

Approach to Sustainable Architecture through Vernacular Practices: A Case Study of Dwelling in Village of Madhya Pradesh and Gujarat

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Abstract— India is well known worldwide for its vivid culture, it is a matter of fact that this is because of all rich villages and sub-urban areas that differentiate one culture from another. Every city that is developed look same, with same form of architecture, tall buildings, broad-acre, roads full of vehicles, polluted, full with glare of city-lights and industries on outskirts. On the other hand, it's all different and pleasing in villages. Every capitalist and planner in order to expand cities, is capturing and merging villages into cities. This happens majorly with the villages close to cities, national highways, state highways and air ports. Gradually the village turns into suburb then eventually it becomes part of that city. The place which was once a pleasant and silent, turns into a place full of honking, smokes, dust, waste etc. This paper is a part of research that is been carried on concern of conservation of villages. What is village conservation? In this scenario in which cities are engulfing up nearby villages and making them a part of itself, we really need to preserve village and elements of it. Which were once identity of our country. Agriculture and dairy were, what our country used to rely on for everything. When it comes, the discussion of global climate change, every Indian factor behind it is related to cities and urban areas but not villages. May it be CFCs or may it be chemicals polluting rivers. What makes villages so pleasant? Why people living in villages don not need conditioned air? How they are really adapted to the climate over there? This paper boldly deals with the study of practices of villages in India, which are adaptable for people living in urban areas to deal with many problems regarding sustainability. The aim is to come up with a model of approach for architects to include vernacular architecture in urban construction practices with acceptance of urbane client. Also some design examples are given to support the model.

Key words: Vernacular Architecture, Rural Conservation, Adaptation, Rural Practices

I. INTRODUCTION

Architecture with integration of art and culture of Indian villages is a great native expression of our country. People in rural India, through their efforts have created rich, colorful, and diverse styles of architecture to respond their respective local climate. This represents an evolution of the humble human response to the climate, environment, geography, topography and ethnicity. Rural Architecture of India as housing has many examples from various region of the country and is studied under the column of vernacular architecture. It could be understood simply as building practice which have been developed and evolved by people living in villages over generations and often constructed by themselves. These practices are result of actual trials and errors, which have actually sustained the wreck of time. Being sustainable, without any compromise that any generation had to make, these practices were gifted down to new generations. The main essence of Rural Architecture is

that; it relies on passive measures. The house unlike urban area is never considered as an asset but just as a dwelling with a bit of aesthetics. The idea of keeping it simple results in Vernacular Architecture. People in village manage to do it with whatever readily available, may it be stone, wood, bamboo, steel or mud. The rural architecture especially Indian rural architecture reveals a special combination of local micro-climate conditions, locally and readily available materials fit for construction, simple construction techniques in sync with materials, significant living style, culture, traditions and related socio-economic conditions of a particular region. It's a fact that this type of architecture has evolved through many trial and error methods over past years and hence such settlements are often studies as the predecessors of current sustainable built environments.

Rural architecture represents inherent, user-experience-based, unwritten, undocumented, information for understanding the vast area of sustainability. Thus, buildings in villages built by local people as artisan and correspondingly other settlements must be considered as a knowledge source for ideas of sustainable building and design. And hence, lessons learned from rural architecture can help in design of sustainable built environments.

II. METHODOLOGY

Observation of styles of architecture in rural parts of country.

- Selection: Selection of types of dwelling based on accessibility, feasibility, originality and vernacular characteristics from the perspective of substantial case study.
- Collection of every possible data related to construction techniques, materials and aesthetics of selected types of dwelling.
- Analysis of collected data in context of sustainability.
- Categorization of data on the basis of acceptability in urban construction practices.
- Integration of selected rural construction practices with specific urban construction techniques.

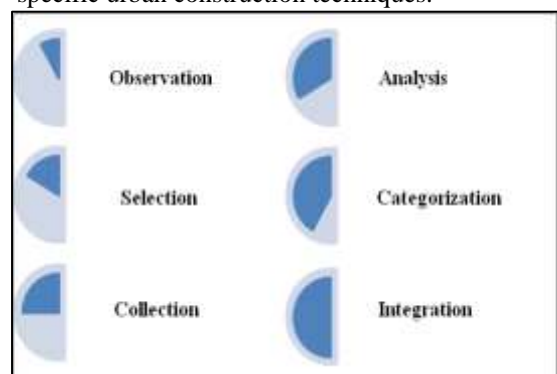


Fig. 1: Methodology

III. CASE STUDIES

A. Ground Case Study: Potters' Dwelling in Suburbs of Indore

A community of potter living in a small village Bercha, an area in outskirts of Indore, Madhya Pradesh was selected for Primary case study. Several families in the community live in separate clusters in houses with nearly same characteristics. Major spaces in the houses are, clay preparation space, working space, firing space and most important space for the storage of raw and finished product. The open space in front is used for working and selling and the private backyard is generally surrounded by private spaces like washing area, toilets and other household works that a women perform.



