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Affordable Housing Techniques by Ar. Laurie Baker (Is the Techniques are Relevant in Indore?)

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Abstract: ***Increasing awareness for materials, architecture and aesthetics trends in people are the good signs for a better future in field of architecture and developing city conditions and living standards, but this is a fact that everyone want to build their house in an affordable and in an innovative way, but due to lack of awareness and minimum budget people are avoiding to go for better construction practices, that designers and engineers are providing, due to this people are going for wrong practices and unauthorized people for their low budget construction, this is the major issue now a days, that people are doing wrong practices, out of standards, poor working quality, and incomplete knowledge, all these are decreasing the life span, and quality of building forms, materials, and architecture. On the other hand, ar. Laurie baker and there principles in affordable housing changed the way of thinking and also improved the living standards of the people with minimum budget for build their homes. So, this study is to analyze the working style and principles, there techniques for building houses in a innovative way by using local materials. By this study and analysis, the paper is portraying Indore housing conditions, and how to improve the affordable housing conditions by applying the techniques and elements sir baker used in Trivandrum. As mentioned study aims at analysis of basic affordable techniques (cost-cut) in building construction - suggested and practiced by Sir Laurie baker. The study is to achieve a good specification of design elements and techniques that can be apply in city Indore to make the housing qualities more sustainable and affordable as Sir Laurie baker did in city Trivandrum.***

Keywords: affordable, laurie baker, local, architecture

1. Introduction

As stated by Gautama Bhatia (1991), "baker's work can be viewed as part of a much larger worldwide efforts to re-examine architectural values, ar. Laurie baker's work is based on high principles such as integrity, self-sacrifice and genuine concern for the under privileged people. His architecture and techniques is highly influenced by the people, their local materials, techniques and wisdom passed over generation. After having achieved recognition in the field he turned out to be great inspiration to many in the nation. His influence on architecture has spread far and wide.

The study aims at analysis his influence on architecture through his principles and cost reducing techniques. We have some specialized architects some of them trained under worked with Laurie baker and are influenced by him. And some of them are architects working on his principles and low cost housing techniques.

There are others who have been inspired by baker and learned from him, the research would look at the work of these architects and the extent of the influence on their architectural values and principles along with further development of Baker's ideology.

2. Life and influences

Laurence Wilfred (2 march 1917 – 1 April 2007) was a British-born Indian architect, renowned for his initiatives in cost-effective energy-efficient architecture and designs that maximized space, ventilation and light and maintained an uncluttered yet striking aesthetic sensibility.

Influenced by Mahatma Gandhi and his own experiences in the remote Himalayas, he promoted the revival of regional building practices and use of local materials; and combined this with a design philosophy that emphasized a responsible and prudent use of resources and energy efficiency. He became an Indian citizen in 1989 and resided in (Trivandrum), Kerala from 1963 and served as the director of cost ford (centre of science and technology for rural development), and an organization to promote low-cost housing.

3. Contribution in Indian architecture

His initial commitment to India had him working as an architect for the world leprosy mission, an international and interdenominational mission dedicated to the care of those suffering from leprosy in 1945. The organization wanted a builder-architect-engineer. Baker had no choice but to observe and learn from the methods and practices of vernacular architecture. He soon learned that the indigenous architecture and methods of these places were in fact the only viable means to deal with local problems. Baker adopted local craftsmanship, traditional techniques and materials but then combined it with modern design principles and technology wherever it made sense to do so. Baker built several schools, chapels and hospitals in the hills. Baker's capacity to combine social consciousness and expressive freedom in a witty and vivid manner is already clearly.

4. Literature case study Laurie baker's centre of development studies

The 10 acre campus stretching across a heavily wooded site houses the library, computer centre, auditorium, hostels, guesthouses and residential units for the staff.

The design is a response to the sloping contoured site and seems to grow out of it. There is hardly a straight line with each structure curling in waves, semicircles and arcs. The main administrative building is the focus of the campus, with the 6 storey circular library tower behind. The main entrance is majestic, sloping up towards the sky with the side walls welcomingly sloping outwards towards a wide set of steps. Baker has symbolically not provided a front door. The building is totally open, symbolic of an institution whose aim is to promote research into helping the poor. The library tower is a circular tower with an external jali wall which encloses a circular staircase in the centre. The staircase winds around a circular shaft which runs from the bottom level all the way till the top. Baker's architecture is more than just the materials and cost effectiveness. He plays with spaces, light and shadows, creating comfortable.

5. Inferences from Baker's Work

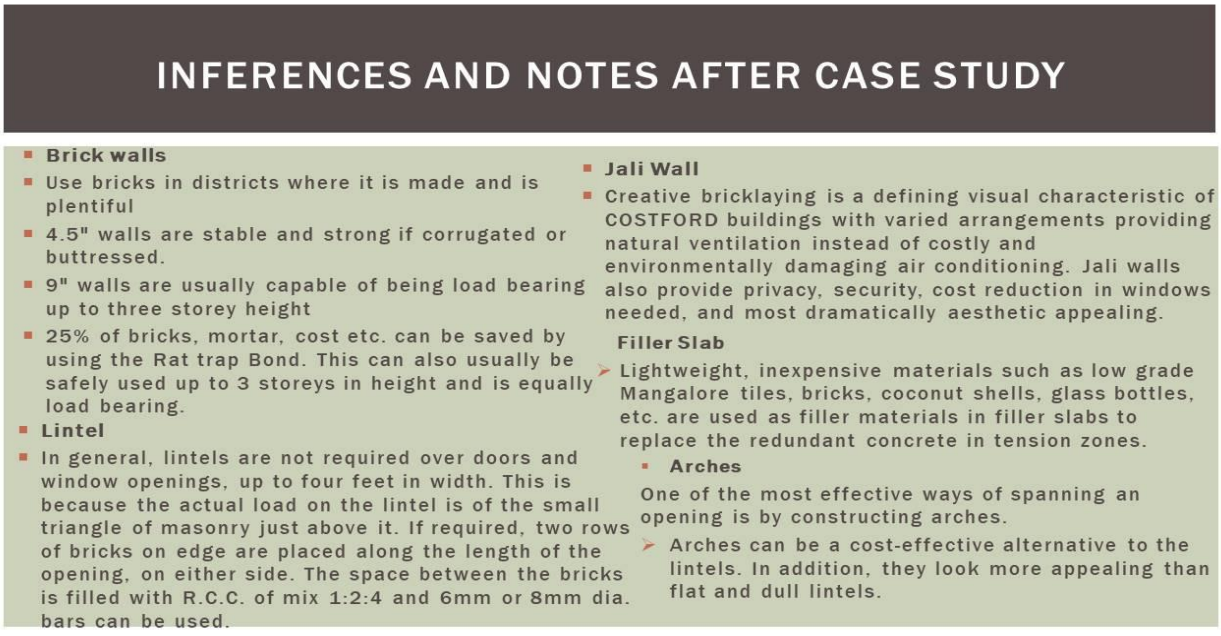
5.1 Design principles and cost reducing techniques

