywords: Western Ghats Development Programme, Disaster Management, Lonavala, Sustainable Development

Introduction

This is a Report on the sustainability of the Development Plan for the Western Ghats with reference to the area in and around Lonavala. The Report consists of 2 parts: A. The Issues of in Sustainable Development in and around Lonavala and B. The study of the Development Plan for Western Ghats with reference to the areas in and around Lonavala.

Aim

To identify the gaps in the development programmes for the Western Ghats

Objectives

1. To understand the causes of landslides
2. To study the severities of real-life cases
3. To study the problems of hilly habitations

Research Methodology

This research paper has been done by collecting the primary data in the form of field work and secondary data in the form of survey of literature. The field work includes interviews with experienced and practicing architects of Lonavala, namely; Ar. Swati Aringale, Ar. Gayatri Khatau and Ar. Vishwas Kotkar.
The survey of literature includes the study of cases in and around Lonavala as mentioned in the references below.

Part A

The issues in sustainable development in and around Lonavala.

This section is based on a research articles on the issues in sustainable development in and around Lonavala.[1]Relevant extracts from the article are mentioned below. The broad geographic outline of the region is mentioned below.

Topography:

The Deccan Volcanic Province in Western Maharashtra is endowed with a variety of landforms. These landforms can be observed from sea level to over 1500 m altitude.

Climate:

Meteorological parameters such as rainfall, temperature and humidity play a role in both physical and chemical weathering of rocks and subsequent mass wasting processes.

a) Temperature: The Western Ghats experience a tropical monsoon climate. Though there is a variation intemperature all along the Ghats, temperature maxima occur in May (around 31°C) and minima in December and January (around 11°C).

b) Rainfall: The Western Ghats act as a barrier to south-west monsoon. The rainy season is restricted to four months i.e. between mid-June and mid-October. The distribution of rainfall is uneven, and its occurrence is uncertain, the components of uncertainty being dates of onset and cessation of monsoon, average rainfall, number of rainy days, dry spells, cloudbursts etc. During the month of June, depressions in the Arabian sea cause heavy rains, occasionallyin association with cyclonic storms, over the coastal area. Sometimes heavy rainfall is observed even in the interior areas.

Geology:

The Western Ghats of Maharashtra are constituted of horizontally disposed basaltic flows. These flows vary in thickness from a few meters to tens of meters and run laterally for a considerable distance in terms of kilometers. The rocks dominantly exhibit spheroidal weathering. The occurrence of weathering is erratic. The spheroids
can be of varying size, from pebbles to boulders, depending upon the nature and spacing of joints along which the process of weathering is found to be initiated. The development of in situ soil is largely controlled by the physiographic setup.

Anthropogenic changes:

Human induced changes along Western Ghats that are responsible for shifting
the equilibrium of slope stability is briefly described below:

a) Transportation Routes

As many as 9 State Highways and 2 National Highways (NH3 and NH4) pass across Western Ghats, besides 2 rail axes at Kasara and Khandala a 470 km long Bombay-Goa Highway (NH17) and now the Konkan Railway make their way through the foothills of Western Ghats. Though a few transportation routes are old, their widening is in progress intermittently. The transportation routes are found to be responsible for removing the support of the slopes from the toe at some places and/or adding weight to the slopes at other places.

b) Construction of Dams

The mountainous topography and fan shaped catchments developed particularly along the eastern flank and the high rainfall have provided an opportunity for undertaking several major and minor water harvesting projects. Majority of these projects are complete, and a few are on the way of completion.

c) Hillside Development

The metamorphosis of slopes due to housing, terracing for agriculture, shifting cultivation, gardening and approach roads, cutting trenches for diverting surface runoff, has attained an alarming stage in some parts of the Western
Ghats. Many towns are, linked by transportation routes and settlements are linked by rough roads. A vast area between Panchgani-Mahabaleshwar and Lonavala-Khandala

d) Deforestation

Considerable area of the Western Ghats that once supported thick vegetation has become barren due to deforestation for food, fodder, and fuel by inhabitants and unauthorized persons. Further, the practice of shifting cultivation by the tribal population has deforested a considerable area. The forest area is fast narrowing, thereby exposing the slopes to erosion due to loss of root support.

e) Quarrying

In few areas, hectic stone quarrying is on, where tremors caused due to blasting widen the joints or shatter the regolith. These quarries are located at various altitudes to obtain basaltic and lateritic blocks for civil construction, road material etc.

Examples of Landslides in and around Lonavala. These examples can be categorized into two:

1. Examples of landslides occurring in regions away from the Expressway
2. Examples of landslides occurring on the Pune Mumbai Expressway

I. Examples of landslides occurring in regions away from the Expressway

i) Case Study Of Bhaje Village Landslide In 1989

The episode occurred along hill slopes of eastern flank of Western Ghats, mainly between 750 m and 830 m altitude in Maval taluka in Pune District (between latitude 18°4N3' to 18°4N7' and longitude 73°2E7' to 73°3 0E') within a span of 2.27hours on 24th July 1989 between 6 am and 8 am, following the cloudburst event. Over 110 events ofsoil creeping and slumping and 11 events of land sliding (debris flow) were recorded. The landslides took place along the steep slopes (18° to 30°). A geological section observed at landslide in Bhaje, which took a toll of40 human lives. Rainfall data collected from Karla rainguage station, 1 km away from Bhaje, reveal that rains started in the middle of June. The ground was gradually saturated with water and springs emerged along the slopes. Heavy rains resembling cloud burst occurred in the area around 5 pm of 23rdJuly 1989. The rainfall continued for 24 hours. The total rainfall recorded on 24thJuly 1989 was over 600 mm which amounted to 1/6thofthe average annual rainfall ofthe area.

ii) Case Study Of Malin Landslide In 2014

A massive landslide wiped out the village of Malin located at 110 km from Pune city, in the Western Ghats on July 30. Mound of mud and debris that came down from a nearby hillock, swallowed up almost the entire tribal village of around 50 families. Due to the remoteness of the village, the tragedy came to light only when the driver of the first state transport bus reached the village a little after 7.30 am to find it uprooted. Final death toll was 153 when the rescue operation was stopped and around 100 people were missing. This tragedy has brought the focus back on the management –or mismanagement – of the vulnerable hills of India especially Western Ghats, Himalayas and North Eastern states There are many speculations about what caused such massive landslide. In this paper we are analyzing geotechnical aspects of the catastrophe. Some of the key facts to note are, heavy rainfall before the landslide (10.8 cm on July 29) and heavy downpour throughout the following day. This calamite is a lesson for sustainable geotechnical planning in future to avoid massive loss of human life and property. Detailed analysis of geotechnical facts is carried out and an attempt is made to pinpoint the cause and preventive measures are suggested.

Geographical Background Before Landslide

Malin village is a part of western ghat which is a UNESCO World Heritage Site and is one of the eight "hottest hotspots" of biological diversity in the world. Basalt is the predominant rock found in the hills reaching a thickness of 3 km. Other rock types found are charnockites, granite gneiss, khondalites, liptinites, metamorphic gneisses with detached occurrences of crystalline limestone, iron ore, dolerites and anorthosites. Residual laterite and bauxite ores are also found in the southern hills. Malin is southern part of Ambegaon taluka which falls to the foothill of Sahyadri Mountain range and is towards the west side of Pune city. The region has heavy rainfall during south-west Manson. In Malin region soil type is brown in color and western region have an average rainfall of 1171 mm. Common crop in the region is rice and fingemelet.

Culprits Of Landslide:

Inevitably there is huge speculation in the Indian media about the causes and triggers of the Malin landslide. Based upon detailed study following are found to be the culprits of Landslide. Malin is one of the 37 villages in Ambegaon taluk that was identified ecologically sensitive area by the Kasturirangan committee in its report on Western Ghats.

It was only in December 2013, that orders were issued to implement Union Environment Ministry's notification that banned mining, quarrying, construction of thermal plants and big building complexes in such areas. Recently Ambegaon had become realty hot spot. Several real estate developers have been advertising these farm houses or boutique residencies as "Lake Villa" or "Hill Villa". The taluka also has several tribal villages and one of them is Malin. Based upon the study following are found to be culprits of the landslide:

Very Heavy Rainfall

The region was receiving particularly very heavy rainfall in the week between 25th to 31st July. The data suggests that as much as 600 mm of precipitation may have affected this area prior to the landslide occurring. Cumulative rainfall in the last week of July as recorded by NASA's (The National Aeronautics and Space Administration of US) TRMM (Tropical Rainfall Measuring Mission, was more than 600 mm. In fact, on the 29th July, the region including Malin was shown purple in 24-hour rainfall map, which signifies the highest range of rainfall, exceeding 175 mm.There was continuous heavy rainfall since the last three to four days in the area, rainwater saturated the soil along the slope of the village. This developed as loose mud and eventually flowed down after gaining momentum, sweeping terraces, walls and ultimately the houses in the village

Human Interference in Nature

Stone quarrying results in formations that are unstable and could cause sudden landslides. This reason should be mainly considered in high rainfall region like Malin where rainwater may loosen the rocks and helps them to slide. Landslides caused by the human activity are common in the inhabited areas of the hilly terrain. Despite knowing the possibility of landslide after slope cutting for construction, many a time slopes are cut without any slope stability analysis and adopting necessary preventive measures. Similarly, slope cutting, construction of support wall etc. is carried out by untrained workforce with very little knowledge about good methods of hill slope development which results in the destabilization of slope. Construction of hydroelectric dams, deforestation and the spread of unregulated buildings along riverbanks magnify the impact of the monsoons. Development works carried out in pursuit of greater economic growth – such as the construction activities and deforestation – are putting people and the environment at greater risk when disasters strike. India is one of the most disaster-prone countries in the world, and many of its 1.2 billion people live in areas vulnerable to natural hazards such as floods, landslides, cyclones, droughts and earthquakes.

II. Examples of landslides occurring on the Pune Mumbai Expressway

i)**Case Of Landslide On The Pune-Mumbai Expressway In July 2015**[3]

The Pune-Mumbai expressway was kept out of bounds till late on 20th July 2015 after a landslide killed three persons on that afternoon.One of the passing cars had been completely smashed after tons of earth and rocks landed on the highway near the Adoshi tunnel, close to Lonavala, blocking a portion of the road. Though traffic towards Mumbai could not be restarted as continuous rains had loosened the soil and increased the possibility of more landslides.

The traffic on the expressway was hit the previous month too, after a landslide near the Khandala tunnel. No casualties were reported.

ii) Second Case Of Landslide On The Pune-Mumbai Expressway In August 2015[4]

A landslide occurred at the Mumbai-Pune Expressway in the early hours of 7th August 2015. The landslide struck at 3:30 am near the Adoshi tunnel, which is situated close to Lonavala. The traffic, however, was running uninterrupted. No injuries were reported. This was the second time in less than a month that a landslide has occurred on the Mumbai Pune Expressway near the Adoshi tunnel. On July 20, three people were killed after a landslide there. Continuous rains had loosened the soil and increased the possibility of more landslides, officials had then said.The Mumbai-Pune expressway, a nearly 100-km-long, six-lane road, was built in 2002. It usually

sees high traffic over the weekend, with people travelling from Mumbai to Pune and vice-versa. The traffic on the expressway was hit last month too, after a landslide near the Khandala tunnel. No casualties were reported.

Part B

Development Programme for Lonavala and Western Ghats[2]

The Western Ghats suddenly rise from the sea board like a wall from the Arabian Sea and have certain peculiarities of forests and other formulations. Due to its physiography, there are certain areas which have very heavy rainfall during monsoons, certain areas with high velocity winds and certain which fall under the rain shadow areas.
The Government of India, Planning Commission prepared a report on the problems of hilly habitations in areas covered by the Hill Area Development Programme/Western Ghat Development Programme in April 2008. This development programme caters to the issues of soil conservation, forestry, social forestry and horticulture. The schemes implemented under the Western Ghats Development Programme in Maharashtra are as follows:

1. Watershed Development Programme
2. Horticulture
3. Animal Husbandry
4. Fisheries
5. Minor Irrigation Programme
6. Sericulture
7. Bee-keeping
8. Roads (Foot Bridges)
9. Non-Conventional Energy sources

Conclusion

The entire focus of the Development Programme is towards the sustainability of the livelihood. The report does not consider any of the issues raised in the research paper mentioned in Part A. The development programme should also focus on identifying the areas which are prone to landslides. The Planning Commission does not take into consideration the construction activities taking place in landslide-prone areas. There should be provisions made in these programmes for spreading awareness of disasters to the people through social programmes explaining the causes and effects of the same and mitigating its adversities.

Acknowledgement

I thank my teacher and mentor for the subject of Research in Architecture, Prof. Aparna Mhetras for being a guiding light throughout the creation of this research paper. My sincere thanks to the Ar. Swati Aringale, Ar. Gayatri Khatau and Ar. Vishwas Kotkar to help me understand the scenario of Lonavala for my study. I also thank my father, Mr. N. Ashok Kumar for making me understand the importance of this research paper.

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Air Pollution Control Strategies: A Perspective on Planning in the Transport Sector Including Pedestrianization of Communities and Super Block System

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Abstract : Automobile and traffic congestion are the major issues faced by our urban areas today, leading to air pollution and change in climate. The emission of harmful gases in the transport sector has reduced the air quality in turn affecting the life cycle of the citizens. Pune being a metropolitan city with IT sector has a flooding population from various neighboring states and villages. Due to increase in the population, the use of private vehicles has also increased. Public transport is not well connected and is time consuming hence people prefer to travel on their own. Improper traffic planning, road construction and lack of rules and regulations causes jams. Road widening, flyovers, subway and ongoing metro construction work has added to traffic inconvenience and air pollution. Concrete and Tar roads with busy traffic flow and lack of open, green spaces has reduced air visibility adding dust and smog in the atmosphere. The paper addresses different modes of public transport, pedestrianization policies, cycle track system, super block arrangement and limiting vehicular access to promote healthy and active living conditions. It includes the study of foreign cities like Barcelona and New Yorkdiscussing their planning principles and urban design guidelines for traffic regulation and facilitating healthy environments. The paper concludes with suggestive measures for curbing air pollutionof Pune. Following factors like improvement of traffic flow, expanding BRT service, promoting cycling, public carpooling and building transit infrastructure would help maintaining air quality and support a good life of the citizens in Pune.

Keywords: *Traffic congestion, Super block system, Active living, Air pollution.*

AIM:
To study air pollution control strategies by researching on planning policies in the transport sector of urban agglomerations.

OBJECTIVES:
- To collect information about all the traffic issues taking place in and around the developing urban areas in Pune City.
- To observe the traffic flow and congestion areas causing a rise in air pollution level.
- To do a comparative study of the planning principles and urban guidelines of foreign cities like Barcelona, New York City and applying it to Pune's transit infrastructure development.

Introduction

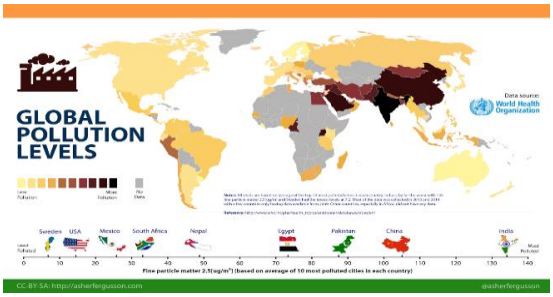

Figure 1 Global Pollution Level (ecoclimax, n.d.)

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Air is one of the most important constituents of the living environment consisting of 78% nitrogen 21% oxygen & 1% carbon dioxide and other gases. An average human being needs about 12kg of air each day which far more than the amount of food is consumed every day. But this necessity of life is rapidly getting degraded due to the increasing developments that usually occur as countries become industrialized, increasing traffic, economic development and higher level of energy consumption**.**

Air pollution is a serious environmental concerned for human being. According to the CPCB studies about the air quality in India, a cubic sample of air was tasted which gave the idea about the sources of pollution causing agents those were majorly 22.5% transportation, 22.3% diffused sources, 17.7% industries, 12.2% diesel generator sets, 11.5% dust, 9.8% brick kilns, & 4.8% power plants. Now days the awareness for growing risk of environmental problem causing threat to the life support system, including excessive use of natural resources, combustion of different fuels which releases high amount of toxicity into the breathable atmosphere, which cause unstable lifestyle.

Due to the population explosion the use of vehicular access has been increasing tremendously, becoming one of the major causes for global warming, on an average a single passenger vehicle releases around 4.6 metric ton of oxygen each year. According to the study of WHO global air pollution ranking, India stands in top 3 most polluted countries in the world. 14 cities out of 20 most polluted cities in world are from India but the top 14 cities are from India itself.

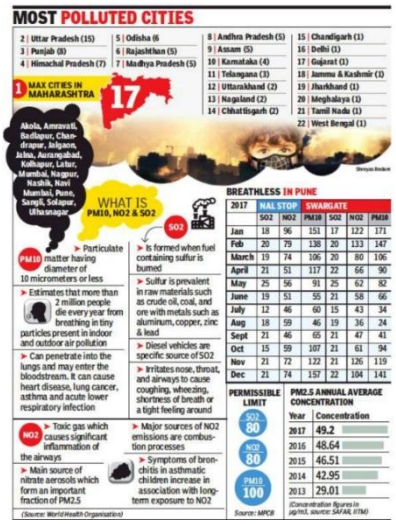
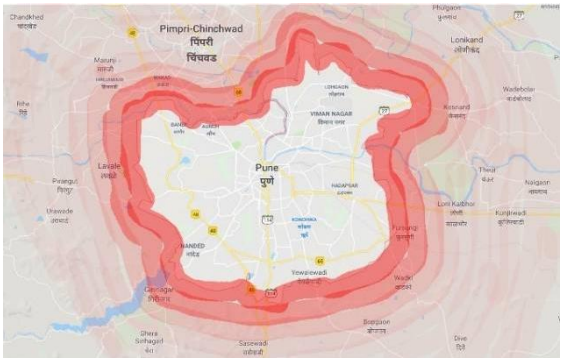


Figure 2 Air Pollution Level In Pune (The Times Of India, n.d.)

Air pollution has become one of the serious environmental concerns of the urban cities of many countries including India, where majority of the population is exposed to poor air quality. It causes health related problems such as respiratory diseases, risk of developing cancer and other serious illness. Most of the Indian cities are also experiencing rapid urbanization and the majorityof the country's population is expected to be living in cities within a span of next two decades. It has also resulted in increase of the number of 2 stroke vehicles. The vehicle mob has doubled in some cities in the last decade. Vehicle emissions are now becoming the main cause of air pollution in modern India. The growth of the vehicle industry in India ranks second in the world. Approximately around 10 million vehicles are manufactured annually in the country today. Motorization rate in India is 26 vehicles per1000 population, and this is lower than many developing countries throughout the world but over the last three decades number of motor vehicles has been doubling against a 2-5% annual growth transport sector emits an estimated 261 tons of CO2, of which 94.5% is contributed by road transport. According to data out of total 3,000 metric tons of pollutants out every day, close to two-third (66%) is from vehicles in Delhi. Similarly, the contribution of vehicles to urban air pollution is (52%) in Bombay and close to one-third (33%) in Calcutta, and (35.7%) in Pune city. Due to which there is an adverse relation between engines and air pollution. Vehicular emissions depend on vehicle age, performance, usage & speed. The average speed in Indian cities are far less than the moderate one.

Increasing traffic and limited road space have reduced average peak speeds to 10-15 Km/h in the central (The Times Of India, n.d.) areas of many major cities.



Puneis one of the fastest developing IT sector area which leads to high number of migrants travelling through all over the cities to Pune which might lead to increase in vehicular pollution. As per the recent declaration by the Government that Pune is the best livable city due to the tropical.

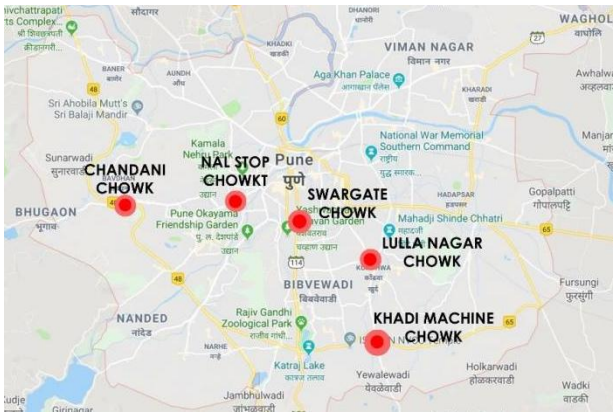


Figure 3 Expanding Pune

moderate climate but due to the increase in industrial development the quality of the air is drastically changing towards unhealthy type. In years of 80's, Pune was famously known as the city of bicycle for transportation and means of fast communication, but due to vast development in urbanization and industrialization, the means of transport change drastically over the time and the city became known for large number of two stroke two wheel engines which later was an attraction point for two wheeler manufacturing companies which leads to an increasing air pollution.

Literature Review:

Traffic problems in Pune

The inadequate number of traffic signals in the city for the increasing number of mishaps in the city. There are around 1,400 chowks in the city of which only 236 have traffic signals. (DNA, n.d.) The main traffic problems of Pune are road accidents & traffic jams. "Pune metropolitan region has over 37 lakh vehicles.(INDIATODAY , n.d.) As per the data stats accidents claimed 363 lives in the 365 days of 2013 & a drop by 44 compared to 2012 i.e. 1 accident per day. Hence Zebra crossing must not be parked with vehicles and there should be a separate timer for pedestrians and those who will violate will attract certain amount of fines. Inefficient Road Network, Inter-City Bus Transport, Poor Traffic Management, Violations of Traffic Rules & Regulations, Bad Constructions & Improper Management, Absences of Infrastructural Requirements these are the problems caused by drastically increase in vehicular demand day by day.Since 1960, Pune traffic has increased by more 105 times, whereas the road network has grown by merely by 6 times. Hence due to huge traffic load, the road network is insufficient and hence is causing traffic jams and fatal accidents. As per the data, the existing road network is 7% while the requirement is more than the double i.e. 15% .Hence there is a gap of 8% between them and due to this gap, there are many huge traffic jams in different parts of the city and these traffic jams are time consuming and hence the

commuters are in hurry to reach their destinations. The road infrastructure has not expanded sufficiently with the increase in the number of vehicles in the city. There are more than 12.5 lakh registered vehicles in Pune as on date which also at high risk for increasing air pollution. In Pune there are three major inter- city bus terminals located at Swargate, Shivajinagar and Pune Station. These terminals cause problem to the inter-city traffic with origin and destination other than Pune. Traffic police are positioned at major traffic signals and mainly they are busy in issuing challans to the offenders. The contactors are making money by doing bad constructions which causes jams and accidents instead of providing good road quality. Amenities like Flyovers, ROB and Subways are limited in number in Pune city and due to which many parts are facing huge traffic jams problems.

Impacts of traffic problems:
Traffic Jams involve rush, slower speeds and increased travel times, which costs on the economy. It has also a range of indirect impact including the marginal environmental and resource impacts of jams, impacts on quality of life, stress, and safety as well as impacts on non-vehicular road space users such as the users of sidewalks and road frontage properties.

Reasons of traffic problems:
New traffic norms, VIP Movement Cultures, Inadequacy of Traffic Police, Narrow Roads, Illegal Parking, Increasing number of populations, Improper Planning of City Development, Improper Lane Management.

Following are the most congested chowks of Pune:

Swargate: The road infrastructure has improved but the vehicular flow has also increased. The underground subway is a located at the junction along with S.T. stop which will contribute towards greater traffic at this junction.

Khadi machine chowk: The state ofthe road infrastructure has not improved for this place. Kondhwa being a suburb of Pune is constantly expanding with new construction which is polluting the environment with dust, noise. Absence of traffic signals, insufficient road width, haphazard roadside parking are some of the reasons whichamount for the traffic.

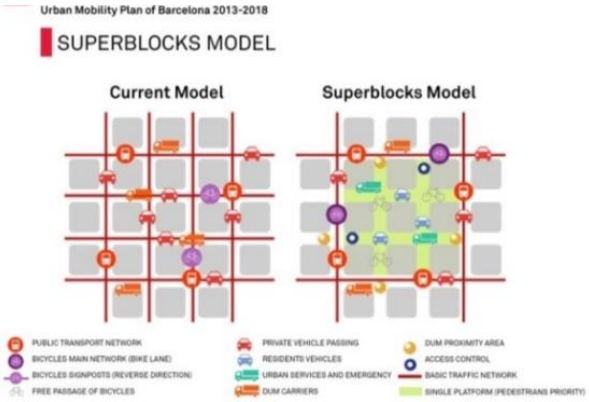
Nalstop chowk: At this junction, there are two signals which hold one side up to 2 minutes. Narrow strips of parking are not sufficient hence people tend to park on the street side and reducing the road width. The Karve road serves as aroad with major traffic or vehicular flow and due to the undergoing metro construction has contributed to more traffic and air pollution.

Chandani chowk: High traffic along with diversion to Paud road from Bavdhan results into traffic jams. Various activities taking place at this junction. The sloping road from Bavdhan is directly connected to diversion from highway which accounts for majority of accidents. As the vehicles on hold emits more carbon dioxide and traffic also contributes to it.

Lulla nagar chowk: Lulla nagar chowk connects all the main parts of Pune like viz. cantonment, Hadapsar, Kondhawa, Bibwewadi, the traffic flow is much denser during peak hours. With traffic the construction of flyover and various ongoing building construction projects also adds in major proportions to the existing air pollution.

Planning principles for transportation implemented in different countries:

1. Barcelona: Super Block System



In the developed cities like Barcelona, the awareness for air pollution has been taken seriously based on its measures one of the most important step includes CPULS (continuous productive urban landscape) which involves in plantation of annual usable green belt, like planting fruit trees, nuts, berry hedges, diverse vegetation. These bio threads allow nature into the cities, birds, pollen, bees, etc. Also, vertical gardening plays a vital role in prevention of air pollution.

Another most important measure is 'The Super Block Model'. According to the model theory only a certain type of vehicle is allowed in the core of city only. In case of emergency rest there are specific zones which allow the vehicular movement, which helps pollution reduction.

2. NYC (New York City): Promote public transport

Although NYC air quality has been improving for several decades, air pollution makes a serious concern. Therefore, NYC launched 'PLANYC' its first long-term sustainable plan it includes: Built and expand transit infrastructure, increase capacity on key congested routes by funding projects that eliminate capacity constraints, Improve and expand bus service, Promote cycling. NYC had given preferences to the public transit system it cause to reduce in air pollution.

Suggestive measures to traffic problems

For Pune, to be a city with good and healthy environment and fresh air, following measures need to be implanted in Pune's congested areas such as: Bus Rapid Transit (BRT), metro rails and mono rails should be built to encourage the use of public transport, Mass Transit System should be started in the city by inviting private operators to share the burden which will help in carrying more people with fewer vehicles, No entry without helmet, No road side parking, Big Vehicles should be not allowed to park at roads, A Strict lane management system like Different lanes for different types of vehicles should be marked on the roads and law, Any Vehicles older than 12 years should not be allowed to run on road, People should be motivated to use public transport more and more, Sharing Transportation System (STS) should be promoted, Number of Buses should be increased based on population of the city, Traffic department should use RFID technologies to stop rules violations, Traffic department should start a radio channels which will announce the traffic updates, Traffic department should install CCTV cameras at every signal to monitor the rule violators, Superblock traffic management system should be imposed, CPULS (continuous productive urban landscape system) should be taken into consideration.

Conclusion:

In 2nd millennium the key problem is the air pollution where certain measures by experts are been taken to get it under control and support the crucial life form on Earth. Technical measures alone are insufficient therefore some following steps need to be taken on individual basis. Employed as part of an integrated transport and environmental problem, certain measures can bring about necessary changes in building up environmentally friendly transport system. In addition, use of effective public transport system and alternative fuels also improves environmental condition.

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Designed Accessories, Gadgets & Smart Appliances for Elders & Differently Abled

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Abstract : Aging leads to balance impairment - visual impairment - learning disability - mobility impairment. Performing standing, seating, walking, relaxing, eating, bathing, toilets, sleeping, studying etc. are normal activities for everyone but are very critical to aged. Accessories, gadgets & smart appliances make elders younger. So product design is profession which designs & serves the purpose of such crowd. We have interviewed with users & analyzed their problems to perform activities & products shortfalls. Special appliances – smart technologies & gadgets are designed by us in following categories for smoothening activities related to elderly (having 3 categories such as independent elders- partially dependent elders & fully dependent elders).
Standing ques

Walking / movement / climbing appliances such as walkers – wheelchairs etc.
All activity exploring gadgets
Opening accessories
Wash room gadgets
Alarming / call digital technologies
Accidental emergencies appliances
Electrical appliances switches
Furniture / opening hardware's
We are coming out with sketch with sizes & material, specifications of various projects which smoothens activity of elderly a prototype module.

Key Words – assistive technology, elderly people, acceptability, home, gadgets

Introduction

The terms *assistive device* or *assistive technology* can refer to any device that helps a person with hearing loss or a voice, speech, or language disorder to communicate. These terms often refer to devices that help a person to hear and understand what is being said more clearly or to express thoughts more easily. With the development of digital and wireless technologies, more and more devices are becoming available to help people with hearing, voice, speech, and language disorders communicate more meaningfully and participate more fully in their daily lives.

Defining assistive technology

Assistive technology was defined in the research as 'any device or system that allows an individual to perform a task that they would otherwise be unable to do, or increases the ease and safety with which the task can be performed'(CowanandTurner-Smith1999).Thisdefinitionembracesservices and interventions provided by various professions and organisations and with different funding sources. Many in Britain have been separately provided, namely community equipment, housing adaptations, community and other alarms and 'smart' technology, except when prescribed and commissioned by occupational therapists. The definition also embodies a 'social model' of disability, which recognises that older people's disability arises from the interaction between their physical and mental capacities and the environment, especially their housing. The value of the social model of disability to the circumstances of older people is increasingly recognised (Askham 2001; Heywood 2001; Heywood, Oldman and Means 2002). As Oldman (2002) wrote, 'the message is never so compelling as in the case of housing … the house, its steps and stairs, its too

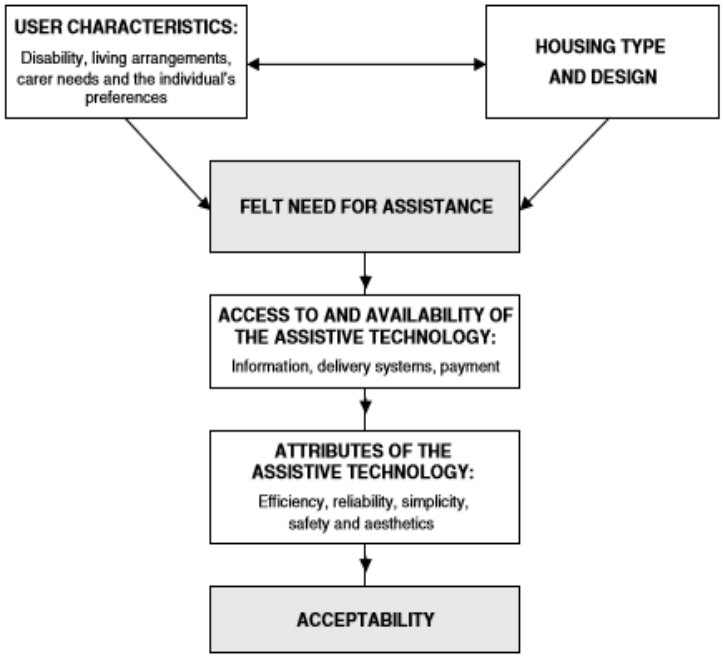

Figure 1. A model of the acceptability of assistive technology.

Importance of assistive devices in Indian context

In India the field of assistive technology for locomotor disability had largely been an unorganized and unregulated domain, although there had been some documented evidence of organizations keeping accounts of total turnover in terms of device units and fiscal turnover. But accountability in terms of device usage; device rejection; user's perspective; influence of various socio-political, sociocultural, socioeconomic and socio-demographic was found to be almost non-existent in Indian context. These aspects coupled with some of my personal clinical experience lead me to ponder and search for relevant existing works; although the western world was found to be extremely vigil in these domains, there weren't any encouraging document found in the Indian context. And thus the non-existent evidence was my inspiration to embark on this pursuit.

This study included subjects with wide range of locomotor disability using variety of assistive technology, representing various socioeconomic strata and from different part of the country, thus making a compilation of very rich data. And finally four type of assistive technology (wheelchair, tricycle, crutches and knee ankle foot orthosis), that were found to be most prevalent amongst the locomotor disabled, were taken up for further analysis to establish the various psychosocial associations in the context of the users. The psychosocial outcomes in the current study had been described under two constructs the first psychosocial impact with assistive technology and the other improved life satisfaction with assistive technology. In the process of this study several useful information that were unearthed and hope to go on to make some useful link into the system – the way assistive technology is managed and perceived in India.

Perspectives on older people's use of assistive technology

Assistive technology (AT) has the potential to narrow the gap between an individual's capacityand theirenvironment,andtherefore to makeiteasier for people to remain in their existing accommodation. The extent to which AT can narrow the gap depends on older people's willingness to use it, which in turn depends on several complex factors: the needs that people perceive, amongwhichsafety maybe the mostimportant(Mannetal.1994; Zimmer and Chappell 1999; Wielandt and Strong 2000; Roelands et al. 2002); the perceived usefulness of the AT (Czaja and Barr 1989; Hartke, Prohaska and Furner 1998; Chamberlain et al. 2001); and whether the individual feels that use of the device either supports or undermines their sense of personal identity (Gitlin, Luborsky and Schemm 1998). The heterogeneity of older people and the diversity of their living circumstances mean that individual preferences will play a strong part in people's attitudes.

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Literature review

As the disability & it's percentage differs from person to person. The need & use of available devices changes as per individual's preference. This is due to various factors, cultural background, economical status, availability of required environment, stigma issues etc. All these factors impact on the making of assistive devices.

Gadgets used for hearing aids

i. Ear lift lobe support
ii. Axon blazon sound enhancement
iii. Siemens hearing aid vita
iv. Omron digital hearing aid
v. JSB professional hearing aid
vi. Altering devices
vii. Amplified handsets
viii. Computer assisted notetaking
ix. Telecommunication devices
x. Wireless device
xi. VRS video phones
xii. VV talker

Gadgets used for speech impairment

- Augmentative & alternative communication

(AAC) devices with digitized speech output

- AAC devices with syntheized speech output
- Low tech AAC
- High tech AAC
- Electronic fluency devices

-delayed authority feedback (DAF)
-frequency altered feedback (FAF)
Talking device

Gadgets used for visual Impairment

- Electronic travel aids (ETAs)
- Electronic orientation aids (EOAs)
- Position locator device (PLD)
- Assisted vision smart glasses
- Aluminium glasses
- Braille ebook reader
- Finger reader
- Magnifiers
- Typewriters
- Light probe

Assistive devices have a central role in social policy. Health professionals use a variety of names to describe assistive devices:

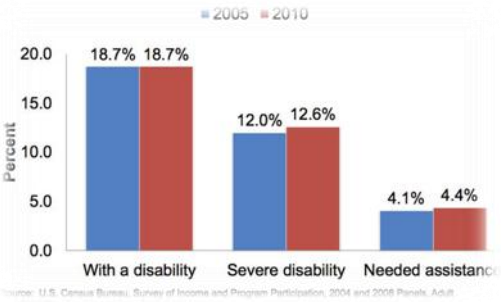
Assistive listening devices (ALDs) help amplify the sounds you want to hear, especially where there's a lot of background noise. ALDs can be used with a

hearing aid or cochlear implant to help a wearer hear certain sounds better

Augmentative and alternative communication (AAC) devices help people with communication disorders to express themselves. These devices can range from a simple picture board to a computer program that synthesizes speech from elderly people, who are facing different disability due to medication, old age, accidents, etc

Use of assistive device make one's life more enjoyable though they have varied disability issue. Especially the elderly people want to live freely & independent. Due to development in various seators in Indian context, many job avenues are available for younger generation. Hence living alone becomes the only option left for maximum elderly population in urban India. The assistive devices are useful for them to enjoy all the aspects of life. Assistive device reduces barriers between people with disabilities and their environment. They empower people with disabilities to live with dignity as equal members of society and give them a new freedom and independence

Alerting devices connect to a doorbell, telephone, or alarm that emits a loud sound or blinking light to let someone with hearing loss know that an event is taking place.



Methodology

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Further research area which are elaborated through the following table.The table explores them.

HEALTH ISSUES	FURNITURE RELATED ISSUES	REQUIREMENTS	TRANSPORTATION	USE OF GADGETS	DEMANDS
Blood Pressure, Diabeties , Heart ailment.	Since she is a aged person she stated that she had some difficulty using the washroom, hence there should be a provision of bars.	Didn't use public transport.	Living on the first floor provides a difficult task of treading the stairs everyday so she wished for a lift to be installed.	No such use.	She refrained herself from using any technologies
None	Switches should have been provided near the bed for better comfort.	Travelled in a cab if necessary.	She demanded the installation of non-slippery tiles.	Nope	Automatic gadgets should have been provided.
Back Pain	Asked for the chairs to be well cushioned.	Didn't use public transport.	Requested for the food to be served directly to the rooms	TENS device (to relieve back pain)	No such Demands.
None	Lack of Circulation space in the room.	Used public transport.	No requirements	No use of any type of gadgets	None
Hearing Ailment.	Was content with the furniture.	Travelled with a helping aid when necessary.	Flash lights should be provided instead of bells.	Uses a hearing device.	None
Mental Issues	(We were assisted by someone on her behalf but couldn't get much needed information).				
Speech Impairment.	No issue regarding the furniture	Didn't travel much.	Bells should be provided in each room.	Signages were used for communication	A tablet
Blood Pressure, Diabeties	The bed should be placed near the toilet	Didn't travel much.	Room service should be provided.	Wheelchair	The wheelchair could have been automatic.
Hearing ailment.	No issues regarding the furniture.	Didn't use public transport.	Asked for the provision of lifts.	Cyber Sonic hearing device.	No such demands.
Knee Pain	Lack of space between Chair and Table in the Dining area.	Seldom use of public transport.	Recliner chair should be provided.	Knee Caps.	Social events should be organized .

Conclusion

This study focuses more on hearing and speech disability, the explaination is about the assistive devices used for it in Indian context.

This paper reports the findings of an opinion survey using a semi-structured questionnaire of a purposive sample of 12 people aged 65 or more years living in the community in India. A purposive sample was drawn because, to our knowledge, no sampling frame of older in the community is available. The response rates to the screening questionnaire are shown in Table. Eight respondents were recruited from the returned screening questionnaires to include a range of AT(assistive technology), ages, gender, problems faced, demands, types of gadgets used, extent and types of disability, and those living alone or with others.

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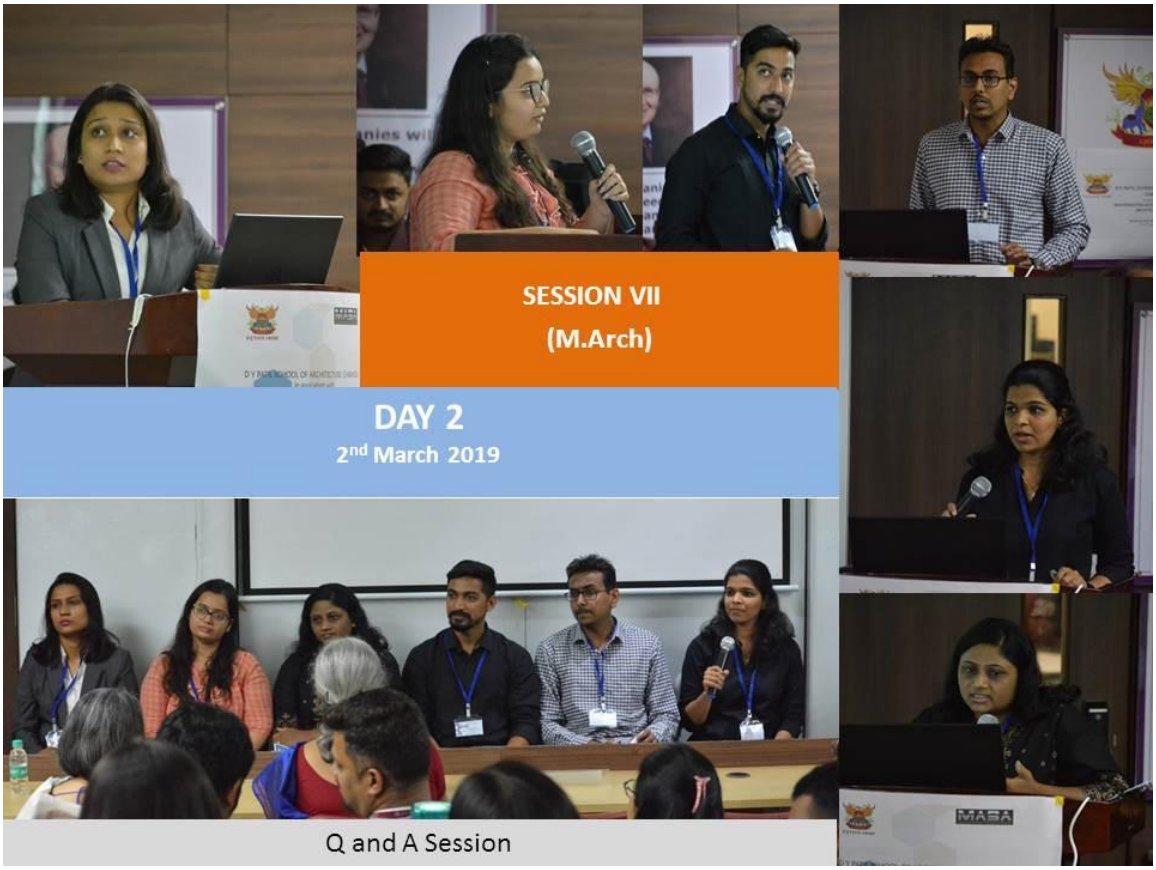

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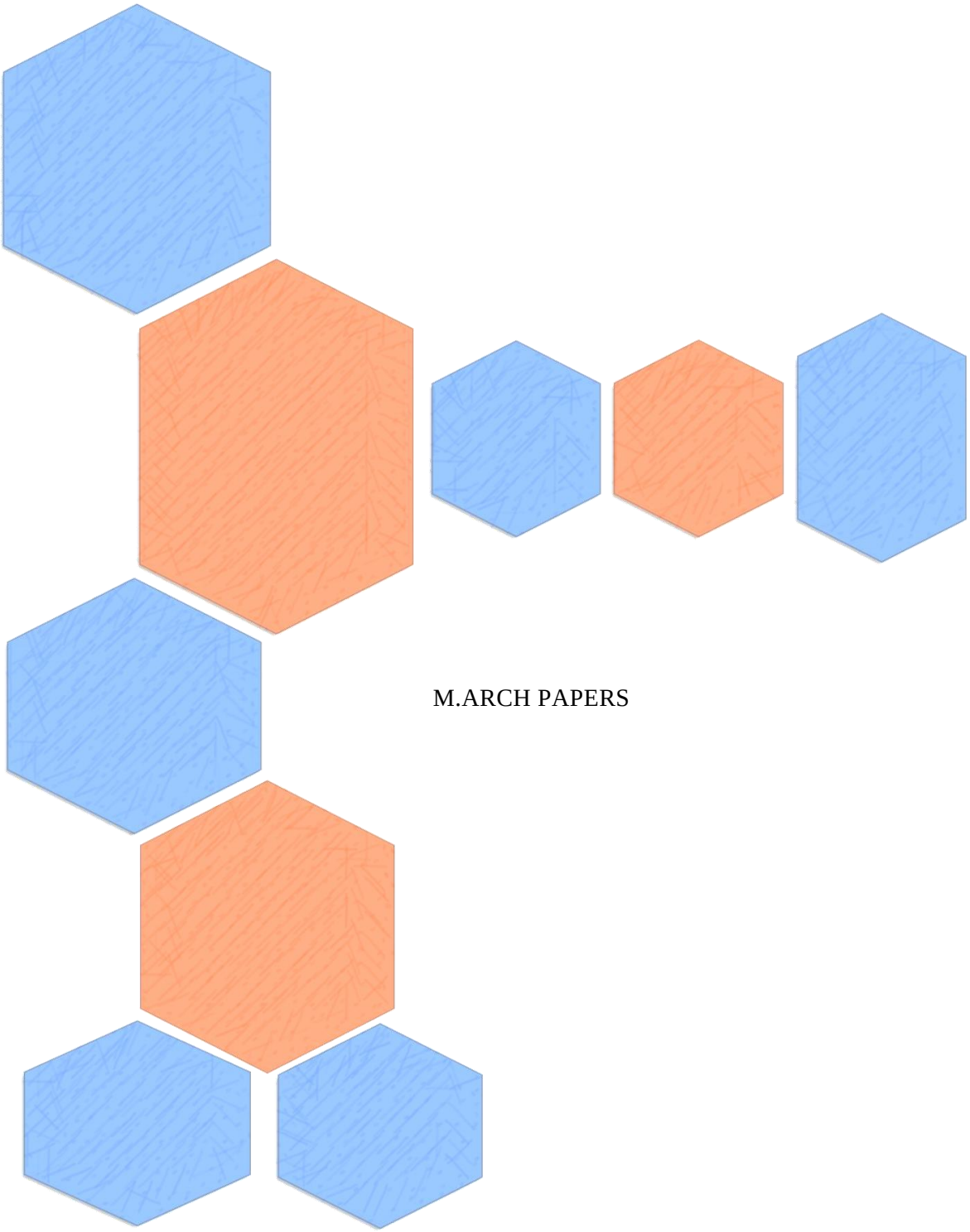

M.ARCH PAPERS

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Role of Native Plants for Greenway Mapping in Charholi Budruk, Pune

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Abstract : It is a proven fact that there is steady rise in the population of cities. The semi urban regions are now transforming into urban cities in faster pace. This trend of shift from rural to urban will continue and more people will come to stay in the cities. In this given factual situation, it is imperative to make cities more livable by providing more pollution free green areas, from singular plants to continuous corridors and green urban forests. The coming years will be of great challenge for environmental experts to contribute in the well-being of humans living the urban and semi urban cities. In this context, the present study focuses on identification and analysis of existing trees, native and non-native, for promoting green spaces. It is well understood that the enhancement of the urban fabric through native trees will play vital role in the city development plan. Therefore it becomes essential to map the native trees which in turn will create a basis for establishing a continuous greenway corridor. For the said subject under review, this study conducted in Charholi Budruk, in the city of Pimpri Chinchwad, Pune. The study conducted in Charholi Budruk explores the viability of creating continuous greenway corridor through existing and proposed native trees, using the overlay technique. Thus it is concluded that it is possible to create such greenway corridor and insert it in the development plan of the city, which will help to enhance the livability of the citizens through conscious environmental up gradation.

