

MICRO / MODULAR HABITATION DESIGN AND ARCHITECTURE AS SERVICE APPROACHES TO SUSTAINABILITY URBAN AS WELL AS SMART URBAN

GLOBAL CASE STUDIES

Increasing population in urban areas has put up additional pressure on urban and city resources. Housing, being in one of the three basic amenities required for human survival, is the worst hit. Widening income disparity, lack of space, and costly construction has added to the unhappiness. This has become a worldwide phenomenon and is posing challenges to Indian cities as well. To bridge this gap between need and fulfillment, can architecture be considered as a service? And rather than an end product; for those who need it severely and doesn't have capacity. A possibility is being explored to how the same can be planned? And we try to find out an opportunity to consider architecture as a service and plan micro habitats in the urban areas as an extension to the existing infra-structure.

At this stage 12 million houses are lying unoccupied across urban India. Between year 2001 – 2011, number of households increased by 60 million (187m – 247m) and number of houses rose by 38 million (250m – 331m) in India. In urban India, 38 million new homes were built as against 24 million new households [CBRE South Asia, (2015)]. It is evident, there is surplus growth seen in the real estate sector in India as against demand. But on contrary, there is a shortage of approximately 20 million homes in India. This shortage affects, the economically weaker section (EWS), the most. 95.6% of housing shortage is in EWS group. The average house prices in India's three metropolitan cities vis-à-vis, Mumbai, Bengaluru and New Delhi are \$203,602; \$134,690; and \$115,897 respectively. A large number of household's need for a house is unmet owing to high prices. Real estate sector has become a money making sector rather serving the basic need of humanity. Projected prices are being asked as against actual cost. It is not surprising to see why slums, unauthorized settlements, unauthorized additions in buildings, encroachments, etc. in and around urban areas are common. Nearly 30% of population lives in urban areas and this is rising every year due to migration from rural to urban areas for various reasons.

Housing, being one of the basic needs of human survival, is hit by soaring prices; lesser available space than ever, rising costs of materials and labor, stringent civic building bye-laws, etc. Further, income disparity, demand by increasing population, is making the whole thing difficult to get. Though Government of India is trying to frame policies to provide housing to EWS group, minimum one house per family, safeguard interests of people from builder lobby, etc., but scene is still the same. Policies such as Smart City are also initiated. This whole scenario of real estate sector in India, is giving a strong push to construction sector. A huge volume of almost every construction material is required, largest than ever. The push is observed in manufacturing sector, lifestyle changes, growing aspirations, consumeristic approach of living, etc. To meet such scenario, we may require concept of compact living [Sassi, P. (2006)] high density, with mix land use, access to facilities by choosing of end 'product delivery' or service rendered by the product.

Can architecture be delivered as a service to the end user?

Maybe if it can be separated as two entities of an end product and service. Since the cost of average house has gone beyond affordability limits of most, the economics behind housing needs may be in need of rejuvenation. A systemic innovation is needed to derive an economic model delivering habitation as a service to the needy in urban settings. The accessibility to the one of basic need may be extended to the wider audience by paradigm shift from traditional individually owned buildings to a commonly owned resource. The value is in decoupling it with traditional ownerships of bigger units than to make it smaller and decentralized. This would have distributed model of service delivery and exert lesser consumption and environmental impact due to wider distribution of users per unit of traditional space consumption. An increased social equity can be achieved in current scenario of

economic disparity and affordability challenges. Stakeholder configuration approach of SPSS [Vezzoli, C., et.al. (2014)] system design for sustainability shall increase interaction and participation of end users in the proposed habitation as a service satisfaction-system. A unit of satisfaction in habitation as a service can be defined as an end user having access to a living space for a given timeframe. It may include all products and services associated with housing needs and their fulfillment.

Further, collaborative services of community habitation and extended home can be developed based on particular housing infrastructure to share domestic resources and shared household activities for developing a model collective infrastructure system for social innovation and sustainability. Domains of building services like facility management, energy & utility, building automation & BIM, operations, maintenance & system integration can be distributed among the peers. Besides, spaces can be shared and utilized as multi user laundry, play areas, gardens, neighborhood library, parking, party places, laundry restaurants and guest rooms, etc.

Some case examples from across world are available in form of commercial hospitality accommodation services. The first to mention here was Nakagin capsule tower, Tokyo. It was designed by architect Kisho Kurokawa and was completed in year 1972. It was a mixed use building having 11 & 13 floors in two tower structures. It had 140 self-contained prefabricated capsules for stay. Lately similar attempts are made in Osaka, Mumbai, Hong Kong and New York, etc. Extremely small rooms (capsules) intended to provide economic overnight accommodation, fitted with modern automated amenities are coming in vogue.

Micro apartments are being planned in concrete pipes to ease out negative and leftover urban spaces to ease congestion of cities. Stackable, modular, 3D printed composite units with prefabricated units are used on scaffolding on a dead wall of an existing building. At present it may not look like a permanent solution but at least it offers a temporary relief of the crisis for people who are in need of affordable habitation in shorter time. The effort may not be sufficient in its present form but establishes a dialogue in the bigger conversation of the above stated problem.