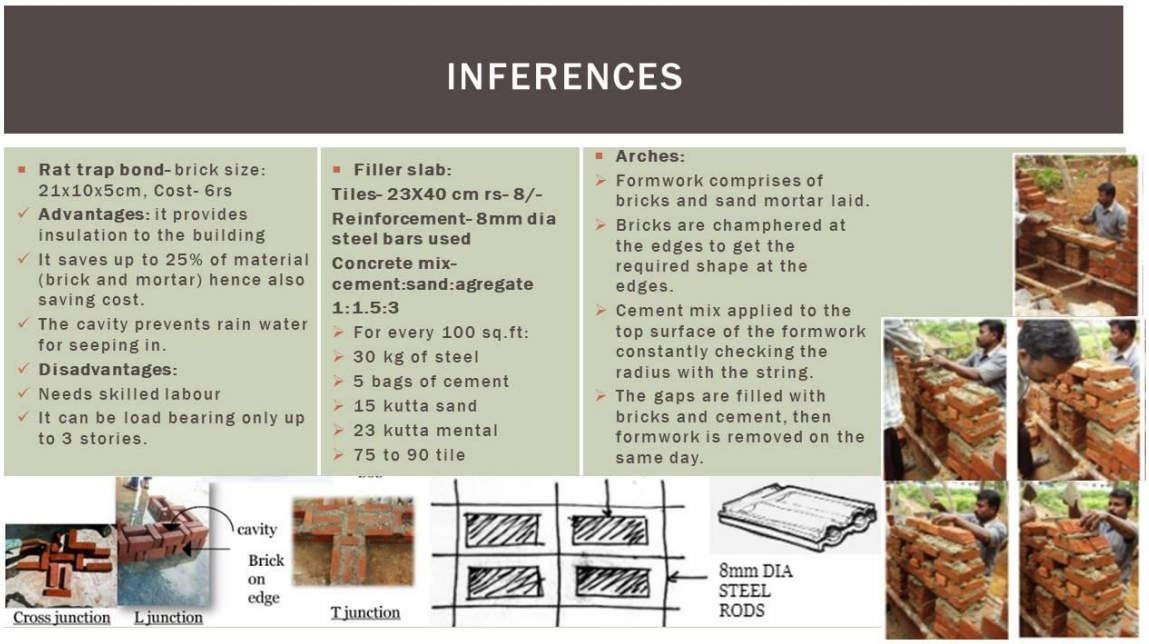
It should be made very clear that the principles of good housing for whatever strata of society in whatever geographic or climatic regions, and concerning planning, design, materials and construction techniques are in no way different whether for rural or urban housing.

It is frequently assumed by planners of all sorts that the rural housing is inferior to, less costly than with fewer needs, requirements than urban housing. This is not so. Usually the needs and the planning arid the implementation of rural housing is more complex and calls for more planning structural administrative skills than urban housing.

We should also keep in mind, as planners, the very long traditions and patterns of rural living.

There is no one type of plan, no one set of materials, no one type of construction techniques, no one set of rules that will be applicable to all parts of India, but the above principles do apply everywhere.





5.2 Summary of architectural principles

Baker followed a set of simple principles in his life as well as his architectural practice. Based on his notes, writings, and the literature surveyed, baker's philosophy can be summarized as follows:

- Use of local materials
- Employment of local techniques
- Labor involved (local / architect's team)
- Cost effectiveness of the projects.
- Plan form of the structure
- Minimal energy use
- Site response
- Uniqueness of the project
- Creative & innovative use of materials
- Avoid extravagance
- Extent of personal involvement of the architect in the construction process.

