

HOUSE THAT!

MOVING BEYOND CONVENTIONAL HOUSING

A Cushman & Wakefield Research Publication



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INTRODUCTION

India, the world's largest democracy, is on the threshold of becoming an economic power in its own right, metamorphosing into a much sought-after investment destination. As India opened its doors to globalization, liberalization and privatization, it heralded an era of economic growth positioning itself as one of the fastest growing economies of the world. While the global economy undertook a tumultuous ride with the global financial crisis muting growth rates across countries, for the most part India managed to remain unscathed, as compared to other countries. However, global conditions resulting in a slowdown in manufacturing rate and rising inflation dented macro-economic growth and development in the country.

After years of tepid growth, reforms and initiatives by the Narendra Modi-led Central Government are now paving the way

REGULATORY EASE

- Easing processes for doing business in India by faster clearance of projects and adopting single-window approval. The Indian Prime Minister aims to bring India to Rank 50 from 142 on World Bank's 'Ease of Doing Business' index
- Increased Foreign direct investment in key sectors of Insurance, Defence, Railways and Construction is expected to spur growth in these sectors
- 'Make in India' initiative launched last year to develop India as an investment destination and a global hub for manufacturing design and innovation
- Higher Infrastructure outlay for roads and railways for modernization and expansion, apart from job creation. Government has planned to spend more than \$1 trillion on infrastructure in the next five years
- Plan to build 100 new 'Smart' cities that will also serve as twin cities or satellite towns. Development of these urban centres will result in building the requisite infrastructure and a favorable environment of development and job creation.
- Imminent introduction of the GST Bill, which is at destination-based, indirect tax to be levied on manufacture, sale and consumption of goods and services. Once implemented, GST will make the country a unified market, replacing most indirect taxes that currently exists, with one tax.
- The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (Amendment) Bill, 2015, popularly known as Land bill is expected to expedite pending infrastructure projects in the country.

for rejuvenating the Indian economy, thereby positioning India as a globally competitive market offering greater business opportunities.

India's growth is expected to accelerate in the coming years on the back of higher GDP forecast and improving economic outlook. Optimistic economic sentiments, tapered inflation and the government's increased focus on the housing sector is set to provide ample opportunities for investment.

The urban population in India which is growing at a significant pace poses many a threat to the existing infrastructure, land and other resources. As per estimates¹, the urban population in India may reach 600 million by 2031 (over 50% of the total population), from 377 million in 2011. According to the 12th Five Year Plan, the government estimated the total urban housing shortage at 18.78 million units. This shortage based on Socio-economic category bifurcation comprises of 56% by Economically Weaker Section (EWS) and 39% by Lower Income Group (LIG). Less than 5% is contributed by Middle Income Group (MIG) and High Income Group (HIG).

India's burgeoning middle class and upper-middle class, comprising of a large youth population is seeing its preferences constantly evolve. Well-travelled citizens and an increasing exposure to global lifestyles have led to a change in the way Indians live.

While one set of the country's population has high aspirations, inspired by a global culture, there is another group -- the Low income group (LIG) -- that is still in need of a roof. The emphasis on affordable housing in India has never been stronger with the government's ambitious "Housing for All by 2022" initiative. For greater participation from developers, although the government needs to provide incentives to them, the bigger challenge lies in bringing about a change in the mindset of the private sector.

DEMOGRAPHIC BOON

- Half of India's 1.2 billion population is under the age of 25
- India's middle class of 250 million already represents one of the biggest consumer markets in the world
- By 2020, India will have the world's youngest population, with a median age of 29 years

Source: Census 2011; 'State of the Urban Youth, India 2012: Employment, Livelihoods, Skills,' by IRIS Knowledge

1. The High Powered Expert Committee (HPEC), 2011

As per Cushman & Wakefield research, affordable housing² demand across seven cities is around 535,400 units. Keeping in mind the high demand in this segment, it is time that developers change their perception about affordable housing development, since its success lies in the scale of operations, compared to the Middle Income Group (MIG) and High Income Group (HIG) which have higher margins that drive profits. As a primer for increased residential activity that is forecast over the long term on the back of increased focus on housing, this report endeavors to evaluate and present housing models and technology solutions that can be adopted by developers in a country where balancing the rich-poor dichotomy is of utmost importance.

Affordable housing presents a USD 11.8 bn opportunity in India across major seven cities, backed by demand in these cities

2. This opportunity is based on the demand as ascertained by Cushman & Wakefield for units in the range of INR 2-5 million (USD 31,300-78,300) in these cities, except for Mumbai where the price range is between INR 5-7 million (USD 78,300-109,700). Seven cities include Bengaluru, Chennai, Delhi-NCR, Hyderabad, Kolkata, Mumbai (MMR) and Pune.