Keywords: Native plants, Greenway, Overlay method, Charholi Budruk

Introduction

The concept of Native plants has been broadly accepted, but the detailed meaning of "native" is doubtful to be found in agreement. (Web, 1985). Web Defines nativeas:*a native plant is one that has arrived before Neolithic times, or has arrived since without human agency* (Web, 1985). Though the context is referred for UK, it may be accepted as a generic definition. Thus, nonnative species are those which have been introduced intentionally or unintentionally after this time. (Mark, 2011).

The importance of nativity in plants and the dangers of non-native and exotic species have been argued under the following five heads (Hitchmough and Dunnett, 1996; Gilbert and Anderson, 1998; Worrell, 1998).

- Natives are efficient in growth compared to exotic species
- Exotic specieseventually become invasive and outgrow native species
- Natives plants support ancillary species and promote their growth
- Native plants exhibit biodiversity and contribute to world native seeds
- Native plants define the landscape character of the region

(Kendel and Rose, 2000)

Odum (1971) defines the ecosystem as, a set of living organisms in a given area which interact among themselves and between them and the physical environment in which they are inserted, resulting in energy flows and material transfers through the various levels of the food chain.

This paper will understand the contribution of native plants in the urban ecosystem. Charholi Budruk is the selected study area to conduct the research. Data collection is done through Google earth imagery and on site verifications with the help of guide books and expert comments. Analysis of the data is done through overlay method in CAD and GIS software for evaluating the role of native trees in greenway mapping. A proposal is presented to prove the possible insertion of a continuous greenway through policies and plantations in the missing links. Livability index of the city is thus enhanced through a continuous greenway of the existing water stream and the native plants.

Urban Ecosystem and Native Plants

Unlike natural ecosystems, the urban ecosystems are different. Urban systems are affected by the various interactions which are necessarily man made and also with respect to culture, personal behavior, politics, economics and social organization (Sriniwas, 2014). Climate change is an accepted phenomenon based on the physical evidence published in form of report by UN's climate panel (IPCC, 2013). Around 2050 over 6 billion people are said to be living in the cities (McCarthy et al, 2010). The huge benefits provided by urban green areas will be topic of interest to be seen on how they respond to the changing climate. Therefore it is of utmost importance to design the cities of the future as green cities such that they safeguard the integrity and maximize the functionality of the photosynthesis process in the changing climate. We know that trees absorb carbon dioxide through the process of photosynthesis and store carbon and emit pure oxygen (Nowak *et al*., 2000, 2006; Ling Qiu et al., 2018). Leaves absorb the particulate and the gaseous pollutants. There are many studies which have scientifically proven the capacity of capturing the gaseous and air pollutants (Maria Rucandio *et al*., 2011; Lorenzini *et al*., 2006; Dzierzanowski *et al*., 2011; Salmond *et al*., 2013). Although there are some evidences which are contrasting and are reported in literature that wind speed are reduced in street ways due to the presence of trees which in turn worsen the situation of air pollutants(Buccolieri *et al*.,2009; Gromke and Ruck, 2012; Salmond *et al*., 2013; Pelkonin*et al*.,). It is confirmed through research that green areas and trees in particular, with respect to an urban environment do have benefits to the social, bioecological, cultural, environmental and economic benefits (Akbari, 2002; Nowak *et al*., 2006). Trees provide shade, they absorb and reflect the solar radiation which in effect reduces the glare from different surfaces like buildings, pavements and so on. Trees in effect control the wind speed by increased resistance and thus retain the evaporating precipitation. Trees transpire and thus raise the humidity in dry season. This is observed particularly under a tree canopy. An important research proves that healthy large canopy and quickly growing trees provide greater ecological and environmental benefits rather than small slow growing trees (Nowak *et al*., 2002). It is now understood that trees will be our good allies in the struggle against climate change, and for that they need to be in good health. Although trees are vulnerable to the stresses due to global climatic changes, they have been exposed to such changes over a longer period of time and they have resisted the impacts in an efficient manner (F Ferrini *et al*, 2014)

The Study Area

Charholi Budruk is an ancient village near Alandi in Pimpri Chinchwad, PuneDistrict, Maharashtra state, India. Charholi lies on the southern bank of Indrayani River. It has Latitude: 18.65866 Deg Nand Longitude: 73.893685 Deg E

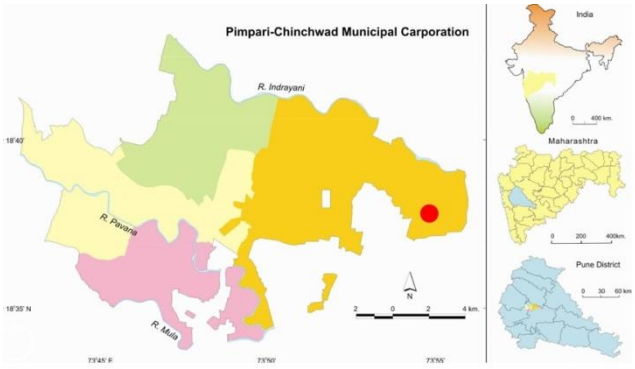

Figure 1: Location details of Charholi Budruk, Pimpri Chinchwad

The population of Charholi Budruk is15,600.(Census 2011) and the extrapolated population growth is envisaged at 5,00,000 in the year 2021.Charholi is located at a distance of 23 Km from Pune towards north east side. The main occupation of the native population is farming. This region is rapidly urbanizing due to migration from Pune and other surrounding regions and developing as new residential town, along with industrial growth in central region of Pimpri Chinchwad Municipal Corporation.

Pimpri Chinchwad Municipal Corporation (PCMC) has published the development plan (DP) for the newly merged villages in the fringe areas including Charholi Budruk. The DP indicates a very insightful thought process for the overall development of the region based on the requirements that are bound to be fulfilled in the next 20 years. As such, strategic reservations are proposed for public utilities, transport, recreation, industry and green belt. (PCMC 2014). The green belt reservation kept along the water stream is demarcated as 12m on both the banks.

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Figure 2: Partial proposed development plan of Charholi

Data collection

The data was generated primarily from Google earth software. High resolution image of the study area was captured and transferred on CAD software. A layer was created which demarcates the location of each tree. Another layer of the development plan, published on the Website of PCMC was created in CAD. Both the layers were superimposed and matched to scale. The pinpointed location of all the trees was confirmed on the software with the reference of the existing elements, such as roads, water stream and plot boundaries. A physical verification was done on site for confirmation of exact superimposition of the 2 layers with respect to the above measurable physical elements. A sample area of approximately 1 hectare was selected from the total of 15 hectares of the study area. A physical verification was done on site, by measuring the distances between the trees and the verified elements such as roads. The tally of the physical verification was done through GPS software support using Smartphone device and a compatible GPS application. The confirmed data was extrapolated over the remaining 15 hectares of the study area and thus tree locations were confirmed on the map.The aspect of native tree identification was an important factor in data collection for the selected study area. Reference guides were used to identify and demarcate the native trees. (Mahajan, 2009) (Mahajan, 2010)

Some of the common plants found in Charholi:

Umbar (*Ficus racemosa*); Amaba(*MagniferraaIndica*); Kadunimba (*Azadirachta Indica*); Chinch (*Tamrindus Indica*); Erand(*Ricnus communis*); Shevaga (*Molinga olefera*); Subhabhul (*Leucaena leucocephala*); Wad (*Ficus fenghalensis*); Pimpal (*Ficus religiosa*); Jambhul (*Syzygium cumuni*); Sitaphal *(annona squamosa*); Ashok (*Polyalthia Longifolia*); Naral (*Cocos nucifera*); Awala (*Emblica Oficinalis*)

Kadunimba (Azadirachta Indica)

Awala (Emblica *Oficinalis*)

Umbar (*Ficus racemosa*)

Amaba(MagniferraaIndica)

Shevaga (*Molinga olefera*)

Erand(*Ricnus communis*)

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Wad (Ficus fenghalensis) **Pimpal (*Ficus religiosa*)** **Chinch (*Tamrindus Indica*)**

Figure 3: Common plants of Charholi

The demarcation of the existing water way in Charholi was done in a similar way. The stream was located in the Google earth software. A high resolution image was transferred in Cad software be creating a layer. This was superimposed on the layer containing the Development plan for PCMC. Physical verification was done on site by confirming the dimensions with existing physical entities such as roads and trees. The entire data of Trees, water stream and thedevelopment plan was thus correlated with each other on the software and confirmed on the site.

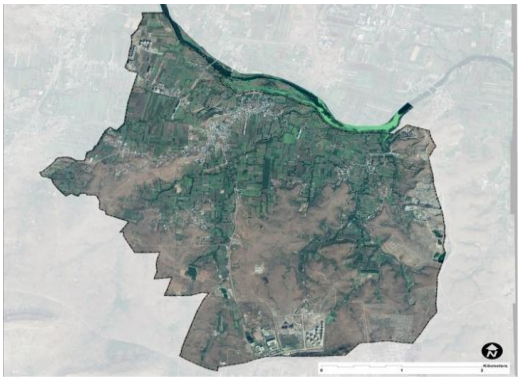

Figure 4: Arial Image of Charholi (Google Earth)

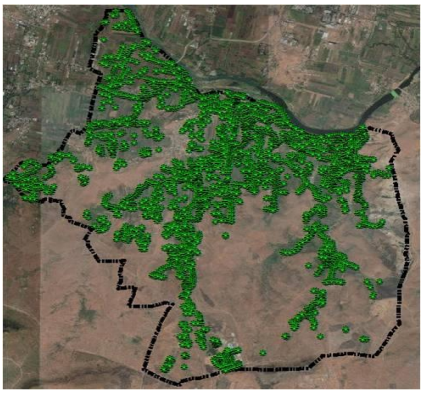

Figure 5: Tree point locations on Arial Image

Data analysis and findings

The collected data was then migrated into the ArcGIS software. Subsequent integration of the layered data consisting of the Tree locations, Water stream and the existing developmentplan was done in the Geographical Information System (GIS).Further analysis of the data was done to understand the spatial configuration of the tree location in comparison with the existing water stream. Boolean overlays were done to mark the extent of the spatial integration between the layers of trees, stream and the proposed development plan. It was found out that the native trees follow the path of the water stream, visible on ground surface, or invisible below the surface.

The existence of the water stream was further confirmed on the Topographic sheet whichwas downloaded from the official website of Survey of India. The Topographic sheet layer was converted to high resolution image which was then integrated into the GIS. The layer of topographic sheet in the GIS was cross referenced with the other layers to understand the spatial configuration of trees with the stream.

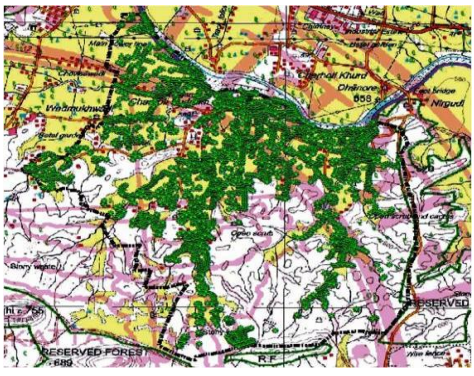

Figure 6: Tree point locations on Topographic sheet

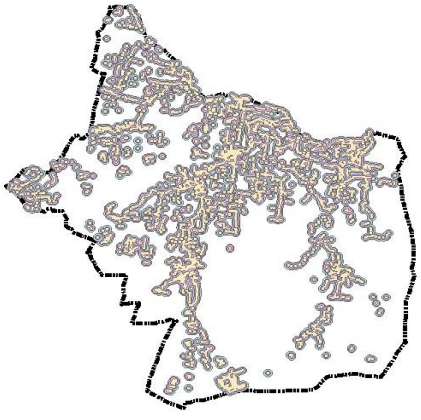

Figure 7: buffer creation in GIS for existing tree locations.

All the layers and the physical survey confirmed the data that the native trees followed the stream location right till the point that it meets the Indryani River. The collected data and the analysis was shared and discussed with botanical expert (Mahajan, 2010) for further insights on native trees identification through photographic images.
All the above analysis clearly indicated the path, which was evident on the spatial integration map between the native trees, the water stream and the terrain. Thus, it leads to a justified and proven greenway map which had measurable environmental markers. The identified greenway had a variable dimensional width in the terms of the location of the native trees along the path of the water stream.
Analysis was further done to understand the effects of spatial extent of land along the line of greenway with the native trees. This was done by creating buffers in the GIS software. Three buffers were generated of 20m, 35m and 50m diameter respectively on the tree location point's .The diagram was analyzed to study the extent and the continuity aspect of the greenway. Figure 7 showed the missing links of native trees in certain patches. Some of the patches were investigated physically on site to understand the discontinuity of the native trees. In most cases it was observed that man made interventions such as cultivation requirement, roads and building construction were the cause of the missing native trees.

Proposal

Based on the analysis and findings, a zonal diagram was derived to understand the concentration of the spatial organization of the native plants. Spaces were identified of the missing patches of native plants. A purposeful intervention is proposed to plant native plants such that the continuity of the greenway is reestablished from the origin of the water stream till the point that it reaches the Indrayani River. The inventory of native plants is established based on the recommendations of the botanical experts.

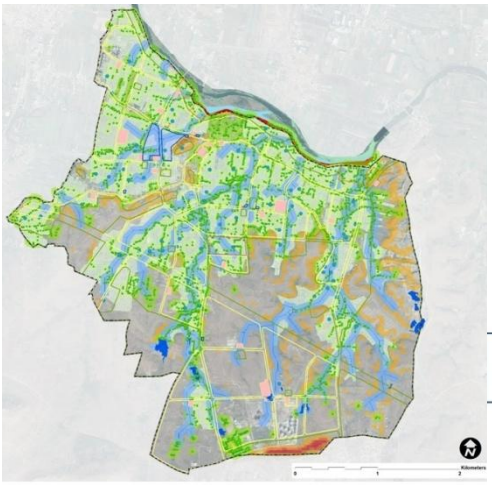

Figure 8: Overlay layers of Trees, DP plan, Arial Imagery

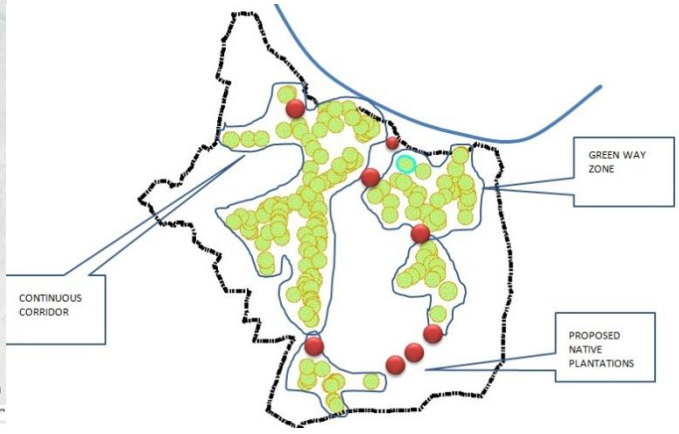

Figure 9: Proposed locations of Native plants insertion.

A no development zone is also proposed to be increased from 12m to 35m on both sides of the water stream in the proposed development plan. This policy is proposed considering the factual data that the native plants found along the water stream have been demarcated at a variable distance between 5m to 35m from the water stream. The policy level implementation of the no development zone near the water stream of up to 35m will certainly control the proposed residential development near the stream thus safe guarding the existing native plants.

Discussion and conclusions

It has been proved through several research papers that the smaller green interventions at local city level prove as a basic change factor in mitigating the global effect of pollution due to increased population and industrialization in the urban areas. The excessive growth of the cities in the limited urban space creates a lower livability index of the city and contributes to environmental degradation.
The analysis carried out in the study area concluded that it is possible to establish a continuousgreenway which would be compatible to the overall ecology of the region. However, several changes will need to be considered in terms of the DP, environmental input and the operation of the greenway itself. This proposal will have to be worked out in relation of the DP such that reservations against various land use planning will cause a minimum

clash. With insertion of the greenway in the urban fabric, the environmental up gradation of the region will help increase the livability index to a certain extent. It will also contribute to the beautification of the city, making the city more attractive and livable.

As future scope of work, it is proposed to extend the study area and take up the water streams of the entire city and analyze the contribution of the native trees. It is further considered, to take up a more detailed study with physical survey of the area instead of relying on the aerial imagery. Analysis of the data, of each identified case to exactly pin point the location of the native trees, with its identification, and correlating it in the greenway network, is identified as scope for further research. Monitoring of the established greenway through GPS and physical measurements of the air quality is a future identified research scope which will further reinforce the role of native trees in the urban greenways, contributing to the higher livability index of the city.

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Formulation of Climate Responsive Design Guidelines for Beach Resorts Using Vernacular Architecture

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Abstract : The goal of climate-responsive design is to create a comfortable interior while reducing the building's reliance on artificial energy. A climate-responsive building design reflects the weather conditions in the precise area where the building is constructed. The design utilizes data on the region's weather patterns and accounts for factors like seasonality, intensity of the sun, wind, rainfall and humidity.Several elements play a role in limiting a building's energy use based on its site-specific conditions.Buildings in different climatic zones require different assemblies to minimize unwanted energy loss. Due to the increasing trend and popularity of coastal tourism, beach resorts are attracting people for their stay and good travel experience; this has led to the need of climate responsive design for beach resorts as it is easier to understand climate responsiveness in warm and humid climate zone. This paper aims to study and analyze the present architectural practices involved in beach resort planning w.r.t. vernacular architecture.Vernacular architecture is strongly influenced by its geographical location. From all the geographical constraints, one of the most relevant is undoubtedly the climate. Based on the need of designing buildings adapted to a specific climate and territory, it is pertinent to study vernacular buildings in order to develop and integrate their design strategies in the up-to-date construction context, contributing to its sustainability. The outcome of this paper is the formulation of climate responsive design guidelines for beach resorts using vernacular architecture.

Keywords : Climate responsive design, warm and humid climate, beach resort, Vernacular architecture.

1. Introduction

The tourism industry in India is substantial and vibrant, and the country is quickly becoming a major global destination.The Indian coastline has a large number of scenic spots, which attract tourists. With the increasing trend and popularity of coastal tourism, beach resorts are attracting people for their stay and good travel experience. Beach resorts are defined as geographic areas offering a variety of facilities, services and activities which are orientated towards seaside recreation for the accommodation, use and enjoyment of visitors (adapted from Metelka, 1990, p. 130).Beach resorts evolve from natural contexts through the expansion of accommodation and other recreational functions offers activities like surfing, diving, sailing, beach sports, etc. designing of these resorts with the help of vernacular architecture will help achieve an environment responsive design. The aim of the paper is to study and analyze the present architectural practices involved in beach resort planning w.r.t. vernacular architecture; the study is limited to Konkan region. Vernacular architecture tends to evolve over time to reflect the environment, cultural and historical context in which it exists.The outcome of this study is the formulation of the climate responsive design guidelines for beach resorts using vernacular architecture.

2. Development in Coastal Areas:-

Today's coastal regions face intense problems caused by the rapid urbanization, coastal erosion, sea level rise, global warming and climate change. Tourism in coastal areas brings along both positive and negative effects on the environment as a result of activities exerted upon such areas by proponents and tourists. While tourism development results in the modification of coastal environments, it can also flourish where such environments are left unmodified as the pristine nature of the environments attract visitors.

2.1 Adverse Effects of the Development:-

One of the most significant adverse effects of tourism on the environment is the increased pressure on the carrying capacity of the ecosystem in each tourist locality, increased transport and construction activities led to large scale deforestation and destabilization of natural landforms related to coastal erosion, siltation, pollution, destruction of mangrove swamps, salt marshes, sea level rise, floods, landslides and slope failure, pressure of population, industrialization, road transport etc.

2.2 Need of Sustainable and Eco Friendly Resort Design:-

The damage doesn't end with the construction of tourist infrastructure. Some tourist resorts empty their sewage and other wastes directly into water surrounding coral reefs and other sensitive marine habitats. Recreational activities also have a huge impact. For example, careless boating, diving, snorkeling, and fishing have substantially damaged coral reefs in many parts of the world, through people touching reefs, stirring up sediment, and dropping anchors. Therefore, it is very important to design a good resort and provide an environmental benchmark with eco-friendly and energy efficient design; this will make lesser adverse impact on the coastal areas.

3. Climate and Geography in Konkan Region:-

The Konkan region is on the west coast of India, south of Mumbai in western Maharashtra. The climate of warm-humid zones is characterized by high rainfall and high humidity. The temperature range is relatively high at around 30 - 35°C and is fairly even during the day and throughout the year. However, heavy precipitation and storms occur frequently.

Strategies for designing in Warm and humid climate:-

- Provide maximum ventilation and free air movement by large openings.
- Provide maximum shading of direct and diffuse solar radiation.
- Avoid heat storage.
- Use reflective outer surfaces.
- Use ventilated double roofs.
- Use vegetation to moderate the solar impact.

4. Vernacular Architecture of Konkan Region:-

Vernacular buildings are evolved through trial and error method over the period of time. These buildings are constructed more on ‘design-based approach’ suited to a particular climatic condition and socio-cultural setup. Vernacular buildings are the structures that use the bioclimatic concepts and locally available building material to a large extent (Singh et al., 2011b). This provides an edge to vernacular buildings to withstand with the local climate constraints through adaptation.

Konkan vernacular architecture which was inspired by nature is sustainable, cost effective and climate responsive.The traditional buildings were always climatically sustainable; it made use of local materials, such as laterite masonry, stone, wood carpentry and mud. The technology and method adopted were passive. Slopped roofs were appropriate for heavy rains. The use of wood regulated humidity. The use of terracotta roof tiles allowed infiltration of air. Attic spaces helped regulate the temperature inside and at the same time, provided storage space too. The courtyard planning helped in the circulation of air by letting the hot air escape from the house and pulling in cooler breeze through the windows. The use of timber was done as it prevents or reduces heat gain to a greater extend.

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5. Comparative Study of Case Studies:-

SR. NO.	CASE STUDIES	PLAN/ PHOTOS	FACTORS	PRESENT ARCHITECTURAL STYLE
1	Golden Swan Beach Resort, Murud Janjira	**Fig 1: View of golden swan beach resort building.(Source:- www.booking.com)**	ORIENTATION	N-S, NE-SW
			VENTILATION	Cross ventilation.
			MATERIALS	RCC, Brick, stone, sloping roof with Mangalore tiles.
			VEGETATION	Coconut trees, palm trees, betel nut, bamboo, Babhul, Kaju, Bel, Jackfruit,Neem, Vad,Kokam, Mango,Dalfodi, Karvand, Alu, Nirgudi, etc.
2	Sagar sawali beach resort, ladghar, Dapoli	**Fig 2 : View of Sagar sawali beach resort, ladghar, Dapoli.(Source:- www.booking.com)**	ORIENTATION	N-S
			VENTILATION	Cross ventilation
			MATERIALS	RCC, Brick, laterite stone (admin block), sloping roof with Mangalore tiles, wood, etc
			VEGETATION	Amala, Padal, Babhul, Kaju, Bel, Jackfruit,Neem, Vad,Kokam, Mango, Coconut, betel nut, Kallavi, Dalfodi, Karvand, Alu, Nirgudi, etc.
3	U Tropicana Resort, Mapgaon, Alibaug	**Fig 3: Plan of U Tropicana resort, Alibaug (source:- https://tropicanavillas.com /)** **Fig 4: View of the resort building showing the construction and material used.**	ORIENTATION	N-S , NE-SW
			VENTILATION	Use of courtyard system
			MATERIALS	RCC, Brick, laterite stone (admin block), sloping roof with Mangalore tiles, wood, bamboo, etc.
			VEGETATION	Coconut, betel nut,Shendri,Kala umbar,Surangi,Anjan, Neem, Vad,Kokam, Mango, Coconut, betel nut, Kallavi, Dalfodi, Karvand, Alu, Nirgudi, etc.

6. Inferences from the Study:-

- The use of locally available materials should be done as it is proven to be eco-friendly.
- Appropriate usage of materials can help to increase the life of building.
- Construction style is vernacular and climate responsive.
- Enhancing the value of coastal area by protecting and conserving the environment.

- Identify the natural hazards and reduce the vulnerability.
- Comprehensive assessment should be applied to site development and design.
- Adoption of successful practices for dynamic coastal condition.
- Protection of fragile water resources on coast is necessary.
- Wind pressure affects a building; hence, the correct orientation of the building can reduce this pressure and also help in generating wind energy by the installation of wind turbines according to the wind orientation.
- Openings should be provided keeping in mind wind and sun direction.

7. Conclusion:-

The solution for climate responsive architecture was very simple and cost effective in the past; adapting those principles while designing will help achieve a modern sustainable architectural design with the combination of present technology.

8. Guidelines:-

The guidelines are the outcome of the whole study process with the inferences drawn from the negative impact of development in coastal areas, vernacular strategies seen in Konkan region and the case studies.

- While designing the beach resort one should first study the environmental set up, eco system, biodiversity, climate, refer to the Policies; rules and regulations (CRZ) for the beach resort development.
- EIA is to be conducted for the proposed resort site as it identifies and describes the elements of the community and environment likely to be affected by the proposed developments,the negative impacts and also develops mitigation measures so as to minimize pollution and the environmental disturbance.

1. Site Selection:-

The location of the beach resort is one of the issues to be tackled and considered while designing of a beach resort.

i) Proposed tourism developments should be located such that it ensures habitats of declared rare or priority flora and fauna species are avoided or protected, and disturbance to important breeding or feeding areas is minimized.

ii) While selecting a land for beach resort, consideration should be given to minimize potential impacts upon the protected areas, good fishing grounds and other sensitive environmental areas.

iii) In the screening for land, the stability of beaches, stable ground conditions and the availability of natural lagoons for harbor development should be considered.

iv) Use of mangroves and woodlands in design will act as a complete protection of bio shield.

2. Climate Responsivearchitectural Design:-

i) Sun orientation: - Orient the buildings with the long axis in the east-west direction so that the longest walls face north and south, and only the short wall face east and west direction. Shading of the east and west elevations is difficult because of the low sun, and may require special devices; whereas the south and north sides can easily be protected by an overhanging roof. Thus the best orientation for protection from the sun is along the east-west axis.

ii) Wind orientation: - Where a predominant wind direction can clearly be identified, long-shaped buildings should be arranged across this direction.

iii) Form: -Buildings to be spread out with large open spaces in between for unrestricted air moment. Forms with large surface areas are preferred to compact buildings. This favours ventilation and heat emission at night time. The building could be long and narrow to allow cross ventilation or courtyard planning is also favourable.

iv) Room arrangement: - The arrangement of rooms depends on their function. Since the thermal load is related to the orientation, rooms on the east side are warm in the morning and, if not built with much thermal mass, it cools down in the afternoon. Rooms on the west side are cooler in the morning and heat up in the afternoon.

Rooms facing north and south remain relatively cool if provided with adequate shading. Thus, the rooms can be arranged according to their functions and according to the time of the day they are in use.

a. Bedrooms should be located on the east side, where it is coolest in the evening, with good cross ventilation. Other auxiliary spaces can be located on the west side.
b. Kitchen can be located on the west side.
c. The main rooms which are in use most times of the day, such as living rooms, should not be located on the east or west side.

v) Ventilation: -Provide maximum ventilation and free air movement by large openings, cross ventilation and courtyard planning.

vi) Openings: - Larger openings should be provided for air flowto ensure proper ventilation.

vii) Shading: - Reduction of heat gain can be done with longer façade (with most of the windows) faced towards the south and north so the roof overhang shades the walls and windows during mid –day. For openings usage of vertical shading devices or shrubs to reduce the heat gain on western walls is recommended.

viii) Roof: - Sloping roof should be used for protection from heavy rainfall.

ix) Material:- Use of locally available materials (laterite stone, bamboo, bricks, wood, mud, etc.) should be done; even the transportation cost is also reduced.

x) Colour and texture:-The walls should be painted light pastel shades or whitewashed to reflect sunlight and reduce heat gain. The surface finish should be protected from effects of moisture.

xi) Landscape: - Proper landscaping reduces the direct sun from striking and heating up the building surfaces.The shade created by trees, reduces air temperature of the micro climate around the building through evapo-transpiration.

Deciduous trees provide shade in summers and sunlight in winters; hence, plantation of such trees on the west and southwestern side of the building is a natural solar passive strategy. On the other hand, evergreen trees on the north and north-west of the building provide shade round the year. The use of dense trees and shrub plantation on the west and southwest sides of a building will block the summer setting sun.

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Quality Management for Indigenous Construction Techniques

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Abstract : The Word 'Indigenous' Means Originating Or Occurring Naturally In A Particular Place Or Native.[1]Using The Local Resources Leads To The Creation Of An Unique Traditions Giving Rise To An Unique And Place-Specific Culture And Also Anarchitectural Vocabulary. This Evolution Is Necessarily Place-Specific Evolving From The Geography And Climate Of The Place. E.G.MUD ARCHITECTURE (Rammed Earth, Compressed Stabilized Earth Blocks, Cob, Adobe Or Sundried Bricks, Wattle And Daub), Bamboo Construction, Kathkuni Architecture Famous In Uttarakhand And Himachal Pradesh, STRAW-BALE, ETC. This Paper Aims To Establish The Need Of Quality Management For Indigenous Construction Techniques And To Propose Some Initial Broader Level Strategies That Form The Basis For Developing The Quality Policy For These Techniques. The Indigenous Techniques Had Been Ignored In The Past When In The Firsttwo Five-Year Plans, Pandit Jawaharlal Nehru Took A Decision With His Advisors That We Should Establish Factories And Industries In Order To Bring India Into Global Markets And Generate Employment Opportunities. But Mahatma Gandhi Had Advised To Make Communities And Villages Self-Sufficient. In Order To Do So, It Was Important That Indigenous Systems Of Development Be Adopted Taking The Traditional Wisdom Of A Place Ahead. But This Was Not Done And Hence These Indigenous Techniques Lost Their Importance. Recently While Building Cost-Effective Homes For The Poor, These Materials Again Came Back And Even In NBC 2016, Chapters On Bamboo And Approach To Sustainability Were Added. Thus This Paper Will Re-Instill The Faith In These Techniques And Will Move Towards The Method And Need Of Developing Quality Management For Indigenous Construction Techniques, But Only On A Broader Level Due To The Limitation Of The Size Of The Paper.

AIM

To establish the need of Quality Management for Indigenous Construction Techniques

OBJECTIVE

i. To understand where do indigenous techniques stand in India's **Socio-political context and look at the acceptability of the techniques**

ii. Understanding the reason for evolution of **National Building Codesand Indian Standards** for Construction

iii. To understand the need to have **quality management standards** for these construction techniques.

iv. **To define QUALITY** in the context of indigenous techniques and lay down a **broader level QUALITY ASSURANCE AND QUALITY CONTROL (QA & QC) POLICY.**

Keywords: Indigenous construction, Mud, Quality, QA & QC

INTRODUCTION

India is a country where we have **diverse cultures and traditions.** This is mainly because of the **climate and geography** of the country. The country is blessed with a very pleasant climate as a result of which the basic needs are easily taken care of and one does not have to struggle or compete with against the nature like for example, in the Western countries, due to lower temperatures even growing food is at times difficult. One direct advantage of having a great climate is **various forms of expression via ARTS AND CRAFTS**. When we speak of **Indigenous architecture, the CRAFT of doing things assumes prime importance.**

The word **'Indigenous'** means **originating or occurring naturally in a particular place or native.[1]**Using the local resources leads to the creation of an **unique traditions giving rise to an unique and place-specific culture** and also an**Architectural Vocabulary.**The traditions in crafts and construction become unique as due to diverse

climate, we have diverse naturally occurring materials. The climate and geography also affects the psychology of the people.

It would be interesting to note that **a particular region's geography bears a huge impact on the nature of expression.** If we look at the geology and topography of Maharashtra, we find the Deccan trap stone – the basalt to be formed in this region. **Basalt** is an igneous rock and is extremely hard and difficult stone to work with. This makes the temple architecture in the region a little **less ornate** than those in **Rajasthan or Gujarat where we find sandstone** which being quite porous allows ornate carvings. Interestingly, it is also observed that the **verbal sounds generated in the language pattern of the peopl**e in Maharashtra also suggest sharpness or harshness compared to Guajarati or Marwari language, which makes use of sweeter syllables. The food of Maharashtrians is a little spicier than that of Rajasthan or Gujarat.

The point to be noted is that local climate and geography bear a huge impact in establishing a **relationship between MAN AND NATURE** and Indigenous Construction Techniques harmonize that relationship. These techniques use local materials and we have materials with **the least embodied energies** thus ensuring the **least negative environmental impact.** Indigenous construction methods are capable of making settlements self-dependent or even independent of the Consumerist economies. The dependency on the industries is largely reduced. The people that form the settlement can build with their own skill and traditional wisdom of the elderly and experienced folk. We then start finding **BUILDING TRADITIONS and various INDIGENOUS CRAFT**. It is generally believed that we must conserve those and these crafts also have a large value as it bears **hints of the inventions and innovations** that the community made happen.

So far we have considered only climatological point of view. Now let us understand the relevance of these techniques in the **socio-political scenario** of India and then analyze the relevance of these techniques.

SOCIO-POLITICAL SCENARIO IN INDIA

Let us look at the statistics and ground realities of the **Pradhan Mantri Awaas Yojana – Gramin (PMAY-G).**Then we will analyze the procedures of **Ministry of Environment, Forestry and Climate Change (MoEFCC).**

A. PRADHAN MANTRI AWAAS YOJANA - GRAMIN

As per the data published on the **official website** of PMAY-G, the policy of **PMAY-G** is a further development led by **National Democratic alliance (NDA) Government,** on the **Rajiv Awaas Yojana (RAY)** started by the **Congress Government.** A Public housing programme started in the country with the rehabilitation of the refugees immediately after the Independence and since then it has been the major focus area of the Government as an instrument of poverty alleviation. The Rural Housing programme, as an independent programme, started with **Indira Awaas Yojana (IAY)**in January, 1996. Though this programme was made, a certain gaps were pointed out in the **Performance Audit** done by the **Comptroller Auditor General of India (CAG).** In order to overcome these gaps (like non-assessment of housing shortage, lack of transparency in selection of beneficiaries, low quality of house and lack of technical supervision, lack of convergence, loans not availed by the beneficiaries and weak mechanism for monitoring), a **'Housing for all by 2022'** scheme of IAY has been structured into **PMAY-G** with effect from **1st April 2016.**[2]

Following is the compilation of what construction techniques have been employed under the PMAY-G in various regions of India –

Table 1 Material + Cost Analysis as per PMAY-G Manifesto + PMAY-G Publication titled PAHAL[3]

Sr.No.	Region	Construction Technique Employed	Cost of Single Dwelling unit (Rs.)
1	Assam	Brick house, half brick thk. Walls confined within RCC Posts and RCC Horizontal beams for seismic Resistance | Roof - Corrugated GI Sheets, Bamboo posts for Verandah	1,42,000 to 164737
2	Chattisgarh - Foothills of Maikal-Satpura Mountain range	Brick walls 9" thk. With mud plaster, Roof - Timber framing members with country tiled roofing	93,000 to 2,00,000
3	Himachal Pradesh	Rubble masonry with Cement mortar, Mud flooring, Roof - Bamboo roofing with Corrugated GI Sheet, thermocol insulation	1,14,000 to 1,75,000
4	Jharkhand	Stabilized Adobe walling on brick stub foundation, mud / bamboo mat flooring, Roof - country tiles on Bamboo roofing	99,000 to 1,48,000
5	Manipur	Wattle and daub on concrete supports, mud plaster with linseed oil polish, PCC / Stabilized soil flooring, Roof - Bamboo structure with corrugated GI Sheet	1,78,000 to 1,97,000
6	Meghalaya	Raised Bamboo Houses with Ikra Walling for Khasi, Bhoi and Jaintia Villages	Not Provided
7	Uttar Pradesh	2 brick thick piers bonded with 1 brick thick rat trap wall with reinforcement embedded in masonry at corners, horizontal beams provided, Roof - Precast concrete beam with Ferrocement skin	1,39,000 to 1,64,000
8	Odisha	2 brick thick piers bonded with 1 brick thick rat trap wall with reinforcement embedded in masonry at corners, Ferrocement roofing	1,40,000 to 1,54,000
9	Chattisgarh	Brick wall, stabilized mud plaster, terracotta roof	Not Provided
10	Uttar Pradesh - Bundelkhand	Fly ash brick with rat trap bond, precast concrete beam with Ferrocement roofing	Not Provided
11	West Bengal - Ganga Flood plain	Brick foundation and walls with stabilized mud plaster, mud floor with cow dung, Roof - Treated bamboo frame with CGI Sheet	1,40,000 to 2,05,000
12	Chattisgarh - South, Chaukhandi	Brick walls 9" thk. With mud plaster, Roof - Timber framing members with country tiled roofing	Not Provided
13	West Bengal - seismic zone 4 & 5 using light materials	Not Provided	Not Provided
14	Rajasthan	Wooden frame structure with panel infill - bamboo dap, Ekra, Play-board, CGI Sheet, Bamboo board, Roof - Timber structure with CGI Sheet roofing	1,36,000 to 1,71,000
15	Tripura	Rammed earth walls / brick walls / wattle and daub walls, Roof - Treated bamboo with CGI Sheet roofing	1,23,000 to 1,91,000

From the above table it can be seen that there is a strong attempt from Government side to incorporate the indigenous materials in order to reduce the shortage of housing in the country. But this was not the case about 5 years back when it was mandatory to build with the conventional materials.

Truth be told, the cost of Indigenous construction materials is way lesser than that of conventional RCC and brick structures. This can be proved by the following example –

COST BENEFIT ANALYSIS of a 12" RAMMED EARTH WALL vs. 9" thick Brick wall

i. Materials + Labour cost of Rammed earth wall (no plastering and painting required)

: **Rs. 80-100/ sq.ft.**

ii. Material + Labour cost of a B-class / B-grade brick wall (necessarily needs plaster and painting)

: **Rs. 250-400/ sq.ft.**

B. MINISTRY OF ENVIRONMENT, FORESTRY AND CLIMATE CHANGE (MOEFCC) AND EFFECTS OF E-TENDERING:

Let us take into account many projects initiated (but not executed) by the MoEFCC, Ministry of Tribal development. These projects generally are taken up closer to the time of elections and they are all initially people-inclusive or Public Participatory models of development. It is my observation that after fair development of project proposals and even after proving the feasibility of the project, there is a legal Government process called **E-tendering**. In E-tendering, tenders are invited online. But this system **does not take care of indigenous construction methodologies. They are still based on the conventional schedule of rates, which have only conventional materials like RCC, brick, steel, etc.**

The Forest Department does not even have a mechanism of hiring a sensitive architect who has experience in dealing with such technologies, as even the architect is required to go through the tedious process.

There was a great example of development of **Konkan Railways** in India when an entire new institution was setup to make project and place-specific decisions and to evolve a positive system that can take care of the special needs of the project. It was a successful.

QUALITY MANAGEMENT FOR INDIGENOUS TECHNIQUES

A. Need For Having Quality Management System For Indigenous Construction Techniques

During the **THIRD FIVE-YEAR PLANS**, about **50% of the National Revenue** had to be spent on Construction Projects; half of which went for **construction of Buildings.** The remaining half was allocated for building up the infrastructure and other facilities. Since the investment was so high, it was imperative for the Government to standardize the Construction process and hence Bureau of Indian Standards (BIS) was developed. They formulated the first draft of **NATIONAL BUILDING CODES (NBC) in 1970.**[4] The NBC had design and building guidelines for most of the conventional construction materials like RCC, Steel, Brickwork, etc.
Recently in NBC-2016, a chapter on Bamboo and Approach to Sustainability was added as the BIS realized the need to add in materials that are ecologically friendly. Understanding this background, and knowing the statistics mentioned in the TABLE-1 of this paper, it looks obvious that we need to develop standards for indigenous materials.
Recently **IS-6874: 2008 (Method of tests for bamboo) and IS 9096 : 2006 (Preservation of Bamboo for Structural purposes : Code for Practice)** was developed.

B. Definition Of Quality For Indigenous Construction Techniques

Quality can be defined as meeting the **LEGAL, AESTHETIC AND FUNCTIONAL REQUIREMENTS** of a project.[5]
Legal Definitionrefers to the **professional liability laws.**Every architect and engineer who offers his or her expertise to ownersis subject to professional liability laws.
Aesthetic Definitionrefers to the quality of the design, space and visual aesthetics. It also incorporates the building's psychological impact on the inhabitants.
Functional Definitionrefers to satisfying the concerns of the stakeholders and their expectations.

In the context of Indigenous architecture, the legal and aesthetic definition of quality does not change but it is critical to define the **FUNCTIONAL DEFINITION OF QUALITY.** Following will be the stakeholders ho will be the evaluators of quality –

a. OWNER: concerned with the time, cost, functionality of project. The indigenous project pose a big problem when it comes to the determining the time, cost and functionality as there isn't sufficient number of contractor or skilled laborers trained in these techniques. These techniques are not so popular.

We still are somewhere stuck with the notion that the **indigenous architecture is for the poor.**

b.DESIGN PROFESSIONAL: The role of design professional moves out from boundaries of just designing the building to even training the laborers and conducting various training workshops. He needs to re-think his architectural vocabulary, update specification, which needs to be meticulously, detailed without any reference standards.

c. CONTRACTOR: The contractors generally are very skeptical about delivering the quality since they are not used to doing this line of work. Thus the onus of quality gets transferred by and large to the design professional.

d. REGULATORY AUTHORITIES: As discussed in the above cases of **PMAY-G and MoEFCC or Ministry for Tribal development**, there is a lot of awareness and acceptance required for delivering a project with indigenous technology.

C. QUALITY ASSURANCE

Having defined quality in the context of Indigenous materials, it is important to ensure that quality work is executed. It can be done in two basic steps –

1. **Quality Assurance**
2. **Quality control**

C1. Quality Assurance (QA)

- Quality assurance is the **FIRST BASIC STEP** in the process of Total Quality Management. This is where as per the requirements of the stakeholders of the project, the parameters of the Quality are defined.
- Quality Assurance (QA) is a program covering activities necessary to provide quality in the work to meet the project requirements.
- QA involves establishing project related policies, procedures, standards, training, guidelines, and system necessary to produce quality.
- QA is way of looking ahead and pre-determining quality related problems.
- It is actually writing of all the ways in which Quality can be controlled to the last detail. The more detailed the QA policy, the more control one will have over the quality.
- ***This step involves actual CHECKLISTS and STANDARD OPERATING PROCEDURES written down step-by-step by doing a WORK BREAKDOWN STRUCTURE of the bigger tasks.***

C2. Quality Control (QC)

- Quality refers to specific implementation of the QA program and related activities. Effective QC reduces the possibility of changes, mistakes and omissions, which in turn result in fewer conflicts and disputes.
- QC refers to actual MONITORING AND CONTROL of all the tasks as per the pre-designed QA Policy. This is generally done by Supervision.

In totality,

QUALITY ASSURANCE is all **planned and systematic actions** necessary to provide adequate confidence that a structure, system or component will perform satisfactorily and conform to the project requirements.

On the other hand, **QUALITY CONTROL** is a **set of specific procedures**involved in the quality- assurance process. These procedures include planning, coordinating, developing, checking, reviewing, and scheduling the work.

CONCLUSION

This paper is written with a view to strongly put up the need for Quality management for Indigenous Construction Techniques. Considering the above mentioned aspects - socio-political scenario of India, by understanding the need for developing the National Building codes 2016, by evolving a Functional definition of Quality for indigenous construction techniques – it can be concluded that Quality Management for these techniques is of a high importance from the environmental and socio-cultural point of view. It can be done by detailing out the Quality Assurance and Quality control Mechanisms making the Quality policy project-specific and place-specific.

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Sustainability to Regeneration: Towards a New Architectural Design Paradigm

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ABSTRACT : The current paradigm of sustainability, as understood by modern society today, is an inadequate measure for current and future architectural design. While it had good intentions, sustainability as a concept has failed to do the needful in current environmental degradation scenario, for it aims no higher than trying to make buildings "less bad". Green building concepts were primarily directed at 'doing less harm' or 'reducing the degenerative consequences' of human activities on human health and upon the integrity of ecological systems'. Sustainable or green buildings are centered on creating more efficient buildings rather than aiming for zero or net positive contributions. Regenerative architecture is the practice of engaging the natural world as the medium for, and generator of the architecture. It responds to and utilizes the living and natural systems that exist on a site that become the "building blocks" of the architecture. The word "regenerative" means "to create again". Regenerative design is based on the premise that everything we build has the potential for the integration of the natural world as an "equal partner" in the architecture. This paper introduces regenerative architecture as means for architecture design. It gives a comparison between sustainability and regeneration and establishes the need for a paradigm shift from sustainability to regeneration.

Keywords: paradigm shift, sustainability, regeneration

Introduction

Looking today to the challenges of planning and design of sustainable built environment including, carbon emissions, climate change, human health, water problems, biodiversity, scarcity of resources, depletion of fossil fuel, population growth and urbanization; sustainable architecture plays a key role for sustainable development of the society as a whole. Building construction and operation contribute greatly to the resource consumptions and emissions of the society. According to estimates nearly half of all the raw materials are employed in buildings, and a staggering 60% of all waste is the result of construction and demolition. Thus the resources we need to provide for a high quality life in the built environment are in a decline because they are being used, exhausted or damaged faster than nature can regenerate them. For more than 40 years, the 'energy efficiency reductionism' or 'sustainability' paradigm has been held up as the solution to building's environmental impact. It is time to think not just about sustaining the world's badly damaged ecosystems and human communities, but about regenerating them instead.

Historical background-

In order to understand the changes that accrued in the field of architectural, building design and urbanization practices during the last hundred years we must follow the history of sustainability in the built environment. From the beginning of the 20thcentury there have been five influential paradigms that shaped sustainability in architecture. Four out of five of those phases were influenced mainly by a major reductionist paradigm that defined sustainability for architecture and buildings design. The reductionist paradigm is seeking mainly the reduction of negative building impact through environmental efficiency.