Inferences of cost-ford

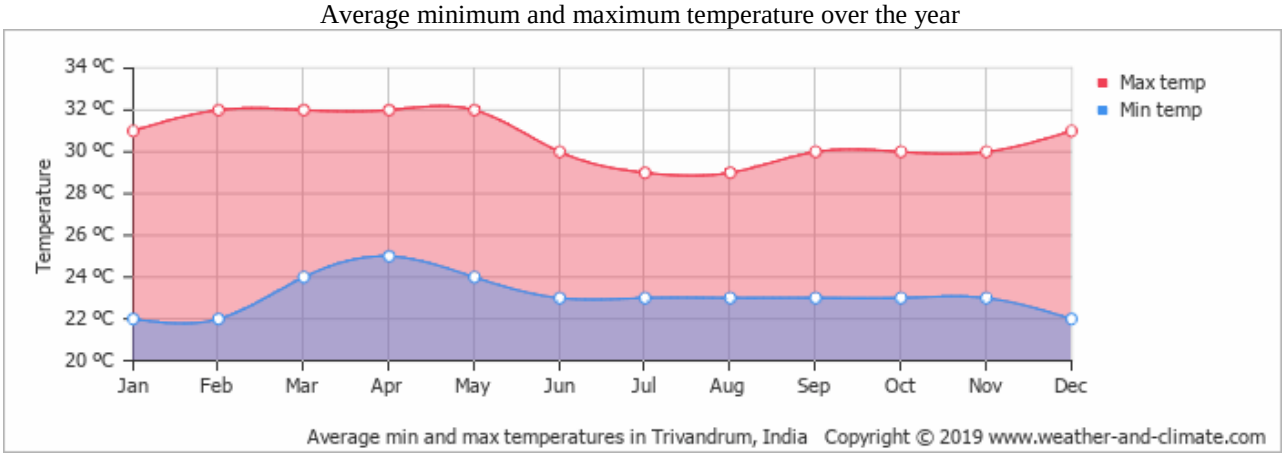
- Rat-trap bond
- Jalli wall
- Filler slab
- Frame less doors and windows
- Rubble masonry
- Arches
- Lintel
- Bamboo construction
- Flooring
- Mud construction
- Built in furniture
- Half brick wall (four & half inch thick wall)

Is the affordable housing techniques can also work in Indore?

Climatic analysis for both the cities (similarities / dissimilarities)