What if the same concept be implemented in regular housing schema of habitation in urban settings?

You explore the creative planning in relation to human needs of habitation to the present economic ecosystem in urban areas. Intervening on buildings as a product and habitation as a service is at the second level of increasing potential role for design in approaches to sustainability.

THE SCENARIO OF COLLABORATIVE SERVICES

The collaborative services in housing can be shared at two levels of community and house.

Tentative design for social innovation and sustainability

- Community Housing based on particular housing infrastructure, which could allow for sharing domestic resources. Since the cost of everything is rising every day, affording a host of resources are proving to be costly and is not allowing possible use of the resource to its optimum limit.
- Extended Home whereby a share of household activities are outsourced to collective infrastructures in the vicinity. The neighborhood and vicinity become more serviceable and usable thus integrating the society. This increasing the interaction and a formal structure of management emerges at micro level. The recent phenomenon of gated community is one of the nascent examples at much smaller level sharing very few things such as security and outdoor open spaces only. In the next version of integration of many more services which carry the potential to optimize on possession cost/maintenance and resource usefulness at larger perspective on sustainability factors.

ARCHITECTURE AS A SERVICE

Domains of Sustainability and their Impact on Micro Habitation (EWS)

- Environmental aspects

As a consumer the EWS sector could share resources and consumables in small groups as compared to individual, some sharable entities are listed below, apart from these, material consumption

against infrastructure could also be lowered. Shared thermal comfort, control on GHG emissions, energy consumption, etc can be lowered.

- Social aspects

The concept could bring together a group of unknown people sharing common resources and brought together with a common cause. Promoting well-being and creating support group for material as well as emotional needs of people. The quality of relationships created through this group could play vital role in mutual growth and development.

- Economical aspects

A long term economic growth can be achieved by sustaining the social bonding and economic model based on mutual cooperative structures. A whole new model of economic sustenance can be developed and better opportunities can be created for people belonging to EWS. Over a long term a stabilized level can be achieved by them proving the worth of cooperative formats of helping in group. Several NGOs are working for empowerment of low strata people, they may get an opportunity to work with them easily.

Spaces

- Community Housing
- Multi user laundry
- Playgrounds
- Gardens
- Neighbourhood library
- Parking
- Extended Home
- Party place
- Laundry restaurant (Combining two unconventional activities)
- Guest rooms

GLOBAL CASE STUDIES: DESIGN OF MICRO HABITAT HOTELS IN URBAN SETTING

Japan

Nakagin Capsule Tower, Tokyo was the first example of Capsule Architecture by Architect Kisho Kurokawa

[Source: Wikipedia]. The project was completed 1972 and it was a mixed use building with two towers of 11 & 13 floors each. The building has 140 self-contained prefabricated capsules of 2.5 m (8.2 ft) by 4.0 m (13.1 ft) sizes with a 1.3 metre diameter window at one end and functions as a small living or office space. The cubes can be connected and combined to create larger spaces. Many such other projects came in existence later in other cities of Japan such as Osaka where modular plastic or fiberglass block roughly 2 x 1 x 1.25 m with amenities like TV, an electronic console, and wireless internet were provided. Luggage is stored in a locker; and washrooms are common on the floor. Later extremely small "rooms" (capsules) intended to provide cheap, basic overnight accommodation (US\$ 18-37) a night were designed in Capsule Hotel 9h in Osaka.

India

Urbanpod Hotel, Mumbai is the so called next generation smart hotel came up for the first time in India. Its strategic location and new concept has caught attention of people and it remains booked in advance. It is mainly popular with new age travellers looking for personal and business travel to the city. The unique experience provided this hotel is the USP. It taps on the conventional hotel industry with providing all regular functions with amazing and convenient solution in much optimized way in space, consumption and energy needs. It offers an exclusive Ladies Only floor also for the ease of female travellers. Preabricated pods are installed in area from 50 to 90 square feet to suit various needs for individuals and couples. It adopts technologically superior interior finishing and common lockers and washrooms.

Hong Kong

Urbanovation, Hong Kong are the micro apartments in concrete pipes designed to ease Hong Kong's housing crisis [Source: Dezeen]. It is an amalgamation of Urban environment with Innovation. Hong Kong studio James Law Cyber tecture has developed a prototype for low-cost, stackable micro homes in concrete pipes, which could slot into gaps between city buildings. Called OPod Tube Housing, the project sees 2.5 meter wide concrete water pipes transformed into 9.29-square-meter homes, with doors that can be unlocked using smartphones. Hong Kong is currently facing a major housing crisis, due to a rising population, a high demand for accommodation, skyrocketing property prices, and land limited by the city's island geography. The 2017 Demographia International Housing Affordability Survey ranked Hong Kong as having the least affordable housing market in the world. Law doesn't see his proposal as a permanent solution to the crisis, but he believes his design could provide temporary relief for residents looking for something affordable in the short-term. It appeals to "young people who can't afford private housing". It is proving to be an effective social experiment in architecture to provide sustainable temporary and semi-permanent accommodation needs to the economically sensitive segment of society.