Table 1: Sustainability paradigms influencing architecture in 20th and 21st century

Source: S. Attia, Regenerative and Positive Impact Architecture, SpringerBriefs in Energy

Paradigm	Years	Influencer	Paradigm
Bioclimatic architecture	1908-1968	Olgyay, Wright, Neutra	Discovery
Environmental architecture	1969-1972	Ian McHarg	Harmony
Energy conscious architecture	1973-1983	AIA, Balcomb, ASES, PLEA	Energy efficiency
Sustainable architecture	1984-1993	Brundtland, IEA, Feist	Resource efficiency
Green architecture	1993-2006	USGBC, Van der Ryn	Neutrality
Carbon neutral architecture	2006-2015	UN IPCC, Mazria	Resilience
Regenerative architecture	2016-Future	Lyle, Braungart, Benyus	Recovery

Sustainability- The less bad approach

As a concept, sustainability in its original premise was to meet the needs of the present without compromising future generations' ability to meet their needs—all within available resources. But, it doesn't make complete sense! Imagine a bucket brimming with any finite resource. Over the years, that resource is diminished as a function of development, industrialization, manufacturing, and population growth. After a century of environmental thievery, the bucket is half-full and sustainability—with all of its good intentions—calls on us to use only what is needed so that we don't compromise the needs of future generations.[1]

Thus, the current population adjusts its needs to provide the next generation access to a bucket of equal quantities of resources. The problem is, world population is growing at breakneck speed. In 1900, we had 1.6 billion living on the planet. In 2050, we're expected to reach 9 billion.

Conservation has its limits. Regardless of the conservation strategy the population needs a bare minimum to survive. As the population grows, our bucket's resources will start a deficit trend. Generation after generation will pass that bucket to drive the deficit so deep that resource extinction is eminent. The question becomes: Is sustainability a model that our culture should adopt and promote knowing that the bucket will one day be empty?[1]

[1]Sustainability is dead: Regenerative architecture is the new green
HMC Architects Blog- May 16, 2018
Eric Carbonnier and Eera Babtiwale

Shift from sustainability to regeneration

Several interrelated, innovative building concepts are now challenging the traditional building paradigm and even today's standards for sustainable design by introducing the idea of buildings as more dynamic and interactive structures. These include the concepts of living, regenerative, restorative, and adaptive buildings. These buildings differ in their innovative strategies and technologies that seek to integrate and restore the natural environment rather than just addressing the building design itself. These strategies aim to move more quickly than traditional design strategies to achieve truly sustainable outcomes. A regenerative approach restores whereas a sustainable approach quite simply, maintains.

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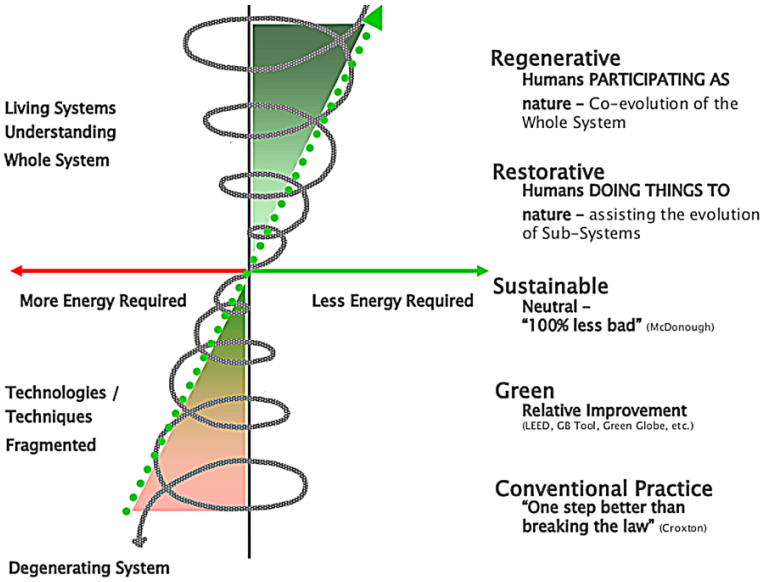

Figure 5: Steps towards regenerative architecture

Source: (Reed, Shifting from 'sustainability' to 'regeneration', 2006)

Conventional Practices realize high efficiency and reduced impact in the building structure, operations, and site activities. This term can imply a more technical efficiency approach to design and may limit an embrace of the larger natural system benefits.

Green is a general term implying the direction of improvement in design meaning that, continual improvement towards a generalized ideal of doing no harm. It is believed to be more applicable to buildings and technology.

Sustainable means 'Green' but with an emphasis on reaching a point of being able to sustain the health of the planet's organisms and systems over time.

Restoration is an approach that thinks about design in terms of using the activities of design and building to restore the capability of local natural systems to a healthy state of self-organization.

Reconciliation is an approach of acknowledging that humans are an integral part of nature and that human and natural systems are one.

Regeneration is anapproach that engages and focuses on the evolution of the whole of the system. It engages and focuses on the evolution of the whole of the system meaning, place – community, watershed andbioregion – is the sphere in which participation takes place. By engaging all the key stakeholders andprocesses of the place – humans, other biotic systems, earth systems, and the consciousness that connects them – the design process builds the capability of people and the 'more than human' participants to engage incontinuous and healthy relationship through co-evolution.The design process draws from and supports continuous learning through feedback, reflection and dialogue, so that all aspects of the system are an integral part of the process of life in that place.

Such processes tap into the consciousness and spirit of the people engaged in a place, the only way to sustain sustainability.

The benefits of Regenerative architecture development cannot be fully understood at the completion of a project since it will take considerable time before the positive outcome is seen or even measured. A simple comparison between RA and sustainable architecture is illustrated in Plate I and Plate2

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Plate I: Sustainable storm water channel

Source: (Littman 2009)

Plate II: Regenerative storm water channel

Source: (Littman 2009)

The image in Plate I and Plate II are simple storm water management channels. Plate I depicts a separation between human activity and the natural world it also displays a 'solution' to a 'problem', when the 'problem' is purely a construction done by human society. Plate II shows an integration with the environment carried out, which is the basis of sustainable architecture by promoting RA (Littman, 2009).

Regenerative architecture- pathway beyond sustainability

Architecture is defined as "the art or practice of designing and constructing buildings."[3] This is a common definition of architecture, though it is incomplete; the breadth of possibilities for regeneration and integration are nonexistent as the definition limits us to architecture being solely a building. Buildings exist as a part of a place/site, which our definition of architecture does not account for. The question is why do we remove the building from the site in our definition of architecture? The building requires the site for its existence, but we view them as separate elements. Perhaps we can expand the definition of architecture to "the art or practice of designing and constructing place, through the integration of site and building."[4]This definition is more complete and comprehensive as including the site in architecture is the only way for a building to be "beyond sustainable" or regenerative. Architecture is regenerative when the term architecture incorporates more than just the building. The architecture is the place, the site, the systems, the energy, the building, the fauna and flora, etc.
The health of the ecosystem is improved and the architecture is now producing more than it consumes, having a positive existence; this is called regeneration. We can have regenerative architecture when our production output from the system is greater than the net input of resources into the system. The architecture, in its new definition, is producing a surplus of food, more clean water than it consumes, more energy than it consumes, provides richer diversity than was before the structure became part of the system.

[3]Merriam-Websters Online Dictionary <http://www.merriam-webster.com>
[4]Littman, Jacob A., "Regenerative Architecture: A Pathway Beyond Sustainability" (2009)

Regenerative architecture, through the whole systems thinking[5] model, reconnects humans to their life-places. A comprehensive architecture is produced from, by, and for the place in which it is built. It becomes an embedded piece of the ecosystem, contributing to the natural balance, which inherently connects the occupiers of the dwelling to the land on a deep and spiritual level. The deep connection returns humans to their role in being equal shareholders in the health and wealth of the place and the biosphere in which we exist. Through the adoption of whole systems thinking[2] and regenerative architecture, humans develop mutually beneficial relationships with their life places.

Consider a honeybee that pollinates a flower. This action increases the health of the flower species through the bee's action of carrying the pollen of one flower to another, maintaining a diverse gene pool necessary for the health of the flower species. In the process of pollinating the flower the bee is provided with sustenance for itself and its hive. The relationship of the bee to the flower and the flower to the bee is one of symbiosis and reciprocal maintenance. The relationship between the two species is one that has been developed and engineered through the course of the co-evolution of both species; it is a precise and efficient affair between two drastically different species. These reciprocally maintaining and mutually beneficial relationships are the foundation for the health of the world. Without the balance and equilibrium that nature has engineered, we would not exist as a species.

Conclusion-

Though the current paradigm that we use for interacting with the world is threatening and degrading the equilibrium that gives us the opportunity to exist in the first place. We as humans have the opportunity to return ourselves to a place of deep connection. We are the most highly evolved species and are the most capable of rapid adaptation and shifting our means of living by taking an active role in the participation of maintaining the equilibrium that we are so deeply indebted to as a species. We can use the flower and bee example as the model for how we should be interacting with the environment because the one sided relationship that we have developed between us and the earth cannot continue indefinitely.

The concept of regenerative architecture can help to reverse the climate change phenomena under the rules of capitalism. We have the knowledge and technologies to make a positive impact built environment and regenerate local communities.The old paradigm aimed to reduce environmental impact. The future is about buildings that actually improve our environment.

[5]"*Whole systems thinking* recognizes that the entirety of existence is interconnected, and moves us beyondmechanics into a world that is activated by complex inter-relationships—natural systems, human social systems, and the conscious forces behind their actions. Everything is connected—in the act of building design we areinextricably engaged in direct and indirect reciprocal influence in the immediate community (place) and theplanetary systems we are a part of." (Reed, B., 2006, p.5).

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Reducing the Water Footprint of a Sports Stadium through Operational Environmental Strategies
Case: Jawarlal Nehru Stadium Shillong

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Abstract : Sports stadium construction and events have a great impact on the environment which should be considered by the sports authority and the relevant stake holders. New stadium construction should keep in mind the impacts it might have on the environment considering the water footprint as there might be depletion of groundwater level in the near future. Shillong has a rainfall intensity of 1200mm per year which if conserved can be beneficial for the environment .Therefore the requirements for operation of each stadium during an event are of great importance to ensure sustainable integration into the urban, environmental as well as maximized utilization on a long-term basis. The purpose of this study is to examine the water footprint of Jawaharlal Nehru Stadium and to provide environmental operational strategies which would help in water conservation.

Keywords: water efficiency, water footprint, water conservation

Introduction

Sustainability is of prime importance in the present day scenario whether it is residences, corporate offices or big complexes. A sustainable design does not only mean designing of that particular area but it also includes the neighboring area and how they affect each other and also to the stake holders. Stadiums these days have a great impact on the environment and measures should be taken such that they are sustainable and beneficial in the long run. Big events that take place generate a large amount of carbon as well as water footprint which if taken care of can be beneficial for the environment and reduce its impacts.In a city like Shillong, Meghalaya it is highly recommended to follow the environmental regulations and policy for designing of a sports complex as it is a developing city and sport events are increasing with every passing year . Hence, environmental solutions are a key to improve its operational, functional, environmental, aesthetic and economic properties.Shillong has a rainfall intensity of 1200mm per year which if conserved can be beneficial for the environment.One of the measures that can be taken is making use of the rain water received and reusing it for various purposes thereby reducing the water footprint. Other measures include water conservation technique through using of low flow fixtures, reusing of waste water for irrigation purposes and flushing after treatment. Architecturally materials used for hardscapes and roof area can be given a thought by replacing with materials that have low run-off co-efficient. In India there are only two eco stadium at present one is in Delhi (Thyagraj Stadium) the first eco stadium in India and the other one is in Bangalore (Chinnaswammy cricket stadium).

This paper tries to focus on the operational environmental strategy for reducing the water footprint of the stadium after careful study of the site.

Defination and Description

- **Water Footprint**
- The water footprint of an individual, community or business is defined as the total volume of freshwater used for various purposes per unit time.
- **Water Efficiency**

Water efficiency is reducing water wastage by measuring the amount of water required for a particular purpose and the amount of water used or delivered.

- **Water Conservation**

Water conservation is the practice of using water efficiently to reduce unnecessary water usage.

Methodology

- **Study Area**

The study area would be carried out in Jawaharlal Nehru Sports Complex Shillong Meghalaya and the main focus would be on implementing operational strategies for reducing the water footprint of the stadium.

- **Data Collection**

The tools for data collection will include interview and photographs. An interview will be conducted with about 50 people from the sports department to understand the functionality, maintenance, utility and workability of the stadium which would be one to one and one to many. Qualitative data analysis will be performed in order to come into a conclusion and provide recommendations for reducing the water footprint. .

- **Sample Design**

For the interview sample population will include the people from sports department.

- **Data analysis**

Performing calculations for various environmental factors like

a. Rainwater harvesting
b. Waste water

- **Scope**

Providing operational environmental strategies for reducing the water footprint

Jawaharlal Nehru Sports Complex

The Jawaharlal Nehru Complex is located in Polo-Lawmali, Golf Links, Shillong, Meghalaya. Its lat long is 25.579995° N and 91.894326 °E. It has been inaugurated in the year in 1972 after erstwhile Shillong Sports Association president SDD Nichols-Roy mooted the proposal of "coming up with a stadium for Shillong where games can be played under proper conditions" in June 1970. Its total area is 24 acres and comprises of various sports arenas like sepac takraw (197 sq.m), futsal (1018 sq.m), open air tennis court (1016 sq.m), cricket ground (10,000 sq.m), basketball court (2633 sq.m), indoor games stadium (1200 sq.m) and the main stadium which is a combination of football ground and athletic track. The main stadium has a seating capacity of 27,000 spectators and has a turf area of 106 m *68 m while the athletic tracks are of 400 m length divided into 8 lanes of width 1.3 m each. After the 2011 I-League 2nd Division it was announced that a change needed to be done to the pitch at the Nehru Stadium. The ground was renovated in 2011 and an Astroturf was laid out.

The stadium structure has three major parts: (1) an upper part containing VIP gallery of nine numbers and two canteen on each side (2) next lower level is the open gallery which are of 4 in numbers for the spectators and (3) the underground part consisting of the changing rooms for teams and officials, offices, audio room, store room and public toilets. There are There are six public washroom, two VIP washroom, and three dressing (one for the referee and two for the players) consisting of 8 toilets each. There are two canteens on the upper part of the stadium. The stadium is divided into two parts and each side have dressing rooms on the lower tier which has 8 entry/exit gates on one side and 4 gates on the other side for the players to enter the field. There are four emergency exits in the entire stadium. The stadium has four high masts light which are sufficient for a football match to take place at night/evening. The lights installed at these High masts are fed only by DG sets. Two D.G sets are used for this purpose of capacity 320 kVA each.

The indoor hall consist of three indoor sports namely Judo, Table Tennis and Wushu. The seating capacity is 1000 people. The hostel accommodation comprises of 15 dorms, 5 offices, 1 kitchen and a restaurant. The hostel has a population of 40 people in total. The other areas like basketball court, tennis court, futsal ground and Sepac Takraw are used only for practice purpose.

Observation

- The whole sports complex did not have rain water harvesting system or storm water drainage.
- Water is directly drained from the complex to the Wah Umkhrah River without treatment.
- There is no waste water treatment system
- No water sprinklers to water the field. Field are being watered by usage by pipes which leads to wastage of water
- Environmentally very poorly maintained
- Plumbing fixtures do not comply with energy efficiency norms.
- Underground water is being used and pumped for the whole stadium
- Poor landscaping
- Asbestos sheets are used as a roofing material which has a high risk on human health

Data Analyis

Total demand of water supply during peak season using

Sl.No.	Areas	Occupancy	Water Consumption/Head/Day (In Litres)	Total
1.	Hostle	22	135	2970 L/Day
2.	Office	10	45	450 L/Day
3.	Cafeteria	40	70	2800 L/Day
4.	Indoor Stadium	1000	10	10000 L/Day
5.	Outdoor Stadium	30,000	10	3,00,000 L/Day
Total Consumption Of Water Per Day=316,220				

Table 1: Total demand of water supply(Source: NBC)

Note:

As per NBC "The value of water supply given as 150 to 200 liters per head per day may be reduced to 135 liters per head per day for houses for Medium Income Group (MIG) and Lowe Income Groups (LIG) and Economically Weaker Section of Society (EWS), depending upon prevailing conditions and availability of water.

Amount of water required for irrigation of various fields in the sports complex

As per the data collected during the interview it has been found that the fields are being directly watered through pipes and it requires about 50,000 liters per session for the football stadium and the cricket field requires about 1000 liters per usage.

Total water consumption of the complex

=316,220+ (No of matches in a month*water irrigated)
=316220+ (6*50000) + (10 * 1000)
=626220 liters

Material used

After careful study of the site it was seen that grass, asbestos, concrete and AstroTurf have been used the most compared to the other materials. Hence these three materials will be taken for rain water harvesting calculation. (Refer table 2)

MATERIAL	**ASTROTURF**	**RUBBLE MASONARY**	**CONCRETE**	**EXPOSED SOIL**	**ASBESTOS**	**ACRYLIC**	**GRASS AREA**
RUN-OFF COEFFICIENT	0.5	0.6	1.00	0.4	0.9	1.00	0.35
AREA	7208 SQ.M.	4160 SQ.M.	18,000 SQ.M.	5000 SQ.M.	20,840 SQ.M	3649 SQ.M	34569 SQ.M.

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RAINWATER INTENSITY	**1200MM**

Table 2: Rainwater co-efficient of the materials used in the complex

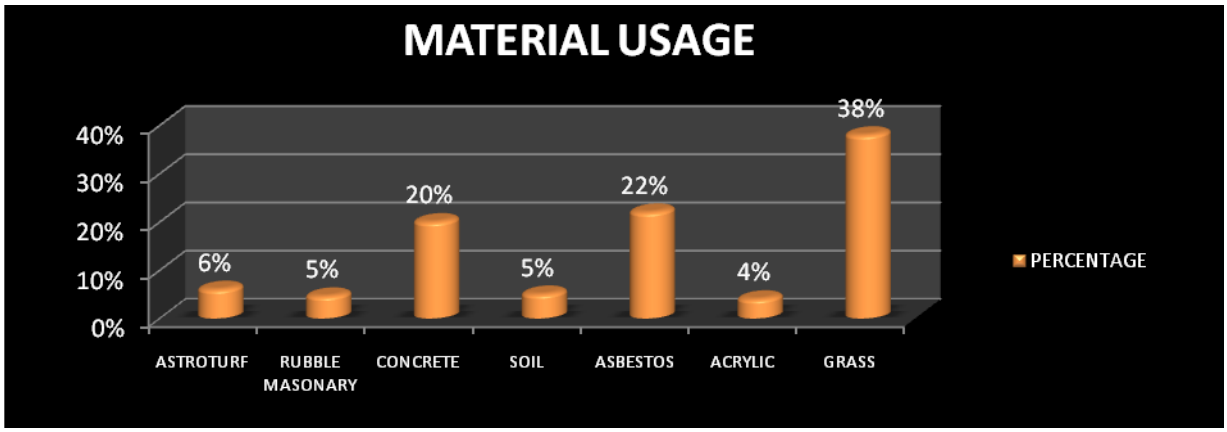

Figure 6: Graphical comparison of materials used for various purposes in the stadium

Rainwater endowment of the area

= 1.2*(7208+18000+20840+34569)
=96740 m^3
=**96740000 liters**

Rainwater harvesting potential

=Mean annual rainfall * Surface of catchment area * Run-off coefficient
=1.2 *(0.5*7208) + (1*18000) + (0.35*34569)
=40,443 m^3
=**40443000 liters**

=rainwater endowment of the area-rainwater harvesting potential
=96740000-40443000
=**56,297 liters**
Therefore 42% of water can be conserved which can be used for domestic and irrigation purpose.
570220litres of water would be required to s

Rain water stored

Inference

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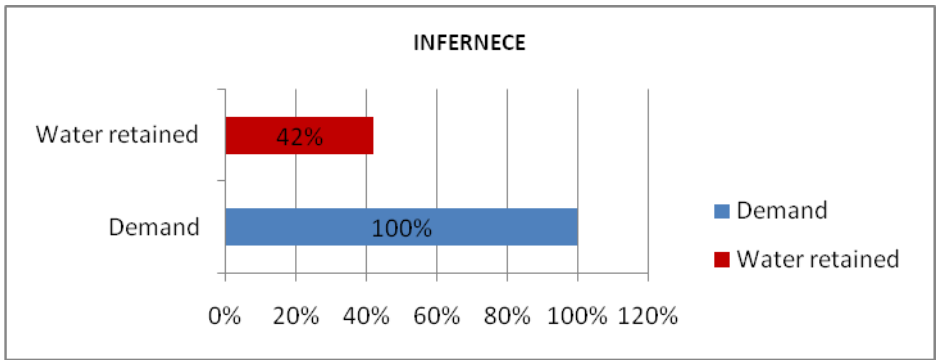

Figure 2: Graphical representation of water saving in a year through rain water harvesting technique

As per the public health engineering department, Govt. of Meghalaya the rate of water per 1000 liters is Rs. 8. Through rainwater harvesting technique for water conservation 56,297 liters of water can be retained hence there is a saving of Rs.450, 376 per year.

Recommendations

1. Providing low flow plumbing fixtures would reduce water consumption. Low flow plumbing fixtures like high efficiency toilet would contribute to 20% water saving, waterless and ultra-low flow urinal over 88%, Commercial bathroom faucets over 75% water savings and showerhead replacement over 50% water reduction. (as per Water Efficient Products-I;A rating system for Sustainable plumbing India)

Total demand of water supply during peak season using low flow fixtures

SL.NO.	AREAS	OCCUPANCY	WATER CONSUMPTION/ HEAD/ DAY (IN LITRES)	WATER CONSUMPTION/ HEAD/DAY LOW FLOW FIXTURES (IN LITRES)	WATER SAVINGS (IN L)	TOTAL DEMAND
1.	HOSTLE	22	135	123	12	2706
2.	OFFICE	10	45	31	14	310
3.	CAFETERIA	40	70	58	12	2320
4.	INDOOR STADIUM	1000	10	6	4	6000
5.	OUTDOOR STADIUM	30,000	10	6	4	180,000
TOTAL DEMAND=191,336						

Table 3: Total demand of water supply with reduction in water demand (Source: IPC)

NOTE:

Values for water consumption of low flow fixtures have been referred from *Water Efficiency Product India-1*

It can be seen that by using low flow fixtures 124,884 liters of water per day can be conserved.

Waste water generation

SL.No.	AREAS	OCCUPANCY	FLUSHING/HEAD/DAY (IN LITRES)	TOTAL
1.	HOSTLE	22	45	990
2.	OFFICE	10	20	200
3.	CAFETERIA	40	15	600
4.	INDOOR STADIUM	1000	6	6000
5.	OUTDOOR STADIUM	30,000	6	180000
TOTAL WASTE WATER PRODUCED=187,790 l/day				

Table 4: Total waste water generated (Source: NBC)

Note:

As per NBC *"Out of the 150 to 200 liters per head per day, 45 liters per head per day may be taken for flushing requirements and the remaining quantity for other domestic purposes."*

2. Root Zone treatment system for waste water. By using this method out of 187,790 l/day 40% of the water gets treated and can be used for irrigation and flushing purpose. Hence there is water saving of 112,674 l/day which would reduce the water footprint of the stadium.

3. By using rainwater harvesting technique the water that can be conserved is up to 56,297 liters which is 42%.

4. Drip irrigation for watering the fields will conserve 30% of the water compared to the traditional system. Therefore 217000 liters of water can be conserved

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GIS based Visual Value Analysis for Mapping Greenways: A Case of Charoli Village, Lohegaon, Pune, Maharashtra, India

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Abstract : Visibility and scenic landscape analysis of a particular region or a state is an important field of study with direct implications in urban and regional spatial planning, landscape planning and management. More specifically, GIS-based landscape visibility analysis can be a tool to protect, manage, and plan cultural urban landscapes, focusing on scenic and visual values. As an important component of urban landscape planning, visual impact assessment is mainly concerned with: A. the direct impacts of the development upon views of the landscape through intrusion or obstruction; B. the reactions of viewers who may be affected; C. the overall impact on visual amenity, which is often cumulated by plenty of minor process and can be range from degradation through to enhancement or vice versa. Visual aspects are fundamental in urban planning and environmental conservation, since each plan choice can generate manipulation or obstruction of urban elements, producing negative effects on the image of the city. Using visibility maps it is possible to predict the visual impact of transformations, locate interventions on the basis of visual sensitivity, and protect landscape of bio-physical importance, cultural heritage and significant landmarks visible from selected viewpoints. The visual value is defined by biological and physical (or biophysical) values, while the perception-based approach emphasizes the human view (subjective) of the landscape. This paper outlines a methodology to identify and study of visual values of Charoli for development of conservative zoning and conservation subdivision design development, an approach we call growing greener using GIS as a tool to identify the potential Viewshed from a potential viewpoint.

Keywords: Conservative zoning, GIS, Visual values, Viewshed

Introduction

Charoli is an ancient village. Charholi issituated in the proximity of Alandi a town in Pune, Maharashtra which is popular place of pilgrimage and also holds a samadhi of St. Dnyaneshwar. It is settled under the foothills of Wagheshwar hill in the west and Indrayani River to the north. The picturesque Charoli village is been documented in a book "Aashi amchi Charoli" which states that Charoli was a small village surrounded by a mass of fertile land, green pastures, hills, mountains and the holy river Indrayani. These visual natural landscapesmake Charoli village a place of significance with natural heritage which include wide expanse of ecosystems, providing habitat to wildlife, rare plants, animal species, wetlands, streams, rivers, etc. In terms of smart urban planning finding land resources with cultural and visual value; conservation of these aspects is of prime importance before going ahead with any kind of urban development. The urban wave of development from city has now approached this village's boundary. Therefore, adoption of greenways as a key concept in the current scenario is of utmost significance as an ecologically responsive and adaptive planning.

Visual Environment and Sense of place

Currently the village has extensive farmlands where farming is a source of income for the people of Charoli. The undulating terrain with hills gives the village potential viewpoints to look at the biophysical features of Charoli. Charoli being an ancient village, the people residing here have strong religious belief therefore temples are seen closely knit with the houses in the core of the village or a number of them are visible on hills. This cultural significant feature can be seen at the ancient Wagheshwar Temple or Shiva Temple which is located on the highest hill in the village which is still the cultural center for religious belief of people that are not only residents of Charoli but also for other believers from distant places. Earlier Charoli Gaon had a fortress around and an entry gate called as Ves; wherein houses or Wada's were built. These old Wada's built with timber and stone used as construction material are now prominent man-made feature of Charoli which speaks of the visual character of the buildings then. Although few houses have altered old houses by new multi-floor houses but the ancient Wada's give a peculiar character here. Hence it is an important task for shaping the growth around the special natural and cultural features of such a region to be considered while deriving local zoning and subdivision ordinances for such community where visual values are already set.

For the communities that have adopted a particular type of land-use pattern and measures to control growth are the two additional choices faced by the local residents and officials respectively [9]. Therefore, by greenway policies modification of conventional zoning and subdivision codes to turn it into new conservation-based tools that can effectively protect the community's most valued resources and special places, while still accommodating full-density growth.

As per greenway policy, the site views in and out from the site is a prime aspect of site design from the perspective of both the developer and the general public. The developers usually wish to maximize attractive views outward from potential house sites, while the public typically desires that the new development be as visually inconspicuous as possible [1]. Considering the visual values of both the parties, it is often possible for development to be sited or buffered in such a way that everybody's principle visual interests are accommodated.

Visual value assessment methodology for Charoli

Existing environmental visual values

The methodology for the identification of the existing environmental values of Charoli surrounding the site and the identification of the viewpoints is detailed below:

a) The field visits and use of GIS datasets, aerial maps, photographs to generate potential visual catchment areas.

b) Classification of Visual values.

c) Identification of potentially affected receptors and viewpoints which are accessible to the public for their respective use or purpose. Understanding the sensitivity of visual receptor.

d) Site verification of publicly accessible and respective viewpoints with photographic records to provide representation of typical views possible from that locality to the project. These viewing situations reflect particular landscape or visual features of importance within the visual environment and local landscape character. Generally, they represent views from key visual receptors (residents and recreation users) where a potentially change in view may occur.

e) The main objective was to understand the Environmental Impact Assessment of visual aesthetics and its human perception for visual aesthetics [6].

The study is carried out in following stages-

STAGE 1- Study of visual values in terms of greenway ordinances and field visits and Literature reviews

STAGE 2- Collection of data and identification of visual values in terms of views and viewpoints of the area.Classification of visual values in terms of natural and man-made.

STAGE 3- Visual quality matrix and map generation process. Classification of visual values or view pointaccording to visual impact factors.

STAGE 4- Classification of visual impact factors to the visually influential factors

STAGE 5- Viewshed quality analysis. Create Viewshed analysis according to visual influential factors distance and calculate Viewshed scores using arc GIS as a tool for Viewshed analysis.

STAGE 6- Analysis of visual value and its cumulative impact

Understanding greenway review standards for visual values

Delineation of vital resources that contribute to the visual aesthetics or values of a Charoli to be studied for greenway policies-

a.Stream channels, floodplains, wet soils, swales, springs and other low-lying areas, including adjacent buffer areas that may be required to ensure protection.

b.Significant visually potential natural areas of species listed as endangered, threatened, or of special concern.

c.Moderate to steep slopes, particularly those adjoining watercourses and ponds where disturbance and resulting soil erosion and sedimentation could be detrimental to water quality hence affecting visual quality of the sensitive receptor.

d.Hedgerows, groups of trees, large individual trees of botanic significance, and other vegetation features representing the site's rural past.

e.Historic structure and sites

f.Existing trails connecting the tract to other locations within or near the municipality.

g.Visually prominent topographic features such as knolls, hilltops and ridges, and scenic Viewsheds as seen from public roads (particularly those with historic features).

Data collection:

Visual value Inventory

Visual landscape inventory is used to delineate, classify, and record areas in the region that are considered to be visually and ecologically sensitive. This information is intended to assist land-use planners and environmental resource managers in deciding appropriate land uses, resource development objectives, and management prescriptions [2].

Landscape visual quality factor: Every visual biophysical feature in the landscape of Charoli can be considered as an LVQ (Landscape Visual Quality) factor as shown in table1 and 2.

Farms, Topography or land form (hills and slopes), Vegetation, River Indrayani, Reserved forest, etc. - It's not just the natural environments that need protection. Historic areas and regions with traditional farming practices may also need protection to ensure that their distinctive appearance is not spoilt by other developing projects and short-term considerations.Where strategic land-use planning is initiated, Ministry of Forests visual landscape inventory mapping or Ministry of Tourism and Culture tourism capability mapping can provide the necessary information to identify the location of sensitive landscapes and known scenic areas, as well as provide management direction [5].

Where landscape unit planning is initiated or under way, scenic areas may be identified and made known and VQOs (Visual Quality Objective) may be established through this planning process. In the absence of higher-level plans, or for higher-level plans not specifically addressing the management of scenic areas and visual quality, district managers can use their own statutory authority to identify and make scenic areas known, and establish VQOs [3].

Vistas and Viewpoints

Vistas and viewpoints are notable points from where landscape can be appreciated. They are connected to the landscape so the vista comprises the location of the viewer and the view they can see from the point. Identify the range of vistas. Order classification- Arrange all the data aesthetical and visual values and their characteristics in the order of vistas against their order of classification like, coherence, dominance, containment, barriers and screens, etc. as shown in table 3.

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Table 2 Showing Landscape Visual Quality Objective of Charoli

	Existing Man-made visual quality		
	High	Medium	Low
Temples	Wagheshwar temple, Hiramata Mandir, Maruti Mandir, Vitthal Rukmini Mandir	Shrimant waghai temple, Hanuman temple, Jain Temple, Molani Masjid, Pirbaba Darga, Laxmi mata Mandir,	Sheetala devi Mandir, Durga Mata Temple, Kadubai Shree Mhasoba
Houses	Clustered old houses/ wadas inside the Ves.	Outside the Ves, individual houses in Farmlands	G+4 newly constructed apartment
Others	Wagheshwar chowk, Tapkir Bhaji Market, Post office, Sewage Treatment plant, RMC plant	Shree Wagheshwar vidyalaya	Swachh Public toilet

Table 3 Showing Man-Made VQO of Charoli

	SCENIC QUALITY		
	High	**Medium**	**Low**
Waterbodies	Main river- Indrayani river. Strong flow during monsoon.	Water in the river for 4-6 months. Scattered ponds and lakes	No water or dried river.
Streams	Flowing streams in monsoon	Minor streams with intermittent flow. Pockets of water can be seen or partially dry	Absence of streams
Land form	**Hills and mountains** High/ steep/undulating/ flat, Focal points, Valley and ridge forms, Irregular, Dramatic seasonal colour, Mountains and hills with pastures and vegetation during monsoon.	Partially dry and less greenery.	Completely dried less vegetation
Farmlands	Farm Lands adjoining the river with high fertile soil. Green farmlands surrounded by the hills and mountains create visual contrast seasonally.	Green farmlands and mountains with less vegetation.Green farmlands with partially dried streams/ water bodies.	Green farmlands with no vegetation.Less vegetation on farm lands and no streams.

Table 4 Showing Matrix for Vistas and Viewpoints

Visual catchment	Dominance	Coherence	Containment	Barriers and screen
	River Indrayani	Trees, flora and fauna	Medium	Houses and Farms
	Built-up spaces, hills and mountains, trees	Visibility of landscape and man-made attributes	High	None
	Road, trees, water stream, farms	Foreground- trees and farms Middle ground- mountains	Focused	Trees
	Farms, Tall buildings and Institution, Mountains	Foreground- farms, Background- Urban development Middle-ground- Hill-	High	None
	Farms, hills and trees	Foreground- trees, farms, Middle-ground- hills	Low	Mountains and hills
	Trees, kuccha road	Foreground- dense trees and shrub	Low	Trees

Visual catchment	Dominance	Coherence	Containment	Barriers and screen
	Farms, mountains, houses	Foreground- trees, farms, Middle-ground- hidden hills and mountains	Moderate	Trees
	Wagheswar hill, Wagheshwar temple	Fore-ground- Clustered houses, water tank	Low	Houses
	Chowk, Banyan Tree	Fore-ground- Ves, Masjid	Low	Built spaces
	Stretch of Farmlands	Fore-Ground- Farmlands/Vegetation Background- natural and Cultural Landscape	High	None
	River Indrayani and Hiramata Temple	Fore-ground- River Flora and Fauna	Moderate	Natural and Cultural Landscape

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Viewshed analysis for visual values

Quantitative analysis for visual values or visual impact assessment includes Viewshed. Its output can be projective maps, which are initiated from viewpoints within the development (inside looking out), or reflective mappings, which are initiated from viewpoints in the surrounding landscape (outside looking in). Objective of the former is to reveal the extent of visibility of the existing visual amenities to its surroundings. And the latter's objective is to determine whether the existing visual value of Charoli affected by sprawling urban development as per PCMC development plans, and to what extent, the development is visible from its surroundings.

Viewshed analyses with Geographic Information Systems (GIS) software uses the elevation value of each cell of the Digital Elevation Model (DEM) to determine visibility to or from a particular cell. Moreover, the viewshed analysis provides to be an instrumental to identify the qualitative or quantitative, positive or negative impact of a particular development has brought in a region [4].

Viewshed and Visibility of Charoli

From visual value inventory, potential viewpoints where marked as observation points to conduct Viewshed analysis as follows:

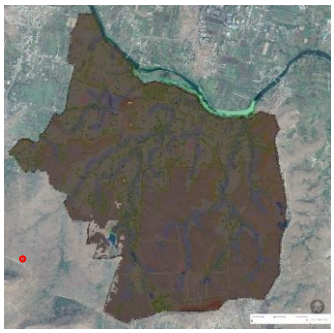

Figure 1: From Pirbaba Masjid

Figure 2: From Waghjai Mandir

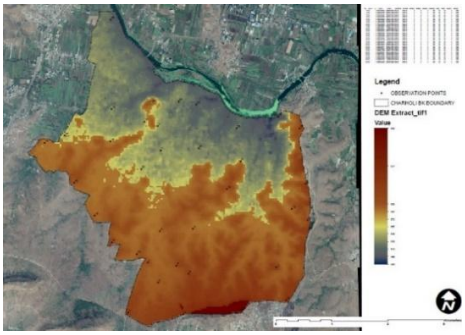

Figure 6: Showing DEM of Charholi

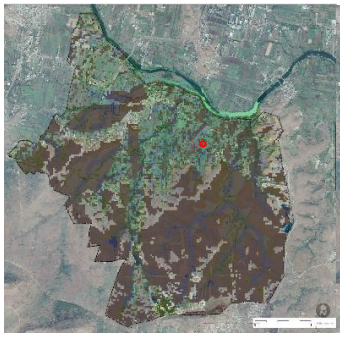

Figure 3: Viewshed From Wagheshwar

Figure 4: Viewshed From Alandi Road Temple

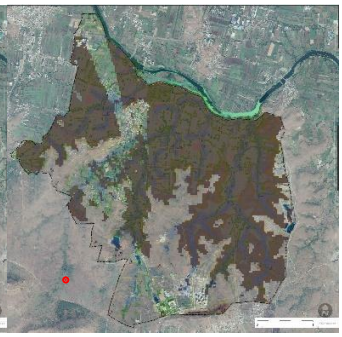

Figure 5: Viewshed From Pride World City

Conclusion

The visual impact for theassessment of visual values of Charoli by using GIS as a tool for mapping greenways to propose a development integrating the city growth as well as balancing the existing ecosystem that addresses three types of issues: spatial, quantitative and qualitative. Spatial issues include where the development is visible from or, more specifically, what or whom it is visible to; quantitative issues include how much of the development is visible, how much of the surrounding area is affected, and to what degree; and qualitative issues include the visual character of the development and its compatibility with its surroundings [8].

Viewshed includes all visible or invisible area in the city from given viewpoints or view corridor (ESRI, 1997). View corridor means the corridor from the viewpoint to the scenery [8]. The viewshed analysis of Charholi (Figure1 to 5) displays potential ecological, cultural and built environment that the developer needs to consider inorder to prevent avoidable damage to the environment and localcommunities. Due to the presence of fertile alluvial soil the occupation established here is farming. The future development should consider the current socio-economic aspect of the village.Farming practices may also need protection to ensure that their distinctive

appearance is not spoilt by other developing projects and short-term considerations [7]. Hence, this will not only help in conserving the socio-economic but also will help the new development to reduce the cost of transportation of vegetables from agricultural land located far away from their houses.The topography of Charoli is such that it acts as a basin containing water. To the north of Charoli flows the Indrayani river. During monsoon, this river overflows due to streams flowing from Charoli gaon to Indrayani river. In this situation, the watershed management for Charoli will aid in maintain the water table below the ground, the lentic and the lotic habitats and as well as the streams of different orders.

As per greenway ordinances, the study of the existing wildlife or critical habitat, topography, rivers, streams, watershed, etc. are the visual ecological markers that not only enhances visual absorption capability of this area but also maintains the ecology. Mapping and overlaying these layers in GISdevelop a prolific ecological corridor. In Charoli Gaon, where the visual landscape amenities are still unadulterated, visibilities between scenery can often be maintained for good visual effects. It is necessary to maintain some visual interdependency between important layers of water bodies, vegetation, farmlands, wetlands, etc. inorder to form the high visual landscape effects.

The burgeoning city population has approached the boundaries of the village. Hence, it is visible that future development is probably inevitable.This future expansion will enter into the village boundaries with its own ideology of development. These viewing corridors are often affected by the layout and height of buildings. Today, it is of equally important for regulatory authorities or the developers to consider various bio-physical, chemical, cultural and socio-economic aspects into local plans [1]. If the authority introduces buildings with high FSI in such an area without consideration of its natural landscape and the existing built environment then such development will not only cause difference in the housing typologies losing the rich cultural context but also will create visual as well as environmental pollution.

The study of existing visual landscape inventory focuses on mapping and conservation of existing landscape that helps in reducing the negative environmental impact and conservation of green corridor. Mapping these green attributes that has maximum ecological markers viz, vegetation, farmlands, critical habitat, streams, lentic and lotic habitats, wetlands, hills, etc. will define the distinct path called as greenways. Themapping of greenways with inclusion of conservation of a corridor embarking harmony of built and un-built environments for better living. As per greenway ordinances, mapping and conservation of greenways that is visually, ecologically, economically, politically balanced will elucidate Charoli as an example of sensitized community living developed with greenway corridor making it environmentally, economically, socially sustainable.

Hence, redefining future development of Charholi into conservative zoning and conservative subdivision design, an approach for growing greener Charoli.

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Climate Vulnerability - Understanding and Addressing Impacts of Vulnerability on Ecosystems and Human Societies, Kothrud Ward Pune

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Abstract : The impacts of global climate change are increasingly being felt around the world. The extent of the impacts depends upon the magnitude of climatic changes affecting a particular system (exposure), the characteristics of the system (sensitivity) and ability of people and ecosystems to deal with the resulting effects (adaptive capacity of the system or area).These three factors determine the vulnerability of that system or area.
This paper introduces what is vulnerability and how it affects the environment contributing to climate change on ward level. Kothrud ward was selected as it experiences the greatest pressure because of migration of population, which also impact land use pattern of Kothrud ward. Vulnerability index is measure of the exposure of a population to some hazard. To calculate vulnerability index of Kothrud ward, Leopold matrix is used. Simple interaction matrix is presented for factors which are under exposure, sensitivity and adaptive capacity. As a result of simple interaction matrix we can clearly say that adaptive capacity of Kothrud ward is very low hence the Kothrud ward area is highly vulnerable.

Keywords: Exposure, Sensitivity, Adaptive Capacity, Vulnerability Assessment

1. Introduction

The impacts of global climate change are increasingly being felt around the world. The extent of the impacts depends upon the magnitude of climatic changes affecting a particular system (exposure), the characteristics of the system (sensitivity) and ability of people and ecosystems to deal with the resulting effects (adaptive capacity of the system or area).These three factors determine the vulnerability of that system or area. Over the past decades, methods of vulnerability assessment have been developed in the wide range of development related fields ranging from natural hazards research, food security research and poverty analysis, sustainable livelihoods research and related fields. Experience with this framework suggest that vulnerability is a complex subject that has many dimensions which may often have overlapping effects that make it difficult to ease out precise cause-effect relationship.

The term vulnerability is often used to describe the potential (adverse) effects of climate change on ecosystems, infrastructure, economic sectors, social groups, communities and regions (IPCC 2007). In the course of increasing global temperature and extreme weather phenomena the intergovernmental panel on climate change (IPCC) has been founded by the united nations environment program (UNEP) and the world meteorological organization (WMO) for a better understanding of climate change and meeting concerns of these observations.

2. What is Vulnerability?

Vulnerability (IPCC 2007): Vulnerability is 'the degree to which a system is susceptible to and unable to cope with adverse effects of climate change, including climate vulnerability and extremes. Vulnerability is a function of the character, magnitude and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.'

Exposure (IPCC 2007): the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social or cultural assets in places and settings that could be adversely affected.

Sensitivity (IPCC 2007): the degree to which a system or species is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g. damages caused by an increase in the frequency of coastal flooding due to sea level rise).

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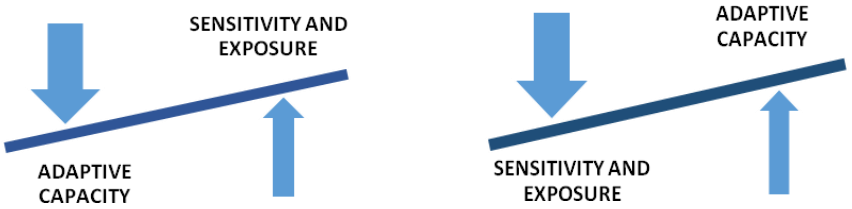
Potential impact (IPCC 2007): impacts of climate change are the effects of climate change on natural (e.g. water resources, biodiversity, soil, etc.) and human systems (e.g. agriculture, health, tourism, etc.). Potential impacts are all impacts that may occur given a projected change in climate, without considering adaptation.

Adaptive capacity (IPCC 2007): the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantages of opportunities, or to cope with the consequences.

VULNERABILITY = POTENTIAL IMPACT (SENSITIVITY X EXPOSURE) – ADAPTIVE CAPACITY



Source: adapted from Alberta Sustainable Resource Development, 2010 and http://www.adaptingtorisingtides.org/vulnerability-and-risk/

Assets with high adaptive capacity and low sensitivity/exposure can tolerate impacts to a greater degree and therefore have an overall **low vulnerability.**Assets with high sensitivity/exposure and low adaptive capacity are more susceptible to impacts, and therefore have an overall **high vulnerability**.

3. Study Area: Kothrud Ward

3.1 Location:

Kothrud (Kothrud Baag during the Maratha Empire era) is a western suburb of the city of Pune, Maharashtra. Experienced rapid growth in commercial and residential real estate. It was one of the fastest developing suburbs in Asia in the 1980s. Landmarks in Kothrud include the Dashabhuja Temple and the Mrityunjaya Temple, both dating to Peshwa times.

Latitude: 18.5074° N, Longitude: 73.8077° E

Figure 7 map of maharashtra showing pune location

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Figure 8 google map showing demarcation of kothrud ward

3.2 Why Kothrud Ward?

Pune is one of the leading city in Maharashtra with respect to industrialization and urbanization. After Panshet dam disaster of 1961, people were forced to move out of the old core of city. This people moved to Parvati and Erandwane. In 1981 – 91 Kothrud area experience the greatest pressure in terms of housing cooperatives as pollution of city increasing rapidly. As Kothrud area experience pressure because of migration of population it impacts on the land use pattern of Kothrud. Land use pattern changed from agricultural land to non-agriculture land. Most of land is converted to residential area. As per national disaster management center pune Municipal Corporation, Pune (2014 – 15) report, out of 15 wards of pune **KOTHRUD** is at high risk for vulnerability.

Figure 9 map showing focused area of kothrud ward for study

4. Calculating Vulnerability Index for Kothrud Ward:

A **vulnerability index** is a measure of the exposure of a population to some hazard. Typically, the index is a composite of multiple quantitative indicators that via some formula, delivers a single numerical result. Through such an index "diverse issues can be combined into a standardized framework making comparisons possible".To be able to calculate a Vulnerability Index it requires the compilation of relevant vulnerability data for the indicators such as changes in rainfall pattern, changes in temperature range, land use pattern, ecosystem imbalance, vegetation cover, population growth, migrations etc.

4.1 Primary data:

A) Collection of primary data through questionnaires:

As per survey was conducted through random sampling for 30 samples, problems occurred in focus area were; water logging, change in road pattern, reduced green spaces, constructions on hilly areas, change in housing typology, rapid development, health crises, food and water: lesser quality, lesser quantity, change in rain pattern, rising temperature, more air pollution, water shortage, improper waste management, improper rainwater harvesting plant, lack of rain water harvesting plants and waste water treatment plants.