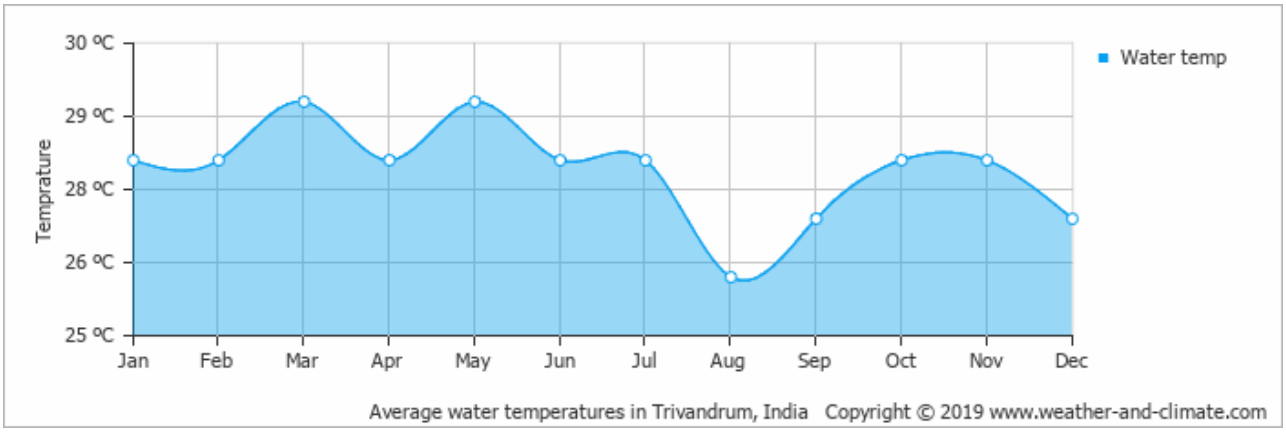
Climate in Trivandrum (Kerala), India

Average minimum and maximum temperature over the year

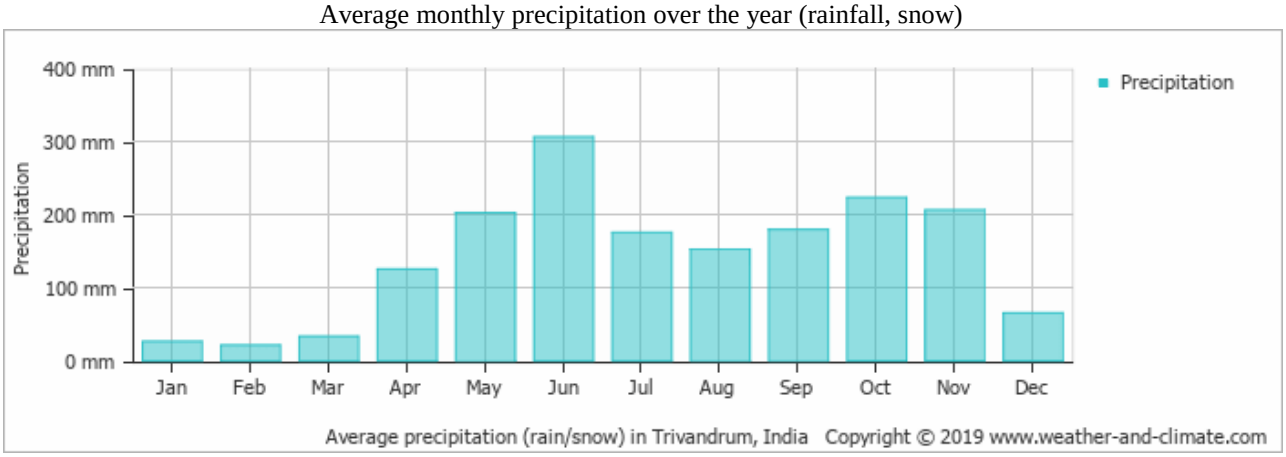


Average monthly hours of sunshine over the year

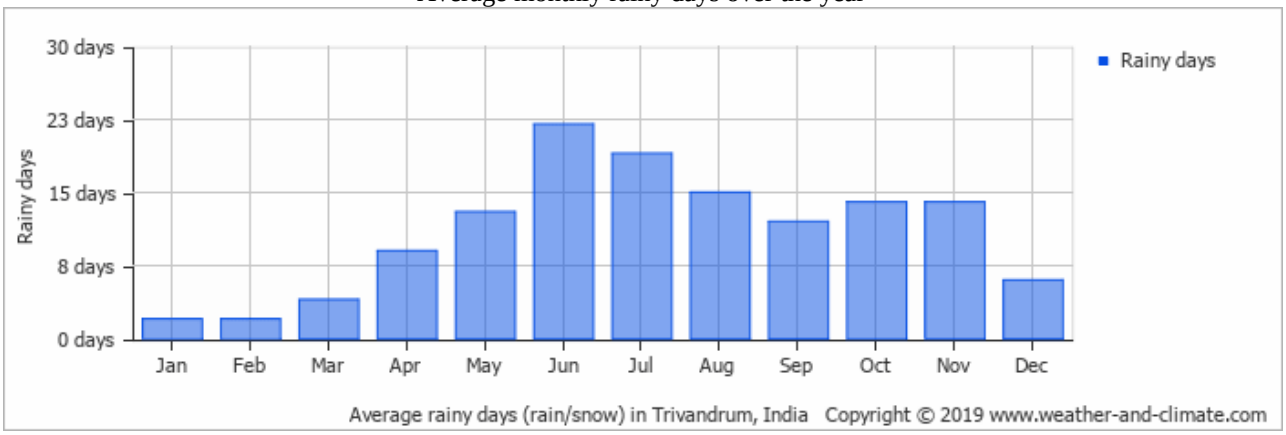
Average water temperature over the year



Average monthly precipitation over the year (rainfall, snow)



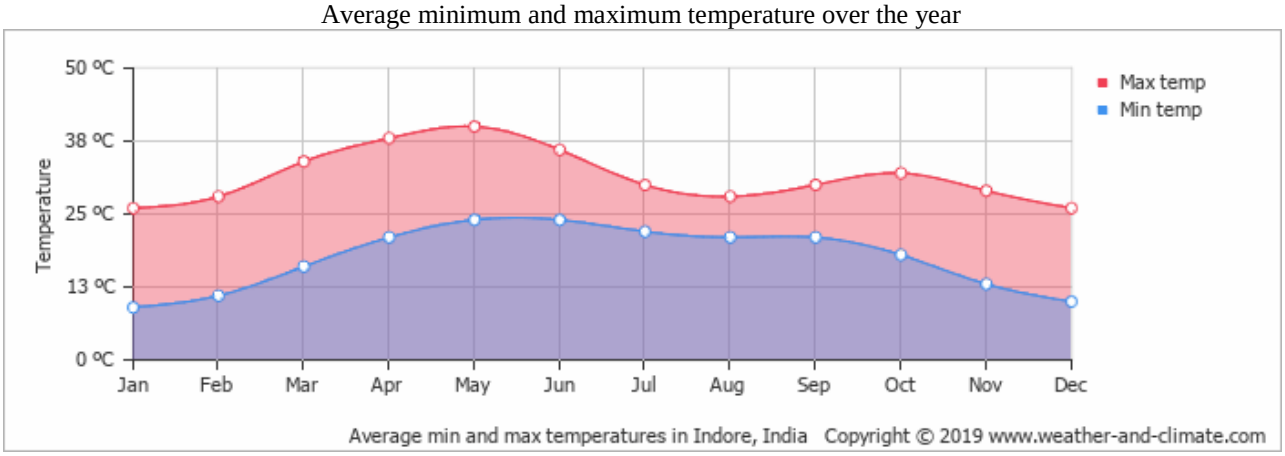
Average monthly rainy days over the year



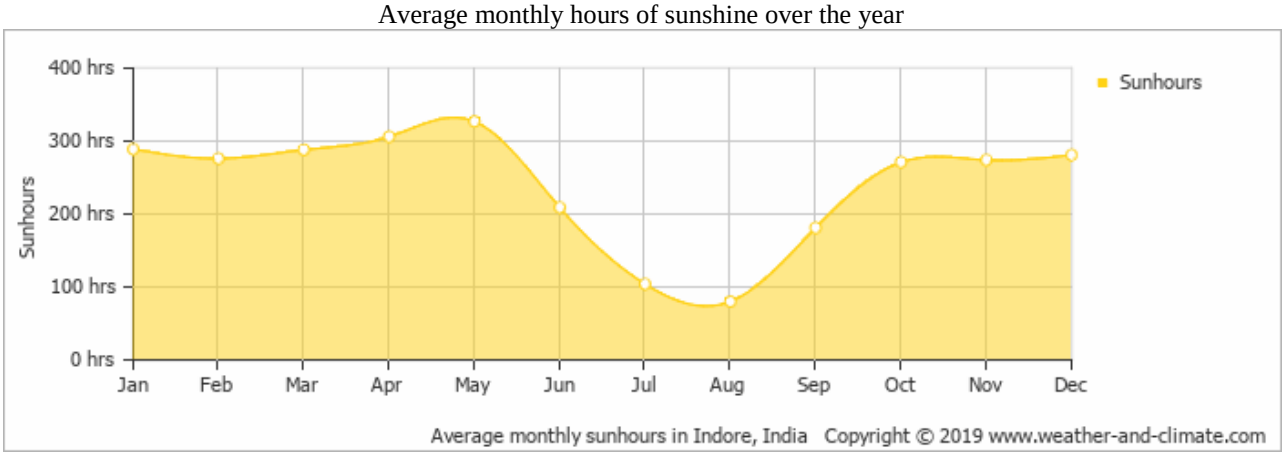
Culture of thiruvananthapuram, Kerala:
Thiruvananthapuram is the cultural capital of Kerala and was a centre of the arts and literature during the rule of the maharajas of Travancore. It retains its cultural preeminence even today with many festivals of the arts, film festivals and traditional festivals which are celebrated with enthusiasm all over the city.