New York

Pods from New York are Framlab proposed parasitic hexagonal pods to sleep New York's homeless [Source: Dezeen]. Empty walls could be covered with honeycomb-like clusters of pods to house the city's growing homeless, proposal by creative agency Framlab formed by building walls to create temporary shelters. Construction of scaffolding onto windowless facades across the city, and slotting the hexagon-shaped modules inside. Outer aluminium shells intended to withstand harsh weather, which would encase inner 3D-printed wall structures made from recycled polycarbonate. Proposal would not solve the homeless crisis in its entirety, but it is important for Architects to be a part of the conversation is. "It critical that the design community is part of the social development.

5.5. Critical Evaluation of above Case Studies

The concepts offer a time bound solution to the situation and tries to utilize existing resources and infrastructure. The lack of habitable spaces in urban areas is in a crisis and a huge number of people find themselves far behind the purchasing capacity of real estate. It saves from filthy, unhygienic and chaotic slums. The concept offers a modern solution with a dignified living environment. Besides, people in a short term requirement for living space may find it suitable for them. It is evolving from hospitality sector to residential needs which validates the need for such service based solutions for the needy.

The approach itself seems sustainable however ownership of units remain public and not individual. This may cause a mental stigma to first get into this and later to move ahead beyond it and own a individual space. This seems perfectly fine with the thematic approach of this concept. The solution doesn't offers for a living of full size family either. It is actually does not offer a permanent solution rather a temporary or semi-permanent stop by in journey of person which sounds fine keeping in mind the floating population of major urban cities of the world today.

COMMUNITY HOUSING

Instead of owning everything from bedrooms to service areas like laundry, parking, etc., the concept of community housing is evolving of shared areas and services in the building. It saves a lot in terms of individual ownership and put valuable resource to its optimized usage over time. Why a washing machine runs only once a week to serve a family? Why can't it run every day and serve a set of seven families in the neighborhood? Eventually high cost of living and maintenance is pushing many of such amenities to go service based rather than product based. From ancient times also, there are innumerable common baths, recreation areas, and shared meal halls. Paper intends to explore idea of developing community spaces in the regular built-environments on the similar lines of proving accommodation in transit (hotels).

The creative Planning in relation to the individual and to the ecosystems suggests a holistic, broad minded, multi-disciplinary, and creative inputs for problem solving. This attitude may come to the rescue of various common problems from across the world such as related with consumerism patterns and product culture. The sense of ownership of a product may be replaced partly by sense of service because it is the sense of fulfilment from the product, we are looking for, rather than the product itself. This could be the approach for future living. Instead of owning a big house, it may be taken as a flexible space for living when required in a resource optimized environment.

DESIGN OF MICROHABITATS IN URBAN SETTING

Two main challenges remain for development of an ecosystem are geographical and temporal challenges. The evolution and development of design revolves around these to function over time. As the populations are increasing, resources are falling short, time is getting scarce, lifestyle is changing to minimal & direct, material science is getting advanced and technological feats are achievable – it is imperative to frame an 'Umbrella Approach' towards design and development of living systems for inclusivity. As suggests, architecture and design of human habitat has to develop from eco system and behavior of individual to its corresponding ecosystem in relation to culture and industrial advancements. In current scenario of urbanism where things are getting smaller every day; a minimalistic habitation could bear the key to fulfill mammoth demands.

Intervention in urban spaces: The shared community living and interactions of domains is key to have harmonic behavior in the living system. Integration of process and systems engineering could create a cooperative environment to run the system effectively. The help from algorithms, automated computing and BIM could lead to minimal error smart city planning and its operations. The efficient energy and utilization of resources would lead to deliver AaaS as a fulfilment.

Materials and technology: The use of technological feats can be directly experimented and used in proposed settings. Context based designing, setting and scenario analysis, serving orientation, anthropometry, ergonomics, economics of scale, LCA of materials used and overall sustainable approach towards designing, construction/fabrication and usage are to be considered in pre planning stage.

It is a probable approach for habitation in urban areas in form of micro habitation is being served by capsule hotels in Japan and several such alternatives are cropping up worldwide. Whether it is India, Hong Kong or New York, etc. The design concepts and executions are coming up. These are the reflections of ongoing phenomenon. It is a combined approach for bifurcating delivery of architecture as a product or as a service should be from both 'item ownership-specific' and 'need fulfillment-specific' approaches. Some advantages and disadvantages over the other but in overall terms, a satisfied need finds more importance and serves effectively on sustainability parameters. General action plan for the designing process of a product- service system may be framed, where sustainability-orienting tools can be integrated into the various stages of the design process, policy frameworks and implementation.