Fig. 2: Clay Lamps drying in porch of house.



Fig. 3: Niche in wall to keep lamp and to store.



Fig. 4: Roof of house used to dry cow-dung cakes, for space efficiency.



Fig. 5: Street that led to a potter's house, Bercha



Fig. 6: Dwelling of a stone sculptor.



Fig. 7: Elevation of a mud house in Bercha with mural



Fig. 8: Attic made in mud, adjoining house is made in contemporary style.



Fig. 9: Art at the door-step of a house in Becha.



Fig. 10: Rafters and Purlins of tin-roof of a mud house in Bercha.

The enclosure of spaces in between are used for living sleeping and cooking. The toilets are kept unattached with the dwelling. A separate space for donkey is constructed as it is most potter friendly animal and nearly every potter in the area owns one. The community are associated with celebrations and ceremonies related to birth, life, marriage and death. The three to four generations of potters live together in the community. It forms a strong social setup. Talking about the construction of house following materials and techniques were observed.

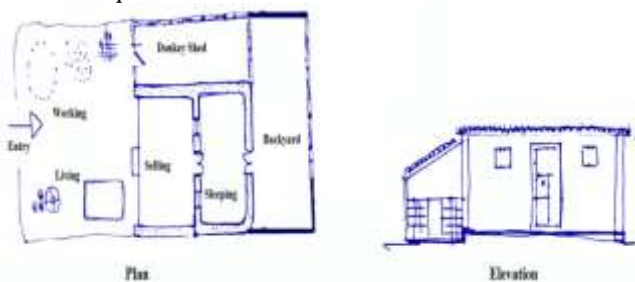


Fig. 11: Conceptual Plan and Elevation of Potter's House

S. No.	Particular	Material and Technique
1	Walls	- Rammed Earth - Kiln dried brick masonry
2	Mortar	- Mud
3	Vertical Member	- Brick piers - Wood or Bamboo
4	Beams	- Wood - Bamboo
5	Attic	- Bamboo Matting and Mud Mortar - Wooden Planks
6	Roof	Wooden rafters and Purlins with covering of Tiles
7	Flooring	Rammed Earth covered with Cow Dung
8	Plastering	Mud plaster along with Red Clay, White Clay or Yellow Ochre
9	Doors and Windows	Wood
10	Electrification	- Without Conduits - Table Fans - TV and Radios

Table 1: Data collected form Ground Case Study

B. Desktop Case Study: Bhunga of Kutch

Bhunga of Kutch came in limelight after the earthquake of 2001, when it was observed that, though being too close to the epicentre, most of the Bhunga houses survived the earthquake. Bhunga are majorly found in desert islands of Kutch, Gujarat. Bhunga is cylindrical in shape, earthquake imparts lateral forces on the structure and at that plane, Bhunga is circle, and one half part of a Bhunga reacts as an arch against the force that is applied from any direction that the earthquake wave hits the structure. Thus, Bhunga uses a circular shape for its maximum advantage against forces of an earthquake which are lateral.



Fig. 12: Example of Bhunga, Kutch

The height of walls is quite less. This helps the house to be stable during the earthquake. The conical shape of roof gives high ceiling in the centre and comes quite low at the periphery and keeps itself stable. Roof is kept light by constructing in thatch. It is very helpful against the lateral forces of the earthquake and causes comparatively less damage.

Being independent circular structures these houses do not share any common walls with any adjoining structures so there is no impact of load of one structure on any other structure. During desert storm, the cylindrical shape creates streamline and lets the air flow without creating much pressure to the building.

S. No.	Particular	Material and Technique
1	Walls	Thick Mud or Stone
2	Mortar	Mud with Husk as Binder
3	Vertical Member	No vertical Member, Circular shape of building instead.
4	Beams	No Beam
6	Roof	Thatch
7	Flooring	Mud
8	Plastering	Lipan

9	Doors and Windows	Small Openings made in Wood
10	Electrification	

Table 2: Data collected from Desktop Case Study

IV. INFERENCES: SUSTAINABILITY IN RURAL CONSTRUCTION

Due to natural and physical limitations people living in rural areas had a very little access to outer developed world. They seek mutual help from other fellows in community for cultivation and wellbeing. In such scenario, with an absence of external distant forces, growth in rural and organic settlements was mostly gradually driven by the basic daily needs of users and mechanisms that morphed with time. The sustainability today is studied in terms of environment, energy, social and economic issues. It would be obviously unfair to analyse the rural settlements on same parameters. On the basis of above two case studies inferences that can be drawn in terms of sustainability are:

Sustainable Attribute	Potter's Dwelling	Bhunga
Materials	Adobe, Stone, Timber, Terracotta	Adobe, Mud, Wood, Thatch
Primary Construction Techniques	Brick-Bonds, Framed roofing	Cob-Wall, Thatch roofing
Climate Response	Climate responsive adobe brick walls, Openings and height	Climate responsive Mud-wall, Extended thatch roofing, independent unit
Planning and Technique	Community based, profession based, Nuclear, Load bearing with vertical members.	Common design, Circular in plan, Load bearing without vertical member, Aerodynamic
Colors and Aesthetics.	Objective, more use of forms and shapes,	Common traits aesthetics throughout a community, more use of colors.