Climate in city Indore, Madhya Pradesh:

Average minimum and maximum temperature over the year



Average monthly hours of sunshine over the year



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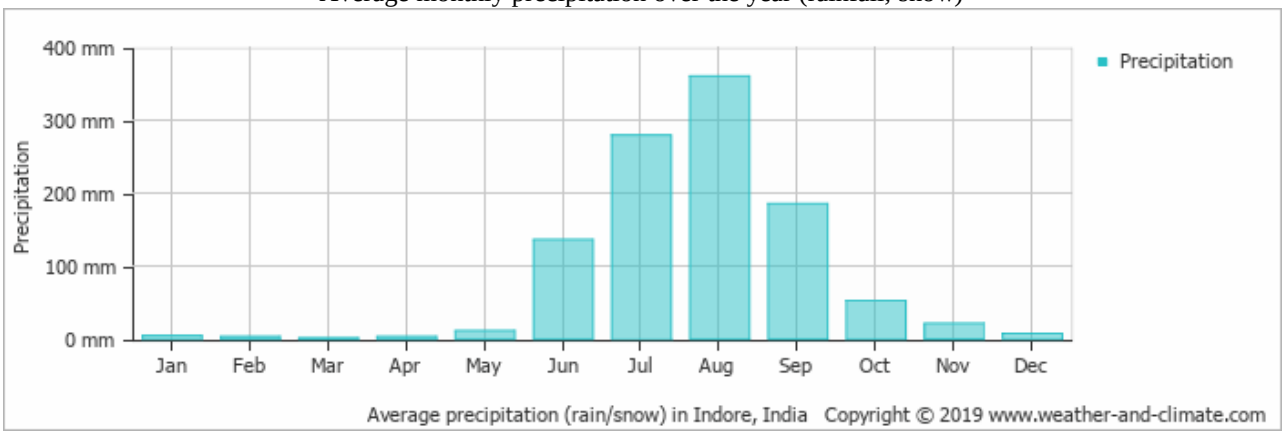
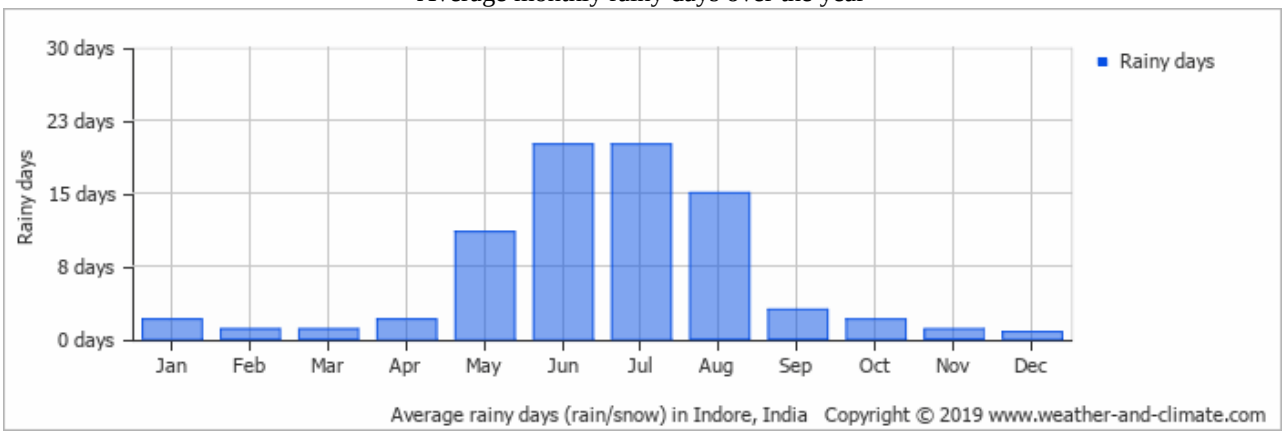
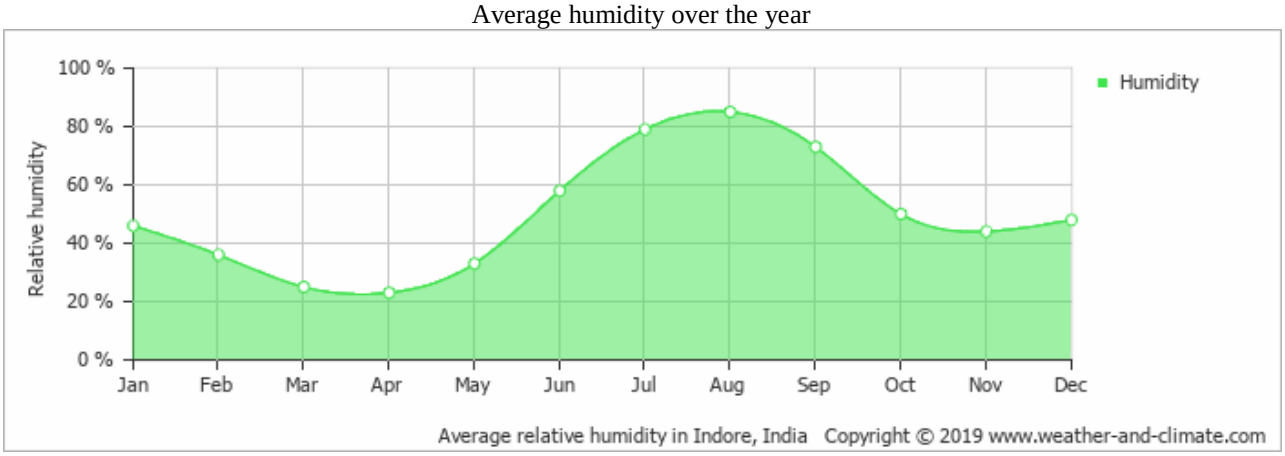


