

Sustainability Lesson Learnt from the Traditional and Vernacular Architecture

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Abstract—*The vernacular and traditional buildings are supposed to be climate responsive, use of local materials, and designed in context with culture and social aspect and above all economical aspect. The sustainability in present context has similar goals as vernacular and traditional, the difference lies that sustainable design elaborate more in detail the criteria's of achieving sustainability and focus on measurable aspect of sustainability in the form of rating system.*

The present generation architects mostly have conception that vernacular and traditional solutions are incapable of solving the problems of modern buildings. This might be true to large extent but the vernacular and traditional buildings are developed throughout centuries and were able to sustain such long period, so there is need to understand the essence of these principles inherent in vernacular and traditional architecture.

The question arise that extent of application of these principles of vernacular and traditional in modern architecture. There are so many architects who try to imitate the vernacular and traditional architecture in their design as it is but there are architects who grasp the essence and modified these principles in modern context to suit the needs of present context. Mere imitating the the knowledge of vernacular and traditional architecture might become boring to the present needs of people except in few cases.

This paper will explore the work of architects who had grasped the essence of vernacular and traditional architecture and transformed these elements in such a way that these elements become new identity in architecture. The selected work will show case that for achieving the sustainability in present context, the traditional and vernacular knowledge could be very useful. It is up to the creativity of architect to apply this knowledge in present context. These selected works might reflects the mixing of the knowledge of vernacular and traditional architecture along with modern technology, materials etc.

Keywords: *vernacular, traditional, sustainability, rating system, identity, culture.*

1. INTRODUCTION

In 1987, the Brundtland Commission published its report, and given definition of sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations General Assembly, 1987, p. 43).

The overall goal of sustainable development (SD) is the long-term stability of the economy and environment; this is only

achievable through the integration and acknowledgement of economic, environmental, and social concerns throughout the decision making process

The goal of sustainable development is very wide as infer from the above definitions and almost dealing with all fields but it is important to establish the role of architect in sustainable devopment. Architects are supposed to design a built environment to full fill the sustainable goals. The main objectives are to preserve natural resources, use of alternate energy resource, use of renewal resources, to reduce the energy consumption in built environment, to reduce the environment pollution etc.

The objective of vernacular and traditional architecture is also based on local needs, local building materials, and reflecting the local traditions. This type of architecture is normally not built by formally trained architect but more rely on design skills and tradition of local builders. Most of the elements used in vernacular are outcome of function needs .On the other hand traditional architecture involves special type of building typologies such as temples, palaces or house for rich people. The elements used in traditional architecture are most of times functional but few elements also to be added for the sake of aesthetic reason, continuing the some tradition without knowing its functionality.

The both type of architecture traditional as well vernacular evolves throughout centuries. This is the reason that element used in these type of architeure are based on functional need most of times , taking care of climate , building material , social and cultural need of people as well economics . The technology involved in this type of architecture is very appropriate to the local needs.

The objectives of sustainable design in modern context are similar to vernacular and traditional architecture except the sustainable design in modern context are more sophisticate and more measurable. But due to similarity in its objective the study of vernacular and traditional architecture might help achieving the sustainability.

2. PEARL ACADEMY OF FASHION, JAIPUR, INDIA:



Fig. 1: Façade of building showing Jalli work.

The Pearl Academy of Fashion, Jaipur is being designed by Delhi based architecture firm Morphogenesis. This building is designed as fashion institute and the campus is situated on the outskirts of Jaipur city around 20 km away soulless Kukas industrial area. There were few challenges, the first one was budgetary constraints and the second one was to design contemporary sustainable building of modern era through use traditional design principles of the Rajasthan.

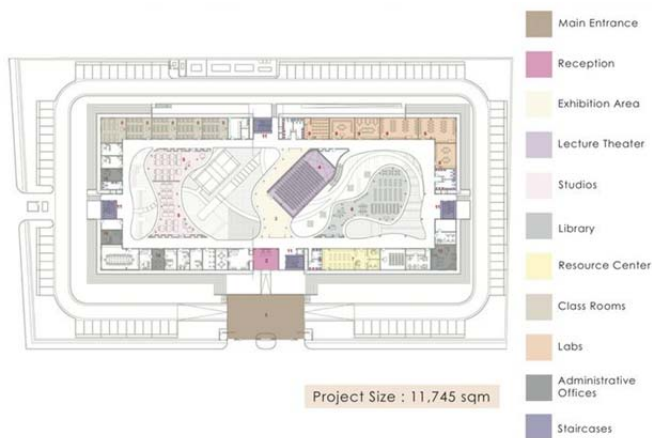


Fig. 2: Ground floor plan

The basic concept of this building is derived by using elements of traditional Indo-Islamic architecture and passive cooling strategies of hot dry desert climate of Rajasthan. The primary elements used are open courtyard, water body, a step well or baloi and jaalis (perforated stone screen).