Column chart for questionnaries:

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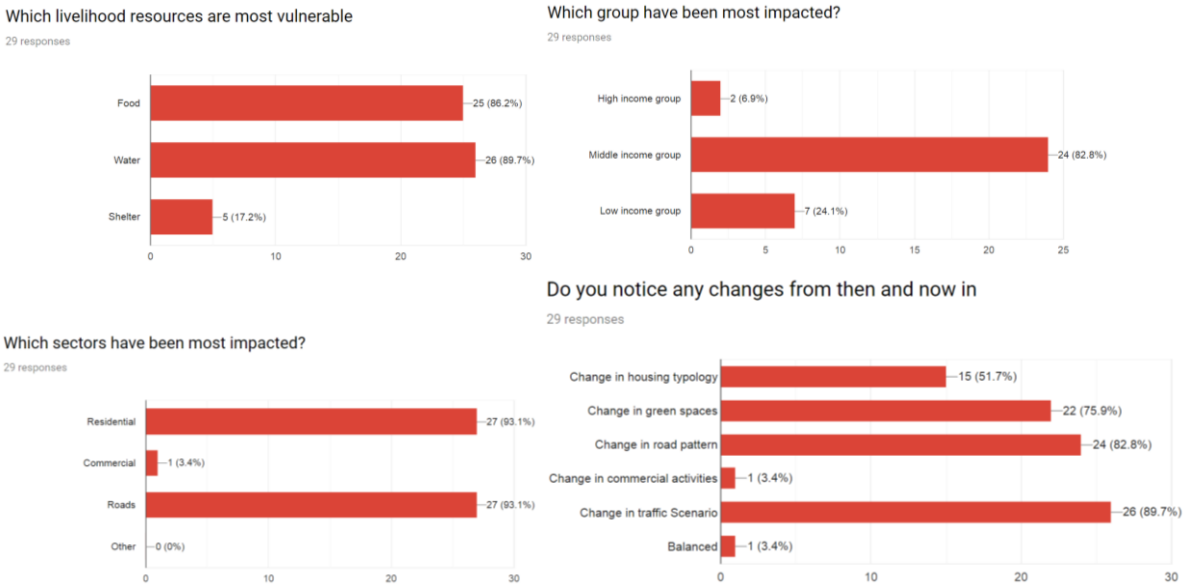

B) Collection of primary data through observations:

Improper road drainage, rapid increase in upcoming new constructions, encroachment on hilly areas, cutting down trees for development.

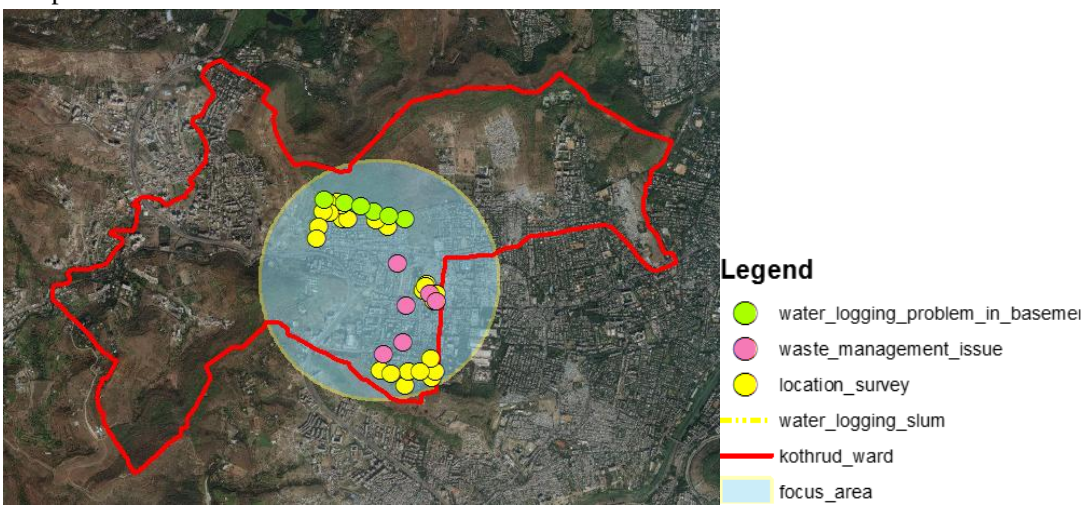

Figure 10 map showing survey locations and problem locations

4.2 Secondary data:

A) Information collected by government departments: As per, Integrated Ward Level Disaster Management Plan of Pune City, Pune Municipal Corporation (2012), risk factors for ward are:

Vulnerability Analysis: It is estimated that about 40% houses that are of vintage construction or slum huts are likely to be severely damaged or destroyed. The other areas may have about 10% structures suffering partial damage. Vulnerable population may be as high as about 30% i.e. nearly 60,000.

B) Indian Meteorological Department (IMD) Data:

As per IMD data (from 2011 to 2016), the IMD data sheets prove the fact that the rainfall quantum in Pune has increased and has established a variable time line. The IMD data sheets also validate the rise in dry bulb temperature in the previous 6 years span.

5 Vulnerability Index:

For understanding cumulative impacts of factors which are highlighted in tables below simple interaction matrix is used.

5.1 Simple interaction matrix: The interaction matrix method developed by Leopold et al. in 1971.A simple interaction matrix displays Factors (magnitude) on one axis and impacts of factors on another axis.Many variations

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of the simple interaction matrix have been utilized in impact studies. For matrix the magnitude is described by assignment of numerical value from 0 to 5, where 5 representing a higher impact and 0 is a lower impact. Assignment of numerical value for the magnitude of interaction is based on an objective evaluation of facts related to the anticipated impact.

Table 2: Factors under Exposure Sensitivity and Adaptive Capacity by IPCC 2007:

POTENTIAL IMPACT - EXPOSURE AND SENSITIVITY							
FACTORS		IMPACT					
		0	1	2	3	4	5
	Temperature Rise						
	Heavy Rain						
	Water table						
	Population						
	Land Use						
	Demographic Characteristics						
	Infrastructure						

ADAPTIVE CAPACITY						
FACTORS	IMPACT					
	0	1	2	3	4	5
Economic						
1. Income						
2.Land Use						
3.Housing Location						
4.Flexibility Of Occupation						
5.Migration						
6.Community Network						
7.Collective Action						
Infrastructure						
1.Building And Roads						
2.Transportation						
3.Drainage System						
4.Health Status						
5.Water Storage Facilities						
Individual Knowledge						
1.Awareness Of Climate Change and vulnerability						
Governance						
1.Government Social Interventions						

Note: where 0 – 5 are in ascending order and impacts are concluded on basis of survey and observations during site visits.

6 Conclusion

As we can see for potential impact most of the factors are highly vulnerable even for adaptive capacity of Kothrud ward most of the factors are highly vulnerable.

For potential impact (exposure and sensitivity) =

Exposure = 15, Sensitivity = 16

For adaptive capacity = 57

Vulnerability = Potential Impact (Sensitivity X Exposure) – Adaptive Capacity

Vulnerability of Kothrud ward = (15 X 16) – 57

= 240 – 57

= 183

As answer is positive it is clear that potential impact is more than adaptive capacity of ward.

As adaptive capacity is less and impacts are high kothrud ward is highly vulnerable.

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Perception of Designers on the Use of Sustainable Interior Materials and Finishes and Their Awareness about Their Effect on Indoor Air Quality

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Abstract : Environmental issues are increasing day by day and construction industry is one of the major contributors to it. Buildings impact the environment and so does an interior space as it gets refurbished more frequently. Sustainability helps to achieve a long-term balance between environment and livelihood. It is necessary to develop a positive environmental attitude amongst architects and interior designers to deliver sustainable solutions. Use of sustainable interior materials and finishes enhances the indoor air quality as well as reduce the load on planet's natural resources. In interior design, the designer has greater hold on sustainability through material selection. As there exists no proper regulation, there is a necessity to investigate designer's initiative of incorporating sustainable materials into real practice. The research aims to understand the perception of architects and interior designers regarding sustainable interior materials and finishes and their awareness regarding the effect of these materials on the indoor air quality. An online questionnaire survey of architects and interior design practitioners was conducted and sample size of 100 respondents was taken for study. The questionnaire was based on incorporation of interior surface materials and finishes in the design, sustainable practices, indoor air quality and impact of materials on human health and well-being. The findings of the research suggest that though designers are aware of the importance of sustainable materials they are not focusing on this parameter. Environmental impact and health factor are the least considered criteria for choosing materials. Also, there is lack of knowledge amongst designers as well as contractors for installation of these materials on site.

Keywords: **Sustainable interior materials, Interior design, Perception, Indoor Air Quality**

Introduction

Sustainability in interior design

The world is facing many key issues like climate change, depletion of resources and biodiversity, allergies and stress, water scarcity, etc. The construction industry is a major contributor to the environmental problems stated above. In order to sustain lifestyle requirements, a healthy economy, reduced global warming and decreased toxic gas emissions is essential to conserve environmental resources (Rashdan and Ashour, 2017).In 1987, the final report of "Brundtland Commission" was released, Our Common Future. It defines sustainability as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". (Stark and Park, 2016).

As the environmental issues are reaching its peak level, it's our responsibility to take action for curbing the adverse effects. It is in the hands of the designer to responsibly make design choices. A designer should make appropriate choices for architectural design as well as interior design. Traditional interior design practices have adverse effects on the environment due to the significant use of natural resources during the manufacturing and installation process (Rashdanand Ashour, 2017).In traditional design practices priority was given to aesthetics and functional need, while environmental and health impacts, initial and life-cycle cost were of the least priority. Commercial interiors get renovated after every 5 -7 years, that increases the burden on the natural resources if sustainable materials are not used (Hayles, 2015).

Interior materials and their health effects

Paints, adhesives, sealants, carpets, fabrics emit chemicals are hazardous to human health. Use of natural sources such as wood, plant products and mineral products which are low-emitting, durable, less likely to off-gas chemicals or Volatile Organic compounds have less impact on the environment(Rashdan and Ashour, 2017).According to The National Human Activity Pattern Survey, a person spends on an average 87% of their time indoors. People suffer from sick building syndrome which has serious health problems. The causes of sick building syndrome can be many, but emissions from architectural and finishing materials like flooring, paints and coatings, adhesives and sealants, wall coverings and wood products are considered as the major factor. Health issues like asthma and other respiratory problems, allergies, or even cancer-related deaths are seen due to indoor contaminants. (Lee. *et al,* 2013).

Sustainable materials

Material is termed as 'eco' materials which have qualities including recycled material content, recyclability, non/low toxic material content and/or low off-gassing from volatile organic compounds, ability to be reused or come from a reused source, biodegradability, low embodied energy, renewable and/or sustainable material resource, low life-cycle impact or reduced ecological footprint. (Mate, 2009).International Organization for Standardization 14040 defines Life cycle assessment (LCA) as: "A technique for assessing the environmental aspects and potential impacts associated with a product, by: compiling an inventory of relevant inputs and outputs of a product system; evaluating the potential environmental impacts; and interpreting the results of the inventory analysis and impact assessment phases. LCA is often employed as an analytical decision support tool." (Khasreen, *et al.* 2009). The Delft Ladder describes the various stages of the life cycle of materials and ensures that materials are exploited to their maximum limit. This helps to reduce the waste that is being sent to landfills. (Hendriks and Te Dorsthorst, 2001). The model of circular economy increases the efficiency of materials and energy usage. The embodied energy of any material can be reduced by using salvaged or refurbished materials, obtaining the material from local sources, etc. Use of salvaged materials, materials with recycled content helps to conserve natural resources and gain tangible economic benefits (Akanbi, *et al.* 2018). The U.S. Green Building Council defines "rapidly renewable" as a material that's able to regenerate itself in 10 years or less. Such materials must be encouraged as they reduce the burden on fossil-fuels. Certified wood encourages sustainable forest management by reducing deforestation, preserving biodiversity and helps mitigate climate change.

Architects and interior designer's perception of sustainable materials

Many interior designers limit in their knowledge about the adverse properties of the materials they specify. (Hayles, 2015).A study was conducted by Lee E. *et al* (2013)to identify factors affecting interior designer's sustainable material choices. It was identified by them that there is a need for interior designers to change their values, attributes and behaviour for environmentally sustainable design. It is necessary to develop a positive environmental attitude amongst interior designers. Stark and Park (2016) conducted a survey of interior design students to assess their perception of sustainability. The limitations of the study were that they did not investigate whether seniors carry perceptions or tendencies of environmental and social responsibility into practice after they graduate.

Research Questions and Objectives

The aim of the research is to understand the perception of practicing architects and interior designers in incorporating the concept of sustainable interior materials and finishes in their projects.

The following research questions were identified:

- Are the architects and interior designers aware of sustainable materials?
- Do they incorporate these materials in their projects?

The objectives of the research are:

- To identify the criteria for selecting interior materials and finishes by the architects and interior designers.
- To understand the extent of incorporation of sustainable materials into practice by designers.

- To understand the difficulties faced by architects and interior designers in using sustainable materials.

Methodology

The methodology used for research is structured survey wherein a questionnaire was prepared to find out the desired outcome. The sample for this study is practicing architects and interior designers from India working on all types of interior projects. Random sampling is done to choose the practicing architects and interior designers for survey.

The format of the questionnaire was multiple choice questions, with space for giving brief explanation wherever necessary. The respondents had answer from the choices given for each question. The survey had two sections. In the first section, details of the respondents were asked such as number of years of practice, projects undertaken, etc. The second section included 21 questions on sustainability in interior design focusing on incorporation of interior surface materials and finishes in the design, sustainable practices, indoor air quality and human health and well-being. Respondents were asked about the salvaged, refurbished, recycled, regional, rapidly renewable, low-emitting materials and their extent of use in their projects. Questions regarding indoor air quality, indoor pollutants and awareness of standards specifying the emission limits were asked. The questions for this section were based on the Leadership in Energy and Environmental Design (LEED) and Indian Green Building Council (IGBC) Green Building Rating System. The initial draft was pre-tested through pilot study on 10 designers to avoid ambiguity. They were not considered for the final sample.

In the first section that covers general information, number of certified projects were asked to see their involvement into sustainable and green practices. In the second section, respondents were asked to give their preference for choosing the materials. One question was based on incorporation of sustainable material practices into real life projects and five questions were asked about the incorporation of sustainable materials into real life projects. Further, six questions were asked about low-emitting materials and their effect on indoor air quality. Frequency of evaluation of materials for its life cycle and life cycle cost was checked. Respondents were asked about the barriers they face while using sustainable materials1. Also, respondents were asked about their certified projects. To understand the importance of materials in interiors, respondents were asked about their focus areas in interiors and accordingly preferences were given. Further, interest of respondents in incorporating sustainable materials in future projects was asked. Lastly, a statement was made to check their approach towards sustainability. Likert-type scale was used for some of the questions while multiple responses were used for some of the questions. To obtain a high response rate, follow-up was taken in every week and reminder messages were sent. The questionnaire was sent to 400 designers and the response rate was approximately 25%, i.e. 100 valid responses were obtained.

Results and findings

All the designers had worked on residential projects, 63.52% had worked on commercial projects, 24.7% worked on different typologies like healthcare, restaurants, cafes, hotels, etc. 47.05% of the respondents had an experience of more than 10 years. It was observed that environmental impact (Figure. 1) and health factors (Figure. 2) were the least preferred criteria for choosing the materials. 36% of the respondents marked environmental impact as their 4^{th} preference while 18% of the respondents marked it their 5^{th} preference. Also, 45% of the respondents marked health factor as their 5^{th}criteria for choosing the materials and 25% marked it as 4^{th} criteria.

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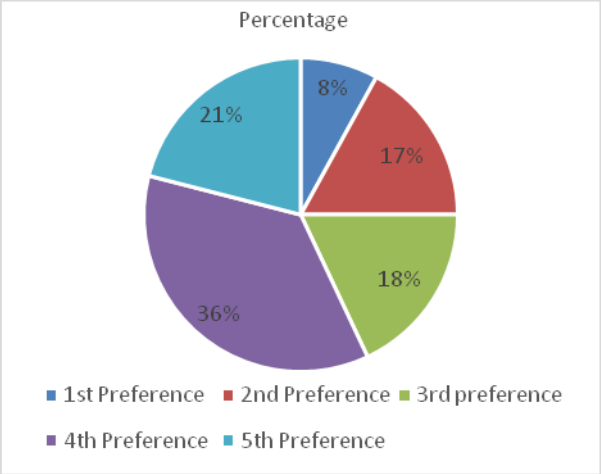

Figure 1: Environmental impact as the criteria materials

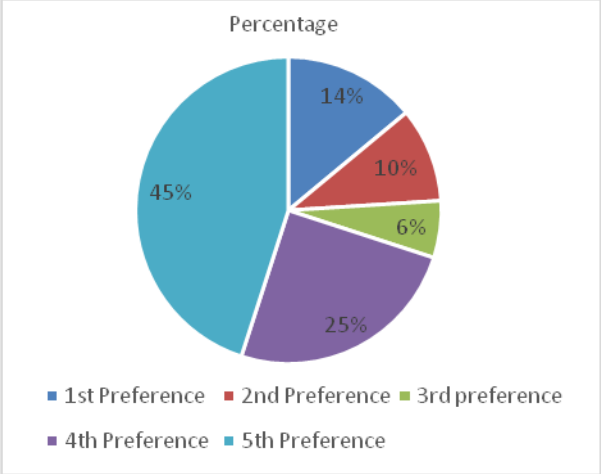

Figure 2: Health factor as the criteria for choosing for choosing materials

Sustainable materials and practices: On a five-point Likert-type scale from always to never, 49% of the respondents claimed that they "usually" manage their material waste and avoid it being sent to landfills. The rate of response for "always" and "sometimes" was 22% which meant that most of the designers manage their waste efficiently. When asked about the use of salvaged, refurbished or reused materials, 48% responded that they "sometimes" use these materials, while 30% said that they "usually" make use of such materials and 13% said that they "rarely" use these materials. Materials with recycled content was used "sometimes" by 37% of the respondents and "rarely" by 35% of them and only 8% and 20% responded "always" and "usually" respectively. It was observed that regional materials wereused extensively by the designers with response rate as 46% to "always", 32% to "usually" and 15% to "sometimes" and only 8% responded that they "rarely" used regional materials. When asked about the use of rapidly renewable materials, 37% of the respondents said "sometimes" while similar response rate was received for "usually" (29%) and "rarely" (26%). 54% of the respondents said that they use certified wood and 1% responded that they haven't used certified wood at all. It was observed that very few designers actually conducted analysis regardingthe life cycle of materials. 30% of the respondents said that they "never" did the LCA, 38% and 18% said "rarely" and "sometimes" respectively. Also, calculating thelife cycle cost was rare amongst the designers. 22% said that they had never done Life cycle cost analysis (LCCA) while 33% and 23% said that they "rarely" or "sometimes" do LCCA.

Low-emitting materials and indoor air quality - Questions were asked on indoor air quality and low-emitting materials to see the awareness of such issues amongst the designers. 27% of the respondents were "extremely aware" that materials contribute to indoor contaminants and 41% were "very aware" of the same. Also, 43% were "extremely aware" and 29% were "very aware" about the health issues caused by indoor air pollutants. Very few (10%) were "not so aware" of these issues. When asked about the kind of low-emitting material or finishes used by the designers, maximum used were low-emitting paints (82%), and the least used were low-emitting carpets (36%) and low-emitting furniture and seating (35%). 55% had used low-emitting adhesives and 49% had used low-emitting Composite wood and Laminate Adhesives. The respondents were asked about their awareness regarding indoor pollutants (Figure. 3). Maximum (81%) were aware of carbon dioxide as indoor pollutant and benzene (43%), Particulate matter (46%) and nitrogen dioxide (45%) were the least known pollutants. To maintain the indoor air quality, certain standards specify the limits of the acceptable pollutant levels in the air (Figure. 4). Out of these standards, World Health Organization was widely known (77%) amongst the designers and South Coast Air Quality Management District (SCAQMD) was the least known (9%). Also, 12% of the designers did not have any idea about such standards. The response rate was low for other standards like Green Seal Standard (34%), Green Label Plus (35%), Greenguard Indoor Air Quality (25%), The WELL Building Standard (21%) as well.

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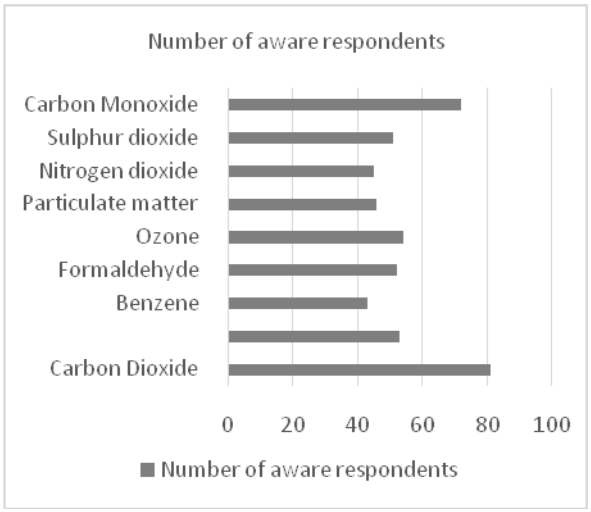

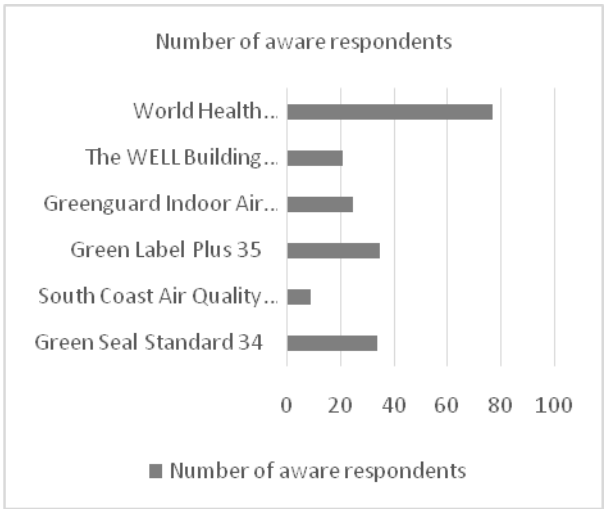

Figure 3: Awareness regarding indoorpollutants Figure 4: Awareness regarding standards specifying emission rate

The barriers for incorporation of sustainable materials in real practice were asked to the respondents. 79% of the respondents felt that budget constraint was one of the barriers. Similar weightage was obtained forother barriers like client's approval (47%), availability of materials (49%), andlack of knowledge about these materials (50%). Also, some of the respondents faced problems concerning joinery details of new sustainable materials. Contractors are unaware of the materials and its properties like strength and workability and therefore, designers had to choose material accordingly. Even clients had doubts regarding new materials and are reluctant to use them.

Only 10% of the respondents had their projects certified by the certification body like IGBC, LEED, Green Rating for Integrated Habitat Assessment (GRIHA - Under Low-emitting material credit). Focus areas in interiors were asked to know the position of materials amongst other parameters like energy consumption, daylighting, ventilation, thermal comfort and water efficiency. Water efficiency was found to be the least focused area and thereafter material was the second least focused area. 31% of the respondents marked materials as their 4th preference while 17% marked it as their 5th and 6th preference. (Figure. 5)

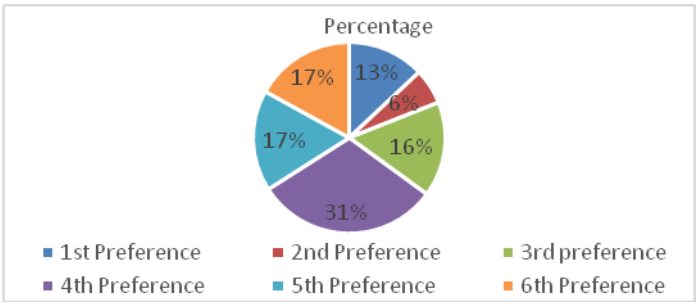

Figure 5: Material as a parameter in interior design

69% of the respondents said that they "definitely would" incorporate sustainable materials in future projects and 30% of them said that they "probably would" incorporate these materials and only 1% denied to incorporate these materials in future projects. Lastly, a statement was made to analyse the awareness of environmental responsibility every designer bear upon himself. 78% of the respondents "strongly agreed" that use of sustainable materials is a part of environmental responsibility while 28% only "agreed" to this.

Conclusion

Designers are aware of their environmental responsibility and aretaking steps towards sustainability. They are realizing the importance of using sustainable materials and are incorporating salvaged, reused, in their projects. Materials with recycled content are less frequently used. Interior materials and finishes as a parameter of sustainable interior design has not been the focused area while designing. Even though architects and interior designers are aware of the environmental impacts and health issues caused by inappropriate use of materials and

finishes they are not giving preference to these criteria. It is estimated that time consuming practices such as life cycle analysis and life cycle cost analysis are not frequently adopted by the designers. Though designers face certain barriers like cost, most of the designers are unaware of sustainable materials and hence they continue with the traditional practice. Further research can be conducted on manufacturers and vendor's perception on sustainable materials.

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Study of current Material Management Techniques forConstruction Projects

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Abstract : In any construction projects the major component is the material it contains more than 60% of the total cost of project, poor planning and control of material, lack of material when needed, poor identification of material, re-handling and inadequate storage cause losses in productivity and overall delays that can indirectly increase total project cost. Effective management of the material could reduce the total cost involved in the project. This paper will describe about the importance of material management and of the different inventory control techniques that could be applied in order to make effective material management in the construction projects. This study of the material management in different construction projects and analyse the material handling process undertaken by the company and applying inventory control techniques like ABC analysis along with EOQ analysis, S-Curve analysis etc. to achieve the desired results and suggest the best suitable techniques so as to minimize stock out problems and minimizes the total cost of inventory.

Introduction

Construction material is major costlier component in construction projects. The total cost of installed material may be 50% or more of the total cost. The goal of material management is to ensure that the materials are available at their point of use when needed hence, efficient procurement of material very important in the successful completion of the work.

Organizations need to understand the effects of proper materials management techniques on the effectiveness of project execution. Too often, construction projects suffer from delays, budget overruns, and claims. A properly implemented materials management program can achieve the timely flow of materials and equipment to the jobsite, and they can improved work planning, increased labor productivity, better schedules, and lower project costs.

"Material management'' is defined as the process to provide right material at right place at right time in right quantity so as to minimize the cost of project". Material management is concerned with the planning, identification, procuring, storage, receiving and distribution of material.

The responsibility of Material management department for the flow of material from the time the material is ordered, received, and stored until they are used is the basic responsibility of material management. Materials represent a major expense in construction, so minimizing procurement cost improves opportunities for reducing the overall project cost.

Outline of Research Work

Aim:-

The aim of this research is to **Explorethe current Material Management Techniques for construction site**. By applying inventory control technique &to analyse the effect of material management on construction projects.

Objectives:-

Objectives which have covered in this project study are as follows:

- To Compare Planned Vs Actual material consumption & to find the problems in planning, purchasing, procurement & to suggest remedies regarding the material management.
- S Curve Analysis is used for comparison of planned and actual cost of construction material
- To apply Inventory Control Techniques such as A-B-C analysis.
- To apply EOQ analysis to "A" & "B" class inventories so as to avoid stock out.
- Apply inventory control technique so as to minimise the total cost of inventory.

***Key Words*: Inventory, s-curve Analysis, EOQ Analysis.**

Research Methodology and Data Collection

The combination of both the qualitative and quantitative methodologies was adopted in this research. This research has the advantage of to explore the current Material Management Techniques.
Such as , interview, questionnaire survey and literature reviews were the methodologies adopted .
The experimental analysis of practical concepts are used for the research . Therefore the work can be classified as site management, inventory controlling, purchasing procedure, cost ,and procurement and tracking etc.

ABC Analysis
The grouping of all materials used in production into materials which require the highest attention, materials which require medium attention and materials which require the least attention such that the control mechanism be focused on selective class of materials is called selective inventory control.
The ABC inventory control technique is based on the principle that a small portion of the items may typically represent the bulk of money value of the total inventory in construction process, while a relatively large number of items may from a small part of the money value.

The money value is determined by multiplying the quantity of material of each item by its unit price.
The items "A" Category – 5% to 10% of theitems represent 70% to 75% of the money value.
"B" Category– 15% to 20% of the items represent 15% to 20% of the money.
"C" Category – The remaining number of the items represent 5% to 10% of the money value.
The relative position of these items show that items of category A should be under the maximum control, items of category B may not be given that much attention and item C may be under a loose control.

Economic Order Quantity(EOQ) analysis:
By using EOQ analysis method the firm can order the exact order quantity of any material ,so the cost for the specific order will also minimum. If a firm place unnecessary orders, it will require more unnecessary order costs. If a firm places too few order, it must maintain large stocks of goods and will have excessive carrying cost.

Economic Order Quantity is calculated by following formula,

$$Q=\left(\frac{2\times S\times Co}{Cu\times I}\right)^{\frac{1}{2}}$$

where,
Co = Ordering Cost, S = Total Consumption Cu = Cost of Item I = Inventory carrying Cost

Literature review -1

Analysing Material Management Techniques on Construction Project

Author - Ashwini R. Patil, Smita V. Pataskar
Publish on - October 2013
Publish in - International Journal of Engineering and Innovative Technology (IJEIT)

Introduction

The efficient procurement of material represents a key role in the successful completion of the work. Poor planning and control of material, lack of material when needed, poor identification of material, re-handling and inadequate storage cause losses in labour productivity and overall delays that can indirectly increase total project cost. Effective management of materials can reduce these costs.

This paper is written to explore the current practices of Material Management so this study is conducted in two phases, First phase gives the Qualitative information regarding deviation in planned and actual materials in terms of S curve analysis using MSP tool and reasoning over the deviation is essential to know the effect of material planning before execution of project.

Conclusion –

- Material Planning and scheduling can be done at every stage using construction software such as **MSP**.
- **HIT office** also a very good software for maintaining material inward, issue records which gives the accurate results in terms of Reconciliation Report.

literature review -2

Efficient Techniques of Construction Material Management In Construction Projects
Author - Review Deepak Karoriya & Dr. Mukesh Pandey
Publish date - Volume: 05 , Issue: 03 , Mar-2018.
Publish on - International Journal of Engineering and Innovative Technology

This paper represents the technique of finding optimum cost used in material management for a particular site using EOQ (economic order quantity) analysis.

Questionnaire survey is the main source for the study using EOQ analysis, which helps in minimizing the cost of materials.

This paper includes review of study of management for good practice to avoiding the extra cost of the materials, which is very essential for construction industry.

The EOQ analysis can sort out the materials management problem in construction area and reduce the construction cost by the timely order of the construction materials.

CONCLUSIONS

The EOQ analysis is better technique for avoiding the extra cost of the materials by good management of the ordering construction materials. Thus the EOQ analysis is most essential to the construction projects The proper management of the construction materials should be well on the construction site and there is no wastage of the material. The EOQ techniques provide right number of order at the right time and the right quantity of the construction materials at the right places.

In this study, there are four case studies is done with the help of the EOQ analysis.

literature review -3

Fundamental Principles of Site Material Management
Author - H. Randolph Thomas; David R. Riley ; and John
Publish date. 2005

- This paper was written to fill a void created by the absence of fundamental principles of site construction management.
- Efficient material management is essential to managing a productive and cost efficient site. Using deductive reasoning, fundamental principles were developed to avoid poor practices. A construction site should be portioned into three areas or zones:

1. semi permanent ,
2. exterior storage and staging areas,
3. Interior storage.

- Each has a unique function relative to site material management. Using these areas as a framework, fundamental principles are stated and illustrated using a case study.

Quantitative Analysis:

EOQ refers to the order size that will result in the lowest total of ordering and carrying costs for an item of inventory. If a firm place unnecessary orders it will suffer un-needed order costs. If a firm places too few order, it must maintain large stocks of goods and will have excessive carrying cost.

In this study EOQ analysis is performed on Cement, Reinforcement Steel, Bricks, River- Sand & Aggregate. While performing EOQ analysis Ordering Cost &Inventory Carrying Cost is assumed for each material with practical execution procedure of construction. Inventory carrying cost incurred for maintaining the inventory.
This includes Cost of Storage, Insurance taxes, Deterioration & obsolescence this calculates in %. Inventory Carrying Cost is 26% Economic Order Quantity is calculated by following formula,

1. Visiting for cost of construction material in local market.
2. Find out the Q (Economic Order Quantity).
3. Find out the number of orders per year (based on EOQ).
4. Find out the frequency of ordering (per year).
5. Find out the total cost.
6. Find out the

$$Q=\left(\frac{2\times S\times Co}{Cu\times I}\right)^{\frac{1}{2}}$$

Q = Economic Order Quantity
Co=Ordering Cost
S = Total Consumption
Cu=Cost of item
I = Inventory carrying cost Inventory cost includes cost of storage, insurance taxes, Deterioration and obsolescence. Hence, Inventory Carrying Cost = 26% for all the materials.

$$N=\sqrt{\frac{C_u * S}{2C_o}} \qquad t=\frac{1}{N}$$

where, N = number of orders per year where, t= time between orders

Name of Material	Annual Requirement	EOQ	No.of orders	Frequency of ordering	Total cost of Inventory using EOQ in lakhs

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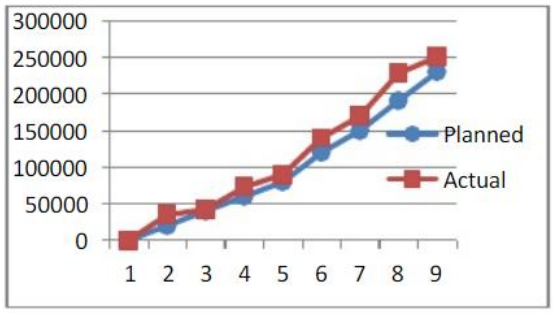
Cement	245420 Bag	34	735	1	736.48
Steel	868 T	20	43	9	279.15
Bricks	500 CUM	12	42	9	9.046
R-sand	990 CUM	21	47	8	14.22
20 mm Aggregate	2548CUM	34	75	5	22.87
Tiles	5250 BOX	49	107	3	36.82

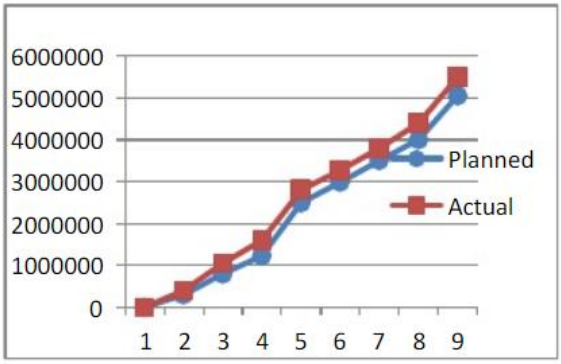
he table shows the EOQ value. By this quantity purchasing at frequent intervals the cost could be control. It also avoids the stock out.

S curve Analysis The analysis report shows the deviations in the actual and planned cost of the materials utilized in this project.

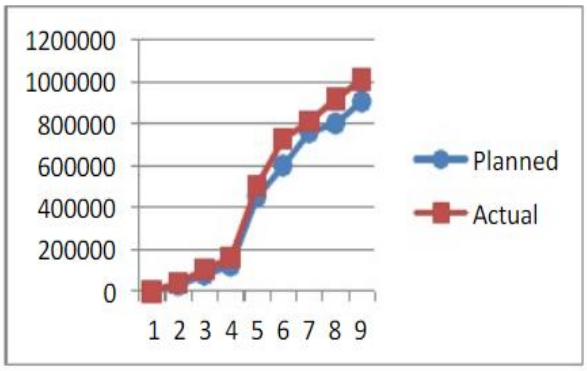
Brick



Cement –



Steel –



Above graphs shows the comparision of cumulative cost of planned actual material.
This cost is less at initial stage. This S curve Analysis recognize that there is increase in material cost while actual execution. Though this is small project but material management aspect never differs whether it is small or big.

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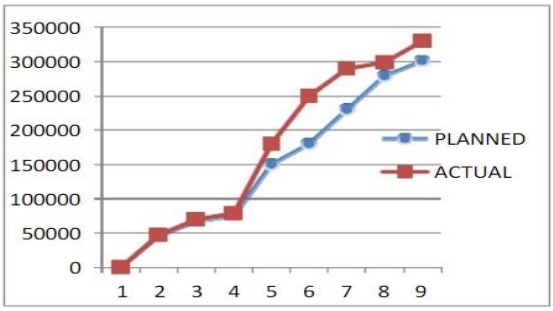
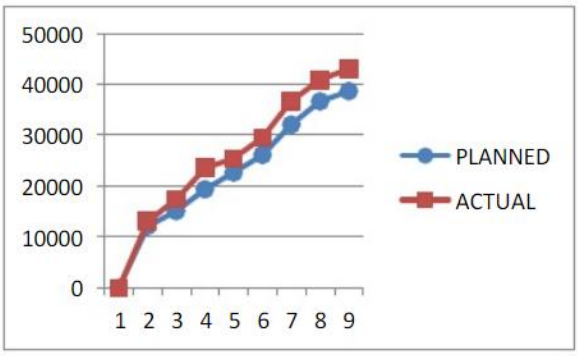


20 MM Aggregate-



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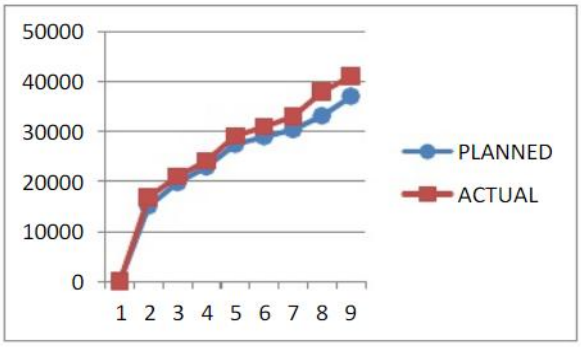

Result and Discussions-

1. After EOQ analysis for cement it is concluded that economic order quantity & frequency of ordering which has overcome the problems of Stock out successfully over the actual Site stock records.

2. For materials such as sand and aggregate on site material are ordered as per requirement because of space availability they could not maintain stock as per EOQ.

3. The Total cost of inventory after adoption of EOQ analysis is less than without adopting EOQ.

Conclusion

The total cost of material IS UPTO 52% of total cost, so that it is important factor to consider that timely availability of material is potential cause of successful completion of project.

Exploring the current Material Management Techniques for construction site is done By applying inventory control technique & to analysing the effect of material management on construction projects is done .

The systematic literature review identified the materials management processes to need efficiency of project completion on time and under the budget. This is because very poor handling of construction materials affects

the overall performance of construction projects in the terms of time, cost, quality, & productivity. This give light to the fact that pre-planning and material present are equally important in controlling the total cost of project

The EOQ analysis is better techniques to avoiding the extra cost of the materials by good management of the ordering construction materials.

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Sustainable Agro-Tourism: Cash Crop for Farmers in Maharashtra

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Abstract : As India is an Agriculture driven economy though service sector contribute 57% of GDP more than any other sectors, our agrarian economy facing disguised unemployment because of lack of options available in rural area for work and skills, it's essential to find our new avenues to create employment or business opportunities in these areas. Government has placed special emphasis on agriculture in the five-year plans and also made steady improvements in irrigation, technology, modern agricultural techniques and provision of agricultural credit and subsidies since the Green Revolution in India. However, international comparisons reveal the average yield in India is generally 30% to 50% of the highest average yield in the world. In India, 85 % of the population is directly or indirectly dependent upon agriculture and a vast majority is based in the rural belt. Tourism is a very significant contributor to the GDP of any country and is a crucial tool for employment generation, poverty a and sustainable human development. India basically being a rural economy, rural tourism and agro- tourism hold an important place in facilitating development. Agro-tourism is a way of sustainable tourist development and multi-activity in rural areas through which the visitor has the opportunity to get aware with agricultural areas, agricultural occupations, local products, traditional food and the daily life of the rural people, as well as the cultural elements and traditions.Agro-Tourism is helpful to the both farmers and urban peoples. It has provided an additional income source to the farmers and employment opportunity to the family members and rural youth. But, there are some problems in the process of the development of such centers. Hence, the government and other related authorities should try to support these activities in Maharashtra for the rural development and increase income level of the farmers. The farmers should also try to establish their co-operative society for the development of agro-tourism centers. The agro-tourism may become a cash crop for the farmers in Maharashtra and also an instrument of the rural employment generation. This research paper aims to establish a link between agro tourism and how Sustainable agro tourism can be made as cash crop for farmers in Maharashtra.

Keywords: Agriculture, tourism industry, Sustainable agro tourism, rural development agro tourism, impacts, regional development, rural tourism.

Introduction

SustainableAgro Tourism is the activities of persons traveling to and staying in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited. Tourism in India has seen exponential growth in the recent years. India is one of the most preferred destinations for both overseas and domestic travelers. According to official estimates the Indian tourism industry has outperformed the global tourism industry in terms of growth in the volume of foreign tourists as well as in terms of revenue.

The tourism industry of India is economically important and grows rapidly, the World Travel & Tourism Council calculated that tourism generated INR6.4 trillion 6.6% of the nation's GDP in 2012. It supported 39.5 million jobs, 7.7% of its total employment. The sector is predicted to grow at an average annual rate of 7.9% from 2013 to 2023. The importance of tourism to economic development has been recognized widely due to its contribution to the balance of payments, GDP and employment. Since last few years, Indian tourism industry has been growing at a rapid pace and it has vast potential for generating employment and earning large amount of foreign exchange. Tourism is now well recognized as an engine of growth in the various economies in the world. Several countries have transformed their economies by developing their tourism

potential. Tourism has great capacity to generate large-scale employment and additional income sources to the skilled and unskilled. Today the concept of traditional tourism has been changed. Some new areas of the tourism have been emerged like Agro- Tourism. Promotion of tourism would bring many direct and indirect benefits to the people. Agro-tourism is an innovative agricultural activity related to tourism and agriculture both. It has a great capacity to create additional source of income and employment opportunities to the farmers. Maharashtra is one of the major tourist centers in the India and there is large scope and great potential to develop agro-tourism.

Objectives

The objectives are as follows:

To examine the importance of Sustainable agro-tourism development in Maharashtra.

To define a suitable framework for the of agro- tourism centers in the view of marginal and small farmers.

To identify the problems of the Sustainable agro-tourism and make suggestions to establishment and operations of sustainable agro-tourism.

Importance

Agriculture is the most important occupation in the India including in the Maharashtra. But, today it becomes unprofitable due the irregular monsoon, prices fluctuations of Agro-products and some internal weaknesses of the agriculture sector. Hence, there is need to do some innovative activities in the agriculture, which will help to farmers, rural people.

Urban population is increasing day by day in the Maharashtra, today the urban people's world is restricted in the closed door flats, offices, clubs, television, video games, spicy fast food, computer, internet, and so on. They can see nature only on television or screen of the computers. More over some people living in the cities do not have relatives in villages and they never visited or stayed in village. These people want to enjoy rural life but there is problem of such type of facilities. Hence, it is opportunity to the farmers for the development of the agro-tourism centers and it serves him and create additional income source.

Data Used

The scope of the study is limited to examine the benefits and applicability of sustainable agro-tourism business in Maharashtra. The study includes their benefits and problems. As well as it includes appropriate framework regarding to establish the Sustainable agro-tourism centers in the Maharashtra. The present study was conducted on the agro-tourism is based on secondary data. The data has been furnished from the related articles, research papers, reports and 11^{th} plan document of the government of India. Some data has been furnished from the websites of the government of India and Maharashtra, as well as ministry of agriculture. Some ideas have been taken from the Tourism Development Corporation of Maharashtra.

Concept of Sustainable Agro-Tourism

A term 'Sustainable Agro-Tourism' is a new face of tourism. A sustainable agro-tourism is farm basedbusiness that is open to the public. These specialized agro-tourism destinations generally offer things to see, things to do, and produce or gifts to buy, and are open to the public. Agritourism is defined as "Travel that combines agricultural or rural settings with products of agricultural operations – all within a tourism experience". **According to Mr. Pandurang Taware (ATDC, Pune) - "Agro-Tourism is that Agri-Business activity, when anative farmers or person of the area offers tours to their agriculture farm to allow a person to view them growing, harvesting, and processing locally grown foods, such as coconuts, pineapple, sugar cane, corn, or any agriculture produce the person would not encounter in their city or home country. Often the farmers would provide a home-stay opportunity and education".** Agro-Tourism and Eco-Tourism are closely related to each other.

Who Can Start Sustainable Agro-Tourism Centers?

The individual farmer can start agro-tourism who have minimum two hector land, farm house, and water resource and is interested to entertain the tourists. Apart from the individual farmer, agricultural co-operatives institute, Non-Government organisations, Agricultural Universities, and agricultural colleges may start their centers. Even Grampanchayats can start such centers in their operational areas with the help of villagersand farmers.

Requirements for Sustainable Agro-Tourism Centers

From above Study we had identified the minimum requirements for the Sustainableagro-tourism centre. To develop an Sustainable agro-tourism in their farm, the farmer / farmers must have basic infrastructure and facilities in their farm as follows:

Infrastructure Facilities:

- Accommodation facilities at same place or alliance with nearest hotels.
- Farmhouse, which has the rural look and feel comfortable along with all minimum required facilities.
- Rich resources and Ecological elements in agriculture namely water and plants and critical habitat at the place.
- Cooking equipments for cooking food, if tourists have interested.
- Emergency medical care's with first aid box.
- The well or lake or swimming tank for fishing, swimmingBullock cart, cattle shade, telephone facilities etc.
- Goat farm, Emu (Ostrich bird) farm, sericulture farm, green house, etc.

Facilities Be Provided

- Offer authentic rural Indian / Maharashtrian food for breakfast, lunch and dinner.
- Provide more energy saving appliances like solar panel, solar heaters, Bio gas, Rain water harvesting, waste management etc.
- Farmers should offer to see and participate in the Organic agricultural activities.
- Offer an opportunity to participate in the rural games to the tourist.
- Provide information them about the culture, dress, arts, crafts, festivals, rural traditions and also give possible demonstration of some arts.
- Offer bullock cart for riding and horse riding, buffalo ride in the water, fishing facility in your pounds or nearest lake.
- Show local birds, animals and waterfalls etc and give authentic information about them.
- Must provide safety to tourists with the support of alliance hospitals.
- Arrange folk dance programme, Shekoti folk songs, bhajan, kirtana, lezim dance, dhangari gaja, etc.
- Make available some agro-product to purchase to the tourist.