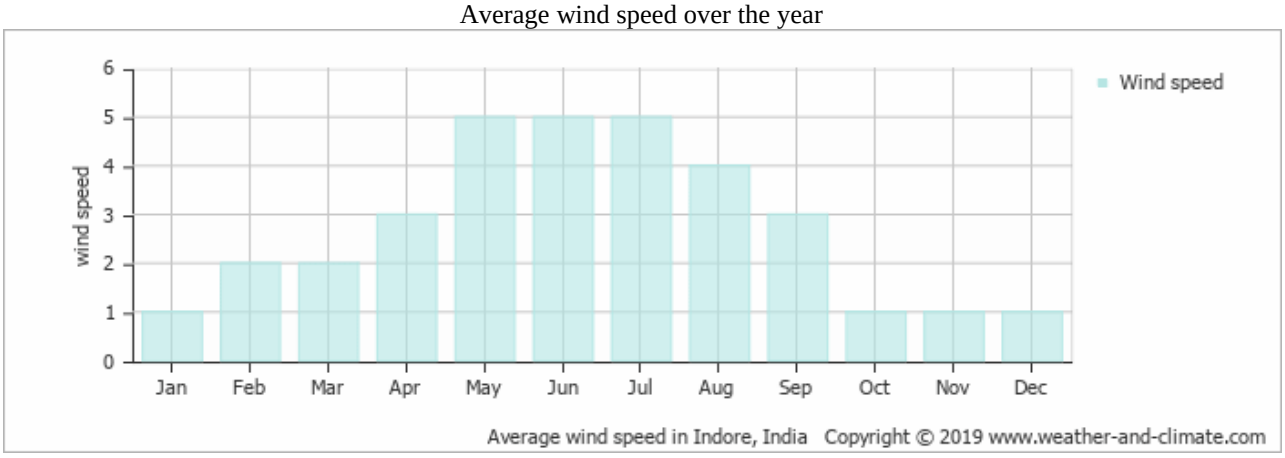
Average monthly rainy days over the year



Average humidity over the year



Average wind speed over the year



Indore culture

The cultural heritage of Indore includes magnificent remains of its glorious past, soulful religious places and beautiful surroundings. Indore culture is a unique blend of various cultures from across the country and makes it a perfect destination to be explored. You will be enthralled to see the royalty and the simplicity of the city. It is known for its food and festivals and welcomes the visitors with warmth. So come, explore the splendid city and lose yourself in its magical charm.

ANALYSIS AND COMPARISON

CLIMATIC DATA ANALYSIS AND TYPE OF LOCAL HOUSING
THIRUVANANTHAPURAM

- **Thiruvananthapuram**
- south-west monsoons and gets its first showers in early June.
- The city receives heavy rainfall of around 1,827 millimetres (71.9 in) per year.
- The lowest temperature recorded in the city core was 17.8 °C (64.0 °F) on 6 January 1974 and the highest temperature was 38.0 °C (100.4 °F) on 4 April 2007.
- The city has a climate that borders a tropical savanna climate and a tropical monsoon climate. As a result, it does not experience distinct seasons.
- The mean maximum temperature of 34 °C (93 °F) and the mean minimum temperature is 21 °C (70 °F).
- The humidity is high and rises to about 90% during the monsoon season.

- **Trivandrum (Kerala)**
  - Sloping roofs, arched openings, skylights, slit windows and jalis.
  - Doors and windows jamming with granite, kota stones in flooring, exposed brick walls, etc.
  - another types are also there with flat roofs, parapets, precast chajjas, brick walls with a coating of paint without damaging the texture of bricks, large openings, courtyards.
  - Planning aspects:
- Inbuilt furniture spaces, courtyards for cross ventilations, slits and jalis.
- Arched openings, not so importance given for staircases, it kept in a circular, or a doglegged, the spaces planned are focusing on the activity areas, and the ventilations,
- Another aspect is for the small plot sized houses, all the principles are same as the villas, they try to make spaces more free of flow and limiting too much furniture's.

ANALYSIS AND COMPARISON

CLIMATIC DATA ANALYSIS AND TYPE OF LOCAL HOUSING
INDORE

- **Indore**
- humid subtropical climate and a tropical savanna climate (*Aw*). Because of its high elevation and inland location even during the hottest months the nights are relatively cool, which is known as *Shab-e-Malwa*.
- Three distinct seasons are observed: summer, monsoon and winter.
- the coldest temperature was 1.1 °C (34.0 °F) in January 1936.
- Indore gets moderate rainfall of 700 to 800 millimetres (28 to 31 in) during July–September due to the southwest monsoon
- The mean maximum temperature of 42 °C (110 °F).

- **Indore (m.p.)**

1. Flat roofs, large openings for windows and doors, dedicated spaces like, dining, living, drawing hall, and Pooja ghar etc.
2. Number of floors and with separate staircase, spaces for the servants and drivers.
3. The purpose of the floors can be rental or can be personal.
4. Type of constructions are very simple as painted walls, parapets, flat slabs, separate staircase lobbies, veranda with foyer, small green spaces etc.
5. Floors with sitouts and zen gardens
6. Separate spaces with dedicated spaces, privacy is the major key for designing the spaces.
7. Wall claddings, marble or stone floorings, vitrified tile in flooring, false ceilings, interiors with proper furniture's and aesthetics.