While the Affordable housing segment faces an acute shortage in supply, the high-income groups have been marked by slow absorption of housing units, developers could look at exploring innovative solutions that could inspire confidence in consumers to take the plunge. This can be done by designing innovative residential models that take into consideration the paucity of space in urban centres, and the unmet demand for low-cost housing, while yet catering to market segments that have an appetite for promoting sustainable living.

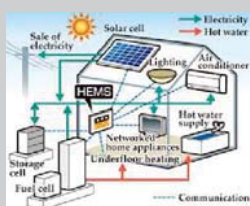
The following table outlines models and ideas that present various opportunities for developers, and have been discussed in detail in subsequent sections of the report. Some of these models may require a fresh look from the government as they may necessitate certain regulatory actions post discussions with all stakeholders.

IN A NUTSHELL



LOCALIZING GLOBAL SOLUTIONS

- Micro housing
- Co-housing
- Rental housing



INNOVATION-BASED HOUSING MODELS

- Prefabricated construction
- 3D printed apartment construction
- Passive houses
- Smart homes
- Bamboo houses
- Earthquake resistant development



LIFESTYLE-APPROACH BASED HOUSING MODELS

- Branded residences
- Theme-based projects
- Second homes
- Service apartments



SPECIALIZED HOUSING MODELS

- Student housing
- Senior living
- Affordable housing
- Mid-segment housing

LOCALIZING GLOBAL SOLUTIONS

Addressing local housing issues in a creative manner can help to develop a system of need-based dwelling. In a country like India where lack of space, especially in urban spaces is a major roadblock, developers need to embark on new ways and processes to tackle specific issues such as lack of space, high cost of land and construction costs, lengthy approval process related to creating housing. Most of the models are prevalent in mature markets of Europe and the United States, which lead the way in

terms of commercially viable models of innovative housing. Though the Indian market has a more traditional view when it comes to housing, a few innovative models of housing already exist in certain markets of the country, albeit in an unorganized manner and in a few instances have been modified to suit Indian sensibilities. The Indian government intends to address the housing deficit (especially for the EWS of the society) in the country by the 'Housing for All by 2022' initiative and has already introduced a framework for grants and subsidies to ensure its success. Developers and investors can make the most of this opportunity by evaluating various housing models that would solve the all-pervasive issue of space, as they try to bridge the gap between demand and supply in the housing



TINY / MICRO HOMES

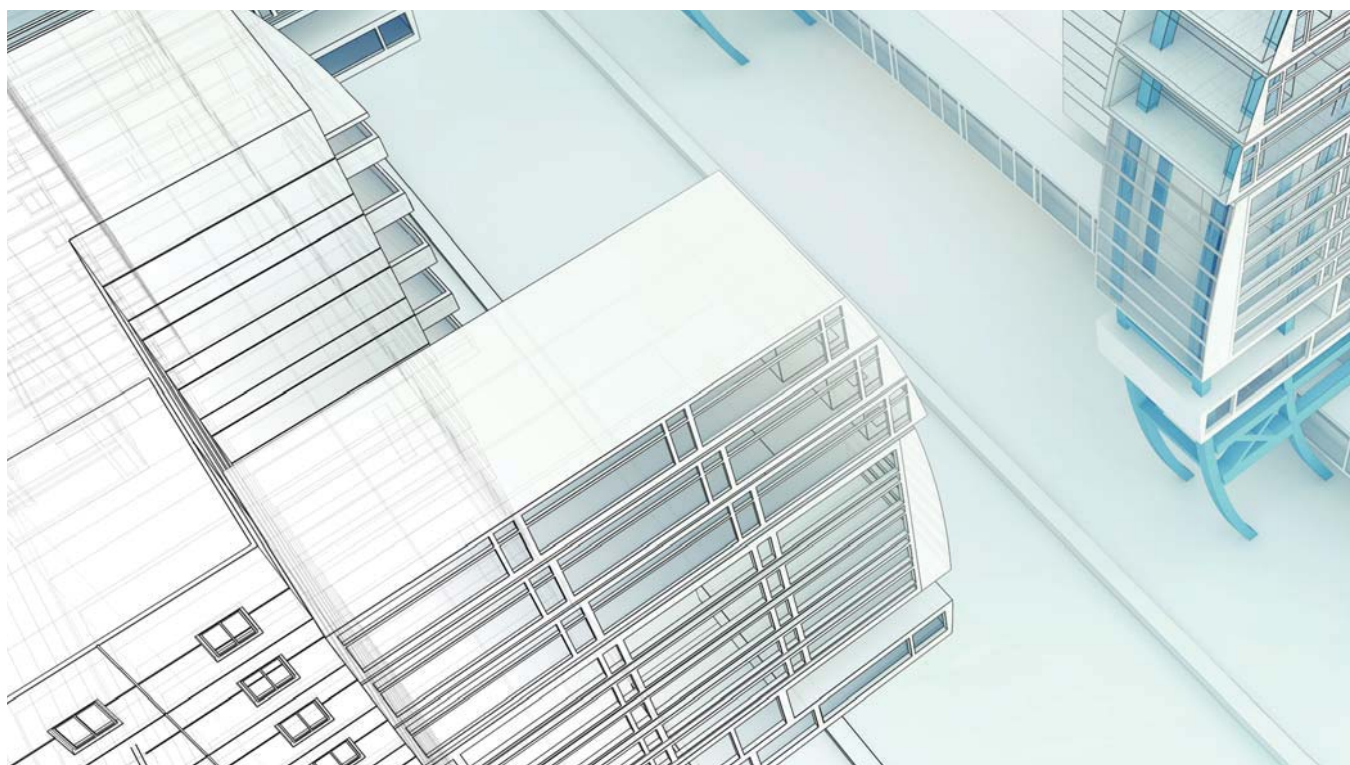
Concept: Micro homes address the housing shortage issues in the urban context through economical use of prime real estate property. Ranging between 100-500 square feet (sf) of space, these homes can be ideal for the LIG in urban centres that are faced with a dual-challenge of lack of space and low finances. Location is extremely crucial to the success of such projects, which need to have accessibility to public transportation that enhances overall mobility within the city. In a micro home, each family has their own room, while they share a community kitchen or washroom with others in the complex.