Location for the Sustainable Agro-Tourism Centre

Location is most the important factor for success in the Sustainable agro-tourism. The location of the centre must easy to arrive and have a good natural background and natural ecological elements. Urban tourists are interested into enjoying the nature and rural life. So, farmers should develop their centre in the rural areas only which have a beautiful natural background to attract urban tourist in your farm.

The place of Sustainableagro-tourism centre must be easy accessible by roads and railways. Tourists want to enjoy some historical and natural tourist places along with the Sustainable agro-tourism. Hence, the centre should be developed near of these tourist places. It is more beneficial to both tourist and farmers. The places which are already tourist centers like Mahbaleswara, Panchgani, Nashik, Jotiba, Narshinghvadi, Pandharpur, Akkalkot, Konkanetc. These arethe better places for the development of agro-tourism. Other than these places farmer can develop their centers in any affordable places.

Benefits of Sustainable Agro-Tourism Centers

Sustainable Agro-Tourism has the potential to change the economic face of traditional agriculture and Energy savings like electricity, water.It would bring many direct and indirect benefits to the farmers and rural people. Some of the benefits are following:-

- Employment opportunities to the farmers including farm family members and youth Additional income source for the farmers to protest against income fluctuation.
- Cultural transformation between urban and rural people including social moral values Farmers can improve their standard of living due to the contacts with urban people.
- Benefits to the urban people, they can understand about the rural life and know about the agricultural activities.
- It support for rural and agricultural development process.
- Help to the reduce burden on the other traditional tourist centers.

Sustainable Agro-Tourism and Traditional Tourism

Sustainable Agro-tourism also a tourism business but it is different from the traditional tourism because it has a base of agriculture and rural lifestyle. Generally tourism has provided to see and enjoy the natural places as well as some heritages. But, agro-tourism has a tourism with includes experience, education and cultural transformation. It varies special from general tourism in the following manner:

- It provides pollution and noise free sites for travel and tourism at rural background.
- The cost of food, accommodation, recreation and travel is minimum in agro-tourism
- **Sustainable Agro-tourism can satisfy the curiosity of urban peoples about sources of food, plants, animals, and industrial agro-raw materials.**
- It provides information about the rural handicrafts, languages, culture, tradition, dresses and lifestyle.
- A family environment at the tourist place, is one of the most important characteristics in the agro-tourism
- In the Sustainable agro-tour, tourists not only see and watch agriculture farms but they can also participate in the Sustainable agricultural activities and experience the farming.
- **It provides natural situations for watching birds, animals, water bodies etc**
- Sustainable Agro-tourism creates awareness about rural life and knowledge about agriculture It also provides opportunity for education through experience of organic farming and knowledge about the rural life including entertainment. Sustainable Agro-tourism is an instrument of urban-rural connectivity through the tours.

Why Sustainable Agro-Tourism in Maharashtra?

Agriculture business is becoming more unsecured in Maharashtra due to the irregular monsoon, unsecured product prices. Many farmers cannot afford it and have a problem of indebtedness. Due to the agricultural problems some farmers are committing to suicide in various districts of the Maharashtra. More than 29,000 farmers committed suicide between 1997 and 2005 in the Maharashtra, official data show, no other state comes close to that total. Hence, there is need of start any of allied agri-business to support their farming and create allied income source from farm.

In order to encourage farmers to establish small and viable agro-business activity, like agro-tourism. It offers several potential benefits to farm operators. It can help supplement income generation activity while providing an opportunity to more fully employ assets, including farm household members. Maharashtra has a great potential of agro-tourism due to the beautiful natural site and basic infrastructures.

Sustainable Agro-Tourism Potential in Maharashtra

Maharashtra is the third largest state of India, both in area and population. It is located on the west coast of India with a 720 km long coastline along the green Konkan region. There are many tourist centers in Maharashtra which are the supporting natural environment for the agro-tourism centers in Maharashtra.

Although, Maharashtra has a total 22368 thousand hacter area under the agriculture and 36122 thousands of livestock. Principal crops include rice, Jowar, Bajra, wheat, pulses, turmeric, onions, cotton, sugarcane and several oil seeds including groundnut, sunflower and soyabean. The state has huge areas, under fruit cultivation of which mangoes, bananas, grapes, and oranges etc.

Maharashtra is blessed with a rich and diversified cultural heritage. The state has several communities belonging to different religions, and a number of festivities colours the culture of Maharashtra. Some of the popular festivals that are celebrated in Maharashtra are Diwali, Ganesh Chaturthi, Gudhi Padwa, Dasara, Nag Panchami, Gokul Ashtmi, Narali Pournima, Pola, Makar Sankranti, Banganga Festival and Holi etc.

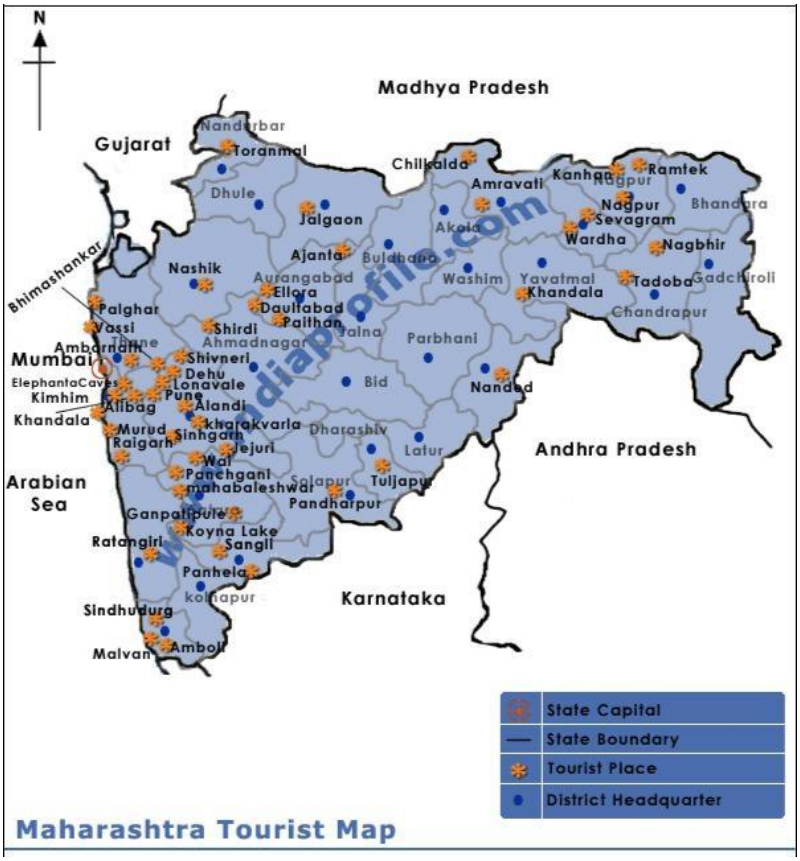

Figure 11: Map showing Agro tourism centers in Maharashtra.

More than 4.11 core (43 percent of total) population is living in the urban areas of the Maharashtra, which will become a customer of the agro-tourist centers located in the rural areas. Other than nature and culture there is an enough road and rail connectivity in urban rural areas to travel in rural Maharashtra.

About 25 such locations have been identified by ATDC in Maharashtra as rural agro-tourist destinations. Thus all the districts in Maharashtra have a tourism potential. Some following notable factors are helpful to the Sustainable agro-tourism in Maharashtra.

- Tourist places are already exist to support Sustainable Agro-Tourism Good communication and transport facilities
- Green house cultivation of long stem cut flowers, vegetables, fruits etc.
- State has 13 lakh hectares area under horticulture Maharashtra now is a major horticulture state.
- Maharashtra is already established as one of the top tourist destination in the world.
- Maharashtra is major producer of fruit, spices, medicinal and aromatic plant allowed under horticulture in India.
- Maharashtra has diverse Agro-climatic conditions, diverse crops, people, deserts, mountains, which provide scope for promotion of all season, multi-location Sustainable agro-tourism

Supports to the Sustainable Agro-Tourism in Maharashtra

Promotion of Sustainable Agro-Tourism involves some more important stakeholders namely Ministry of Agriculture and rural development ministry of the state and central governments. To promote domestic tourism, thrust areas identified by the government of India for the development of infrastructure, product development and diversification, development of eco-adventure sports, cultural presentations, providing inexpensive accommodation etc. The government has also realized the importance of agro-tourism.

The Planning Commission of India had constituted a Working Group for the formulation of Tenth Five Year Plan on Tourism. It has accorded high priority to tourism as an instrument of employment generation and poverty alleviation in rural and backward areas by developing the potential of agro tourism to supplement farm incomes, and heritage tourism to promote village development.

Problems of the Sustainable Agro-Tourism in Maharashtra

Maharashtra has a greater potential of the development of the agro-tourism centers due to the good natural and climatic conditions. But there are some problems in the process of agro-tourism development in the state. Major challenges and problems are follows;

- Lack of perfect knowledge about the Sustainable agro-tourism
- Weak communication skill and lack of commercial approach of the small farmers Lack of capital to develop basic infrastructure for the Sustainable agro-tourism
- Ignorance of the farmers regarding to the such type of activities Presence of unorganized sector in the Sustainable Agri-Tourism industry.
- Ensuring hygiene and basic requirements considering urban visitors
- Lakhs of farmers have small size holding, low quality land and little or no access to credit or irrigation. Have to negotiate with consistent drought.
- 148 of the 355 Talukas in the state are consistently drought prone

Key Techniques for Success in Sustainable Agro-Tourism

Sustainable Agro-Tourism is a one of the business activities. So, farmers must have commercial mindset and some marketing techniques for the success. For the better success in the Sustainable agro-tourism farmers should follow the following things;

- Give a wide publicity of your tourism centre by new papers, television etc Use all possible advertisement means.
- Use of more energy saving appliances like solar panel, solar heaters, Bio gas ,Rain water harvesting, waste management etc.
- Charge optimum rent and charges for the facilities/services on the commercial base.
- Do the artificially use local resources for the entertain / serve to tourist Develop your website and update time to time for attract foreign tourist
- Take their feedback and comments about the service and suggestions to more development and modification
- Develop a good relationship with the tourist for future business and chain publicity
- Develop different agro-tour packages of for different type of tourist and their expectations.
- Preserve an address book and comments of the visited tourists for future tourism business
- Small farmers can develop their Sustainable agro-tourism centers on the basis of co-operative society.

Conclusions and Policy Implications

Maharashtra has a great potential to the development of Sustainable agro-tourism, because of natural conditions and different types of Agri products as well as variety of rural traditions, festivals. More than 45

percent of population live in the urban areas and they want enjoy rural life and to know about the rural life. It is a good opportunity to develop an Sustainable agro-tourism business in Maharashtra. But there is a problem of low awareness about this business in the farmer and problem of the finance and proper view in the farmers of the Maharashtra.

Hence, the agriculture departments of the districts, Agriculture Universities should try to give orientation about it and provide some innovative ideas regarding to the Sustainable Agro-Tourism like use of more energy saving equipments like **solar panel, solar heaters, Bio gas, Rain water harvesting, waste management etc.**The government should try to provide optimum financial aids to the Sustainable agro-tourism activities in Maharashtra by the grants and institutional finance. Bank should provide optimum financial help for the Sustainable agro-tourism activities in the Maharashtra.

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Impact of Urban Development on Heritage Resources in the Town of Lonar

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Abstract : Cities and towns act as catalyst for cultural, social and economic development. Half of the world's population already lived in urban settlement. Heritage sites represent the heart of the cities which play a very important role in creating a stimulating and economically attractive environment for inhabitants. The development of these sites is an integral part of societies that comprises historic buildings, urban spaces and people using them. Lonar Lake, also known as Lonar crater, is a notified National Geo-heritage Monument, saline soda lake located at Lonar in Buldhana district, Maharashtra, India, which was created by a meteor impact during the Pleistocene Epoch and it is the only known hyper velocity impact crater in basaltic rock anywhere on Earth. The lake was first mentioned in ancient scriptures such as the Skanda Purana, the Padma Purana and the Ain-i-Akbari. During the period of the Mughals, Yadavas, Nizam and the British, trade prospered in this area. Several temples found on the periphery of the Lake are known as Yadava temples and also as Hemadpanti temples. In recent year lake undergoing eutrophication due to domestic sewage from fast developing Lonar town. Further anthropogenic activities like construction, washing, bathing and alternation in basin are having an adverse impact on the lake. Because of this ecosystem of the lake is hamper and it's directly impact on the flora and fauna of the surrounding. How heritage resources take part in developing city fabric over the period of time and in recent year how urbanization impacted on the lake is the main Intention of the research.

Keywords: Development, Lonar Lake

Introduction:

Cities and towns in developing countries increasingly face the challenge of balancing urban conservation and development due to rapid urbanisation and development pressure. Historical sites are the economic, cultural and social drivers for a dynamic and sustainable environment. They constitute an integral part of nations' history, identity and regional diversity. Small and medium-sized historical sites with their outstanding built cultural heritage strongly shape the urban landscapes and form the backbone for a balanced and polycentric settlement structure. Historical sites face many challenges, like accelerating globalization, structural, social and demographic changes as well as environmental problems and urban growth. Heritage resources at risk of destruction because they are being treated as isolated objects, instead of an intrinsic part of the contemporary urban fabric. Need of adaptive reuse of heritage buildings is an important factor in creating sustainable communities. Learning about the history of a place is a good way of bringing communities together through a shared understanding of the unique cultural identity heritage places give to an area.

The increase in population happens due to the concentration of economic activity, which is an important determinant, and the result of urbanization. This results in introducing unbalanced trends which destroys human cohesion and builds social exclusion in cities and regions. Through urbanization, people ignore their identities and traditions seeking adequate services and a better lifestyle leading to the disappearance of existing urban fabric that creates an undefined urban pattern. The right balance between restoring and preserving unique cultural heritage has to be set to enable futureproof urban development.

Lonar is a town and municipal council in Buldhana district of Vidarbha region of the Indian state of Maharashtra. Lonar town is famous for Lonar crater or Lonar Lake. It is a meteorite lake created in the Pleistocene Epoch and it is the only known hyper velocity impact lake in basaltic rock anywhere on Earth. The lake contains salt water lake is 1.8 km in diameter and is about 137 m below the level of the crater rim. It is surrounded by forests with a large variety of birds, particularly peacocks and ducks.The place is important not just for its lake, it is

important also for its wonderful temples. Numerous temples surround the lake, around the rim of the lake and further down around the lake, most of which stand in ruins today, except for the temple of Daitya Sudan at the center of the Lonar town, which was built in honor of Vishnu's victory over the giant Lonasur. It is a fine example of early Hindu architecture. Vishnumandir, Wagh Mahadev, Mora Mahadev, Munglyacha Mandir and Goddess Kamalaja Devia are the other temples found inside the lake.

Figure 12: Panoramic view of Lonar lake.

Lonar Lake:

Lonar is one of the strongest,lovelist and least known places in India. Geographically located at Latitude 19°58′N Longitude 76°30′E. It is about 170 kms from the town of Aurangabad, which is the famous jumping-off spot for World Heritage Sites of Ajanta and Ellora. But Lonar is, if that is possible, at least as interesting as these famous temple sites. In some ways it is more so, because the central feature of Lonar is a massive lake formed by a meteorite impact over 50,000 years ago.

It is the only lake in th world formed by meteorite impact in basaltic rock.Uniqueness of the lake is its salinity and alkalinity.Salinity of lake has been decresed from 300 ppt in 1958 to 100 ppt today. pH of the lake water is 10.5.Thus lake water is highly alkaline. The lake contains many sub-ecosystems,each constituting a subtle combination of floral and faunal species,due to localized variations in conditions of soil,water and humidity.The Lonar ecosystem has evolved in a unique way due to the unusual geohydrological and climatic conditions.However,the same conditions have made it extremely fragile and vulnerable to human intervention,Therefore , the biotic zones resulting from such isolation ,need immediate protection.There is a general consensus that the Lonar lake should be given a special status in order to protect and conserve it as a natural and cultural heritage of extraordinary significances.

Two Things are rather unusal about Lonar lake ,They are –

1. The waters are a unique,shifting combination of azure and turquoise and parrot green when seen from the viewpoint.This has somethings to do with the fact that the meteorite is stall dissolving itself into the water.The lake has two distinct regions that never mix – an outer neutral (Ph7) each with its own flora and fauna.
2. There is a perennial stream feeding the lake with sweet water but there seems to be no apparent outlet for the lake water.And it is also a big unsolved mystery where the water for the perennial stream comes from,in a relatively dry region like Buldhana.Even during the height of the summer months of May to June,the stream is perpetully flowing.

Historic Importance's:

There are numerous historical reference over the centuries in various documents, which prove the importance of Lonar. The social, economic, and religious reference are found only after the twelfth century. This entire region was a part of Ashoka's empire and later passed under the satavahana rule. It was also a part of the Chalukya and Rashtrakuta Empires.Besides Being famous as a religious centre it was also an important trade centre, during the rule of the of the Moghuls, Yadavas, Nizam and British.

In medieval times, this town was reputed for its glass, soap and salt. The Ain-e-Akbari mentions that the raw materials required to make glass were richly available here. Emperor Akbar is said to have had a fondness for soap from Lonar. And in his Days a salt factory was located here. Shah Jahan was the next king to visit Lonar as well as Nana Saheb Peshwa. Peshwa Raja Chandumal,the minister of the Nizam of Hydrabad,realized the religious important of the place and presented 'Motha Maruti' (the Big Hanuman) to religious trust.

Temple at Lonar Lake:

Lonar Lake is surrounded by many temples, there are 14 temples situated within the slope Lonar. The oldest temple is some 1300 yrs and many of them fallen before. These temples are built by different kings of different religions. A temple has sculpture which tells about the formation of Lonar. The temples at Lonar are known as Yadav Temples and also known as Hemadpanti Temples named after Hemadri, who was military general of the Yadav period. There are altogether thirty-two temples, seventeen monuments, thirteen kundas/lakes and four inscriptions at Lonar. The all belong to the Yadava and the medieval periods. The architectural**Figure 2:**Gomukh Temple at rim of the lake

plan and intricate decorations of the Daityasudana temple in Lonar town has been centre of attraction. The temple near the lake are equally impressive even though they lie in decay and ruin and are now permanent abodes of bats and mice,their beauty and majesty cannot be ignored. Also many of the idols have long since been stolen. Only the ones that attract pilgrims have some resemblance to their original selves. Temples located insides the lake are Ramgaya, Vishnu Mandir, Wagh Mahadeva ,Mora Mahadeva /Munglyacha Mandir and Goddess Kamalaja Devi.

Lonar Lake Ecosystem:

The Lonar lake lies amidst the vast monotonous plateau surrounding it from all the sides.The unique location has caused a localized transition in the important geographical,geological,climatic and ecological features.Being subterranean hollow closed from all sides ,the lake is protected from heavy wind and retains higher level of humidity and a localized tempemture regime. Due to typical geography ,the lake basin gets partly screened from direct sunlight at different places and times of the day thoughout the year. Being a low –level basin,the lake receives water apart from springs ,also due to percolation.

Following are the characteristic Geo- morphological features of the Lonar ecosystem:

i)Relative seclusion of the lake basin,ii) Higher humidity level in basin,iii)Higher ground water levels in the basin ,iv)Perennial fresh water springs,v)Perennial salt water reservoir , vi) Sandy and silty lake shoreline, vii)Dry deciduous ecosystem around the lake,viii)Dry bushy vegetation on the rim and slopes.

Flora and Fauna:

The Lonar lake form not only a spectacular sight bit over the centuries they have evolved an ecosystem that is not replicated anywere else in the state.for the lake is host many species of aquatic birds like flamingos,moorhen,coots and dabchicks and so on. Peacocks are to be seen making spectacular glides from tree to tree. Unlike the rest of the country they do not even need to forage upon the ground, so plentiful is the insect and small prey population in the vegetation. The trees that grow in this region are rather tall and they form a canopy that filters out most of the heat.It does tend to get a bit muggy with the unusal level of humidity. You can even see dung beetles the size of your palm busily rooling their balls,right in your path.There is no danger of snakes but geckos abound.one feature that has a potential to be a nuisance is the monkey population.They are immensely territorial and throw and twigs at your heads if you have ventured near the trees they stake out.If this is close to running water ,as the lake has many little streams with cold water,they become agitated. It is also not a ggod idea to openly display food as they will leran soon enough that tourist are easy prey.

Water streams and land use pattern along the lake:

Water from two main water streams called Dhar and Sita Nahani are run along lake. Streams are used by the priligrams and people of Lonar village for their domestic needs including drinking , bathing and washing.The freshwater springs are also harvested by local people for agriculture activities carried out in the lake basin.water from third major springs (Ramgaya) is pumped by two schools located on the rim of the lake for drinking purpose.

About 21ha of fertile land at the base of the base of the lake is used for agriculture purosed by the local farmers and chief crops includes vegetables,banana and papaya.Most of the 150ha land under the control of forest department is used for plantation.

Lonar Town:

Lonar town is an municipal council in Buldhana district of Vidarbha region of the Indian state of Maharashtra. The town is the headquarter of Lonar taluka and is located near Mehkar. Lonar is situated around 360 km from Nagpur, around 100 km from Buldhana, around 100 km from Akola, 550 km from Mumbai, around 160 km from Aurangabad and around 140 km southeast of the Ajanta Caves, about 4½ hours' drive via Buldhana. Lonar town is located at 19°59′06″N 76°31′23″E. It has an average elevation of 563 m (1847 feet). As of the 2001 Indian census, Lonar had a population of 20,082. Males constitute 52% of the population and females 48%. Lonar has an average literacy rate of 66%.

Human Acitivites and Their impact on the lake:

1. **Discharge of sewage in to the lake :** Solid and liquid waste from hotels and stalls in the vicinity of the lake is relased directly into the natural streams and ends up to the lake.Similarly piligrams use the Dhar strem for bathing and washing therby generating effluents that finally enter the lake.

2. **Deforestation,hunting and cattle grazing :** Large scale deforestration and extensive grazing inside the lake is a common feature. This problem is mainly on account of agriculture activites right inside the lake.unfortunately such an unregulated access leads to hunting of birds and other fauna.

3. Bathing and washing activities in the freshwater springs : Local inhabitants have been regularly using the Dihar water for washing and bathing purposes. The effluents thus generated ultimately not only pollute the lake water,but also sustain a eutrophic state of the ecosystem.

4. **Agriculture inside the Lake:** The land to the extent of 21.26 ha privately owned by 66 local farmers inside the lake is under cultivation and use of pesticide,insecticide and inorganic fertilizers generate problems of toxicity and eutrophication of the lake.

5. **Religious fairs and rituals inside the lake:** There are twenty seven temples,three monuments, seven kunds and three inscriotions inside the lake.All of these monuments belongs to Yadava rulers and the medieval periods.Historically,religious fairs and rituals at many of these temple is a regular practice.For example during Navaratri around 150 thousand pilgrims visit Kamaljadevi temple.Although the festival is limited to 10days,the impact is enormous on the lake ecosystem and special challenge for effective management.

Impact of development activities by the Government Departments:

The development activities undertaken by different Government agencies in and around Lonar Lake and the lake have produced problems for sustainable management of the lake.

1. **Irrigation Department:** In 1984 minor irrigation department constructed a percolation tank near Deulgaon- Kundapal village, about 2km from Lonar lake in south western direction. The percolation tank and couple of other tanks in vicinity of Lonar lake are partially responsible for rise in the water level of the lake. The altering hydrology also has its adverse impact on the unique water quality. The rising water level is also damaging sites of archaeological importance in the lake.

2. **Forest Department:** During the period of 1986-92 the forest department (Govt.of Maharastra) carried out extensive plantation in the lake. The most surprising feature of this programme was plantation of unsuitable exotic species,Prosopis juliflora (locally called as Vedibabhul) right in the heart of the lake. This plant is dwarf, spreading type and extremely thorny. It is progressively encroaching inside the lake. Presently the Prosopis thickets have completely covered all temples on the lake and now it has become difficult even to reach some of them and even the lake shore. This species is now spreading towards the higher slopes of the lake and many adversely affect native flora and fauna.

3. **Public Works Department (PWD):** The Public works department (PWD) is recently working on a project for widening the road which at one point runs at a tangent to the lake and cuts through the Ejecta blanket. It is indeed unfortunate that the department has neglected the importance of the lake while fixing the alignment of the road in the initial stage and damage caused to geographical feature of the lake is irreparable.

4. **Lonar Municipal Council:** Provision of proper drainage and sewage management is the responsibility of Lonar Municipal Council. In the last few years Lonar Town is growing very fast and for want of proper sewage treatment and disposal facilities, the waste water is getting into the lake leading to its gross pollution.

5. **Archaeological Department:** Haphazard renovation work in some of the temples has led to a distortion and deterioration of the architectural and religious values of the protected monuments. Such thoughtless renovation by Archaeological Survey of India (ASI) is adversely affecting aesthetic, socio –cultural and tourism value of Lonar ecosystem.

Conclusion:

Natural and Cultural Heritage sites can have a very positive influence on many aspects of the way a human and city development. People are very proud of their local history, but don't always express how much they value a place until it's threatened. Because it adds character and distinctiveness to an area, heritage is a fundamental in creating a 'sense of place' for a city.

Lonar lake is not an ordinary meteorite crash site. It has significant values of cultural, social and economic development of town.The deterioration of Lonar Lake because of anthropogenic impact has now reached a level where if the activities go on uncontrolled and unchecked, there is a great danger of permanent damage to the ecosystem in near future. We need to conserve our heritage that shape to creating a stimulating and economically attractive environment for inhabitants. The development of these sites is an integral part of societies that comprises historic buildings, urban spaces and people using them.

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Assessing the Current Status of the Mutha River as an Ecosystem

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Abstract : An ecosystem is the sum of interactions and energy flows between the living (biotic) and non-living (abiotic) components of the environment. River is an ecosystem, not a single entity, while we talk about river it is important to consider all the aspects around the river right form its origin to its end. It has been observed that the existing state of Pune's Mutha River is in a critical state. Mutha River has been widely contributing in the evolution of the city since the beginning of civilization. The flowing nature of rivers make them self-cleansing and lets harbor not only diverse plant and animal life but human needs. Unfortunately, today our river is one of the most polluted rivers according to Ecological society's latest survey. It's high time we realize that if the current situation prevails, there could be a permanent loss of a healthy natural system to society. Considering all the factors and lack of time and resources, we thought of studying a representative stretch of the river for understanding the stresses the river ecosystem is facing. A representative stretch of about 600 meters on Mutha River from Vartak Garden to Nana-Nani Park has been studied from an ecological perspective. We found that this particular stretch is dominated by various religious and cultural activities and heritage structures which is very common for any river. Hence we thought of studying this stretch of the river. This paper would provide a brief on the background of the stretch and documents all the stresses on this stretch. Studying the general character of the channel, flow, habitats, biotic aspects, interventions and water quality are the certain parameters used to assess the state of the stretch. This research has vast future scope as rapid urbanization is putting enormous pressure on the environment directly or indirectly and hence there is need for Sustainable Development. The information gathered during the study would be helpful for reviving the river back to life.

Keywords: Mutha River, ecosystem, biotic aspects

Introduction

River Mutha, which was once the lifeline of Pune, is in dire straits. Concerted and systematic efforts involving citizens, experts and administrators need to be made urgently to save the river. River Mutha, the pride of Pune, lovingly called 'Muthai' or 'mother Mutha', is dying a slow death due to the rapidly urbanising city which is depositing huge amounts of untreated sewage and garbage in its waters. Mutha originates at a village named Vegare, in the Western Ghats, about 45 km to the west of Pune and has two tributaries, Ambi and Moshi. The river enters the city after the Khadakwasla dam and meets the Mula River at Sangam Bridge. The Mula-Mutha eventually meets river Bhima and later the Krishna before they drain into the Bay of Bengal. Starting from its source, the Mutha travels approximately 1,100 to 1,200 kilometres till it reaches the Bay of Bengal. However the moment it enters the city it turns toxic and drains downstream. Only one bank of the representative stretch has been studied for this research. The bank on which the Omkareshwar temple is situated has been studied, right from Vartak garden to Nana-Nani Park and the pedestrian causeway which goes towards Siddheshwar Ghat (Fig.1).

Figure 13: Google image showing the Omkareshwar temple stretch from Vartak Garden to Nana-Nani Park having all places indicated with respective color code

Mutha River will be undergoing a Riverfront development as per the Pune Municipal Corporation (PMC). Considering the present state of the river when there is consistent rise in chemical oxygen demand (COD), biochemical oxygen demand (BOD) and negligible dissolved oxygen (DO) as per the annually published Environment Status report by PMC, physical modifications of the river bed, such as excavations for laying pipes, building of bunds, retaining walls, conversion of natural banks into manicured gardens, expansion of ghats etc would completely destroy the river and its ability to rejuvenate.

Methodology

This research is based on qualitative assessment of the river. The study has been divided into two phases. The first phase dealt with reviewing of historical data, published literature, surveys and observations. The second phase dealt with site visits and interactions with citizens, experts and persons engaged in working on the ground for river revival in order to understand the changes, stresses on the river and its impacts. There were no primary surveys undertaken in this study, however, while conducting baseline surveys via site visits we encountered a continuously flowing spring, water samples of the spring were collected periodically and sent for quality testing to authorised laboratories. All other information gathered has been sourced through secondary data sources and focused group interactions with the experts.

Observation and Findings

The study has been conducted from June, 2018 to December, 2018 for a period of seven months. Site visits of the stretch were conducted during the monsoon as well as non-monsoon days.
Following arethe findings of the study.

A. General Character of the Channel

In this stretch, there is meandering near Balgandharva Bridge. The gradient is low and width of the river bed is large and some part of the channels is braided. (Society, n.d.).

As the image (fig.2) shows, there are two public gardens in the stretch, one is the Vartak Garden and other is Nana Nani Park. There is a Dhobi Ghat that belongs to a trust and employs a few people that wash clothes daily draining the detergent led wastewater directly into the river without any treatment.

There is a natural spring called ‘Bappu’s Zara’ on the riverbed area that faces the backside of Omkareshwar temple. The spring water looks clear and fresh, labour class people come here for bathing and washing clothes. On interacting with these people it was found that spring has been there since ages now and is continuously flowing and draining clear looking water into the river. The flow of the water is sometimes high or low. In order to check the same, we measured the flow of spring water with the help of experts from Acwadam. We found that daily, the spring drains more than one lakh litres water of clear water into the river. After testing this spring water through a Public Health Laboratory, we came to know that this water is not portable at all though it looks clear.

There are many heritage structures on this stretch like there is Omkareshwar Ghat, Omkareshwar Dashakriya centre, Mahadev Pind, Annasaheb Patwardhan Samadhi, Siddeshwar Vruddheshwar Ghat & Mandir and huge heritage stone wall that dates back to Peshwa Era built for protection from flooding of the river.

Pune is famous for the grand Ganesh Festival every year, for the same this stretch has four Ganesh Immersion tanks and one Ganesh immersion ghat. Ganesh immersion tanks provision is PMC initiative for ensuring river protection, however people believe in immersing into flowing water and hence the whole purpose of building these tanks has been futile. The Ganesh immersion ghat is used as Majur Adda for labourers except during Ganesh festival days. There is a pedestrian causeway which connects two heritage structures. There is an existing vehicular road that comes in red flood line area and during monsoons the riverbeds are completely under water and this existing road is closed for commuting for safety purposes.

B. Flow

Flow of the river is channelized through the wide riverbed. Shallow and stagnant water near the Siddeshwar Ghat accumulates and creates anaerobic conditions. Due to the inflow of untreated domestic sewage, one can see methane gas bubbles in the water giving out foul smell (Ecological Society, n.d.).It is quite evident that what is flowing in this stretch is mostly drainage water from Pune, and hardly any natural water from the original river flow.

C. Habitats

There are no specific habitat and species that can be found in this patch, however habitats like boulders in river channel, lining of dense upland vegetation at the backside of Vartak Garden and Nana-Nani Park have been observed. Open grassy patches, marshy areas, few riparian patches are also found (Ecological Society, n.d.).

D. Biotic Aspects

Flora and Fauna

As per a recent survey conducted by Ecological Society, upland vegetation includes dense canopy cover of Rain Trees and *Terminalia arjuna* at the back side of Nana-Nani Park area. Large open patches are dominated with grass cover like Cynodon associated with herbs like *Xanthium, Ludwigia, Croton* etc. Along the channel wall, in small patches there are shrubby growth of *Ricinus, Phyllanthusreticulatus* which is associated with few herbs like Xanthium. Some marshy areas near Siddeshwar Ghat are dominated by vegetation like *Hygrophila, Colocasia, Persicaria* etc. Some grasses and *Cyperus* is also seen near Bappu's Zara, individual growth of *Ficus racemosa* is also observed. Few patches of water hyacinth can be seen where water is shallow and stagnant (Ecological Society, n.d.).

In fauna, scavenging birds like Crows, Black Kites, Pond Herons and Rock pigeons are dominant which are also indicators of highly polluted water (Ecological Society, n.d.).

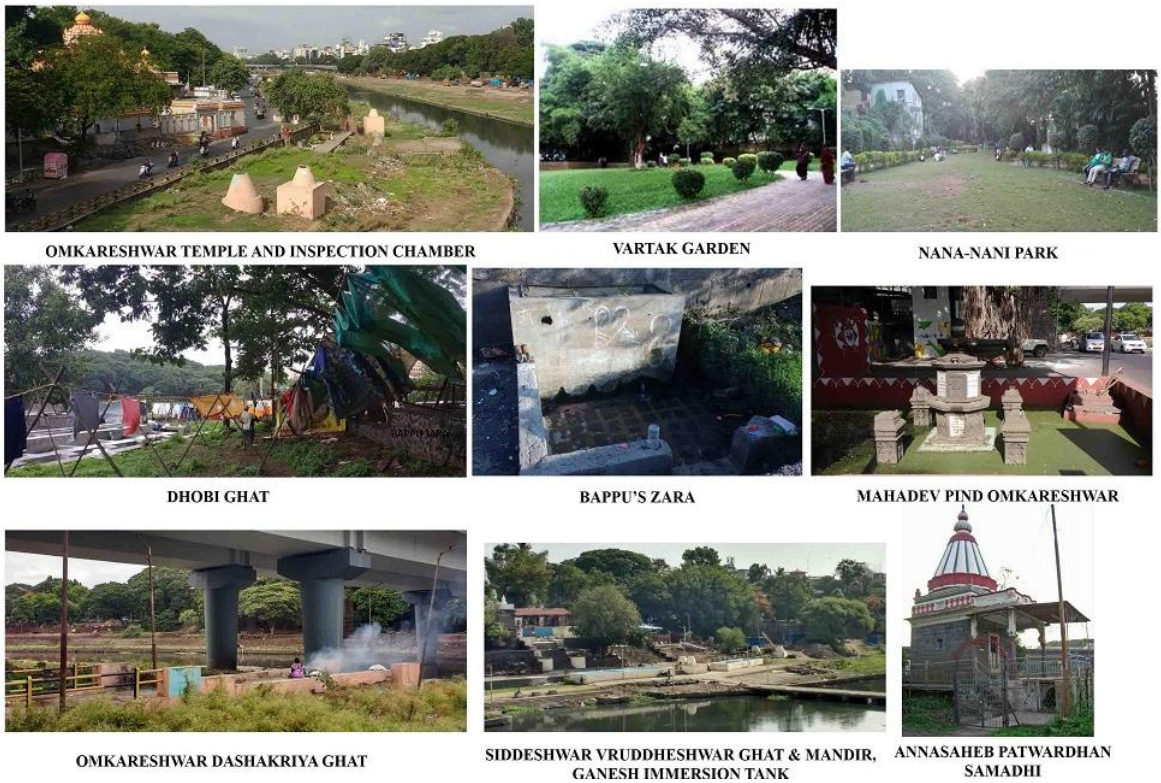

Figure 14: Existing uses of the Stretch

E. Interventions

1. Construction of dams

Our rivers are not perennial. Dams obstruct the natural flow of the river, release water into the river as per human needs. Hence the minimum environmental flow required to sustain the river ecosystem is not being maintained in the river(Society, n.d.).

2. Channelization

Due to rapid urbanization, more and more land is required for construction, hence a lot of feeder streams were channelized and diverted. These streams acted as feeders to the river, channelization led to disruption of this system making the river devoid of its groundwater reserves. This affected the flow and water quality. Moreover, the ratio of sewage water to fresh water carried by the streams drastically increased. Due to channelization, the flow is restricted to a small section of the river bed. Rest of the river bed remains dry and deprived of water, which makes the existing habitats defunct and adversely affects the species diversity. (Ecological Society, n.d.)

3. Alterations in topography to construct road and infrastructure

Due to alterations in landuse there is destruction, disturbance and loss of habitats. There is also loss of recharge and discharge zones. Development of a road affects entire functioning of the river. It is not advisable to carry a detailed hydrogeological survey before constructing roads near the river channel. The riverbeds are the riparian zones of the river, these have to be strictly protected from any such interventions.

4. Dumping of Garbage in river and Feeding streams

Pune is one of the fastest growing city and a hub for Automobile Industries, I.T. Industries and various Educational Institutes. Solid waste which is collected by Municipal Corporation is stored in the dumping ground without any process. So when there is rainfall, the leachate percolates from the solid
waste along into the river and creates serious problem of water pollution. There is high use of plastic and polythene as well. Plastic waste requires around 400 years to degrade and is a growing concern since a lot aquatic flora and fauna is under stress due to its ill management.

5. Defunct Structures and remains of old causeway in riverbed

Causeway in riverbed acts as a barrier for smooth flow of the river. Due to this there is saturation of solid waste near the causeway.

6. Grazing, Clothes and Vehicle washing in riverbed

In this stretch, horses graze on the riverbeds which is a riparian zone. It's detrimental to the riverine ecosystem as well as aesthetic value of the river.
Discharge coming from Dhobi Ghat is untreated and is directly drained into the river
A lot of vehicle washing is seen along the riverbed, causing a layer of floating oils and greases. These solids obstruct the passage of light and aeration, which are fatal for flora and fauna and also self-purification of water.

7. Incompetent treatment plants

According to PMC only 70% of the wastewater is treated in the city, rest 30% is untreated and led directly into the river. Under the 70% treated wastewater that is treated, it is doubtful if the treated water abides to the water quality parameters prescribed by the pollution control board. Since the river water shows heavy contamination of COD, BOD and DO levels. (Pune Municipal Corporation, 2011)

8. Dashakriya Vidhi, Nirmalaya and Ganesh Idol Immersion in river

Dashakriya vidhi, Ganesh idol immersion and throwing of nirmalaya (flowers offered to god) is a religious practice where all the wastes generated due to these practises mostly organic in nature has to be dumped into the river is a

age old tradition. In spite of seeing the polluted river, it has been observed that such traditions are blindly followed in the name of religion creating additional pollution load into the river. (Ecological Society, n.d.)

F. Water Quality

In this stretch, Dissolved Oxygen (DO) is negligible while Biochemical Oxygen Demand (BOD) is about 14 to 18.2 mg/l with faecal contamination of 150 to 350 per 100 ml. With such high contamination this water is not fit for drinking even after treatment (Klean Environmental Consultants Pvt.Ltd., 2015).

Conclusion

According to research, the major sources of pollution of river Mutha for representative stretch are presence of dissolved salts, carbonates, phosphates from the surrounding areas temples, domestic waste, organic waste and other solid waste into the river. Similar interventions are found along the entire river loading our rivers by heavy pollution. It's high time we start rejuvenating the river by banning human interaction for a couple of years. It's important to give the river some time and space for its revival. River is a natural resource for water availability and also a natural heritage and hence restoration of the river is crucial for our survival as well. Some immediate steps can be taken by ensuring that no untreated or under treated wastewater flows in to the river. Strict actions to be taken on those who are seen dumping wastes/nirmalaya/plastics into the river. There should be real time monitoring of flood plains, wetlands, banks of the river, riparian zones, natural and cultural heritages around the river so as to avoid any future destruction.

Recommendation

A flowing river is not just a source of charm for its citizen, but also a provider of vital environmental services that every city needs for healthy functioning. River is as a natural heritage and that's why it is important to preserve and conserve the river. Though the study is limited to the stretch but upstream and downstream of the river is considered to understand the entire river. Our recommendations are prioritized on ecological and cultural aspects. The other aspects like heritage, recreational, socio-economic also consider which makes it a holistic perspective of looking at the river as a continuum and a living ecosystem. A lot of public awareness is required in order to understand the value of river to the city. We recommend Jeevitnadi's adopt a stretch initiative to be incorporated to all the stretches of river, as our river is our responsibility.

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Ayurveda as expressed through Man and Nature relationship

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Abstract : The research paper intents to put forth the importance of the Ancient wisdom called " Ayurveda "An overview of the origin on Ayurveda that represents Ayurveda as a Rectification that provides balance as well as Harmony of Vedas other than Atharva Veda representing knowledge , Action and will .Understanding the concept of Prakruti – the female energy and Purush -male energy which are an important factors in the creation of universe. The harmony of the above two gives rise to cosmic Intellect. The concept of PanchaMahabhootah-(Earth, Water, Fire, Air, Ether) in the universe as well as its importance in Human body. Human is an integral part of the universe that he resides in and therefore maintaining the balance of the 5 elements is of utmost importance and the ability to perceive the constitution of the 5 elements, changes from person to person because every individual has a different Ayurvedic constitution. Ayurveda is The symbiotic relationship between Man and Nature. It is the response to the extrinsic and existing conditions of the place that effects the intrinsic factors of Human body. Ayurveda is not something that we go to when we need to, it is the tendency of sustenance in the conducive environment that is Reflected in day to day activities. It is not just the as the current scenario where Ayurveda is just treated as ailment healing or medicinal purpose, but is actually the Way of life. It is the establishment as an holistic approach towards wellness .it is the response to the available nature , but it's conservation also is very important parameter.

Keywords: Wisdom, Man, Nature, Response**Ayurveda & It's Origin:**

Ayurveda : Regarded as the ancient wisdom , has its roots in India and its origin dates back to 5000 years ago. The word Ayurveda is comprised of two words Ayuh-*meaning Life* and Veda resembles knowledge, therefore Ayurveda is also said to be Knowledge of life. It is believed that Ayurveda originated from the Vedas. The three Vedas in Vedic literature represents knowledge, will and Action and the Fourth Veda : Atharva Veda represents the Harmony of the other three Vedas.

Ayurveda also was believed to be originated from the deep oceans , where ocean was churned by demons and God , and from this churning of the ocean Lord Dhanvantari(Lord of Ayurveda) emerged with Amrit: The life saving Nectar in his one hand and Ayurveda in the second hand. Therefore this mythical origin of Ayurveda clearly states that the Concept of Ayurveda was evolved from nature And hence it is an important parameter for Human Existence.

Concept of Prakruti and Purush: Man In Nature:

Universe is evolved with two broader concepts known as Prakruti and Purush. Prakruti is the female energy that is responsible for creation of the Universe and Purush represents Male energy that is the witness to the Creation or also could be termed as Dominant Consciousness .Both live in Harmony with each other. Talking about man and nature , Nature is regarded as the Prakruti that is responsible for the creation of energies, Conducive Environment for sustenance, whereas Man is

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the Purush energy is not only witness to the creation of the Nature but has it dependency for on Nature in the form of breath, food, Shelter, Clothing, Medicine etc. The value of nature is reflected in his daily way of life.

Figure 2:PanchaMahaBhootah

Concept of PanchaMahabhootah and Man:

The basis of all creation in the Universe is PanchaMahabhootah namely fire, water, Air, Earth, Space. These elements have different characteristics and therefore account different faculties of Human Experience . Also as per Ayurveda philosophy, Human body also constitutes of the 5 elements. It is associated with senses in Human beings and senses corresponds to the response that is given over it.

The balance of these 5 elements in the human body is very important .Its imbalance gives rise to Dishes namely *Vat/ Pitta /Kapha.* Also called *Tridoshas.* It is the intrinsic tendencies in every Human being and differs from person to person. This difference in the tendencies is caused due to the fact that every human being has got different Ayurvedic constitution and hence the attitude and responses towards the extrinsic Environment changes from person to person depending upon the climate, location of the place, human being is residing in.

Ayurveda : Man and Nature :

Ayurveda in relationship with nature , is nothing but living in Harmony with the surrounding and this is actually the wisdom that is carried out from ancient India till date. This Harmony is the tendency to get acclimatized to the climate of the place. Taking about the climatic data for India, India shows 6 types of climatic zones namelyMountainous Climate, Desert Regions, Semi arid Tropical wet, Tropical wet and dry, Humid subtropical. And hence the traces of the ancient wisdom can be seen prominently within the communities corresponding to the climate they are situated in

Their response to the extrinsic climate is their daily way of life , livelihood which is nothing but the wisdom that is nurtured by them.

The responses of the communities /tribes can be mapped on the on the basis of the climate they are residing at.

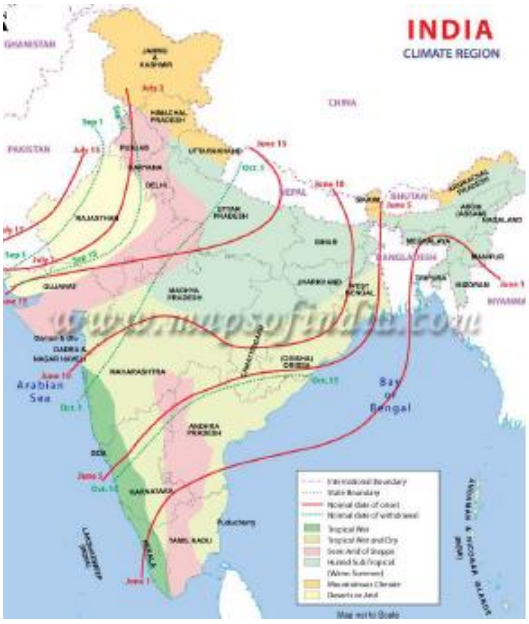

Figure 3: Map of India showing Climatic Zones of India

1. Mountainous Climate(Cold desert)

Community /Tribe : Drokpas

These tribes are mostly found at Ladakh :Himachal Pradesh which is the coldest desert of India, has a different kind of way of living. Farmers by occupation .They worship nature as God .They have flowers decorated on head because of the believe that it is the only way to get closer to God. They survive on forest produce of that area . They pride themselves in gardens and trees are God since they are the reason for human survival.