Table 3: Comparison among case studies

V. FEASIBILITY AND ACCEPTANCE IN URBAN SETUP

Though being very friendly to environment, cost effective, and a sustainable practice. The use of rural or vernacular architecture is very seldom observed as a trend in urban setup. The reason behind the less acceptance of rural style of architecture in our urban areas is the structural reliability of structures that follow rural construction materials and technique. Another response experienced against rural architecture is that it hardly follows the urban rhythm and hence creates pollution in urban visual harmony. As an architect and designer it becomes ones responsibility to smartly integrate selected sustainable rural construction practices with contemporary techniques so as to promote acceptability of vernacular architecture. Below is a conceptual model that can be followed in the design process.



Fig. 13: Boundary wall made with Mud.

Some design examples that can be considered as construction that include rural architecture are

A. Boundary wall:

As boundary wall of premises does not have to bear live load, it can be constructed with stone or mud and aesthetics and backbone the design.

B. Tile Roofing:

Places such as semi open restaurants and parking lots, where roof is to be used, just as shed but not as load bearing member, tile roofing can be cost and energy effective option.

C. Bamboo Framing:

Public places where partitions are to be provided with semi-permeable nature, Bamboo framing can be a sustainable considerable material.

D. Landscaping:

Landscaping is the field with maximum scope of experimenting with rural architectural elements. Upcoming Amusement parks like Chokhi Dhani based on theme of rajasthan is one of the best examples of such practice.

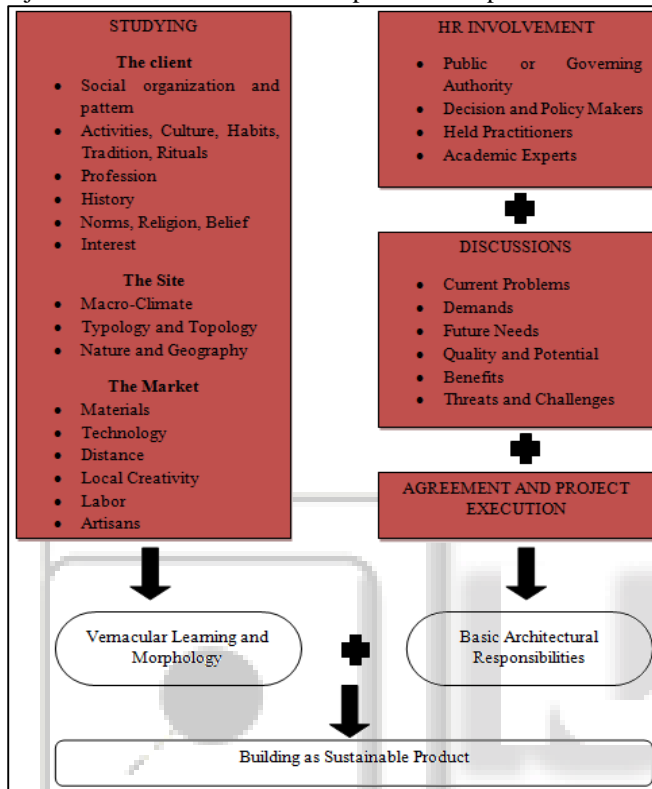


Fig. 14: Model for Practice with inclusion of rural architecture in urban construction.

VI. CONCLUSION

It can be derived from the discussion that rural house had formed and morphed with time and had always reflected the life of rural India which is rich with culture and tradition. It is the example of cultural design and construction technologies like a big showcase. Also a prominent, successful and great variety can be observed and documented from different regions of country. It mostly been developed rationally and with respectful to the surrounding environment.

Most of its properties are lost or ignored with time in new housing and buildings. As architects we must bring back these practices and modify them for the acceptance in urban areas. By using various smart parameters, a wide range of design with different plan layouts can be worked out as per the need of client. These preliminary designs, then can be altered, manipulated, defined and detailed on subsequent phases of construction.

Furthermore with the inclusion of IT and help of computational technologies, tools and CAD, programs can be developed which can help in mass-customized production of buildings in urban areas. This way construction may be more compatible to environment, can be more sustainable and help the overall growth of country.

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- [14] Figure 1- Authors' Interpretation
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- [19] Figure 13- <http://photos1.blogger.com/blogger/3088/1210/1600/Cape1%20-%20cob%20wall%202.jpg>
- [20] Figure 14- Model