The site area is not so large as compared to built up area and site surrounding have not interesting view. The building has been made completely introvert due to this reason and other reason lies in climatic consideration. In traditional architecture of Rajasthan, the building are not exposed to outside due to wind storm in desert, they uses jalis and buffer spaces such as verandah or corridor to main space. In similar way 4 feet wide

corridor is provided around the whole perimeter of building to act as buffer to reduce heat gain and the Jali is provided on the outer screen. This corridor also acts as service area for the whole building. Drip channels running along the inner face of the Jali allow for passive downdraft evaporative cooling, thus reducing the incident wind temperature.

The traditional architecture of Rajasthan used to have small courtyard, narrow streets because Self shading is essential in hot and dry climate. In a similar way, big courtyard is divided into small courtyards to create self shading and these small courts are only allowing sufficient lighting to building. This has been achieved through computerized analysis of shadow and lighting in the whole building. The courtyards are having organic shapes which create fluidity inside suitable to functional planning.



Fig. 3: Organic shape courtyard and water body.

The entire building is raised above the ground and a scooped out under belly forms a natural thermal sink which is cooled by water bodies through evaporative cooling. This concept has been brought through traditional baoli, the step well of Rajasthan. This underbelly portion is thermally banked on all sides and act as major node of recreation and exhibition for students. In the night when the desert temperature drops, this floor slowly dissipates the heat to surrounding areas keeping thermally comfortable.

The material used for construction is mixture of traditional as well modern materials. The traditional materials used are stone jalli and the earthen pot in the roof for insulation. This technique of using earthen pot in the roof for insulation is brought by traditional architecture of Rajasthan.

The building is designed self sufficient in terms of captive power and water supply, the concept of rainwater harvesting and waste water recycling is also done on the modern sustainable design principles.

It can be concluded that Pearl academy of fashion is perfect example of blending of the sustainable principles of traditional architecture and the modern sustainable design principles.

3. 72, SCREEN (OFFICE BUILDING), JAIPUR, INDIA:

This building has been designed by Ar Sanjay Puri and won so many awards at national and international level. Designed as a corporate office headquarters, the ground level houses a reception and conference rooms and all above levels are office area. The building is located in city Jaipur in India which has desert climate with average temperature in the day is ranging between 30 to 50 degree C throughout the year.

The site is very small approx 1075 sqm , so building is made like box due to setback and height restrictions but building has been given new dimension through a screen inspired from traditional “Jali”of Rajasthan.



Fig. 4: Entrance façade of 72 Screen

This screen is the essence of project and the project name is also named 72, screen. On the façade the planes are not straight but planes are folded in different direction and these planes are made up of screens. The concrete screens around the building are supported by a steel framework with projections that vary from 0.9 to 1.5m. This creates an external periphery space for plants at each level that will act as further insulation from the external heat creating cooler office spaces within. The screen is made up of glass reinforce concrete for its structural stability.

The staircase and toilet has been placed on the southern side to act as buffer to heat gain in the main office area.

It can be concluded that there is no need to repeat traditional elements in the same form as they were used in past but use them in present context and need of time . The concept of screen has been taken from traditional architecture but the form of building has been done in so abstraction that one never feels the same traditional architecture but the principles of jali is used very effectively to create the comfort condition.