Figure 4: Drokpas Tribe and Decorated flowers on head

2. Thar Desert Climate

Community/ Tribe :**Bishnoi**

There tribes are mainly found near That desert area of Rajasthan. They live in the desert area but still have their survive through the toughest climatic conditions. These Communities are basically said to be the saviors of Environment as well as wild life. Mainly farmers, these tribes grow crops in the harvesting season and save till the next harvesting season. Also Alas there is scarcity of water, it is treated as gold and hence used wisely. In order to save the Environment, they Do not burn the dead soul in spite of being into Hindu religion. When the tree dead , it's used as wood and fuel comes from cow dung .

Figure 5: Bishnoi Tribe saving Environment and love for wild life

3. Semi Arid:

Community / Tribe: **Ahir**

These tribes are mainly found in the Rann of Kutch area of Gujarat. They are cattle breeders, Milkers or cow herds by profession. According to them the cattle must gaze on forest and hence they choose to reside nearer to the forest area of Gujarat. These people mainly are non vegetarians but Regard cow as the sacred since it's the main source of milk. Fishing is the second occupation that is seen here. They depend on the nature available to them and hence conserving nature also becomes important to them.

Figure 6: Ahir tribes breeding their cattle's

4. Tropical Wet:

Community/ Tribe : **Katkari**

These tribes are found in Raigad district of Maharashtra. These are forest dwellers and mainly work a Laborers but the females of this community pick wild fruits that are not commonly seen in cities and sell them at the nearest city market for income. They live in the deep forest and do not fear wild animals. They survive on the forest produce their houses are made of locally available materials in the region and live a very simpler life.

Figure 7: Katkari tribes with vernacular houses and picking up fruits from forest

Community / Tribe : **Siddhi**

These tribes live in the forests of Karnataka. They have African origin and hence they look like Africans. Although this community has its origin from Africa but it since ages now they reside in India and hence are indigenous. Fishing and hunting is their main occupation. They hunt for Red Ants for protein intake. Honey comb as a refreshment and during Hunting they survive on bark of the tree named *bainemara*, it tastes like coconut. Also they do fishing from the River and vegetable near by the river named *murdibhaji*is used in their food. The sides are also available in the forests they reside in and therefore this community has a close relationship with nature. Also there is a tattoo culture in this community, which they believe is that one thing which humans take with them after they are dead.

Community / Tribe : **Orali**

These tribes live at the interface of forests of Western Ghats as well as Eastern Ghats .They are nature dwellers, hunters by occupation. They live in the deep forest areas in harmony with the wild life. They depend on the forest produce for daily living and hence conserve it too. Use of coconut is seen in food as well as for the construction of houses .They have a vernacular housing typology .They sustain with whatever resources are available in the nature.

Figure 8: Orali tribes with vernacular houses and working in the forest

5. Tropical wet and Dry:

Community / Tribe: **Lambadi**

These tribes reside in forest areas of Eastern Ghats. Farmers by occupation and transporters of firewood. During festival season they Sow seeds in bamboo bowels and water it and then the grain grows which is considered to be a good omen. They sustain with forest produce and express nature in the firm of Art like songs on nature during festivals, Tattoo on body and painting with natural colours from nature.

Figure 9: Lambadi tribe with their Art forms expressed in the form of Dance and Tattoo

6. Humid Sub Tropical:

Community/ Tribe : **Santhal**

These tribes are mainly found in the generic plains of Bihar. They have this characteristic feature of the Sacred grove at the end of the village where they offer prayers and offerings to the nature .They believe that there is the presence of many spirits and hence series of annual festivals takes place there. Their love for nature is expressed in their folk dances and art forms . They believe that forest and water bodies are the resource that is available to the humans but balance has to be maintained to meet the future demands and hence whatever is taken from the nature has to be given back to nature and that too within the stipulated time .

Figure 10: Santhal Tribes performing ritual in the forest and also the type of Houses they live in

Ayurveda : Current Scenario:

Figure11:Traditional Medicine

Ayurveda forms it's base from the PanchaMahabhootah And therefore it can be said that the tendencies or the responses of Human changes from place to place Depending upon the climate of the region, where Human is located at. It is only used as healing at Ayurvedic health care's, Naturopathy centre's etc. It is treated mainly as a traditional medicine system that is used for healing, for stress life. But as said earlier Ayurveda is not something that not *something that one goes too when one needs too*, it is the way in which we respond to nature, it is the way in which we life in harmony with the nature.

Ayurveda : Symbiotic relationship between Man and Nature:

As seen the responses in the communities of the communities to the climate, it is the response that matters towards any kind of extrinsic Environment. In spite of belonging to varied climatic conditions, the communities survive on just the available nature .They survive in the forest with forest produce and at the same time save it for future generation. Though they live a life that does not offer them wealth but their real wealth is where they live in. They survive on why they have , and makes the best use of it for food, for housing and hence their living becomes economical too. The nature is their wisdom which offers then everything's right from sustenance to healing. Therefore rather that only getting back to roots with only therapies, Neuropathy etc, it is very important to understand Ayurveda, it's rooted ness to the place where it belongs too, it's responses towards the climate and the role of 5 elements is very important. And therefore it could rightly be said that Ayurveda is the way of life which the people live. it's the theory of sustenance and survival. It is the rootedness of the place and the climate it is located in.

Acknowledgement:

A sincere thanks to my guide for giving me the right direction to put forth the Concept of Ayurveda which in today's world is loosing it's wisdom and only treated as the ancient Medicinal system.

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Adaptive Building Facades for Hot and Dry Climate

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Abstract : The facade of a building defines the internal living space by controlling the flow of energy through it. They contribute to the energy budget and the comfort parameters of any building. The energy to be reduced used in achieving design criteria in terms of thermal properties, lighting, air quality, acoustics, and security, the facade must be able adapt to the changing external environment conditions and internal needs of the occupants. Adaptive facades can provide the buildings with the required flexibility in terms of thermal comfort and energy flow. Adaptive facades are building envelopes that can adjust to changing climatic conditions on an hourly, daily, seasonal, or annual basis. Several different types of adaptive facade concepts have already been developed, and an increase in emerging, innovative solutions is expected in the near future. Adaptive facades, can be divided into macro, micro systems This research paper aims to study an adaptive facade for hot and dry climate region. In this research adaptive facades are studied, how they work, which materials that can be used for such systems. An overview has been made for facade components that can adapt manually, mechanically and on a material level called 'smart' materials.

Keywords: Adaptive Facade, hot and dry region, adaptive systems, smart materials.

Introduction

The building facade as the name suggests is the face of the building and in turn, also the face of the city or its located context. It represents both the function and the occupant while also protecting the inhabitant from harmful effects of the external environment, offering privacy and a physical boundary of one's property[1].There are several definitions and words trying to describe the adaptive facade concept. Active, advanced, dynamic, flexible, innovative, intelligent, interactive, kinetic, reactive, responsive, smart, switchable, transformable are only some of the words used by the practitioners and researchers in the context of adaptive (Addington and Schodek, 2012, Aelenei et.al., 2016, Loonen et.al., 2013, Kolarevic and Parlac, 2015). The definition of adaptive facades by Loonen et al.: "A climate adaptive facade has the ability to repeatedly and reversibly change some of its functions, features or behavior over time in response to changing performance requirements and variable boundary conditions, and does this with the aim of improving overall building performance." Adaptive facades can adapt to the changes of their environments. As the population of the cities continue to grow and more buildings - residential and commercial - are constructed, the energy demand for cooling of occupied spaces will continue to rise[2]. The adaptive facade aids in the controlling of solar gains, it helps in the energy balance of the building, its benefit from passive solar energy while avoiding indoor overheating.

Understanding Built Environment In Hot And Dry Climate

Climate is an important aspect of life particularly in areas with hot and dry. In India this type of climate can be experienced in Rajasthan, Gujarat, Maharashtra and some parts of Madhya Pradesh. The modern architecture of international style which has dominated the new developments, it was introduced without consideration for the local climate or for the cultural need of the population. In

hot dry climate the excess solar gain which may result in consumption of high cooling energy and indoor discomfort. In hot and dry climate, the most significant problems are those caused by solar radiation and UV rays. These can destroy surface finishes, above all coated surfaces of metal sections, metal sheeting and wood surfaces. The great temperature difference of 45^{o}C in summer and cold winter nights with temperature below freezing point, impose considerable strain on the construction and material which can be in the form of swelling and contraction [3].

Shading Strategies and Solar Control for Hot Climate

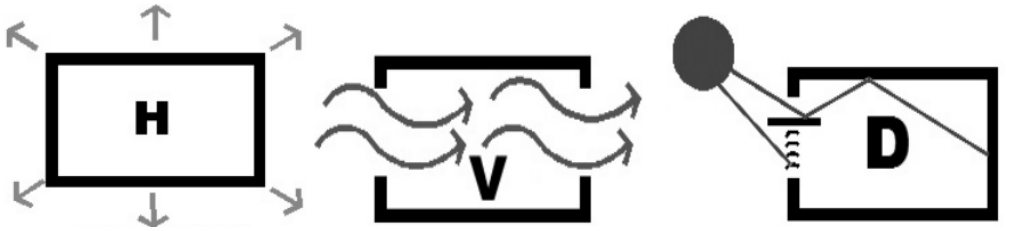
In hot climates region, shading is one of the most important design strategies due to exposure and intense solar radiation; it is not a new approach in architectural solutions. Solar control in buildings not only helps to define an energy balance in the envelope, also it can contribute to the reduction of lighting systems by collecting available daylight. Thus, this can contribute to the reduction of electricity consumption [4]. It is understood by building designers that envelopes, which respond to the climate conditions, will automatically lower energy consumption However, this is not always set in practice[5]. Incoming solar radiation in buildings has strong implications both on visual and thermal aspects. Solar shading systems influence daylight levels in a building and the view to the exterior environment; they also reduce yearly solar gains and modify thermal exchanges through the glazed building envelope [6].

Responding to Solar Radiation

The adaptive solar shading systems can take on many different shapes and forms, there are external and internal systems, different kinds of blinds and shutters [7], but also more innovative examples both when it comes to shape and appearance but also in terms of driving mechanism. Whether it is macro or micro, based on natural reactions or computed algorithms, it is especially important to consider the trade-off between solar heat gain and daylight, obviously as they have the same original source the use of shading systems also affects the amount of daylight, that are let into the building [8].

Energy and Comfort Guidelines for Adaptive Facade Design In Hot and Drt Climates

Integrating early climatic principles and active elements result in consistently high energy savings. Therefore, any active or passive facade element must follow the climatic strategies summarized in
Fig 1.



(a)Heat Rejection (b)Ventilation for comfort and cooling (c)Sunlight control desired

Fig:1 Climaticstrategies that must be followed by adaptive facades in hot and dry climates
(Source:facades-in-hot-climates-energy-and-citeseerx)

Heat rejection

Particularly in public buildings, for most of the year, building envelopes must exclude external heat. However, there must be means to allow heat storage or generation during cold periods. Heat exclusion can be achieved, for example, with elements such as: adequate orientation, insulation, and window size as well as fixed or dynamic shade elements deploying at a given radiation level. These elements can also help to achieve heating savings if winter time requirements dictate so[9].

Ventilation

Ventilation must be provided to control relative humidity in hot-humid climate or correct it by evaporation in hot& dry [10]. It helps to achieve internal comfort, and to cool thermal mass of a building. Depending on local climate conditions, relative humidity can be controlled either by mechanical room ventilation or night ventilation. This also allows a high number of air changes to be achieved. Natural night ventilation offers the least energy option to cool thermal mass [11].

Sunlight control

In order to provide visual comfort and at the same time reduce heat gains, sunlight must be controlled and daylight must be re-directed into the space. This can be done through a variety of fixed or active devices. For example: overhangs, shades, anabolic concentrators and light shelves [12, 13]. However, care must be taken into their design and configurations to avoid becoming sources of glare [12]. By using advanced electrical controls (such as dimmer), artificial lighting is used as a supplement to natural light for performing visual tasks. This also helps to reduce

cooling demands in a room. Daylight control offers opportunities to incorporate innovative active elements and materials, such as automatic blinds with special reflective profiles or holographic films [13].

Adaptive Facade System

There are two levels of mechanisms that drive the adaptive behavior; micro level and macro level but combinations are also seen.

Macro Level

The macro level is related to mechanical movement. Macro scale changes have an impact on the configuration by moving parts resulting from sliding, expanding, creasing, rolling, inflating. This can be done by supplemented components external to the building shell, subsystems of the building shell itself, movement of the entire facade or the building as a whole. Except for mechanical moving, the transportation of fluids is also a possibility [14]. This can be the flow of air, use of foam bubbles, phase change materials, transparency of water, opaque constructions (Loonen et al., 2013). An example of a macro-level adaptive concept is mechanically controlled venetian blinds, but they could come in all different shapes and transformation patterns.

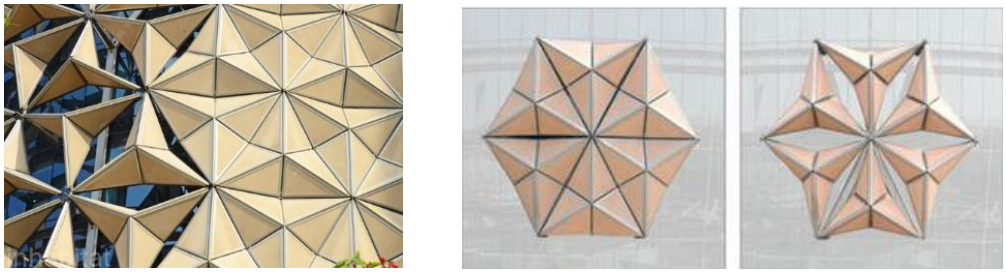


Fig:2 Example of a macro- level adaptive system at Al Bahar towers, wherethe panels fold or unfold to act as solar shading.
(Source:http://en.uaezoom.com/al-bahar-towers-in-abu-dhabi)

Micro-Level

As the name implies, micro-level changes occur in a smaller scale. The change occurs within the material itself, for example the arrangement of water molecules when the water transits from the fluid phase to the solid phase (ice). This change in a material's properties could be applied as an invisible change in the envelope that alters for example the thermal properties or it can be used as a motor to drive a larger system, for example wax pistons or photovoltaic cells. In wax pistons wax expands when the temperature is increased, this in turn induce a pressure in the piston, which can be used to create movement of for example blinds [14].

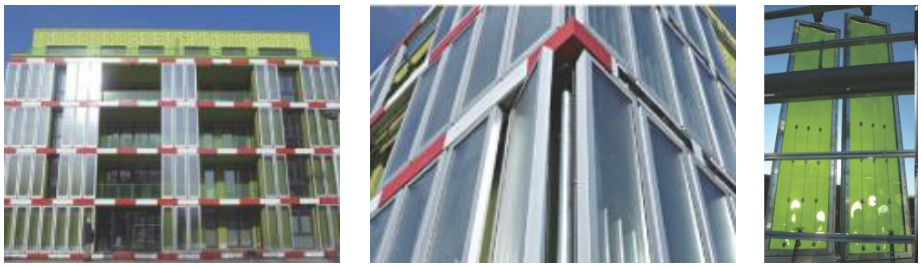


Fig:3 Example of a micro- level adaptive system(solar leaf facades) at GSA building in LA
(Source:iitbuildingscience.wordpress.com)

Facade Concepts for Hot and Dry Climates

Manual facade

Manual facades are facade that preferably uses manual components only for adaptivity. The main advantage of this type of facade in comparison to a facade with mechanical components is that the input needed for the facade once build is low: it needs the user of the room behind it to adapt it. The user must act upon the facade in order to influence the internal climate of the room. If the user does not change components at the right time, the comfort levels might change in a negative way [15].

Mechanic-facade

The idea behind this concept is not very innovative: the facade is able to adapt itself by components that are driven by electricity; it does not need any interaction with the user of the facade. The facade is intelligent in that it can adapt itself, but for this it will need sensors and mechanical components to act upon internal or external changes; room comfort is programmed in advance[15].

Smart-facade

The 'smart-facade' concept assumes a facade that is (completely) build up by 'smart' adaptive components. In this concept, it is not necessary for the user or the facility management to change or replace anything within or on the facade; no components will be interchanged. The facade can adapt itself to create the best comfort inside[15].

Example

- The Homeostatic Facade System. The New York design firm Decker Yeadon use muscles and homeostasis in biological systems as the inspiration for their double-skin glass facade system for large buildings. The facade resembles a window with a swirling design that opens and closes itself in response to changes in interior room temperature to permit or deny heat gain from the sun.

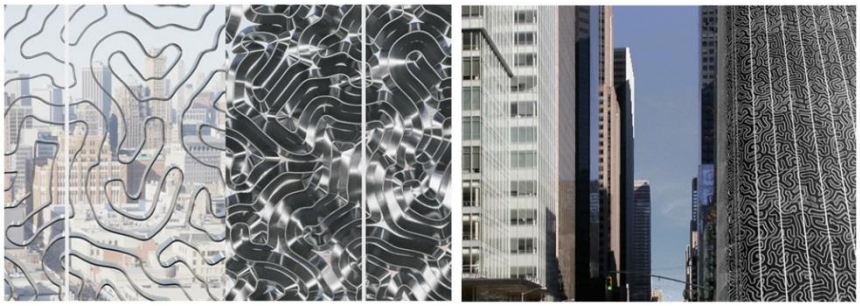


Fig:4 Example of a smart adaptive facade. A self-regulating facade system in USA (Source:arch5541.wordpress.com)

Passive Adaptive Facadesfor Hot and Dry Climates

We can refer to passive adaptive facades as the facades provided with technological systems which do not require power, controls and require little or no maintenance. The passive facades falling into this category are: double skin facades; wood based responsive building skins; glass surface with silkscreened patterns of ceramic-based paints; brise-soleil and fixed or pivot-mounted louvres. The passive facade mostly designed to react to changes from external factors should be able to:

- Maximize direct solar gains as it is fitted with extensive glass surfaces with high thermal insulation and should be equipped with shielding systems to control the glare effects and provide protection from solar radiation.
- Provide buffer zones between the transparent and opaque closure systems in order to increase the protection against the cold and exploit solar energy in winter.
- Reduce indoor overheating during the summer months through the presence of artificial and/or natural solar screens;
- Increase natural lighting by creating transparent openings of suitable sizes
- Encourage natural ventilation by reducing energy consumption for summer air conditioning.

Technologies for Passive Adaptive Facades Which Can Be Used In Hot and Dry Regions

The most common examples of passive adaptive facades there are:

double skin solar facades; wood based responsive building skins; glass surface with silk-screened patterns of ceramic-based paints; brise-soleil and fixed or pivot-mounted louvres; light-directing systems.

- Double skin solar facades consist of three functional layers. is a self-supporting solar collection facade that encloses existing buildings, forming a double envelope. As the panels open, they also serve to shade building interiors during hotter months and passively ventilate the double envelope. When closed, the panels lap and seal to create a watertight exterior.

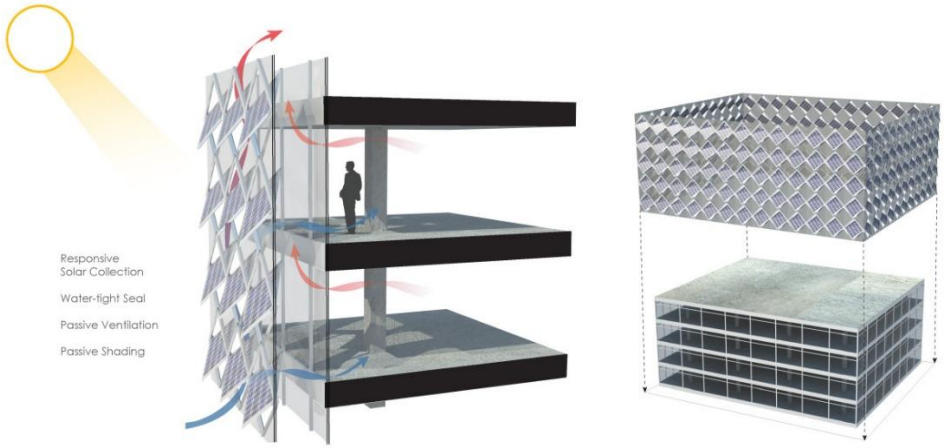


Fig:5 Double skin solar façade serves as a second buffer for thermal and acoustic variations
(Source:https://danielraznick.com/about/adaptive-solar-skin)

- Other applications based on wood responsive building skins have been investigated by Bridgens et al. 2017 and Mazzucchelli and Doniacovo 2017. These components can be used as cladding panels, sunscreen, passive layer (see Fig. 6) for photovoltaic systems (Mazzucchelli and Doniacovo 2017), etc

Conclusion

- "Adaptation is essential for survival and success: This is as true for our buildings as it is for all other aspects of our lives. Buildings with adaptive systems use less energy, offer more occupant comfort, and feature better overall space efficiency than static buildings do.
- The need to improve the energy impact is triggered by the current changing climate. The adaptive facades use flexibility to adapt and react to changing climatic conditions. Adaptive building facades will be able to improve building performance in hot and dry regions
- Adaptive facade in hot and dry regions will help to minimize at least some of these disadvantages so that a high comfort level will be achieved even without air-conditioning.
- Modern adaptive facades can significantly improve energy and thus cost, efficiency of both new and refurbished buildings by responding to the changes in the outdoor conditions.
- A careful study of realization and prototypes of adaptive facades in the hot and dry climate will result in useful knowledge and comprehension of innovative initiatives, shortcomings and potential improvements. Further augmentation is necessary to facilitate and improve future designs to make them more economical and applicable on a larger scale.
- The use of smart materials in the building facade could be one possible way to approach the problem.
- Smart materials with their adaptability and their ability to store heat reduce the peaks in interior climate so that cooling and heating requirements will be minimized.

Recomendations

- Architects should analyse best possible energy conservation techniques to enhance the application of adaptive building principle in the design of the buildings.
- All adaptive building principles should be noted in the derivation of the adaptive facade design which would serve the target of the specific building.
- Assessment of the adaptive facade system should be detailed and clear, due to varieties of techniques adopted in this system.
- An appropriate ventilation, lighting strategy should be designed to suite the building usage.

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Components of Built Environment Impacting Human Health With Respect to Green Buildings in India

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Abstract : "We shape our buildings and thereafter they shape us" . Buildings' indoor environment is where people spend most of their time. The design of homes, schools, hospitals and other buildings can impact directly and indirectly on health. The relationship between indoor environmental parameters and human health is same all over the world, however, the extent of impact depends on many region specific factors/variables- climate, ambient air quality, ambient noise levels, dietary habits and lifestyle .There is not much data available on built environment in India with respect to their impact on occupants' health especially considering Indian scenario. The objective of this study is to establish connection between green buildings in India and human health and wellbeing through literature review and identify strengths and gaps to address all relevant aspects of occupants' health through mapping of LEED rating system in India. A limitation of much of the research is the reliance on indirect, lagging and subjective measures of health. Study highlighted strengths that rating systems like LEED always had human health and wellbeing as one of the integral facts in their overall approach towards sustainability. It also revealed the gaps such as existing framework of this rating system can be expanded to integrate health aspects and it can be achieved by developing new credits in existing criteria. Though there are various rating systems In India, study is limited to application of framework to one rating system, LEED (USGBC) which can be applied to other rating systems In future research to identify the gaps and overcome identified issues.

Keywords: Rating systems, Occupant Health and wellbeing, indoor environment, LEED

Introduction

Most people are unaware of the impact that the built environment can have on their health.built environment provides several opportunities to positively impact occupants' health and wellbeing.As mentioned, indoor environment quality influences occupants' health directly. Therefore to provide better indoor environment quality, we need buildings with less impact on environment and human health. Green building concept is a comprehensive strategy to approach to this aim. Howard (2003) has defined green building as practice of Increasing the efficiency with which buildings and their sites use energy, water, and materials and reducing building impacts on human health and the Environment through better sitting, design, construction, operation, maintenance and removal the complete building life cycle. Materials which are used in green building construction process not only are environmentally friendly but also they are healthier and cleaner for the residents. Green buildings with having exclusive features such as better ventilation, using more sunlight and higher indoor air quality provide healthier environment and increase occupants' productivity and wellbeing compared with non-green buildings. Enhancing the quality of life and social equity over all would certainly lead to a healthier population. Reversing climate change would absolutely improve health, as major weather events are mitigated and air quality improves. Protecting and restoring water resources would undoubtedly improve the both quality of life and health outcomes for the human population, across urban and rural, developed and underdeveloped areas. This paper is not intended to include a review of these factors in detail, but to cite a few important aspects here to highlight the breadth of the issue and to strengthen human health aspect in existing products.

To address this, study proposesa framework of health and wellbeing Indicators for green buildings in India and recommendations on how to identify and integrate these to LEED rating system which can be used with other rating systems for future studies of buildings and health.

Are green buildings healthier buildings?

While health has always been included in the green building conversation, it's been somewhat difficult to quantify when compared to energy and water consumption. But as the relationship between climate change and human health is further demonstrated along with an interest in living healthy lives, both business owners and individuals are more mindful of fostering holistic health and well-being in their built environments. Green buildings are a necessary, but not sufficient, component of the future of sustainable urbanization. Building for health is the paradigm of the future that includes a focus on ecosystem health (green buildings) and indoor health (healthy buildings). There is an opportunity to frame health-promoting indoor environments and expand the green building movement in the context of sustainability. Rating systems can reframe the purpose for green buildings as a transformational process to develop a healthier built environment. (Allen, J.G. 2015)

Most of the LEED credits that are directly linked to individual occupant health fall under the Indoor environmental quality category LEED credits directly addressing physical health resided mostly in the indoor Environmental Quality (IEQ) category and included opportunities that were obviously targeted at mitigating harmful practices, such as the Environmental Tobacco Smoke Control prerequisite and credits like Low-Emitting Materials and Indoor Chemical and Pollutant Source Control, all of which deal with the inhalation of documented noxious, harmful chemicals. (U.S. Green Building Council. Green Building Facts. 2015)

The indoor pollution can be caused by the building and materials which used for building decoration. It may damage people's health condition even more than outdoor pollutions (Raw G. Building Regulation Health and Safety; 2001) Nowadays, human has to suffer not only outdoor factors such as noise, water pollution and motor vehicle pollution that result from global industrial development but also the indoor environment pollution that comes from buildings and indoor decorative materials. 68% of diseases are related to indoor pollutions or poor indoor air quality, such as the aging of skin, hair shedding, general fatigue, forgetfulness, infertile, leukaemia and cancer (Liqun*et al*., 2011). According to Liquana*et al* (2011), 37% of the respiratory diseases are caused by indoor environment, Also 22% of chronic disease, 5% of bronchial catarrh, 5% of cancers and 5% of leukaemia are caused by indoor environment or indoor pollution.Indoor environment quality (IEQ) influences occupants' psychological health (Spector, 2006). Psychological health includes such issues as anxiety, depression, stress as well as feelings of confidence, energy, and generally being in good spirits. Studies stated that access to natural view; improved ventilation and temperature condition in working environment positively influence employee's performance and productivity.

Results of literature review revealed that buildings with green features and environmental friendly materials provide better indoor environment quality for their residents compared conventional buildings. Consequently, high indoor environment quality will lead to less indoor pollution and improve occupants' health and productivity compared with conventional buildings residents.There is ample research that clearly demonstrates that quality of the indoor environment has a significant impact on the health and productivity of its occupants. In Offices it has a direct impact on the productivity of the employees, in schools it influences the health and learning abilities of the students and in case of healthcare facilities, it impacts the patient's healing process, recovery time and general well-being.Here, in this study existing credits of LEED rating systems are mapped considering components of built environment impacting human health to strengthen health related aspects.

Human interaction with built environment

Our built environments have proven to have a direct effect on our overall health and well-being. As architects and designers, we are always faced with design challenges that revolve around our end-user's sensory experience within the built environment such as breathe, see, hear, work, sleep, eat, think, smell, move.Each of these activities gets affected in some or the other way by the quality of our built environment.

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Components of built environment impacting human health

Physical comfort- Thermal (Temperature and humidity inside space, heat island effect), **Visual** comfort (lighting levels, glare, light quality), **Acoustic** comfort (indoor sound quality and ambient noise pollution reduction), **Universal accessibility, Ergonomics**

Mental health- Daylight availability, outdoor views, connection with nature, availability of quiet zones for doing tasks that require high levels of concentration; overall ambience, social equity related issues, human safety, education and awareness on health and so on.

Features encouraging fitness: Does the built environment design promote physical activity- walkability, bikeability related facilities, staircase design and designated space for physical activity.

Analysis

Mapping of Existing Rating criteria for LEED BD+C

Green building rating systems are known for their ability to assist in the development of high-efficiency in buildings. in order to identify strengths and gaps to address all relevant aspects of occupants' health, above mentioned parameters impacting human health are studied through credit criteria given in LEEDgreen building rating system.

LEED BD+C: The Leadership in Energy and Environmental Design (LEED) Green Building Rating System represents the U.S. Green Building Council's effort to provide a national standard for what constitutes a "green building." Through its use as a design guideline and third-party certification tool, it aims to improve occupant well-being, environmental performance and economic returns of buildings using established and innovative practices, standards and technologies. LEED is similar to checklist of credits that can be achieved in 7 major categories.The specific credits in the rating system provide guidelines for the design and construction of buildings of all sizes in both the public and private sector. In this study the framework of parameters influencing health and wellbeing is used to identify matching pilot credits (figure 1) and criteria from LEED **BD+C** rating system (figure 2) and weightage of the same is calculated to identify the stringency level of the existing criteria. It also shows the gaps in categories where LEED criteria are not addressed.

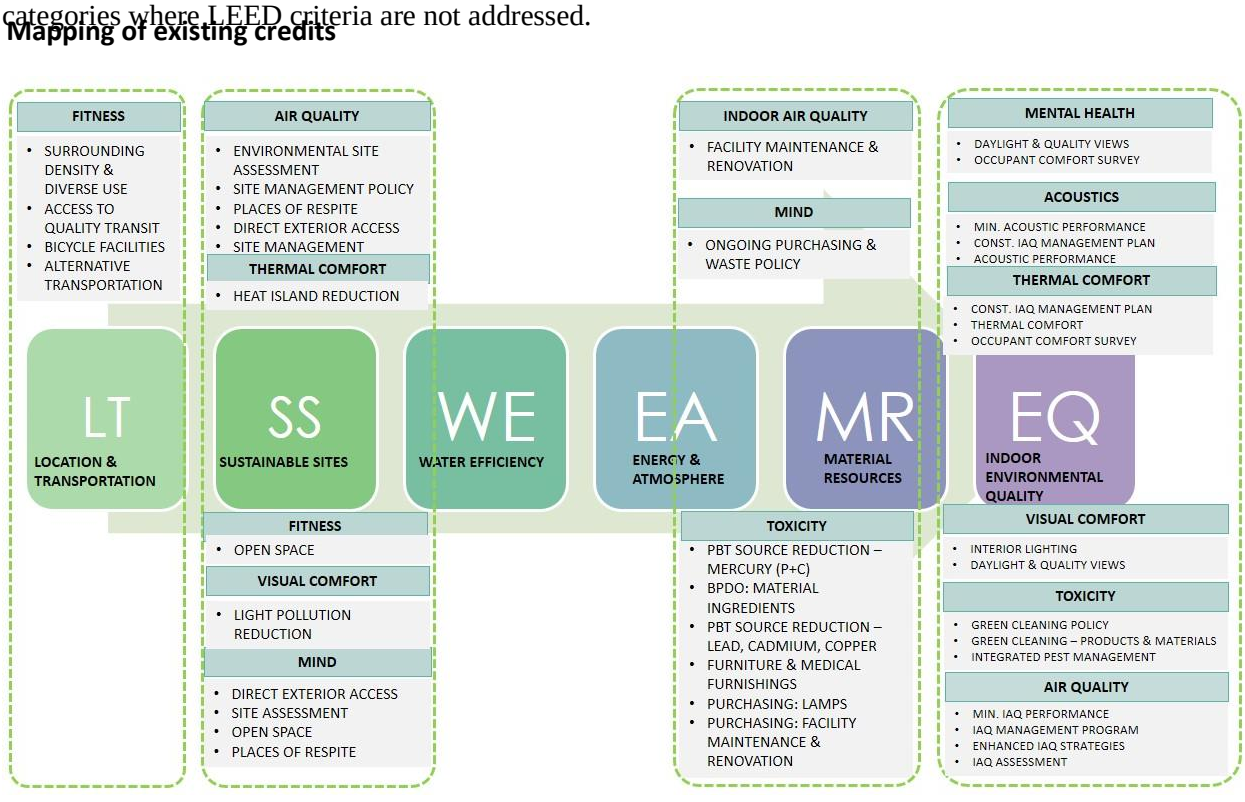

Figure1: Figure showing mapping of Existing credits matching to the parameters of health and wellbeing

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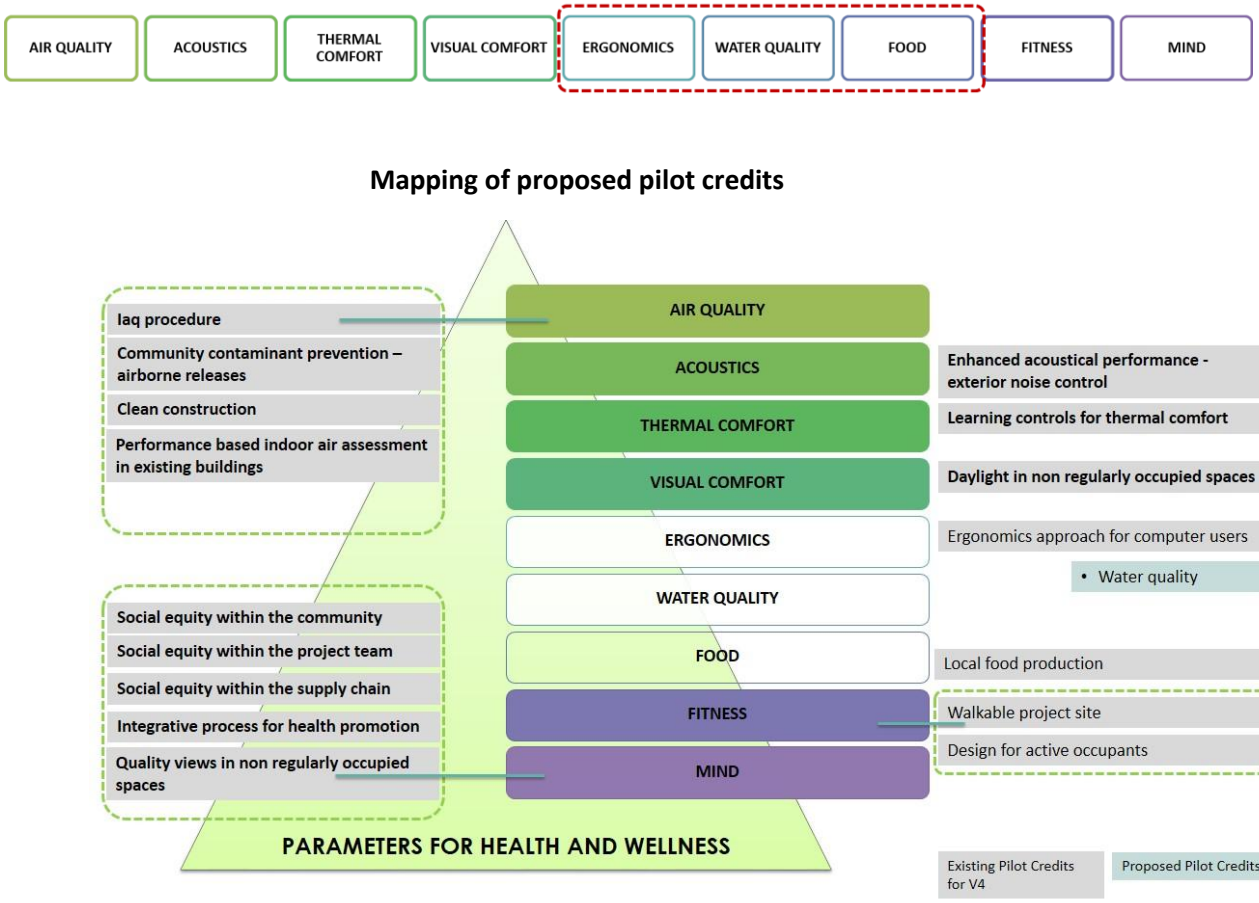
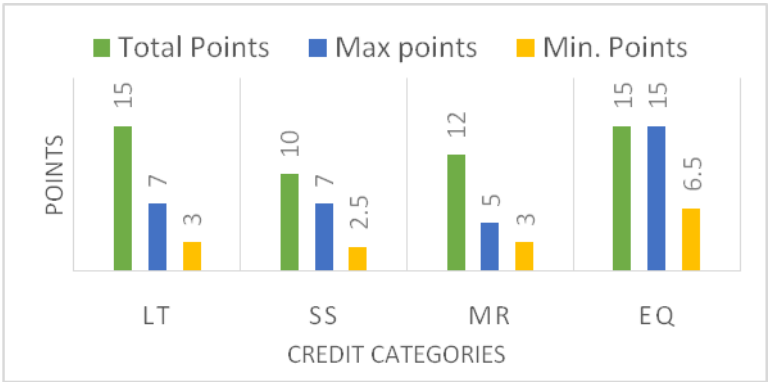


Figure2: Figure showing mapping of Existing and proposed pilot credits matching to the parameters of health and wellbeing



17% (min) - 34% (max)

Figure3: Figure showing category wise weightage given to parameters of health and wellbeing in LEED BD+C

Results and Recommendations

This study demonstrates the huge impact of components of built environment on health. Overall, the initial scientific evidence published to date indicates better measured and perceived indoor environmental quality and health in green buildings versus non-green buildings. For indoor environmental quality, green buildings had lower levels of environmental contaminants that have been linked to adverse health effects are explicitly addressed in green building design credits, so these early findings suggest that the design elements targeted at improved IEQ translate to significant reductions in actual exposure. Effective planning for public health and wellbeing involves

much more than planning curative services. It is about healthy human habitat and supportive social structures. These all depend on our ability and commitment to creating a healthier built environment. Green spaces can positively influence health through their contribution to improved air quality. Vegetation removes pollutants, whether gases or dust-related and this effect is seen on all sizes of particulate pollution. At local level, the design, maintenance and use of buildings, public spaces and transport networks are all important. Design of street networks, the availability of open spaces, and the perceived and actual safety of an area as well as personal resources are important environmental and social influences. For example, encouraging people to walk and cycle around a neighbourhood means making streets safe and attractive, ensuring it meets the needs of all users. People are more likely to exercise if sidewalks are present, attractive, unobstructed and maintained and if the scenery is enjoyable which makes these components important while designing green buildings.

Study identified the factors from each category like location and transport, sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality which are according to the framework of components impacting human health. Mapping of such credits shows that there is gap in the criteria where ergonomics, water quality and food related criteria are not mentioned. This also shows that various other categories like fitness, air quality, acoustic, Thermal and visual comfort, mental health, mind, toxicity are covered In LEED rating system. Though distribution of points to pilot credits and other criteria may change the weightage of these factors while considering overall green building aspect. According to the identified criteria **LEED BD+C have min 17% and max 34% points** (**Figure3)** health and wellbeing criteria with 17% for mandatory pilot credits.

Conclusion

As the researchers begin assessing health and wellbeing of occupants in various built environment, role of assessment criteria in advancement of green buildings in terms of human health, the success of other rating systems in relation to LEED-certified and conventional buildings, the need for high quality health metrics will become paramount.Proposed study of identifying health performance and wellbeing in green buildings will be useful for designing studies that attempt to identify specific building-related attributes, in green buildings or otherwise, that lead to improved occupant health and wellbeing. Also it will help in strengthening the existing criteria in current green building rating systems In India.

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Investigating the Influence of Walkability on the Residence's Satisfaction with their Neighborhood in Nagpur City

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Abstract : Walking is an integral part of human development, but lately, our routine life has affected this activity spontaneously. Walking also has been a key factor contributing to human evolution. Although the urban crowd realizes the importance and benefits of walking very few choose to practice it. Having said this, the idea was to study the likely walk-able and most sustainable areas of Nagpur city, Maharashtra and identify the gap or reason for the decline in the same. The research examined the two-sample questionnaire survey. The initial survey was conducted to understand whether the users are satisfied with their neighborhood, followed by another survey to understand their idea of experiencing it. It gives a room to study the psychology of the residents and their criteria for walking. This study examined, the desired experiential walkways for the people's movement in an urban environment including their neighborhood, so as to sustain a quality and leisure life. This paper presents findings of the research undertaken to identify the relationship between the city and the people, resident's perception towards their surroundings and how they would like to experience it. Subsequently, the survey would help us conclude on the basis of the response, whether walking is by choice or by compulsion.

Keywords: Walking,Satisfaction, Pedestrians, Neighborhood

Introduction

Indian cities in its late 20th century realized that cities are getting lifeless, people are getting fat, and everything is getting mechanized (2010). According to the historical facts, first the life evolved, then the people and spaces around people got organized and at last the buildings came ands that is how cities evolved. We know inhabitation is a basic survival need for a human. It is the most important living constituent and behavior content of human (JiaYan, 2001). "Human beings are born with a tendency to be immediately and spontaneously aware of their physical environment…they experience pleasure and satisfaction from such an environment when it seems to be conducive to the realization of their biological needs and sense of anxiety and dissatisfaction when it does not."(Appleton, 1975). In the course of the human development, the residential area has been always a base of human continuous evolution. Therefore, the environment of the residential area has an intimately close relationship with human beings.

Inhabitation environment is an important part of urban construction, which relates to the national economy and daily life. With corresponding to three elements, which are work, live and entertainment for modern urban people, the residential area becomes the bay with the natural and tranquil environment when people come home after a busy work (Jianguo, 1999). A pleasant environment is an inherent demand for the urban citizen. Urban people spend half and even two-thirds of the whole day in residential areas. Therefore, the quality of environment directly affects people's physical, mental and spiritual life(Wu Liangyong, 1999). Urbanization with natural landscape brings about a sense of the outdoor places with leisurely engagement. Due to lack of vision, our unprotected natural landscapes of the city are eventually engulfed by ever- expanding urban fabric. Therefore, a landscape should be seen as an urban area and not seen as an open space network integral to the physical infrastructure of activity or health and wellbeing of its habitants. Recently, it has been noted that countries that are walkable /cyclable are healthier and are a more pleasant place to live in. Urbanist Lyondell says, a good city is one where people walk, be outside. Also, a good city should invite, spend time outside, fun, attracts own citizens, invites people to walk. Cities 1/3rd population walks to work every day. In our life walking is made for us (Gadepalli, 2010). Hence as

one walks the experience changes it helps in creating dynamic of spaces not by volume, plan and section but by experience.

Literature Review– A background study to understand walking –

History can be read as a millennia- long struggle to free us from the need to walk. The choice to walk is in response to an apparent yearning to be more active and healthy, to do things in a more sustainable way, and to be more directly in touch with the world around us. The deliberate pace of walking allows us to more fully sense the world, to see its richness of detail, to touch, hear, smell, and even taste it. In a book Wanderlust: A History of Walking (Viking, 2000)Rebecca Solnit writes that "[t] he only given is that upright walking is the first hallmark of what became humanity" and "[w] whatever its causes, it caused much more." it freed what are now our arms, allowing humans to evolve into the ultimate tool maker, and our brains responded accordingly. Scientifically, Science writer John Noble Wilford writes, "Anthropologists and evolutionary biologists are now agreed that upright posture and two- legged walking—bipedalism—was the crucial and probably the first major adaptation associated with the divergence of human lineage from a common ancestor with the African apes." Rebecca Solnit suggests taking an ecological approach by considering walking an "indicator species for various kinds of freedoms and pleasures: free time, free and alluring space, and unhindered bodies." In this context, walking might be considered "endangered." She argues that modern transportation and technology lead us to transcend space and time, alienating us from the material world, and leaving us "disembodied." "It is the unaugment body that is rare now," she writes, "and that body has begun to atrophy as both a muscular and a sensory organ." But this doesn't have to be the future of walking, and trends suggest that walking is entering a new phase in which increasing numbers of people are choosing to walk for many of the reasons. Many cities are working hard and successfully to accommodate the needs of walkers through pedestrian malls, better sidewalks and lighting, and greenways to connect home, work, and recreation. Walking is an antidote, an exercise that is accessible to nearly everyone and universally recommended by the medical community. Walking guru Colin Fletcher wrote that ***walking is the yin to life's more hectic yang, and we need to find a balance between the two***(Manning, 2015).

Walking- Facts and Findings-

NBC news.com Stanford University study found that, walking increases creativity by an average of 60%. Researchers labbled this type of creativity as divergent thinking, which they deifine as thought porcess used to generate creative ideas by exporing many possible solution. Everyday 12 minitues of walking increases Jovality, Vigor, Altertivness, and Self-confidence.Walking can be single goal activity or part sequence as seating, standing etc.; or it can be a social activity as gathering, talking, and passing by. Human experience differently in natural and in built environment. Walking is by product of movement as a recreational activity, which is Necessary, Optional or Social (Gehl, Life between Buildings, 1971).

The Social Factor Model

The Social Factor Model says; the way pedestrians behave when walking depends largely on urban settings attractiveness of place and environmental factors. People walk consciously and unconsciously along places. Change in one-aspect leads to quality of environmental experience response and perception. Pedestrians while walking keep certain distance to other (street, people, walls, obstacles) it is smaller the more they hurry, it decreases with growing pedestrians density. When walking people do not reflect their behavioral strategy in every situation anew as positive but act more or less as automatic.(Arnheim, 1941) Behavior connection depends when they interact with eye contact, speed, direction and invasive.