SIMILARITIES AND DIS-SIMILARITIES

- Climate:- **Indore (m.p.)**
- humid subtropical climate and a tropical savanna climate (*Aw*).
- Built form: (climate responsive)
  - The shape and volume of buildings should be compact, yet somewhat elongated along the east-west axis; (e.g. the optimum shape is 1:1.3), because large, compact building volumes gain less heat.
  - In general, the optimum shape is that which has a minimum heat gain in summer and the maximum heat gain in winter.
  - Under winter conditions an elongated form is ideal; under summer conditions a square shape is better. A compact "patio" house type is therefore preferable.
  - Adjoining houses, row houses, and group arrangements (all continuous along the east-west axis), which tend to create a volumetric effect, are advantageous, as are high massive buildings. Lithospheric arrangements (subterranean) are also applicable

- Climate:- **Thiruvananthapuram, (Kerala)**
- tropical monsoon climate
- Built form: (climate responsive)
  - The main goal is the reduction of direct heat gain by radiation through openings and of the internal surface temperature.
  - The building should therefore be designed not only with protected openings, but also with protected walls. This task will be much easier if the building is kept low. In addition, the roof should extend far beyond the line of walls, with broad overhanging eaves and other means of shading.
  - The height of the buildings should, in general, not exceed 3-storys.
  - The intense diffuse solar radiation calls for buildings that have large overhanging roofs and wide shaded verandahs.
  - Row houses elongated along the east-west axis provide the best shading of the critical east and west walls.

Local materials and vernacular in mp region- (changing perspectives)

HOW PEOPLE ARE WORKING IN INDORE FOR AFFORDABILITY AND LOW BUDGET CONSTRUCTIONS?

POOR CONSTRUCTION ON DEMANDS FOR AFFORDABILITY:

- Poor quality constructions,
- Poor material quality,
- Poor and unskilled labours,
- Absence of quality in planning and constructions,
- Working with local labours but without roper supervision and guidance,
- Poor workmanships due to budget restrictions,
- Contract basis constructions in a specific rates with declared materials , avoiding choices and preferences of clients to make in there construction,
- building materials are cement, brick, vitrified tiles, granite stone for platforms, poor sanitary fixtures of any declared brand in contracts, absence of technical knowledge and architectural standards.
- Targeted construction methods and speedy construction to completing the structure in a declared time in contracts, but with poor quality construction.
- life span of the buildings constructed with affordability is decreasing by the time and with this, common people are avoiding to affordable housing practices.

- **Why we need affordable houses?**
- Growing population day by day
- Easy to build
- Fulfils the needs of conventional houses
- Our country aims that our near future each individual has his/her shelter for his family and fulfil this need we definitely need some immediate plans.

PROPOSAL

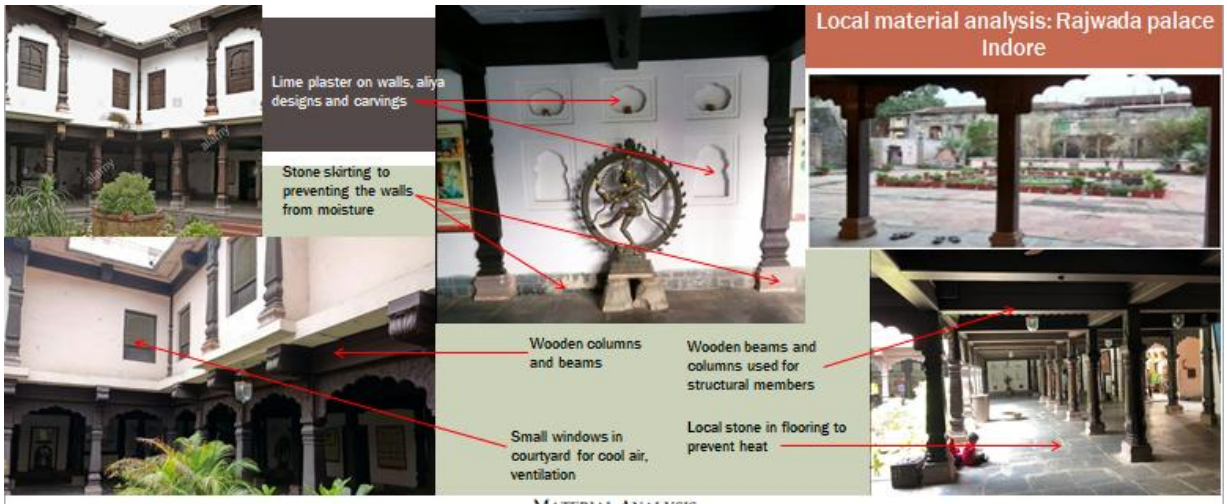
IMPLEMENTATION

LOCAL CULTURE,TECHNIQUES , AND MATERIALS USED IN PAST YEARS IN MP REGION

changes	Characteristics	Different cultures of tribal and folk are well defined.
Culture	Aesthetics	Murals, painting, sculpture are integral part of architecture.
	Planning	Settlement planning as per their lifestyle like circular, squatter and linear.
	Community living	Choupal, otla, chowk, courtyard for social interaction. Strong social binding.
	Site planning	Planning as done as per topography and landscape.
	Response to climate	Plan form and built form are evolved as per the climatic conditions of the region.
Architecture	Materials	Locally available material like stone, mud, bamboo, timber and lime are used.
	Stone	It is used in masonry, roof, flooring, in-built furniture, Chajjas and Jharakhos are provided for shading.
	Mud	Rammed earth, adobe, mud mortar used in random rubble masonry, helps in acoustics and heat resistant.
	Bamboo	Because of strength and flexibility widely used as structural skeleton, roofing structure, composite construction and utility items like jaails, baskets etc.
	Timber	Used as a structural component, in the construction of beams, rafter, trusses, doors, windows and furniture.
	Lime	Used in brick masonry as a binding material, for plastering and fresco painting.
	Brick and Terracotta	Brick is used for masonry walls, piers, jaalis, etc. Terracotta is used in roofing tiles, roof gutters, pottery.
	New materials	Adaptability to new material.
	Cost-effective	Because of locally available material, saves the cost of transportation

case study of traditional architecture done in Indore using local materials in past decades

Local materials and vernacular in Indore- (changing perspectives)



MATERIAL ANALYSIS

S. No.	Particulars	Observations	Analysis
1.	Walls	Composite climate, moderate annual rainfall	Allows the house to breathe by use of perforated mud bricks
2.	Fenestrations	Iron, wood, glass panels	Deep-set windows for the provision of diffused daylight
3.	Plaster	Sand, lime plaster	Lime plaster to provide a smooth finish
4.	Roof	Clay tiles, Timber strutting	Haystack and bamboo is used to maintain
5.	Floor and Tiles	Wood, stone, lime, rocks	These materials remain cool even when subjected to direct sunlight.