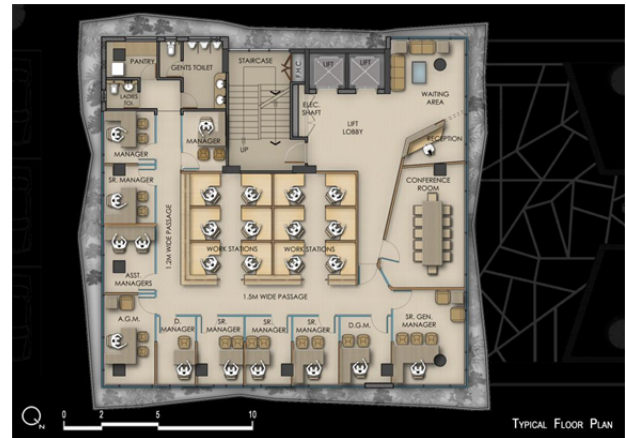


Fig. 5: Typical floor plan of 72 Screen

4. JEAN –MARIE TJIBAOU CULTURAL CENTER(1993-1998):



Fig. 6: View of complex showing pavillions

This complex is designed by famous architect Renzo Piano . This complex is designed as cultural center for kanak people and built in honour for the assassinated Kanak leader Jean-Marie Tjibao. It is situated on the island of New Caledonia in South Pacific. The site is situated on a narrow strip of land surrounded by the ocean and lots of lush vegetation.

The cultural center is modeled after traditional Kanak vialge and the pavillions were inspired by traditional Kanak huts .

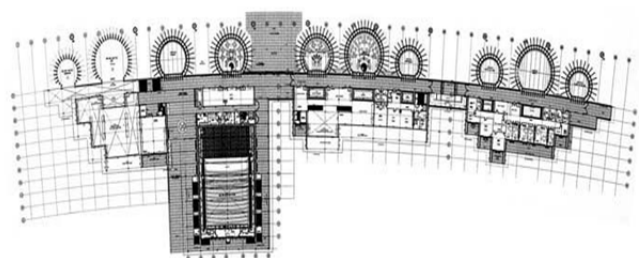


Fig7: Plan of Complex

Ten pavilions of various sizes ranging in height between 9 and 24 meters high are situated asymmetrically along a main path. Each pavilion serves a various function or evokes certain themes and includes permanent or temporary exhibitions. Some contain studios for traditional activities, such as music, dance, painting and sculpture. Also housed at the center is an auditorium, an amphitheater, the administrative departments, research areas, a conference room and a library.

These pavillions were inspired from Kanak huts , Kanak huts are having cricular in plan and used to taper toward top from the its base in conical shpaes . In similar fashion , the pavillions are circular in plan the form is similar in its essence but modified to needs of the present context.The form of pavillions have been worked out to provide the natural ventiation . There are four types of system provided for change of louvers position depeding on the speed of wind. The pavillions are made up of mixture of traditonal materials iroko wood , bamboo and the modern material steel ,glass. The tradtional method of costruction is adopted with sophisticated engineering .

5. ARAB WORLD INSTITUTE, PARIS, FRANCE (1987):

The building is designed by famous architect Jean Nouvel .This building has received Aga Khan award for architecture in 1989 and Pritzker award in 2008. The project was initiated through collaboration of 18 countries of Arab League and the French Government. The main function of institute is to research on Arabic and Arab world's culture and spiritual values. The site is located at the threshold of the historical peripheries of Paris along the River Seine.

The building is known for its façade detailing and he has used the advanced responsive metallic brise soleil on the south façade. This concept has been inspired by mashrabiyya (kind of jali work), an element of traditional architecture of Arab to protect the occupants from sun and provide privacy.



Fig. 8: Southern façade of Institute



Fig. 9: Interior view of institute showing light and pattern

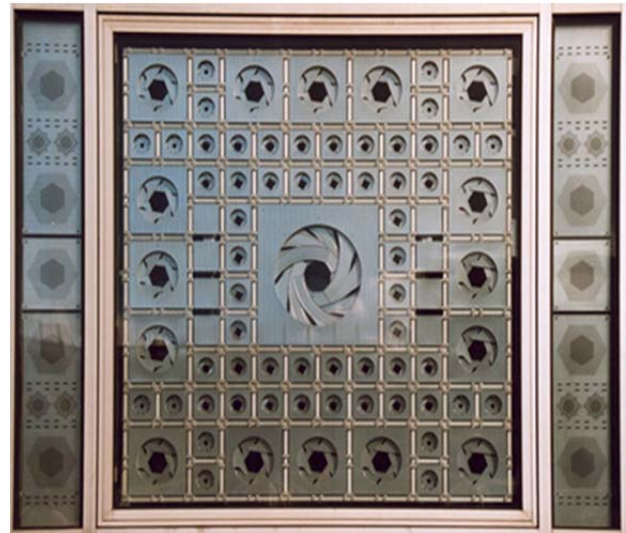


Fig. 10: Lenses on the southern façade for control of light

Nouvel has converted this concept into different dimension; he has used system which incorporates several hundred light sensitive diaphragms that regulate the amount of light to enter in the building. This has two advantages, one is solar gain in minimized and the other it creates patterns of light and shadow in the interior spaces for aesthetic purpose. In these lenses he has used various geometrical pattern of squares, circles and octagonal shape to create interesting pattern inside the interiors.