Walking Speed Factor

A research in an Asian country shows; 10 minutes of walk is equal to 45 minutes of workout. A person walks 1.2m/second, and in social force (crowded scenario) it changes to 1m/sec to 1.35m/sec. Time of day, outside temperature, trip purpose all together creates factors that are responsible for controlling our walking speed. Considering no gradient difference up to grade of 3% slope, walking width as site specific, pedestrians keep 0.30m-0.45m lateral clear distances between themselves and kerbline and 0.30m from building line. Hence lateral

distance should be deducted from walkways dimensions when delinking effective walkway widths.(Stanford University study)

Detailed tendencies that governs an individual behavior when walking in urban contributes-

Edge effect, Attraction effect, Distance effect, Group effect(Alexandra Willis, 2004)

People's tendency to walk changes with -

Aesthetically stimulating elements, Preferences of short path, Distance from walkers, Slip steps, Acceleration, Crossing patterns, Effects of other people being together spatially, Shading pattern, and urban morphology – architectural alignment of spaces.(Bridging the boundaries:human experience in natural and built environment, 2014)

The study area for research-

a) The setting of the study area

Nagpur is located at the geographical Centre of the country. It is an important urban area in the Vidarbha region and the winter capital of Maharashtra. It is seen as one of the rapidly developing central India's metro city and also ranks third in the list of the urban Centre's in the state of Maharashtra. Nagpur enjoys the privilege of being termed as the richest city, greenest city, the city with latent potential, the hub of health care industry in the state, tiger capital of the country, etc. Nagpur has traditionally expanded horizontally with low-rise built-up spaces. Open space within the built-up spaces is very less, which means there is no space available for future Greenfield development within the city, except the peripheral areas (Ministry of urban development,Government of India, 2015). Nagpur being in the list of becoming one of the smart cities in India is the right case to study, where the western neighborhoods of the city shall be considered for the study of influential walkability satisfaction with their neighborhoods on the residents.

b) The research area-

The study was carried out in the city of Nagpur wherein the western part of the city's areas with high walkability index (ESAF, 2015-2016)or sustainable neighborhoods was selected. The four areas that are Laxmi Nagar, Sadar, Ramdaspeth and Shivaji Nagar were selected from the list and were further compared to study the influence of the walkability on resident's satisfaction with their neighborhood. 15-sample survey questionnaire was collected from each neighborhood and a comparative analysis was drawn to understand the satisfying factors of the residents. The second set of questionnaire focused on the design and experienced based questions that were open to all the residents from one of the satisfied area after analyzing the first set of questionnaire and 57 responses were studied for the analysis.

About the survey study areas :

Figure 1 : Laxmi nagar Map extent with NEERI Boundary

Figure 3 : Shivaji Nagar Map extent with Ram nagar hill Boundary

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Figure 2 : Ramdaspeth Map extent with Agriculture college land and Nag Nala Boundary

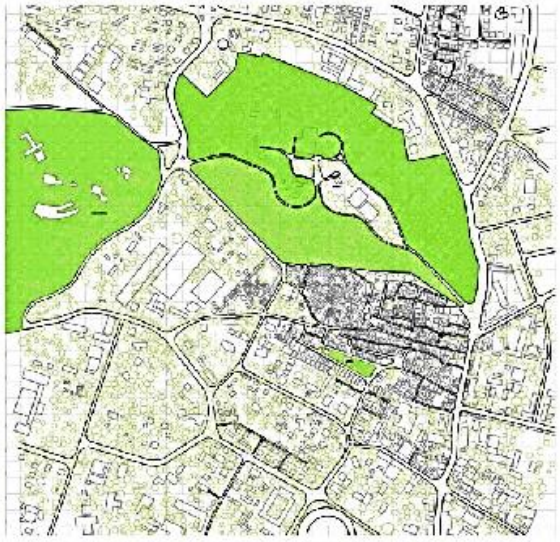

Figure 4 : Sadar Map extent with Seminary hill Boundary

As the city core is congested and urbanized, the scope of work directs to the study areas in a more breathable area, the western part of the city. Below is the description of the areas that were taken up for the studies.

1. Laxmi Nagar [Figure 1] –Area and surroundings- 160 acres approx. It lies in the southwestern part of the city; neighborhood has a boundary of NEERI (National environmental engineering research institute), which keeps the surrounding cool and green, hence facilitating and promoting higher walkability in the area.
2. Ramdaspeth [Figure 2] - Area and surroundings – 360 acres approx. It is the medical hub of the city lies almost at the central part of the city. This area is parallel connected to the Nag Nala that flows along the neighborhood and provides a green corridor. Towards north in its surrounding area is the agricultural institute. Its surrounding area includes the two major squares of the city that is the Jhansi rani square and the Variety square that experiences about 3 lakh pedestrians every day.
3. Shivaji Nagar [Figure 3]- Area and Surroundings - 230 acres approx. It is at the center of the western part of the city with the most balanced neighborhood in terms with the transport connection, open to built ratio. It has a natural boundary of Ram Nagar hill and a market area as Dharampeth in its surrounding.
4. Sadar [Figure 4] - Area and Surroundings –700 acres approx. One of the earlier settlements of the western Nagpur lies on the northern western part of the city. The area is dominated with the commercial, public, institutional, civic buildings and lacks a planned residential core area. Its natural boundary is the Seminary hill that welcomes the pedestrians from all around the city and the residents of Sadar area to walk around it.

Table 1 Images showing existing pathways, its physical condition and movement from main roads to internal roads.

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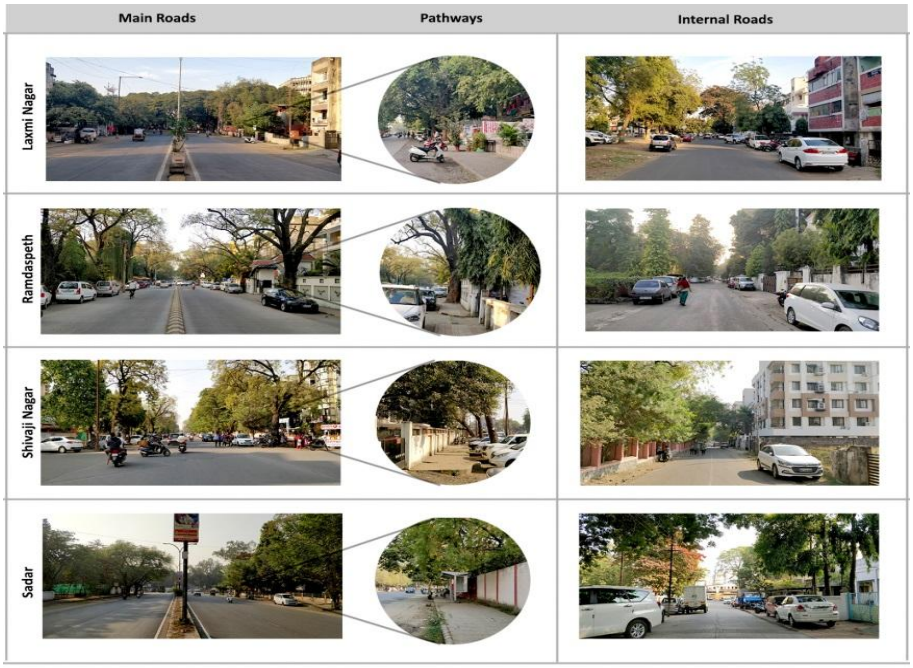

Data analysing and findings from the survey

First set of survey-

The first set of survey was designed to understand the residence and their satisfaction with their neighborhood, which was influencing their daily walking habits. All the above-mentioned areas Laxmi Nagar, Shivaji Nagar, Sadar and Ramdaspeth were selected for the study. The questionnaire was designed with very basic questions that gave an understanding, if the people living in their neighborhood are happy and satisfied with their surroundings and if yes! Then, are they encouraged enough to walk around it daily or not, it was also related to understand their social structure with their neighbors.

The questions directed were then linked with the space structure of the city area and the psychological aspects and experiences that are indirect variables in nature. Study was included so as to understand the conscious and sub conscious minds of the people while attempting the questions.

Table 2 Parameters Considered while making questionnaire (Gehl, How to study Public Life, 2013) **with twelve types of experiences** (Cherne, 2011)

Parameters to study site			
Adaptability	Meaning	Transparency	Intelligibility
Distinctiveness	Spaciousness	Complementarity	Refuge
Intricacy	Coherences	Openness	Visibility
Richness	Expectancy	Unity	Deflection
Ambiguity	Mystery	Complexity	Interest
Diversity	Territory	Identification	Regularity
Legibility	Comfort	Ornateness	Vividness
Sensuousness	Focality	Upkeep	Depth
Dominance	Naturalness	Continuity	Intimacy
Linkages	Texture	Imagebility	Rhythm
Singularity	Compatibility	Prospect	
Clarity	Formality	Variety	
Enclosure	Novelty	Contrast	

Experiences	Mind's Relation
Affectionate	Spontaneous- Consciousness
Desired	Sub consciousness
Emotional	Uncontrolled- Sub consciousness
Sensational	Nature of feeling-sub consciousness
Timely	Satisfying feeling- Consciousness
Spatial	Geometry- Consciousness
Transformation	To be perfect- Consciousness
Creation	Circulate energy- Sub consciousness
Pulsation	Allows to think-Consciousness
Perfection	Accuracy- consciousness
Physical	Interaction- consciousness

Selected Parameters

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Table 3 Set of questionnaire along with experiences of the residents they feel while attempting the questions.

Questions and Public experience	Are you satisfied with your neighborhood? *Pulsation-Onesess allows one to think*	Does the neighborhood feel safe? Spatial-*Consciousness-Geometry*	How often do you interact with your neighbors? *Timely-satisfying sensation for longer time*	Is the neighborhood clean and maintained? *Perfection-Higher form of accuracy*	How much recreational time do you take out for yourself? *Transformation-ability to perfect energy*	Is there any good meeting space/park in the neighborhood? *Physical-Interaction with environment*	How often do you visit the park near your house? *Desire-Subconscious, want to but don't*	Does the surrounding environment help in maintaing your health? *Compatibility-occouring with*	Can you walk down to bus station /work place from your residence? *Regularity-fixed pattern*	Are daily need shops within walkable distance? *Obligation-needs*
Laxmi nagar	5	5	4.3	4.3	3	2.5	2.5	3	3	4
Sadar	4.3	5	3.3	4	2	3	2	4	3	5
Ramdaspeth	2.6	2.6	3	4.3	3	4.6	2.3	4.3	3.6	4.6
Shivaji nagar	4	4	3.3	4	2.65	4	2	4	3	5

Questions and Public experience	Do roads in your neighborhood have walking paths? *Subjective*	Is the neighborhood too overcrowded? *Dominance-influential*	How often do you go for walk in your neighbrhood? *Naturalness-unself conciousness*	Do you feel proud about your neighborhood? *Affectonate-Spontaneous*	Do the parks and trees make a diffreence in your daily living? *Distinctiveness-character*	How attached are you with your neighborhood? *Emotional-Uncontrolled*	Do you desire in making your neighborhood better? *Imagination-creativity*	Are aesthetics of the are important for your living? *Spatial-consciousness*	Do ypu wish to move to some other neighborhood? *Rational Behavioural*	Total
Laxmi nagar	3	4.6	4.3	3.3	4.6	4	2.5	4.3	3.6	3.75
Sadar	3	3.5	2.3	4.3	4.6	3	3	3	3	3.6
Ramdaspeth	4.3	3.6	2.6	5	5	4.6	3.6	4.6	3.6	3.8
Shivaji nagar	4	4	2.3	3.65	5	3.65	3.3	5	4	3.7

The analysis and conclusion of the first set of survey-

To study and analyze the questionnaire each question was assigned with an experience and was compared individually with the four areas to understand residences satisfaction. The areas were then rated out of 5 stars all together to draw and get the most satisfied neighborhood from all the questions.
After rating the set of questions Ramdaspeth, satisfied almost 10 factors from 19, making it most satisfied and desired neighborhood. The least was the area of Sadar with only 2 factors of satisfaction. Laxmi Nagar and Shivaji Nagar being 2nd and 3rd respectively.

An overall fact that was observed was that,only the people of age group above 45 and below 18 are more interested in the activity of walking, leading to the concerns that the middle age people were not countered and even if they were, they seemed not to choose walking as an option for the movement. From the suggestion box we come to know that the awareness about walking is there but only a few consider it to be a social and a leisurely event in their daily lives.

Questions and public experiences that satisfied the residents of the Ramdaspeth were that, the area is clean and maintained, making it perfect. The area also has good meeting spaces and parks, which give them the provision to get into physical interaction with the environment and people. Most of the residents take out time for recreational activities, which shows theirwillingness to transform. The people here are more attached with their neighborhood that is emotional and uncontrollable. Being affectionate to the area, all the residents feel proud about it. They believe distinctively that the trees and parks make a difference in their daily living. Residents of this area also believe that the surrounding environment helps in maintaining their health, which shows their compatibility with their area.The residents walk up to their work place and to the bus station, which gives adds up regularity in their routine life.Being satisfied with the above questions, they all desire in making their neighborhood a better place to live in, which gives a desire of being imaginative and creative. Hence, being satisfied the factor to walk and self-development at an individual level increases eventually.

Second set of survey-

This set of survey took responses of the residents of Ramdaspeth area and was designed to understand the user oriented and accepted designs for a desired and satisfied pedestrian. The questions were purely experienced based and the responses to the same were personal opinions or choice to where and in what circumstances people would like to walk.

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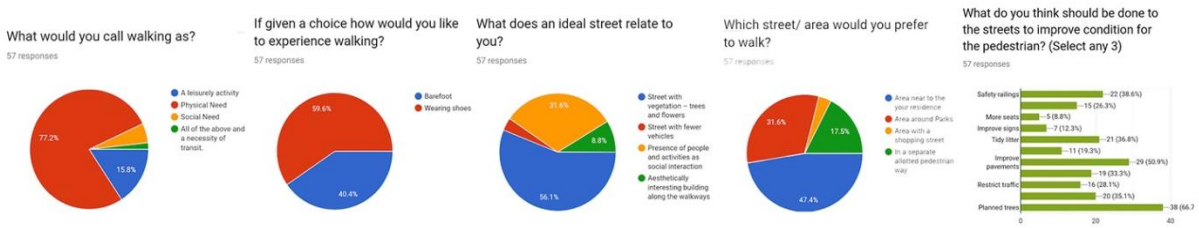

Figure 5: Responses from experience and design based set of questions by the users.

The analysis and conclusion of the second set of survey-

The questions were analyzed individually and the total percentage of the response gave an idea of the most preferred and liked pedestrian designs and experiences.

After analyzing all the questions, the ideas of a content pathway for people were as such that, the maximum numbers of people consider walking as a physical need than a social or leisurely activity. They agree and prefer to walk in an area near to their residence.When given a choice for the improvement of streets 66% of people want to have planned trees along their walkways, while only 50% agreed for improved pavement and tidy litter areas to walk in, a very few number of people wants to have an interactive sit outs along their pathwaysand improved signage along it.Natural pavements with alternate grass and soil are more preferred than paved to facilitate experience, but the choice-to walk barefoot still doesn't exist.A mixed type of plantation, with small shrubs defining edges and tall trees for shading are most desired type of pathways, and about 56% agree that vegetation makes a street ideal. To experience walking to the fullest the users prefer to keep the parking away from the pathways. The idea to incorporate artwork along with the street is mostly agreed so as to create an identity of the street and to memories it. A smooth terrain is recommended for ease in walk for all age groups along with planned, accessible refuge islands. They believe that a pathway should be barrier free along with physical spaces structure that provides shade and a visually connectivity with surrounding.Overcrowded streets give a negative impression while streets along with shops, residence, parks and water-body helps in providing a positive expression of the street. Poorly maintained pathways and extreme weather conditions discourages walking.

Figure 6: The Image above was selected to be as the most liked space for walking by the users.

Conclusion

The psychology and the lifestyle of a person orthe residents in a city largely depend on the city's condition and the type of facilities a city is providing to their people. Satisfactions, contemplates ones decision and changes the idea of perceiving the things the way the people want. Cities are for the people and should satisfy all the user groups in the city. To fulfill the experience, users orientation, need and purpose should be considered while designing any module that is serving the city's people as a universal design solution. The cities today reflect more number of forced actions than preferred ones, considering walking, we observe that, the younger and the older age groups are willingly walking but the mid aged people are under the forced segment of walking. This mid aged people are the ones under the need to be most healthy, satisfied and content within themselves and with their surroundings, according to the current alarming health conditions. The design for the pedestrians for encouraging walking should be such that, it should include all the social forces, physical parameters and other mentioned factors that govern the movement in the street. It should also be such that they revive and fulfill the purpose of human beings as bi-paired walking species.

Development of such desired pathways should be like a spark in a smaller segment of a city's part like neighborhoods and shall further lead to the development of the city after facilitating the needs of the residents. This shall help in increasing the walkability of the city, where more healthy people, would willingly choose to walk and explore the city making it more livable and smart.

Acknowledgements

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Energy Consumption Analysis of High Rise Façade

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Abstract : Nowadays, Curtain Wall system is commonly used for new high-rise Buildings; it becomes major investment in both construction and long-term success of the building. As the interface between interior space and exterior environment, a building's skin plays a crucial role in heat and light exchange. Its performance in that role affects occupant comfort and productivity, energy use and running costs. One big opportunity to reduce the use of energy is by designing the perfect building Façade considering the use of the materials, percentage of the openings compared to the massive area and the orientation of the building. The primary objective of this paper work was to study the different types of high rise façades, along with different glass typology and assess the energy consumption of single skin façades vs. double skin façades. This was undertaken through dynamic thermal and day lighting simulations of both types at various conditions. The outcome of this study was that double skin façades play a crucial role at thermal insulation and light transmittance. The double skin façade fared better at thermal insulation compared to single skin façade but resulted in poor light transmittance which can be overcome by the size of the glazing. Integration of Façade systems with other building systems provides an opportunity to maximize performance benefits and cost savings. The additional costs involved compared with single-skin façades have to be offset by lower costs achieved through greater operation of the building.

Keywords: high rise, Façades, thermal analysis, daylight analysis.

Introduction

Population burst and ever increasing space demands are causing stress within cities. A way of reducing the stress is to provide high rise buildings which consist of large built spaces concentrated over a small building footprint. But they become massive consumers of energy due to their scale and purpose, even so as we focus directly on environment friendly tall buildings. The exterior façades of these buildings are directly exposed compared to other buildings and have full impact of the climate.

Façades, the first aesthetical feature of a building that distinguishes one building from another, has to fulfill the basic aspects like protection against fire and burglary, climatic influence and environmental pollution (Umarani Gunasekaran*et al.* 2010).It is, therefore, important to ensure façade structures are properly designed, installed and maintained, to provide an interesting living environment, while maintaining 'green' and safe living conditions for the community. For commercial buildings, aesthetics play a very important role, and so having an aesthetically pleasing exterior façade is a must for them. At the same time, the energy consumption of these buildings is high, and so reducing the energy consumption in any way is imperative.

Double skin is a concept that can be used to meet lighting problems of insufficient daylight and extra glare along with thermal comfort which results in energy performance of the building. The bulk of research on the performance of double skin façade in various climatic zones with concern to various factors has been done. This research concerns daylight performance and thermal performance of double skin façade in high rise commercial building in warm and humid climate. An optimization of this configuration is needed to improve its performance in high rise commercial buildings.

Research Aim and Objective

The primary aim of the paper is to assess the energy consumption of single skin façades vs. double skin façades in commercial high rise buildings. To achieve the aim, it was important to study the various types of high rise façades, their construction, merits and demerits along with different glass typologies and their properties.

Research Methodology

To attain the aim, the methodology adopted was to synthesize and synergize the available literature on single skin and double skin façades and to create conceptual module to qualitatively compare and evaluate the performance of single skin façade and double skin façade in terms of energy consumption. Furthermore, to evaluate the performance of the façades, it is important to consider thermal environment and daylight as they are fundamental aspect of human comfort, well-being and productivity and can offset a significant portion of the building's energy consumption. Thus to prove this, a hypothetical case for warm and humid climate is studied, where simulations are undertaken for thermal and daylight analysis with the help of Autodesk Ecotect Analysis 2011. The results give an overview of the performance of both the types of façades in terms of energy consumption.

High Rise Façades

The structural elements of a high rise façade and conventional façade possess same element assembled in composite fashion. Though varieties of structural materials are not limited by the height of the building, high rise façade do possess some unique properties. For one, the façade structure must be designed for **high wind loads**, and for another its concept and design must compensate for the complex deformation response of the corresponding **load-bearing structure.**

The Façade As wind surface

Aside from the aesthetic architectural imperative, to divide and differentiate a high rise façade in order to give the building a form, the façade must be divided into zones for the purpose of structural engineering. The principal reason lies in the strong variations in wind loads, depending on building form. Thus up to the middle of the building, 40 percent of wind acting on the building flows downward and this wind energy that is 'swept down' overlaps with the wind load present at the base of the high rise. Consequently, the local wind loads at the face may be similar or greater at the entrance level of high rises than at a height of 100m.

It is important to differentiate between the global wind load of the load bearing structure also referred to as **structural wind** and the local wind load on the façade – **the panel load**. The local turbulence load of a panel may reach 500 kg/m^2 while the global structural load is only 150 kg/m^2. Both types of wind load are important for the façade structure.

Types of Façades

Strip Window Façade

The strip window façade is created by cutting continuous horizontal opening strips into the carcass, Instead of individual openings cut into the carcass. This creates floor-high strips around the building consisting of a continuous window strip. The vertical loads are usually assumed by slightly recessed columns.Depending upon the building location, building height, external noise level, and user requirements, it can be double-skin or single skin Façade.

Curtain Wall Façade

A curtain wall is defined as thin, usually aluminum-framed wall, containing in-fills of glass, metal panels, or thin stone(Wong Wan Sie, 2007). The framing is attached to the building structure and does not carry the floor or roof loads of the building. The wind and gravity loads of the curtain wall are transferred to the building structure, typically at the floor line.

Curtain wall systems provide a finished exterior appearance and most often a semi-finished interior as well (Sang-Tae No and Kang-Soo Kim, 2005). They are also designed to accommodate structural deflections, control wind-

driven rain and air leakage, minimize the effect of solar radiation and provide for maintenance-free long term performance.

Common types of curtain wall systems for high-rise buildings (on the basis ofconstruction)

1) Stick system
2) Unit system
3) Panel system
4) Unit and mullion system
5) Column-cover and spandrel system
6) Structural glazing

Types of Glass

There are various types of glass available, which have various different applications depending on the use like –

1. Annealed Glass – mainly used in High rise buildings.
2. Tempered or toughened glass – Used for commercial applications where thermal loads and strengths exceed annealed glass.
3. Heat strengthened glass – used in spandrel and vision panels of curtain wall.
4. Reflective glass – for high rise buildings
5. Laminated glass – usually used in interiors.

Of these, annealed glass will be considered for simulation analysis.

Analysis

The fundamental aspects of buildings and the building enclosures are to provide a thermal environment and sufficient daylight which supports occupant comfort, productivity, and well-being.In this case a hypothetical commercial building case is undertaken for simulation between single skin façade and double skin façade for both, thermal analysis and daylight simulations.

Climate Context

Mumbai (19.0760^0N, 72.8777^0E) has warm and humid climate according to ECBC code(2017). The mean temperature is 27.2 ^{0}C and average precipitation is 242.2 cm. The temperature in peak summer months shoots up to 30 – 40 ^{0}C with humidity 70 – 80%.

Thermal Analysis

A fundamental aspect of buildings and the building enclosure is to provide a thermal environment which supports occupant comfort, productivity, and well-being.In this case simulation was undertaken between single skin façade and double skin façade for hourly heat gain of the module.

Case 1 – Calculate hourly heat gain by a single skin façade and double skin façade and compare.

Case 2 – Calculate hourly heat gain by a double skin façade at various different heights.

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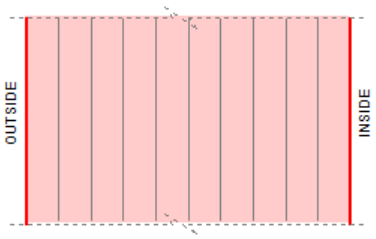
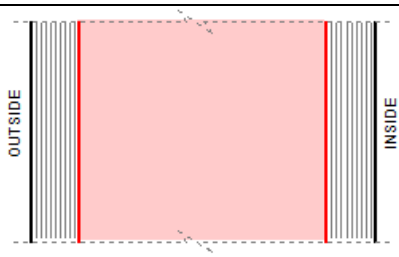
Table 1 Single Skin Façade Vs Double Skin Façade

Single Skin Façade	Properties	Double Skin Façade
5.44	**U-Value (W/M^2k)**	2.71
5.390	**Admittance (W/M^2k)**	0.84
0.94	**Solar Heat Gain Co-Eff.(0-1)**	0.81
0.753	**Visible Transmittance (0-1)**	0.639
0.99	**Refractive Index Of Glass**	0.06
6.0	**Thickness (MM)**	42.0
13.80	**Weight (Kg)**	27.639
Int. - 0.1 Ext. - 0.1	**Emissivity**	Int. - 0.78 Ext. - 0.78

Sections



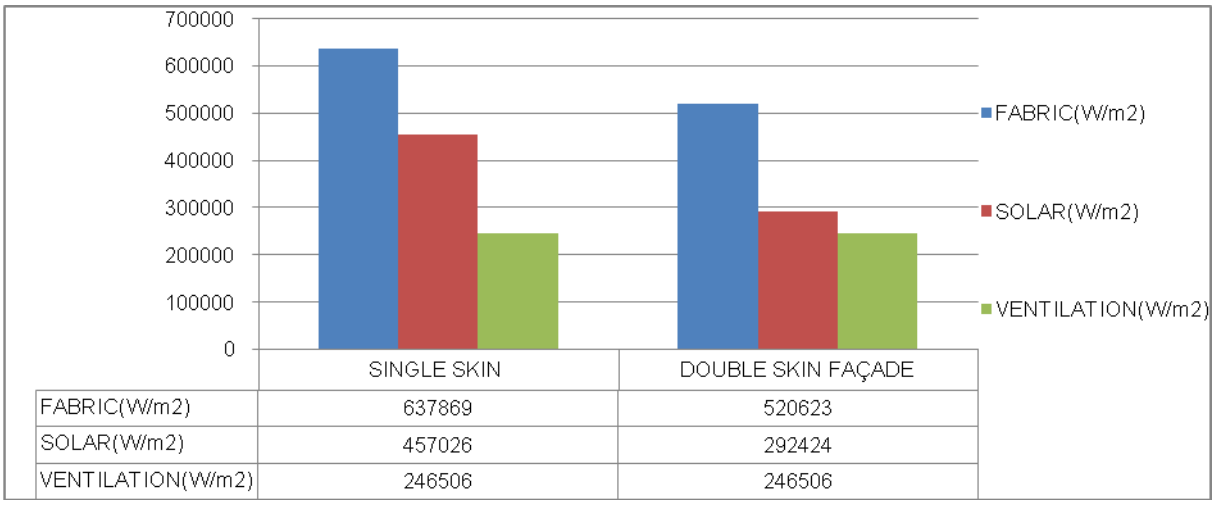


Layer name	Width	Density	S.p Heat	Conduct	Type
Glass Standard	6.0	2300.0	836.8	1.046	75

Layer name	Width	Density	S.p Heat	Conduct	Type
Glass Standard	6.0	2300.0	836.8	1.046	75
Air Gap	30.0	1.3	1004.0	5.560	5
Glass Standard	6.0	2300.0	836.8	1.046	75

(Note: The values are taken from the simulation tool Autodesk Ecotect Analysis 2011)

Graph 1.Hourly Gains in Single Skin Façade and Double Skin Façade (W/m^2)



	SINGLE SKIN	DOUBLE SKIN FAÇADE
FABRIC(W/m2)	637869	520623
SOLAR(W/m2)	457026	292424
VENTILATION(W/m2)	246506	246506

It can be observed that, in Double skin façade, hourly gains are comparatively less than single skin façade. Fabric gain and solar gets reduced, U-value is less and thus they can help in reducing the energy demand.

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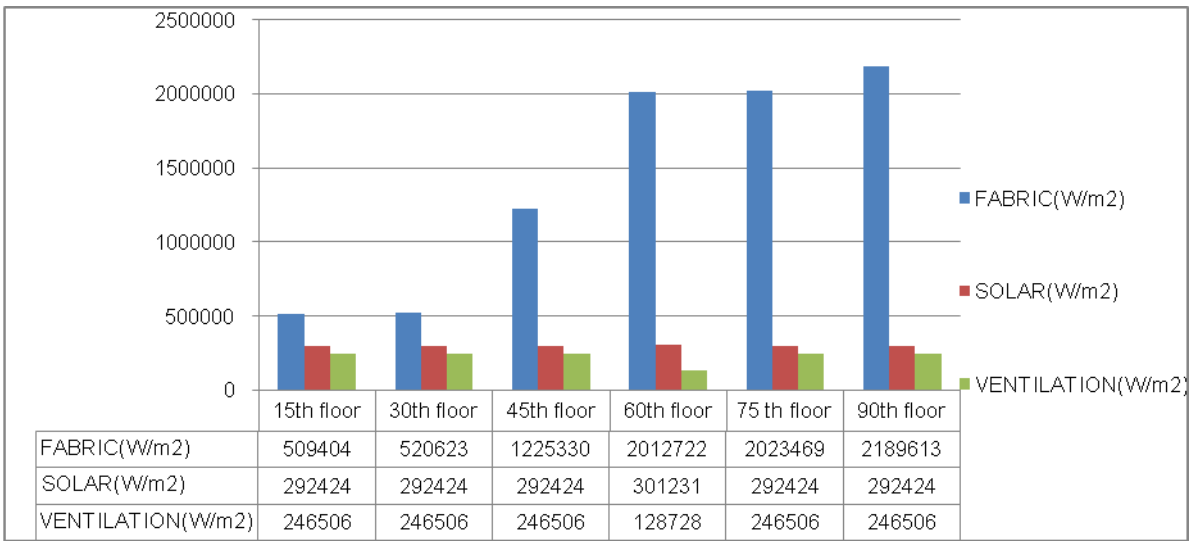
Graph 2.Hourly Gains in Double Skin Façade (At Different Heights)(W/m^2)



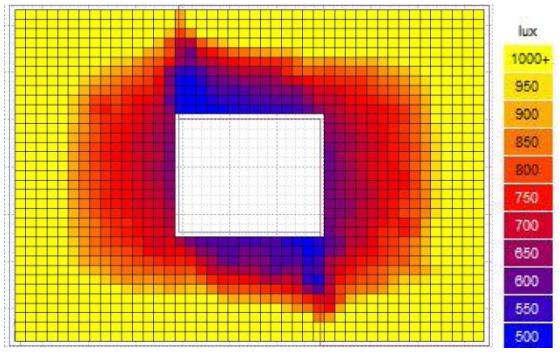
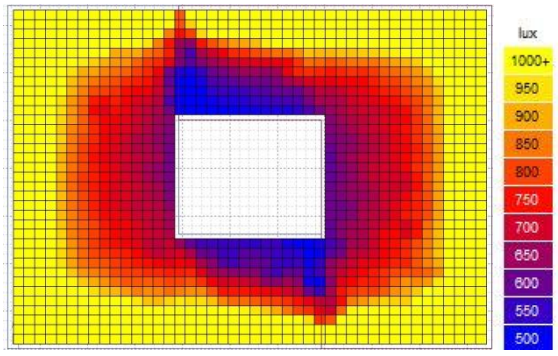
	15th floor	30th floor	45th floor	60th floor	75 th floor	90th floor
FABRIC(W/m2)	509404	520623	1225330	2012722	2023469	2189613
SOLAR(W/m2)	292424	292424	292424	301231	292424	292424
VENTILATION(W/m2)	246506	246506	246506	128728	246506	246506

After getting positive result in first simulation for double skin façade, then it was simulated at different heights to understand the effect of external climate conditions at those heights. It was observed that heat gain changes, at different height levels, due to the increased exposed façade. Radiations are always influenced by the surroundings, but in this case an obstruction to the direct radiation is very less which results in the increase of direct heat gain.

Daylight Analysis

Day lighting has a significant impact on buildings and occupants – it is essential to human health and well-being and productivity and a fundamental design element, which can offset a significant portion of a building's electricity use.

Table 2 Daylight Analysis of Single Skin Façade and Double Skin Façade

Single Skin Façade	Properties	Double Skin Façade
500-1000	**Value Range**	500-1000
Daylight Analysis		
		
1251.02 lux	**Average Value**	1138.44 lux
1464	**Visible Nodes**	1464

Conclusion

- Double skin façades presented better results compared to single skin façades, especially related to the thermal analysis.Thus they can help to reduce the energy consumption into the building.
- Double skin façades has a special aesthetic value and can be exploited architecturally.
- Double-skin façades result in poorer light transmission values because of the additional external layer of glass. In most cases, a larger area of glazing will compensate for this. The areas where glazing are relatively small

(solid walls with conventional window openings), reduced light transmission will result in increase in demand of internal lighting for longer period.

- Double skin façade with natural ventilation can be beneficial in case of energy savings rather than double skin with mechanical ventilation.
- The role of a Façade is a complex one and the following factors need to be considered in its design for environmental performance: Energy efficiency (i.e. the building should contribute to the reduction in energy consumption), Provision of central daylight to reduce direct and reflected glare.
- Simple design strategies (proper building massing and orientation, moderate window-to-wall ratio, high-performance glazing, fixed exterior shading, etc.) have a predictable impact on energy use, so these should be taking care whenever possible.
- Double skin façades with natural ventilation can be effective in warm and humid climate, as air circulation is the basic need of the climate due to the high humidity.

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I would like to thank Professor Ar. Aparna Mhetras for her unfailing guidance and patience for me throughout my quest in fulfilling one of the hardest tasks of my life.

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Lastly, I would like to thank my family for their great patience andsupport, which has made my study somewhat much more enjoyable and a greatsense of fulfillment.

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Building Expert's Perception on Application of Dynamic Facades

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Abstract : Building facade is an intermediate component between external and internal environment, which affects the user comfort. It also helps to control energy consumption of the building. Facade is a major component of the building which is directly exposed to the external climatic conditions. Therefore, designing of facades becomes a challenging task. There are many technologies that have been introduced for sustainable facades which are climate responsive. Dynamic facade is a new concept in building industry related to the climate responsive facades. This fulfils the aesthetic and sustainable demand in contemporary facade architecture. It results in better building performance in terms of energy consumption and user comfort. Dynamic facades respond to changing external climate in order to achieve energy efficiency by reducing heating and cooling loads. Such technologies have been introduced in many countries. Introduction of energy efficiency systems has been considered by architects in India in recent times. This paper is an attempt to understand the perception of building experts regarding dynamic facades in India. The study tries to identify barriers in implementation of these facades in the Indian context. It also attempts to understand the awareness of the importance of facade design. The methodology adopted for the study includes interview and questionnaire survey of various experts in building the industry. The results would help to understand the current scenario in India about the importance of facades and awareness of new technologies. This study may prove useful in understanding the future for dynamic facades in India.

Keywords: facade, energy efficiency, dynamic facade, climate responsive facades

Introduction

Today's biggest concern about environment is climate change. This issue reflects in every aspect of mankind. We all are facing its consequences in our day to day life. The shelter we are living in is not always suitable in changing climates. To live a comfortable life, accepting sustainability in every aspect is a must. Rapid urbanization has increased challenges in building industry. Sustainability is not only related to materials or resources, it is also related to human comfort for long term. To achieve human comfort, one must understand the surrounding nature. The changing climate directly affects user comfort and thus increases the need for artificial technology. Though such technologies are achievingtheir goal, they are also becoming the reason for climate pollution. Choosing a technology which helps to achieve its goal without harming the nature is a wise decision.

Building sector is one of the most energy consuming sectors. Rapidly growing urban scenario is contributing the increasing energy demands. Energy conservation is the key to control the energy demands. There are factors that affect the indoor environment as per the changing external environment. Energy conservation can be achieved by controlling these factors. Building facade is large surface which is directly in contact with external climate. If facades are properly designed then they can contribute to energy conservation of building. Many architects have already been working on new technologies for facade development to look into new perspective of energy efficiency. Energy efficient facade is the concept to achieve indoor comfort by adjusting with changing climate.Many countries have incorporated these facades which fulfill the user as well as climatic demand.

Energy Efficiency:

Increasing energy demands increases challenges for building sector in terms of technology, investment, maintenance. In terms of energy efficiency, reduction of energy consumption is the key. Controlling behavior of the building can reduce the impact of climate on interior equipments which plays a major role in energy

consumption. Building skin can be developed so that it adapts according to outsideclimate which contributes in reducing energy demand.India is the world's fourth largest energy consumer (EIA 2013) and fifth largest source of green house gas emission (GOI 2010). With increasing energy demand till 2030 energy efficiency is major concern. High performance facades can significantly reduce energy consumption achieving indoor environment quality.

Many architects, facade designers are experimenting with building skin as it is the outermost layer of the building which is exposed to the changing climate outside. Energy consumption in building sector is tremendous and thus every aspect of building element needs to be carefully designed for energy efficiency. (Shete and Kshirsagar, 2018) In their study discussed about the sustainable materials for sustainable development in Indian context. They have suggested that rather than going for conventional glass facade which is not preferable for climates like India, new options should be hold which are suitable for climatic conditions. They have suggested that existing building could also be retrofitted with new technologies for energy efficiency. This will not only help to maintain clean indoor air quality and health both but also contribute to smart city environment. Building facades and adaptability with climatic conditions maintaining comfort in indoor environments, is a concept introduced in the building industry. This is in term of dynamic facades which work efficiently to achieve all aspects of comfort. Dynamic facades are important elements of the building which contribute to control the indoor environment. Erem and Erturan (2013) have discussed about energy conservation through intelligent facades. Facades can help to make buildings energy efficient. Researchers have compared and studied different types of facades and their functions.

In India building facades are designed for aesthetics which may result in inefficiency of the building. There are very few buildings which use sustainable facades for energy efficiency. This paper presents the new concept of dynamic facades for Indian context. Dynamic facades aim to fulfill the goals, aesthetic as well as of energy efficiency by achieving user comfort. Building experts are facing barriers to get such dynamic technology in India. This paper aims to understand and study the perception of building experts on application of dynamic facades in India. The paper studies the current scenario about dynamic facades and helps to understand awareness to incorporate such technologies for better energy efficiency. The scope of this research is to understand the application of dynamic facades in the Indian context from building design experts only. In this paper building experts like architects, facade designers, structural engineers are targeted for the survey.

Dynamic facades:

Nady (2016) has introduced the concept of dynamic facades in his paper in which he has studied its application in Egypt. Facade of any building is a medium between indoor and outdoor activities take place. Nady (2016) has highlighted the concept, its history and implementation of the facades for sustainable building. Building should interact with climate intelligently and to do so the elements of the building i.e. building skin, floor, the roof and the facade has to be designed in a way to make it sustainable in changing climate. He has also listed the parameters for designing dynamic facade such as *Sun control, Natural ventilation, Day lighting, Connection to outdoor, thermal insulation, Moisture control, Structural efficiency, Material choices, Possibilities of energy generation*. His study focused on facade techniques to control effect of climate such as solar heat gain, also to maintain indoor environment by having natural ventilation and technique for energy conservation as well as sometimes energy generation. Nady (2016) has concluded that dynamic facades can be used in Egypt by using some of the traditional shading techniques. According to him dynamic facades are mostly used to penetrate natural light. External shading device and movable overhangs are most advantageous and adjustable exterior shading louvers are most effective.

There are different types of intelligent facade solutions studied by different authors.Kanagaraj (2016) has presented the information about External Movable Shading System (EMSS). This system contribute to enhance indoor comfort of the building researcher has compared between two types of facades of office building; one is with high performance glazing and another one with EMSS with double clear glass. Kanagaraj (2016) concluded that the system can be controlled by local weather station to operate shading systems. Harry (2015) has presented a broad review on Dynamic Adaptive Building Envelopes (DABE). According to Harry(2015) the envelope has to fulfill the requirements for day lighting, ventilation, moisture control and thermal protection with reference to the micro climate where building is located. Envelope design should integrate with other design elements. He stated that

dynamic envelope performs better than static envelop as well as it gives better aesthetics. Envelope design is the best way to achieve occupant's comfort and energy conservation. Johnsena and Wintherb (2015) explained innovative dynamic facade system named Energy Frame. Facade design solutions have been demonstrated in two industries by Johnsena and Wintherb (2015). According to study all future new and existing buildings should be net zero energy buildings; to achieve this energy conservation is must. This can be achieved through designing climate responsive facades. By using smart control systems and dynamic facades it is possible to achieve energy efficiency. The simulated energy needs should exhibit reduced transmission heat loss and increased utilization of solar gain, increased daylight utilization and improved controls. Energy frame helps to solve the fundamental functions of facade.. Intelligent facades have been used to incorporate received solar energy for building operations. Upadhyay and Ansari (2017) stated that solar energy can be used fully to operate the building.All the external forces of climate acting on building skin are changeable therefore to achieve comfort and energy efficiency designing of building envelope plays major role.

Application of dynamic facades:

According to external forces acting on building skin dynamic facades vary by its type. Designing of dynamic facades depend on parameters to be considered.

A. Light control dynamic façade:

Control of daylight and automated shading are main factors in this type of facade. Notable examples are Arab Institute in Paris designed by Jean Nouvel in 1988 and AEDAS in Abu Dhabi in Al Bahr Tower 2012. The dynamic features of both the buildings are adopted from geometry of traditional Arab screens called "Mashrabia" to protect from sunrays. Facades create folding and unfolding movement to control the sunlight and changing environmental conditions.

B. User control dynamic façade:

In this type of facades, users are allowed to personalize their own space with user controls. One of the examples of this type of facade is seen in the Kiefer Technic Showroom,Austria. This is an office building having many dynamic panels which changes every day, every hour. It changes according to outdoor conditions to optimize internal climate.

There are many other types of dynamic facades like energy control dynamic facades where envelope has construction feature such as strength and rigidity, stability and durability, control of heat, air and moisture. Wind itself can make dynamic pattern without wasting any energy. These are Wind responsive dynamic facades. Brisbane domestic Terminal Carpark in Australia 2011 has installed 250000 aluminum plates to create this wind responsive facade. All these facades work to reduce use of mechanical system to achieve energy efficiency. In addition to dynamic feature some facades are designed to generate electricity from renewable energy. They have incorporated this function to operate it by using its self generated energy.

Methodology:

The methodology used for this research is primarily based on questionnaire survey. Building experts like architects, structural engineers, and facade designers were involved in the survey. This survey includes closed ended questions related to facade designing and awareness about dynamic facades in Indian context. Some interviews weretaken to help frame the questionnaire. 60 building experts from different professions like Architects, Green building consultants, Structural engineers, and Facade designers have given their responses on designing of facades in practice. This survey haslead to anunderstanding of the current scenario of energy efficiency, sustainability and accepting new technologies in professional practice.

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Results:

The building experts involved in the survey have mainlydesigned commercial and residential buildings. Few have worked on Institutional and Industrial building design. Initially respondents were supposed to give answers about various parameters while designing the facade and eventually the questionnaire leads towards perception about dynamic facades. The results of survey are explained below:

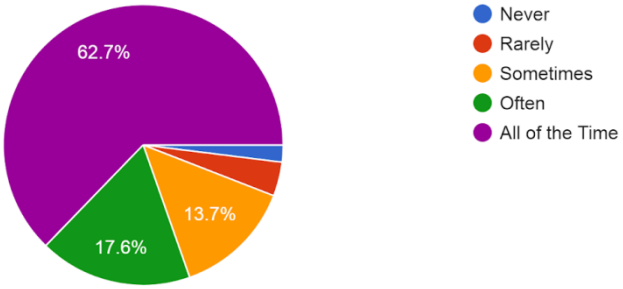

Figure 15: Necessity of facade design

Building experts were asked about the necessity of facade design during building design stage itself. 62.7% of experts have given positive opinion that every time facade should be considered while designing the building. Only 2% of respondents have given negative opinion (Figure 1).

Respondents were asked to choose different parameters which they consider during facade design. The options given were indoor comfort, daylight, aesthetics, energy efficiency and user comfort. Among these options 83% of experts gave preference to aesthetics of facades followed by daylight 76.6% chose daylight, 68.1% chose energy efficiency, 63.8% choseuser comfort and55.3% indoor comfort. The next opinion was taken on the suitability of glass facade for climate like India. 68.1% have said it may be suitable but 25.5% of respondents have said it is not at all suitable. It is depending on specifications and design of glass. Building experts were asked about strategies considered as shading devices. About 90% of experts have said window boxing then chajjas, fins, vegetation. Respondents have also mentioned pergolas, mutual shading, screen walls, jails etc.

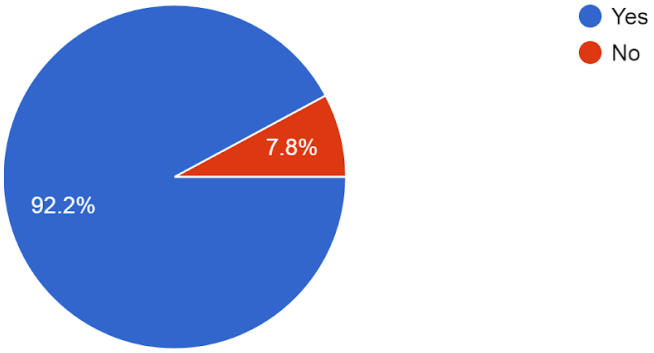

Figure 16: Awareness about dynamic facades

Respondents were asked about awareness regarding dynamic facades. 92.2% of building experts were aware about dynamic facades (Figure 2). Most of this awareness is from social media, architectural magazines, journals, conference, books etc.

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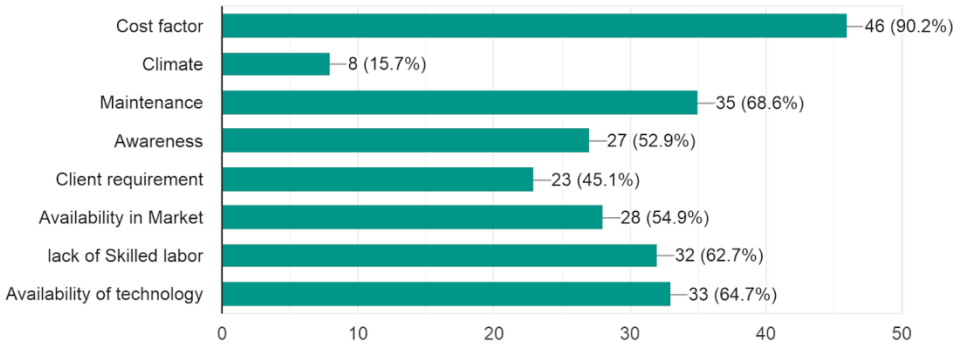

Figure 17: barriers for implementation of dynamic facades in India

Most of the respondents have not worked on dynamic facades. According to the survey,about 90.2% of experts have opinion that cost is the major barrier for not having dynamic facades in India. The next important barrier was that of maintenance (68.6%) as dust was a cause of concern in India. Lack of skilled labor, availability of technology, awareness and then climate are also considered as barriers for concept like dynamic facades.