Materials and vernacular architecture across M.P. region- changing parameters with time

Parameters of changes	Details	Modern Architecture
Culture	Characteristics	Universal characteristics, no reflection of local culture
	Aesthetics	Contemporary art is depicted.
	Planning	People live in isolation, less interaction with others, no place for local arts and crafts.
	Community living	Cultural hubs, sports complex are interaction spaces, intimate relationship and social binding is less.
Architecture	Site planning	Planning is as per the economic status of the user like HIG, MIG, LIG and EWS.
	Response to climate	Eco-friendly materials are in market but are expensive.
	Materials	The market ones are given priority than local ones.
	Stone	With modern techniques it's used in a better way.
	Mud	Rammed earth, adobe are used in modern design.
	Bamboo	It is used as a new material in modern construction.
	Timber	Used for doors, windows and not as structural member
	Lime	It is rarely used, limited to conservation
	Brick and Terracotta	Brick is used for masonry walls, piers, jaalis, etc. Terracotta is used in roofing tiles, roof gutters, pottery.
	New materials	Adaptability to new materials is more
	Cost-effective	Material and transportation cost are high.

6. Conclusion and Findings

CONCLUDING THE STUDY WITH COMPARING THE MATERIALS AVILABILITY AND COST REDUCTION								
	Affordable techniques used in Trivandrum	Key Materials used	Rate %	Available local materials In Indore	Per sq.ft cost	Alternative materials And techniques suggested	Rate %	Y/N
1.	Rat-trap Bond	Brick (9"x4"x2")-8/-, mortar(1:8)	25%	Brick available (12/-) (jabalpur,nimach,etc)	150/-	Fly ash brick, hollow bricks (8-9/-)	0%	NO
2.	Jaali walls	Bricks, mortar,etc	10%	Brick available, (using easy patterns)	200/-	Fly ash brick, hollow bricks	0%	NO
3.	Filler slab	low grade Mangalore tiles – 15-25/-, bricks, coconut shells, glass bottles,etc.	30-35%	low grade Mangalore tiles– 25-45/-, (rates vary acco. To size and patterns)	25-45/-	Local clay pots	20%	YES
4.	Lintel	Bricks, mortar,etc RCC(1:2:4),8mmdia bars etc.	5 - 10%	Bricks, mortar,etc RCC(1:2:4),8mm Dia.bars etc.	10-12/-	Continues lintel can be avoided,	2-5%	YES
5.	Flooring	terracotta tiles or colour oxides	5%	Ceramic tile, vitrified, kota stone, colour oxides etc.	25-40/-	Oxides are more cheaper, and site waste can be use as filling for reducing aggregate cost	10%	YES

Si No.	States	Bamboo	Concrete	Ferro-cement	Bagasse (Fiber)	Jute (Fiber)	Coir (Fiber)	Fly ash	Mud	Rice husk	Straw	Aerocon
1	Madhya Pradesh	√	√	√				√				√
2	Mizoram	√	√	√					√			√
3	Assam	√	√	√		√			√			√
4	Andhra Pradesh	√	√	√		√		√		√	√	√
5	Uttar Pradesh		√	√	√							√
6	Bihar		√	√	√	√		√				√
7	Punjab		√	√	√							√
8	Haryana		√	√	√					√		√
9	Orissa		√	√		√						√
10	Karnataka		√	√			√					√
11	Pondicherry		√	√			√			√		√
12	Lakshadweep		√	√			√					√
13	Andaman and Nicobar Island		√	√			√			√		√
14	Jharkhand		√	√				√				√
15	Chhattisgarh		√	√				√				√
16	Goa		√	√						√	√	√
17	Delhi		√	√						√		√
18	West Bengal		√	√		√			√	√	√	√

FINDINGS AND SUGGESTIONS

Low Cost Housing Materials: (natural)

Low cost Housing materials can be broadly classified into natural materials and manmade materials according to the source of the building materials.

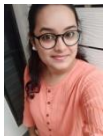
1. Nonerodable Mud Plaster
2. Compressed Earth Block

Man Made Materials

1. Cement Concrete Hollow Blocks
2. Ferro-Cement
3. Aerocon Panels
4. Fly Ash

- This is a fact that everyone want to build their house in an affordable and in an innovative way, but due to lack of awareness and minimum budget people are avoiding to go for better construction practices, that designers and engineers are providing, due to this people are going for wrong practices and unauthorized people for their low budget construction, this is the major issue now a days, that people are doing wrong practices, out of standards, poor working quality, and incomplete knowledge, all these are decreasing the life span, and quality of building forms, materials, and architecture.
- After the study of ar. Laurie bakers practices, Sir G. Shankar, Costford, etc. I found that they practiced for the necessities of the client, their choices and there budget was the preferences.
- Study found that in our past decades in mp, people used local materials for building the houses, in mud, bricks, lime, stone, natural wood, etc. But with increasing trends people started using new materials, like cement, concrete, glass, aluminum etc. Which are the reasons for expensive constructions?
- Let's work on the traditional techniques and materials to make the housing quality better and sustainable.

Author Profile



Shruti Sharma, holds degree of bachelor's in architecture and currently pursuing her masters. She had authored another paper in IJRG named as "sustainability through low cost housing". She has experienced working in variety of projects and planning works across the country, under her own name. She also holds experience of working in various offices and firms in the city Indore

Prof. Suman Sharma, Education -B .Arch, MITS Gwalior, M Arch. Doing Practice since then. Teaching experience 17 years.