It is concluded that this building is showcasing the technological advancement of present context but the inspiration lies in traditional architecture. The traditional knowledge gives unlimited opportunity but it depends on architect to explore it in right context

6. SUSTAINABLE TOWERS, PRECINCT 4, MALAYSIA:



Fig. 11: External View of Towers showing the form

These towers are designed by Studio Nicoletti Associati and Malaysian architects Hijjas Kasturi Associates. The site is situated at Putrajaya waterfront known as Precinct 4, just 30km south of Kuala Lumpur. The towers are for residential development, the project is proposed.

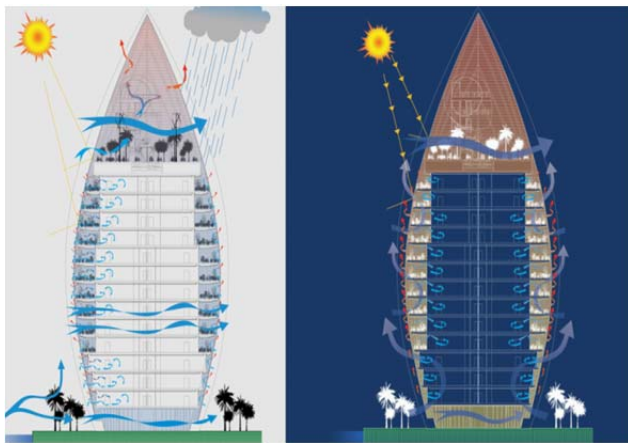


Fig. 12: Section of towers showing bioclimatic design

The design of these towers based on traditional Islamic architecture, marine-inspired structures and forms of blocks are designed keeping in mind of bioclimatic architecture. The main goal of architect (Hijjas Kasturi Associates, Malaysian architects) was to design buildings that tell of its place of origin which is culturally modern, Islamic and tropical in nature. The goal of master plan designer (Studio Nicolette Associates) was to provide a model for sustainable residential development inspired by the city's unique landscape includes an expansive artificial lake. The form of building also represent the fleet of ships and it looks these structures are floating in the sea.

The buildings are also designed keeping in view of sustainable development and an Italian based firm has worked out the details of terraces, sunshades, natural ventilation and integrated green space into the design. The buildings will utilize the alternate energy recourses for the most of its function and supposed to generate 50 % lesser CO₂ as compare to convention buildings in this region.

7. PRINCESS NORA BINT ABDULRAHMAN UNIVERSITY FOR WOMEN, SAUDI ARABIA:



Fig. 13: Eternal view of University

The university is designed by Perkins+Will and Dar Al-Handasah. This is the largest university for women in the world.



Fig. 14: Interior view of building in campus showing tradition features as well modern.

The campus is design based on the traditional principles of design Mashrabiya, intricate Arabic latticework and the use of water. The water features and the traditional elements not only beautified the campus but also act in moderating the climate of the campus. But at the same time campus has four LEED gold certified buildings. It uses the nearly 9 acres solar thermal

plant on the rooftop which is made it most sustainable campus in Saudi Arabia. Buildings are carefully positioned to utilize the maximum day lighting for energy efficiency.

8. CONCLUSION

Pearl academy of fashion has taken so many inspirations from traditional architecture such as use of jali, step well, sunken floor under the earth etc for its suitability in modern context. But at the same time project 72 screen uses only one feature i.e. traditional jali but it has been used so boldly that it has created its own identity only through one element. On the other hand Jean –Marie Tjibaou cultural center uses the inspiration of form of building from traditional architecture and detailing of these forms worked out in such a fashion so that the elements of form act as sustainable features. The Arab world institute also inspired from only one element i.e. mashrabiyya but in this case the architect has transformed these elements through technology to create new dimension of architecture. The other two examples sustainable towers, precinct 4, Malaysia and Princess nora bint Abdurrahman university for women, Saudi Arabia are also inspired by few elements of traditional architecture .

In the end it can be concluded that it is not important to imitate the whole of traditional architecture in one project but few elements of traditional architecture are sufficient to be inspired for suitability. All the projects dealt in this paper shows that these elements are not imitated in the same way as these were used in history but the architects have used their creativity to transform these elements in modern context.

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