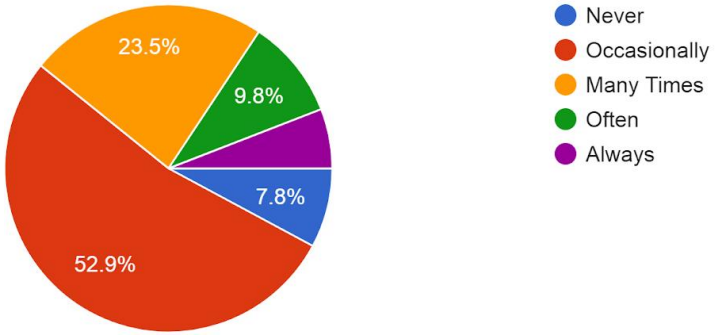

Figure 18: Consideration of dynamic facades in practice

Most of the experts have given opinion that dynamic facades are suitable for commercial as well as public buildings. 51.1% of Respondents believed that most of the time dynamic facades help to control solar radiation and glare. Dynamic facades serve a function is positively responded to by all respondents. Building experts were asked if dynamic facades are designed just for aesthetics. 72.3% of experts have said that sometimes aesthetic value is considered for dynamic facades.

Only 8.5% of experts were of the opinion that dynamic facades are never used for aesthetic purpose. About 52.9% of experts occasionally think about such technology in India. Only 7.8% of respondents have not thought about dynamic facades in India.

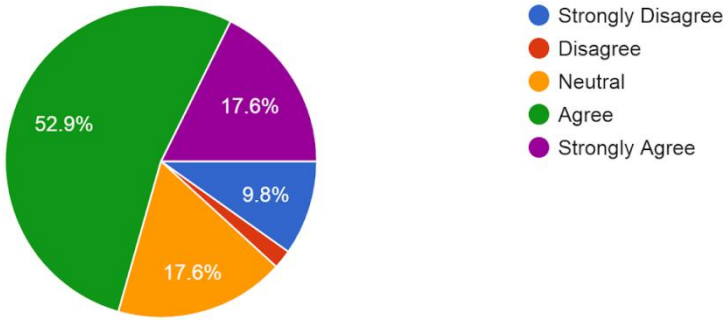

Figure 19: Future for dynamic facades in India

Building experts were asked if there is any future for dynamic facades in India. The responses were mixed for this question. 52.1% of experts agree and 16.7% are neutral about the opinion. There are 18.8% who strongly agreed with the same but almost 10.4% of respondents strongly disagreed that dynamic facades have a future in India.

Conclusion:

Dynamic facade has a future in India. Though cost factor is a huge barrier for not having such concept in India, many building experts are aware about dynamic facades and they have been thinking about incorporating this technology in their projects. As per the survey most of the building experts have knowledge about the functions of dynamic facades and they are aware that such facades help to reduce energy consumption. Facade design is a critical aspect in order to achieve indoor comfort. According to survey, In India incorporation of dynamic facades for commercial buildings has a larger potential as they help in achieving energy efficiency as well as fulfill the aesthetic value.Therefore investment in dynamic facade will lead towards energy efficiency without compromising user comfort which is our ultimate goal.

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Bamboo Plantation Strategies in Urban Infrastructure in India

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Abstract : Today India is experiencing major environmental concerns due to never-ending demands of conventional construction technology and urban infrastructure which led to deforestation, global warming, rendering the urban lands barren with slaughtering of flora and fauna. The spread of environmental consciousness emerges the need for man-made bamboo plantations with stringent regulations governing the exploitation of timber resources. Bamboo plantation furthermore aids in unwrapping great possibilities for business in the construction industry. Bamboo is a natural and renewable resource, capable of rapid growth that can replace use of timber to avoid future deforestation of our forests. Bamboo has been used to make a wide range of items, not only from flooring, exterior walls, handicrafts, tableware and furniture, but also to its use in simple suspension bridges, multi-storied buildings, earthquake resistant structures, and large-scale scaffolding due to its strength, flexibility and relatively slow-burning properties. Instead of adding to the problems of polluting land-fills like conventional building waste, using bamboo can serve as an alternative for building construction material as all the parts of the bamboo can be recycled. Bamboo also helps in bringing degraded land back into productivity. Due to its biological characteristic and growth habits, bamboo is not only an ideal economic benefit but also has enormous potential for diminishing many environmental problems India is facing today. Scores of studies suggest applications of bamboo plantation to serve ecological functions like soil erosion control, soil &water conservation, land rehabilitation, and carbon sequestration. This paper highlights the utilization of bamboo as a construction material alternative, its remarkable properties, recommended bamboo Indian species and plantation strategies facilitating bamboo plantation along urban infrastructure compensating reduced the urban green spaces and feeding increased demands of eco-friendly construction materials in urban sectors in India. This research paper will benefit the land owners, stakeholders, real estate builders, government policy makers, NGOs, researchers in analysis of eco-friendly materials, heat island measurements etc.

Keywords: Bamboo, plantation, strategies, infrastructure

Introduction of Bamboo as Construction material alternative

Today India is experiencing major environmental concerns due to never-ending demands of conventional construction technology and urban infrastructure which led to deforestation, global warming, rendering the urban lands barren with slaughtering of flora and fauna. Vehicular pollution has grown at a threatening rate due to growing urbanization in India. The air pollution from vehicles in urban areas, particularly in big cities like Pune, has resulted in various problems in human life and surrounding eco-systems. The spread of environmental consciousness emerges the need for man-made bamboo plantations with stringent regulations governing the exploitation of timber resources. Almost 1 million acres of forests are lost each week worldwide to deforestation. Bamboo's versatility as a substitute for hardwoods offers a chance to drastically reduce that figure and protect the forests that we have left. Bamboos are tall perennial grasses found in tropical and subtropical regions of the world. It is a traditional yet potential building material. It is a renewable and versatile resource, with high strength and low weight. Bamboo has quite high tensile strength which is comparable with steel. Apart from this, bamboo has an impermeable protective layer on the outer side which protects it from rotting due to water, which is a major problem for almost all organic material which makes it an competent alternative as reinforcement material. Bamboo has been used to make a wide range of items, not only from flooring, exterior walls, handicrafts, tableware and furniture, but also to its use in simple suspension bridges, rafts, towers, multi-storied buildings, earthquake

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resistant structures, and large-scale scaffolding due to its strength, flexibility and relatively slow-burning properties. Instead of adding to the problems of polluting land-fills like conventional building waste, using bamboo can serve as an alternative for building construction material as all the parts of the bamboo can be recycled. Bamboo also helps in bringing degraded land back into productivity. Due to its biological characteristic and growth habits, bamboo is not only an ideal economic benefit but also has enormous potential for diminishing many environmental problems India is facing today. Scores of studies suggest applications of bamboo plantation to serve ecological functions like soil erosion control, soil & water conservation, land rehabilitation, and carbon sequestration. It is widely recognized as one of the most important non-timber forest resources due to the high socioeconomic benefits from bamboo based products. Depending on the species, bamboo can be harvested in one to five years versus 10-50 years for most softwoods and hardwoods. Thereafter, harvests are possible every second year for up to one hundred and twenty years the yield (weight per acreage and year) is up to 25 times higher than that of timber unlike hardwood trees, which can take up to 40 years to grow to maturity. Bamboo absorbs carbon dioxide and releases 35% more oxygen into the atmosphere than an equivalent stand of hardwood trees (Source: J. Janssen, Technical University Eindhoven, et al 2000).

Bamboo in India

It is estimated that there are 1200 species of bamboo in the world out of which 125 species, 11 exotic species of belonging to 23 genres are found in India. The principle bamboo genera occurring in India are Arundinaria, Bambusa, Chimonobambusa, Dendrocalamus, Dinochola, Gigantachloa etc. Stem ranges from 12mm in diameter and 450mm height to 300mm in diameter and 30mtrs ht. It is locally available material to Eastern areas in India like Assam, West Bengal, Arunachal Pradesh, Manipur, Meghalaya, Nagaland,. Hence it depicts in the traditional & vernacular architecture of those places. Also recently cultivated in Maharashta, Madhya Pradesh, Chattisgarh, and Western ghats,Kerala, Andaman and Nicobar (Source: India state of forest Report, 2017).Bamboo architecture endows us with limitless potential for the future as it offers us strength, sustainability, versatility, and serves as a green initiative. It is widely used in different forms of construction, particularly for housing in rural areas. It is remarkably utilized to make bridges, fences, water wheels, scaffolding, bridges , earthquake resistant structures and 2-3 storied contemporary houses.

Growth& Propagation:

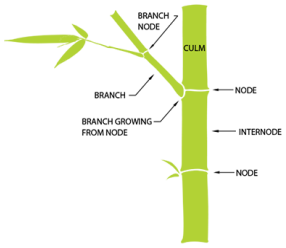

Figure 20 - Bamboo growing from nodes

Bamboo shoots grow during the monsoon. The culm attains its maximum height within 4-5 months. The rate of growth is high, generally 60mm to 200 per day, and some species grow as much as 900mm per day.Lignifications or hardening of the Culm occurs within 2-3 years and maturity is attained in an average of five years.Bamboo is naturally propagated through seeds. Few bamboos propagate through bulbils. Vegetative propagation in the form of running bamboo or clumping bamboo i.e. segments with young branches and buds can be used. Single branches with small portion of mother Culm left attached are also effective. The Culm segments may be planted at steep inclination with a large part of the Culm exposed.Buds above the ground may take root in humid air.

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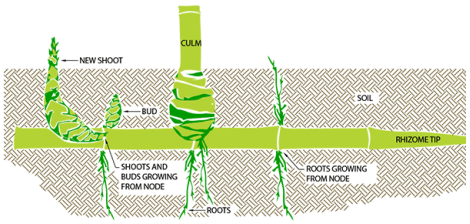

Figure 21 - Growth by clumping bamboo

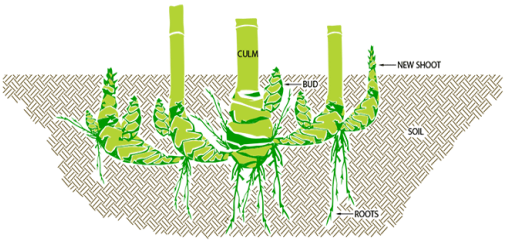

Figure 22 - Growth by running bamboo

Image Source

(Fig1, 2&3):http://www.bamboobotanicals.ca/html/about-bamboo/bamboo-growth-habits.html

Recommended Bamboo Species:

For India context, National building Code 2016, Section 3B Bamboo covers the general principles involved in the design of structural bamboo in buildings with regard to mechanical resistance and durability of structures. Sixteen species of bamboo are recommended for structural applications are classified in three groups on the basis of their strength properties, namely, modulus of elasticity (E) in bending in green condition and modulus of rupture (R) (extreme fiber stress in bending) which can be effectively considered for construction purposes. This document provides all the working details such as compressive strengths, permissible stresses, durability, grading of bamboo, treatments, preservation joineries, defects, design considerations, etc.

Figure 23 – Google image of Bamboo forest in Muthanga, Kerela

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Table 1. Bamboo species & its properties:

Table 1 Physical and Mechanical Properties of Indian Bamboos (in Round Form)

(*Clause* 4.1)

Sl No.	Species	Properties							
		In Green Condition				In Air Dry Conditions			
		Density kg/m^3	Modulus of Rupture N/mm^2	Modulus of Elasticity × 10^3 N/mm^2	Maximum Compressive Strength N/mm^2	Density kg/m^3	Modulus of Rupture N/mm^2	Modulus of Elasticity × 10^3 N/mm^2	Maximum Compressive Strength N/mm^2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	*Bambusa auriculata*	594	65.1	15.01	36.7	670	89.1	21.41	54.3
ii)	*B. balcooa*	783	65.4	7.31	46.7	—	—	—	60.6
iii)	*B. bambos (Syn. B. arundinacea)*	559	58.3	5.95	35.3	663	80.1	8.96	53.4
iv)	*B. burmanica*	570	59.7	11.01	39.9	672	105.0	17.81	65.2
v)	*B. glancescens (Syn. B. nana)*	691	82.8	14.77	53.9	—	—	—	—
vi)	*B. nutans*	603	52.9	6.62	45.6	673	52.4	10.72	47.9
vii)	*B. pallida*	731	55.2	12.90	54.0	—	—	—	—
viii)	*B. tulda*	658	51.1	7.98	40.7	722	66.7	10.07	68.0
ix)	*B. ventricosa*	626	34.1	3.38	36.1	—	—	—	—
x)	*B. vulgaris*	626	41.5	2.87	38.6	—	—	—	—
xi)	*Cephalostachyum pergracile*	601	52.6	11.16	36.7	640	71.3	19.22	49.4
xii)	*Dendrocalamus longispathus*	711	33.1	5.51	42.1	684	47.8	6.06	61.1
xiii)	*D. strictus*	631	73.4	11.98	35.9	728	119.1	15.00	69.1
xiv)	*Melocanna baccifera*	817	53.2	11.39	53.8	751	57.6	12.93	69.9
xv)	*Oxytenanthera abyssinicia*	688	83.6	14.96	46.6	—	—	—	—
xvi)	*Thyrsostachys oliveri*	733	61.9	9.72	46.9	758	90.0	12.15	58.0

NOTE — The values of stress in N/mm^2 have been obtained by converting the values in kgf/cm^2 by dividing the same by 10.

Image Source - Physical and mechanical properties of Indian bamboo (NBC 2016)

Benefits:

1) Environmental Air Quality Improvisation:

Bamboo minimizes CO2 gases and generates up to 35% more oxygen than an equivalent stand of trees. 1 hectare (2.2 acres) of bamboo sequesters up to 62 tons of CO2/year, whereas 1 hectare of young forest sequesters 15 tons of CO2/year. (Source: J. Janssen, Technical University Eindhoven, et al. 2000).Bamboo plantation helps in reducing the impacts of air, noise and dust as it performs natural sink for this pollutants.

2) Soil conservation:

Bamboo can grow in arid regions as it is drought resistant. The roots are left in place after harvesting; it helps to preserve vital moisture in the soil. This bamboo roots also prevent erosion and help retain nutrients for the next crop with their interwoven system of roots and rhizomes contribute to the recovery and conservation of soils. Underneath the ground, an extensive network of rhizomes is present that ties together and prevents soil erosion.

3) Visual Impacts:

Introducing formal pedestrian green spaces and natural buffers from day to day traffic. Also, bring a country side visual experience while driving and glare reduction due to refection from other vehicles.

4) Social and Recreational benefits:

Man-made bamboo plantations will help inviting people to walk more and make interesting shade destinations at traffic prone regions. It will help in providing a cultural characteristic to the urban areas.

5) Economic Benefits:

Bamboo as a lost cost construction material is made locally available alternative to the contemporary concrete homes reducing the transportation costs. Bamboo is a renewable resource and the manufacturing of bamboo products provide job opportunities which is need of social and economic stability. Whereas, the realtors and

developers can capitalize their road adjacent property due to all above mentioned benefits on basis of the environmental friendly oriented market strategy and provide healthy environs to the community living.

6) Employment opportunities:
Industrial forms of bamboo can substitute not only wood but also help reduce use other high-priced materials in structural and engineering applications hence;bamboo plantation sector has infinite potential for generating income and employment. Effective implementations in this sector will lead to employment opportunities such as silviculture, bamboo plantation, harvesting, transportation/storage/handling, weaving into products, industrial labors, cottage industries, bamboo skilled labor for construction engineering, etc. Such propositions will boom the economy of both rural and urban areas of India.

Bamboo Plantation Strategies
The spread of environmental consciousness emerges the need for man-made bamboo plantations with stringent regulations governing the exploitation of timber resources. The strategy involves making it mandatory to utilize bamboo plantations as carbon sequesters at the traffic signals.

Figure 24 - Bamboo Plantation at traffic signals and other urban infrastructures like commercial buildings work as Natural Sinks

Medium scale bamboo plantations can aid in creating buffer façade between footpaths and roadways to encourage pedestrian friendly environments even in busy traffic hours. It will help dropping glare and urban heat island effects in the surroundings.

Bamboo plantation made along the urban infrastructures like flyovers, railroads, malls, commercial offices, schools, community living developments will enable better living conditions with enhance air quality, reduce noise pollution and aid in avoiding thermal pollution as it will act as an natural sink or absorber. It will also assist in retaining ground water level due to its rhizome root system.

Appropriate bamboo species which grow in height more or less 20mtrs can be utilized in creating dramatic shading devices providing relief at the waiting timeat the traffic signals, flyovers etc. Industrial forms of bamboo with innovative bamboo plantation schemes can be used to building non-load bearing structures in urban infrastructure like shading devices at signals, flyovers, and bus stop shelters reducing usage of other metals.

Conclusion
This paper highlights the utilization of bamboo as a construction material alternative, its remarkable properties, recommended bamboo Indian species and plantation strategies facilitating bamboo plantation along urban infrastructure compensating reduced the urban green spaces and feeding increased demands of eco-friendly construction materials in urban sectors in India. This research paper will benefit the land owners, stakeholders, real estate builders, government policy makers, NGOs, researchers in analysis of eco-friendly materials, heat island measurements etc.

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Figure 25 - Buffer between road and adjacent plot

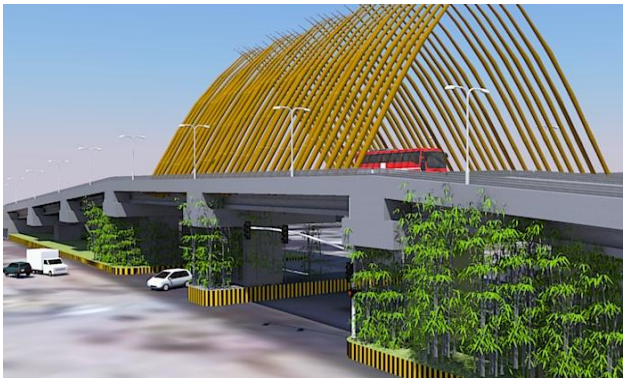

Figure 26 - Bamboo plantation & shading done at flyover

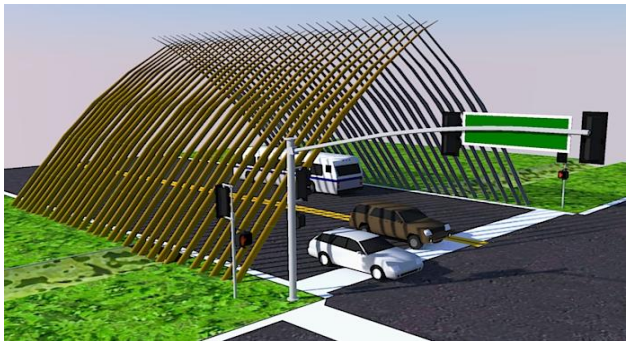

Figure 27 - Bamboo Shading at Traffic signal

Figure 28 - Bamboo buffers created near Railways

Figure 10 - Bus stop made-up of Industrial form of bamboo

Image Source (Fig. 5-10): Modeling of bamboo plantation and other strategies through Sketch-Up Software 2017

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Placing and Proportion of Windows with Respect to Energy Consumption and Daylight in Composite Climate: Prayagraj

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Abstract : The history of architecture is synonymous with the history of the Window from the initial crude openings, letting in light and air, heat and cool air. The window has developed over the centuries, but its purpose of letting in day light has remained its primary role; window openings required a suitable in fill to modify the internal climate. The design of the building is complex in which decisions for the placing of a window are taken into the design stage and this critically affects the in door thermal comfort and energy performances *[8]*.The aim of this study is to discuss the placing and proportion of window with respect to the decrease energy consumption by using day light factor, by taking the essence of vernacular architecture of the same climate and how we can use it with contemporary architecture in window design. For a correct placing of the window, it is advisable to consider the combined effect of day light and energy consumption*[8]*.In this paper,a typical residential building of Prayagraj (Uttar Pradesh) is considered, which is in composite climate was used as a baseline model to analyze the research question and provide guidelines on the appropriate placing of windows. To determine the placing daylight availability, location, movement of the sun and energy consumption is identified as the major criteria. An energy simulation tool Autodesk Ecotect analysis and azimuth- altitude angles are used to see daylight, energy consumption and location, movement of the sun respectively to find the best place for windows. The results can be served as a reference for similar spaces in same climatic conditions and show that a suitable design offenestration in which combined effect of illumination and temperature,could significantly reduce peak cooling load and energy consumption while maintaining good thermal and illumination condition in indoor climate.

Keywords: Window, Energy-consumption, placing of window, Daylight.

Introduction

As the energy consumption through buildings in India is increasing faster than any other region, according to EIA, U.S. Energy Information Administration, International Energy Outlook 2017 (IEO 2017). In the IEO2017 Reference case, delivered energy consumption for residential and commercial buildings in India is expected to increase by an average of 2.7% per year between 2015 and 2040, more than twice the global average increase. EIA expects the rate of India's commercial energy growth to be higher than its residential energy growth, the residential sector remains the greater consumption of buildings energy, representing more than 70% of the buildings total throughout the projection period *[6]*. Due to the environment and sustainable development issues,governmentshaveincreasedtheirfocusonenergy-savingtechnologiesinthebuildingandothersectors.
Forthecommercialandresidentialbuildingevaluationofenergyefficiencyisdifficulttodescribewithprecision as there is often a lot of vague information and various types of inaccurate assessment of data. The evaluation of energy saving in the building design selection has uncertainty and complexity*[10]*. From this case, it is clear that to reduce the energy consumption of residential buildings, retrofitting of existing building should be an optiontowardsenergysavings.Retrofittingofthehousecanbedoneinmanywaysi.e.,changinglighting

fixturesandelectricalappliances,andchangingthewindowplacingtogetampleamountofdaylight.Theenergy saving through the day lighting opening in the building is not only easy for quantitative calculation of the indicators, but also for qualitative description. In the present study, we discuss the placing and proportion of window with respect to the decrease energy consumption by using daylight factor, by taking the essence of vernacular architecture of the same climate and how we can use it with contemporary architecture in window design.Windowscharacterizeenergyconsumptionandvisualcomfortpatternsinbuildings.Choosingtheirsize is among the many fundamental early stage decisions. Therefore, determining optimal characteristics for buildingperformanceisessential.Windowsareavitalpartofanyhome—theyallownaturallightintothehome providing views and fresh air. Well-planned and protected windows improve comfort year-round and reduce theneedforheatinginwinterandcoolinginsummer.Windowsize,orientation,glazingtreatment,shadingand internalcoveringscanhaveasignificantimpactonenergyefficiencyandcomfort.Designingnorthwindowsfor maximum solar access can reduce winter heating bills by up to 25%. External shading can block up to 80% of summer heat gain through windows. Internal window coverings and double glazing can reduce winter heat losses byconsumption.

Overview of Study Area

Climate of Prayagraj

Temperature:Theannualmeantemperatureis26.1°C(79.0°F);monthlymeantemperaturesare18–29°C(64–84 °F).Allahabad has three seasons: a hot, dry summer, a cool, dry winter and a hot, humid monsoon. Summer lasts from March to September with daily highs reaching up to 48 °C in the dry summer (from March to May) and up to 40 °C in the hot and extremely humid monsoon season (from June to September). The monsoon begins in June, and lasts till August; high humidity levels prevail well into September. Winter runs from December to February, with temperatures rarely dropping to the freezing point. The daily average maximum temperature is about 22 °C (72 °F) and the minimum about 9 °C (48 °F). Its highest recorded temperature is48 °C (118.4 °F), and its lowest is −2 °C (28 °F). *[11]*

***Rainfall and sunshine hours*:** Rain from the Bay of Bengal or the Arabian Sea branches of the southwestmonsoon falls on Allahabad from June to September, supplying the city with most of its annual rainfall of 1,027 mm (40 in).The highest monthly rainfall total, 333 mm (13 in), occurs in August. The city receives 2,961 hours of sunshine per year, with maximum sunlight in May.*[11]*

***Wind direction*:** prevailing winds comes from west direction in Allahabad. *[11]*

Building type: Residential Building Occupancy: 4 people

Location of study: Prayagraj, Uttar Pradesh Climate: Composite Climate *[2]*

METHODOLOGY

***Building description*:** The longer axis of the building is towards the north-south direction and short axis is towards the east-west. East and south direction have the residential building of 2 stories. House is facing north direction, which has 12 feet road in front of the house followed by the garden. 7 feet small road is located on the west side and have an adjacent house of 2 storeys. House has a poor quantity of daylight (fig. 1). This contributestoenergyconsumptionandincreasesthemonthlyelectricitybill.Listof applianceswhichis usedin house

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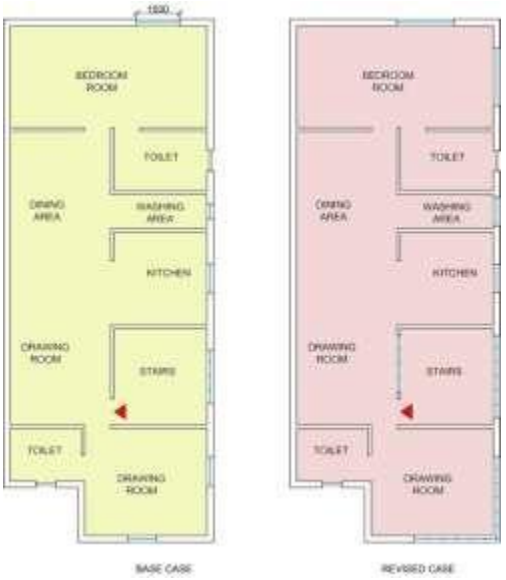

Figure 1: Base case and Stimulated plan

In buildings, lighting systems are responsible for consuming a large amount of energy all around the world. Nowadays significant energy can be saved by creating cost-effective efficiency developments in the buildings. Inthisbuilding,thesecondfloorisconsideredforcase-studyofatwo-storymixed-usebuildinginPrayagraj.The building is simulated in Autodesk Ecotect software to qualitatively analyze the day lighting and energy consumptionofthe2BHKhouse.Thesimulationwasundertakentoseethermalanddaylightanalysisforwarded by calculations of azimuth and altitude angles for placing and proportion ofwindows.

Step 1: daylight analysis of the house to know which part of the building is getting less amount of daylight. Step 2: energy calculation of the house in the existing condition. This will set a benchmark for our study.

Step3:proportionandlocationofthewindowswillchangeaccordingtoazimuthandaltitudeangles.Itwillhelp to distribute an ample amount of daylight in all spaces of thehouse.

Step 3: energy calculation of building after changing the location and proportion of the windows. This needs to be less than a benchmark which is set already in the existing case.

Step 4: comparison of both results will show that if we place a window in a right place in proper size use of artificial lights can be eliminated in the day time. It will contribute to less energy consumption.

Simulation

Daylight and thermal analysis

The Ecotect model is relatively simple and unrefined; it can be used to provide valuable information during the schematic design phase of projects. It has the ability to import climate data files, confirm longitude & Latitude, time zones. The software can perform thermal, ventilation and wind calculations. The software converts weather data, summer and winter solstice, spring equinox, shading design data, sunrise, solar noon and sunset data into the model.

Base Case

Daylight analysis of existing building is done by using Ecotect software (Fig. 2). The figure shows that the house is not receiving appropriate day lighting, in the result, the owner uses electricity in day time also.

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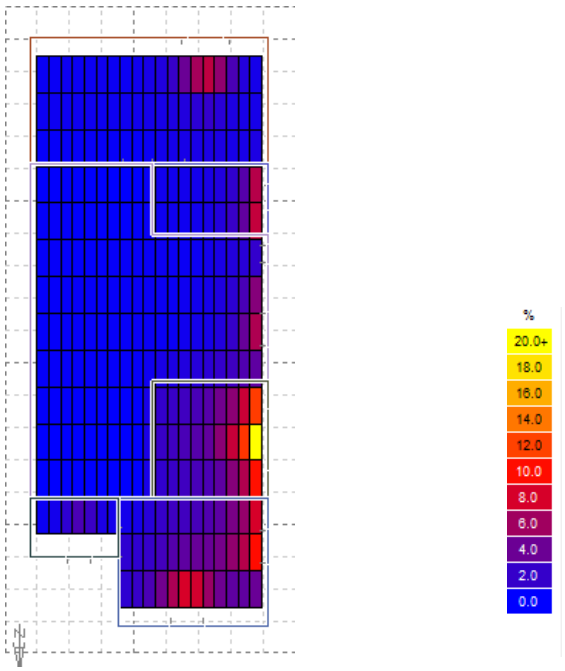

Figure 2 Day light Analysis ofBaseCase

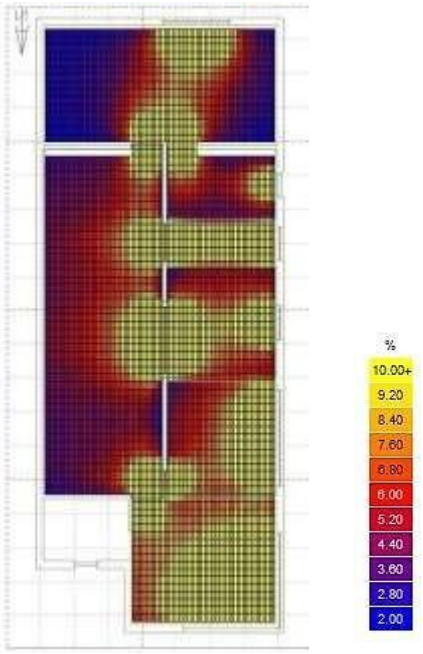

Figure 3: Day light Analysis of SimulatedCase

Revised case

Retrofitting of windows are done according to azimuth and altitude angles of Allahabad to receive ample amount of daylight. After designing the windows for house another analysis of day lighting is done in ecotect. (fig 3). Figure shows that, now house is receiving ample daylight to eliminate use of artificial light.

Calculation of azimuth and altitude angle

Calculationofazimuthangleandaltitudeangleisbasedoncriticalmonthsof Prayagrajaccordingtothehighest temperature, low temperature, and high % humidity. Critical months for Prayagraj are January, May, and August. These are also used for shadingdevice.

By using the azimuth angle width of the window can be calculated, and with altitude angle, we will get the size of the shading device.

Activitiesaredividedaccordingtoallrooms(table1).Forexample-thekitchenisusedfrom7am to12noonin the morning and in night 8 pm to 11pm.

Table 1: Space and its timing of activity

SPACE	ACTIVITY TIMING
Kitchen	7 am- 12 noon & 8 pm – 11 pm
Bedroom (2)	10 pm – 10 am
Drawing Room	3 pm – 7 pm
Dining Room	10 am – 12 noon, 4 pm – 5 pm & 9 pm – 11pm

According to the space and time-activity timing table we need daylight for the kitchen in morning hours.

- In winter months we need the sun to penetrate our rooms, so the width of windows are designed according to azimuth angle (107° - 161°) of the critical month of winter i.e.January.
- Insummermonthswewillgetdirectsunraysfrom10amonwards,whichisrequiredtobeexpelled,because of which shading devices are designed according to 42° to cut direct sunrays.

To determine the sill and lintel level, altitude angles were used between 10 am – 3 pm. But adjacent building whichislocatedin8feetdistanceisblockingthesunrayswhicharebelowfrom40°.Togetmoresunlightinthe critical month

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of winter sill and lintel level are designed according to40°.

- The dimension of shading devices is calculated by altitude angles of the critical summer month. All harsh sun rays are coming in 46°and above. The width of the shading device is designed to block sun rays in summer at 45° angle.
- Similar concepts are applied in other rooms to get the proper size ofwindows.
- The study shows, if windows are designed according to azimuth and altitude angles; use of artificial light in day time can be eliminated. It helps to reduce the electricity bill to someextent.

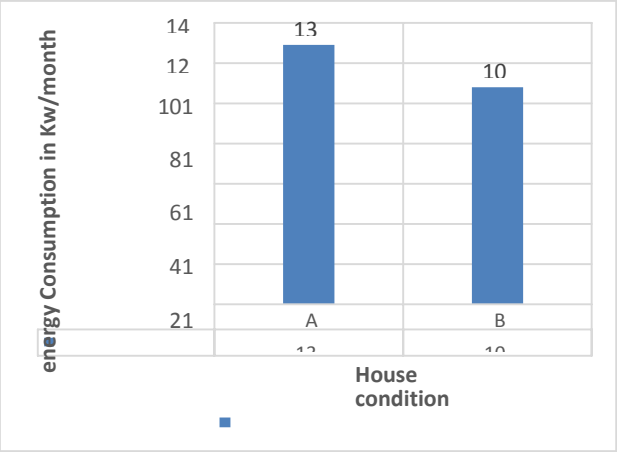

Figure 4: Energy Consumption before and after changing the dimension of windows

RESULT

The daylight systems were made in the building which provides sufficient daylight in the whole building, and there was no need of artificial light in the day time.

Annual energy saving has been found 1119.1 kWh by using the day lighting concept in the building. The paper studied the different sizes of windows with reference to the sun path, azimuth and altitude angles through daylight analysis. The energy consumption of a building depends on many parameters, out of which sizing of windowsisoneparameter.Themethodologycanbeappliedinotherspacesandcitiesoftheworldtoestimate optimal window dimensions that balance both day lighting and energy savings. Result shows that (fig. 4) well plannedandproportionatedwindowcanhelptoreduceenergyconsumptionbyreducingthedaylightintakein summer and increasing the day light intake in wintermonths.

CONCLUSION

Hence, after the study we are concluded that Windows that admit daylight in buildings are important element for the energy efficient design. Daylight is also important for its quality, spectral composition, and variability. Benefitofusingdaylightingforambientand/ortaskluminanceinaspaceisthatitcansaveenergybyreducing theconsumptionofelectricity.Sizeofwindowscanbemanageaccordingtosun-pathanddaylightanalysis.The work,wasanapproachthroughmeansofsimulationalonetohighlighttheroleofwindowsonenergyefficiency of building. While building designing, Architect should keep in mind that windows can be used as a parameter to analyze energy consumption with reference to daylight.

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Strategies to Mitigate Impact of Livestock Production on Environment

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Abstract : The livestock sector globally is highly dynamic. Livestock production are an important protein and calorie source for humans and are an important income source for rural households. The demand, production and consumption of livestock products are growing faster than the increase in world population. In developed countries, demand for livestock products is stagnating, while many production systems are increasing their efficiency and environmental sustainability. In developing countries, it is evolving in response to rapidly increasing demand for livestock products. The environmental consequences and hazards are enormous and obvious in developing countries. This continuously increase in demand of livestock sector has negative impacts on environment such as air pollution, water pollution, climate change, land degradation and soil pollution. The paper describes the impacts of livestock production on environment also gives mitigation strategies for developing countries to control and reduce the impacts to fight against global climate change. Mitigation opportunities involve altered land use for grazing and feed production, feeding practices, enteric fermentation and herd size reduction. In addition, strengthening institutions that promote markets and trade, as well as local support programs can help in mitigation activities.

Keywords: livestock production; climate change; livestock impact; feeding strategies

Introduction

Livestock provide essential commodities and services to the majority of the World's population. With increasing number of people, meat production is projected to increase from 200 million to 310 million tons per year by the year 2020 (De Haan et al., 1996). Although demand for livestock products is stagnated in developed countries, it is rapidly increasing in developing countries due to urbanization and associated shift in eating habits towards livestock products.

Livestock are increasingly being held responsible for many adverse effects on the environment. Loss of vegetation cover, reduced biodiversity, air pollution, soil erosion and compaction and excessive run-off often from overgrazing. Additionally, the livestock sector emits an estimated 14.5% of total global anthropogenic greenhouse gases (Rojas-Downing, 2017). As a consequence, livestock management alterations have been argued to have significant potential for mitigating atmospheric greenhouse gases and reducing future climate change. Livestock emission abatement opportunities include managing grazing land resources, altering feeding practices, altering processing and transport of animal products and altering species and breeds in animal production. This paper presents an overview of livestock related impacts on environment and mitigation strategies for environmental protection.

Impact of Livestock Production on Environment

As livestock production increases worldwide, livestock waste is becoming a serious environmental hazard. Livestockproduction and their waste have polluted the environment in various ways:

Air pollution

"Piling up too much 'stuff' in one place causes problems. If you spread out the animals and let manure lay where it falls in a pasture, it doesn't bother anyone very much. But if you start collecting it, flushing it, spreading and spraying it around—all normal practices in confinement operations—it becomes air pollution."
– Dr. John Ikerd, University of Missouri, 2001

Air is one of the major livestock related environmental problems. The production of livestock has significantly contributed to the increase levels of $CO_2$and other greenhouse gases during the past 250 years (Darwin, 2001). Air pollution and global warming are produced by livestock directly and indirectly. Decomposing animal excreta produce and release a complex mixture of dust particles, bacteria, endotoxins, and volatile organic compounds, as well as hydrogen sulfide, ammonia, and other odorous substances. Air pollution has serious repercussions and damage to health occurs as pollutants molecules interact unfavorably with the intricate molecules and fluids of the human body (Ademoroti, 1996).

Water Pollution

Livestock production adversely impact the water environment by depleting limited freshwater sources and by contaminating surrounding surface and groundwater. Contamination of water resources occurs either directly, via intentional discharge of insufficiently treated liquid waste, or indirectly, via infiltration of contaminants into groundwater from unlined waste lagoons, as runoff from locations where solid waste is stored or has been disposed of, and from the deposition of airborne contaminants onto surface waters (Burkholder et al., 2007).

Climate Change (GHG & methane)

Anthropogenic climate change spurred by livestock generated GHG emissions is a growing threat. Climate change affects biodiversity, soil degradation reducing water quality, nitrate and sediment pollution of water. Climate change and variability are key drivers for environmental degradation, though their effects will be most severely felt in the coming decades. Its key effects will be increased dryness and higher temperatures, reductions in primary productivity, land use changes, changing animal disease distributions, land degradation in some cases, changes in species composition (and thereby animal diets and feeding strategies), livestock productivity, incomes and food security(Ayantunde et al., 2011).

Land degradation

Land degradation such as deforestation, soil quality and desertification are excessive global problems. Prolong heavy grazing contributes to the disappearance of edible plant species and subsequent dominance by either inedible, herbaceous plants or bushes. Excessive grazing has also caused soil compaction and erosion, decrease soil fertility and water infiltration and the loss of organic matter content. Livestock impact on the soil can be classified into two categories as reported by Whitmore (2001); physical impact of the animal on the soil as it moves around and secondly, the chemical and biological impact of the manure and urine that the animal deposits on the soil.

Physical impact

Heavy livestock, such as cattle compact soil structures and destroy vegetation on which they graze. Destruction of soil structure and vegetation is harmful because restoration does not occur immediately the grazing animals are withdrawn. The problems with soil structure are not limited to cattle farming. Pig production is notorious for its destructive effects on vegetation as part of the pig's behaviour to dig into the soil in extensive system common among rural farmers.

Chemical and biological impacts of manure and urine

Although impacts of livestock manure has been seen to have impact on water and the atmosphere, soil is an intermediary. The amount of urine declared by a grazing cow is of the order 2 liters applied to an area of about $0.4m^2$. This represents an instantaneous application of 400 to 1,200kg N per hectare. Such an amount burns vegetation and is often toxic to plant roots which cannot immediately recover (Early, et al., 1995).

Heavy metals

Copper and zinc which are essential minerals for livestock diets are deliberately added to concentrate feeds whereas other heavy metals in particular cadmium, are introduced involuntarily via feed phosphates. Only 5 to 15% of metals additive are absorbed by animals, the rest are excreted. Soils on which pig and poultry manures are

continuously applied at high rates accumulate heavy metals jeopardizing the good functioning of the soil, contaminating crops and posing human health risk (Conway & Pretty, 1991).

Strategies to Mitigate the Impact of Livestock Sector on Environment

Table 1 indicates mitigation strategies for developing countries, considering the consumption and production ways.

Table 1: Mitigation strategies for developing countries

Sections	Mitigation Strategies
Land Resources	***Land Use:*** ➢ Better management of existing protected area ((Steinfeld et al. 2006) ➢ Facilitate eco-services payment mechanisms (Steinfeld et al. 2006) ➢ Improve grazing management (Henderson et al. 2017a) ➢ Legume sowing on pasturelands (Henderson et al. 2017a) ***Land Use Change:*** ➢ Intensify cattle ranching to avoid deforestation (Cohn et al. 2014)
Fertilization	***N efficiency:*** ➢ Increase nitrogen(N) efficiency during both feed production and livestock assimilation stages (Steinfeld et al. 2006)
Enteric Fermentation	***Nutrition:*** ➢ Treat crop by-products with urea in mixed crop-livestock systems (Henderson et al. 2017a)
Livestock Numbers, Breeds and Mix	***Numbers:*** ➢ Decrease herd size (Thornton et al. 2009) ➢ Increase feeding efficiency, especially for swine and poultry ***Breeds and Mix:*** ➢ Increase crossbred shares (Patra 2017)
Market and Trade	***Supply:*** ➢ Shifts in regional production (Henderson et al. 2017b) ***Demand:*** ➢ Shifts in dietary preferences (Ripple et al. 2013)

Land Resources Management—CO_2 Emissions

Livestock need feed, and feed comes from land, both in grazing form and from harvested agricultural products. Land use practices on feed producing crops or grasslands offer opportunities for mitigation. Less soil disturbance, deeper rooted vegetation and greater plant litter retention leads to larger volumes of carbon retained by the soil. Also, improved grazing management can enhance sequestration. Table 1 shows Legume sowing on pasturelands can increase sequestration but it must be balanced against legume induced nitrous oxide emissions (Steinfeld et al. 2006)

Henderson et al. (2017a) derived a global marginal cost schedule for livestock abatement options, finding that optimal strategies vary regionally. Regarding land-based options, the authors projected that improved grazing management (Table 1) would be particularly cost effective in Latin America and Sub-Saharan Africa, while legume sowing on pastureland would work best in Western Europe and Latin America.

Deforestation is another major livestock and land related mitigation concern. Studies have shown that livestock are a principal user of newly deforested land. Cohn et al. (2014) suggest that intensifying cattle ranching on traditional lands can help reduce deforestation and consequent GHG emissions.

Steinfeld et al. (2006) argue that prudent management of land resources is critical for preserving or gaining GHG savings. Land conversion prevention options for CO_2 savings include: better management of existing protected areas; facilitating eco-services payment mechanisms to conserve carbon sequestered savannah lands. Furthermore, other land use mitigation actions involve conversion of cropland to grassland, reduction in grazing intensity, limiting biomass burning, implementing climate-friendly plant species mixes, erosion control and nutrient amendments for restoring degraded rangeland.

In brief, livestock systems are typically intertwined with land resources and the management of which bears potentially promising strategies. Activities such as improving grazing management, legume sowing and avoiding deforestation, can mitigate GHG emissions.

Reducing Fertilization for Feed Production—N_2O Emissions

The livestock sector consumes a large share of feed crops, as well as hay and silage, and is thus indirectly responsible for a share of cropping emissions. Fertilizer manufacture produces about 0.04 billion tons of CO_2-eq emissions, meanwhile applying manure to cropland accounts for almost 20% of total anthropogenic N_2O emissions. Collectively emissions occurring during production, processing and transport of feed have been estimated to make up 45% of livestock GHG emissions, among which about half are N_2O emissions (Steinfeld et al. 2006).

Rafique et al. (2011) found that N_2O emissions are non-linearly related to the nitrogen quantity applied on grazed grassland. For example, when nitrogen applied on grassland increased from 300 to 400 kg/ha per year, the resultant N_2O emissions doubled from 5.0 to 10 kg N_2O-N/ha per year. They indicate that smart management of nitrogen (N) fertilizers would make a mitigation contribution.

Enteric Fermentation—CH_4 Emissions

Enteric fermentation is responsible for 25% of global methane emissions or 4% of overall anthropogenic GHG emissions. Among the sources of fermentation, animals in mixed crop-livestock systems make up for 64%, followed by grazing systems at 35% and industrial systems at 1%. By animal, cattle emit 77%, buffalos 13% and small ruminants the remaining 10% (Gerber et al. 2013).

Gerber et al. (2013) synthesized studies on enteric fermentation mitigation potential, indicating it can be reduced by manipulating animal diets to improve feed digestibility and by using feed additives (Table 1). One contributing factor is the extent of roughage consumption, with emissions getting reduced by using higher quality diets with more cereal grains and oil meals. Henderson et al. (2017a) found that treating crop byproducts with urea can mitigate CO_2, N_2O and CH_4 emissions and using feed dietary lipids and nitrates can reduce enteric CH_4 emissions.

Reducing Livestock Numbers, Altering Breeds and Mix

A major mitigation strategy involves reducing herd size or composition (Table 1). Thornton et al. (2009) mention that the only effective way to reduce livestock CH_4 emissions in pastoral systems would be to reduce livestock numbers.

Patra (2017) suggests that crossbreeding can be a mitigation strategy (Table1). For example, he estimates that if half of the indigenous cattle populations in India were replaced by crossbred cattle, then the carbon footprint of milk production could drop by 30% due to increased productivity. More broadly, for the entire livestock sector, shifting the mix of livestock population towards more productive crossbred cattle, buffalo and ducks may not only satisfy the demands for animal products but also reduce the overall associated carbon footprints.

Market and Trade

Mitigation strategies can also be implemented via market mechanisms. Henderson et al. (2017b) explored the power ofmarket forces on reducing ruminant GHG emissions. They focused on market-based carbon policies incorporating production substitution and trade. These forces were found to incentivize a restructuring of cattle production, raising the share of dairy animals relative to beef. Considering that the reduction in beef might be politically unpopular, they introduced scenarios with subsidies for producers, in combination with carbon policies. They found that market-driven shifts in regional production can help keep the production levels of ruminant products unchanged,meanwhile reducing associated GHG impacts, with emissions-intensive regions producing less livestock products under this type of policy combination.

On the demand side, changes in consumption of meats or dairy products have the potential to reduce both livestock numbers and feed production with accompanying reductions in GHG emissions (Table 1). For example, Ripple et al. (2013) indicate that swine and poultry typically have a lower carbon equivalent footprint than ruminants. Shifts in dietary preferences can thus alter sector-wide livestock GHG emissions.

Conclusion

Livestock sector contributes to global climate change and deforestation around the world. Anthropogenic climate change spurred by livestock generated GHG emissions is a growing threat. The demand, production and consumption of livestock products are growing faster than the increase in world population. The continued growth in livestock production are key drivers for environmental degradation. The impacts of livestock sector on environment includes air pollution, nitrate and sediment pollution of water, climate change, land degradation, heavy metals contaminating soil and crop quality and posing human health risk. As an important source of global anthropogenic GHG emissions, the livestock sector may face pressures to mitigate GHG emissions. The mitigation strategies mentioned in this paper includes alterations in land use for grazing and feed production, feeding practices, enteric fermentation, reducing livestock Numbers, Breedsand market and trade. These strategies help to reduce or control impacts of livestock on environment and global climate change. Land use strategies primarily mitigate CO_2 emissions, feed management reducesCH_4emissions. Themarket-driven reallocation of productionactivities across regions involved in trading can be geared toward better performance in overall GHG emissions reduction, as well as assisting in food security and livelihood support.

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