Implementation: In a densely populated country like India, compact homes can be developed in the form of small apartments that have common kitchens and bathrooms on every floor. While housing authorities like Maharashtra Housing and Development Authority (MHADA), Delhi Development Authority (DDA) have been constructing small apartments, the challenge lies in making these dwelling units more efficient. Developing on the existing concept of *chawls* that exist in some parts of the country, these micro homes can be made more efficient by providing quality fixtures like plumbing, electricity supply etc., ensuring ventilation and adequate green space. In mega cities like Mumbai and Delhi, the government and builders can focus on providing micro homes for the LIG by redeveloping

slums and old buildings in prime areas in city, or by offering small apartments in city peripherals that would have a source of livelihood in the vicinity.

By pricing new homes below INR 5 lakhs (USD 7,835), government can increase Floor Space Index (FSI-that indicates the basic permissible construction on the buildings) for redevelopment in congested areas like Dharavi in Mumbai and Chandni Chowk in Delhi that would lessen the burden on developers and make such dwellings viable. The builders, on the other hand, can offer units through a mix of subsidized and market rates offerings.

Challenges: Since the two main criteria for Micro homes are feasible location and amenities, having accessible and available public transportation and facilities like grocery stores, ATMs etc. are crucial for a successful project. While micro-homes are targeted at a single user or maybe a small family of 2-3 members, concepts like using a loft (which are a common concept in the European and North American concept of micro-homes) to use space efficiently may not be well accepted in the context of the Indian society, as it may be perceived as an invasion of privacy. India has still not been able to ensure fire safety practices in design implementation of high density building. Unless the regulations are strengthened, such high density construction may result in a risky proposition altogether.



VICTORIA STUDIO APARTMENTS

Victoria, British Columbia, Canada

OVERVIEW: Mike Gidora Place, located in downtown Victoria, is a four-storeyed mixed use development created by the Victoria Cool Aid Society. Victoria Cool Aid society provides shelter and support services for homeless people. The project was started in 1999 to serve low-income population and currently serves high-risk adult population receiving public rent subsidies. The city of Victoria provided land at an estimated value of USD 250,000 to the project that is spread over 14,800 sf. The project's total development cost stood at USD 4.1 million or USD 91,000 per unit and USD 277 per sf, including office space.

DESIGN: This project consists of commercial space on ground floor for administrative offices. Thereafter, each floor consists of a lobby space next to the elevator. This common space consists of couches and chairs and overlooks the courtyard. Additionally, there is a common outdoor deck in the fourth floor. Consisting of studio and one-bedroom configurations, the main floors are designed with high ceilings (approximately 12 feet in height) and a loft (4.7' to the ceiling) to give a sense of larger space and provide, ample natural light. The studio/small suites are spread over approximately 250 sf, comprising 186 sf of main floor space and 64 sf of loft space. These contain a 3-piece bathroom (sink, toilet and shower) and a fold-down counter/ table. The next set of units are the single-bedroom units that are spread over approximately 467 sf of main floor space and 92 sf of loft space.

CHALLENGES: The biggest challenge identified in the project was allocating and designing the common spaces for the residents. In order to test this project, the developers first created a model suite. Feedback was gathered from housing providers, potential tenants, service providers and municipal and provincial officials post tour of the model. These inputs were incorporated into the design. As a result, even before the construction began, Cool Aid had a resident waiting list.

CALHOUN PROPERTIES

Seattle, Washington, United States of America (USA)

OVERVIEW: Built in 2012, Calhoun Properties was among the first few companies to introduce micro-units in Seattle's Capitol Hill neighborhood with a complex named Videré. With an intent to provide affordable housing to students and young adults, these units range between 90 to 168 sf in size.

DESIGN: Each room comprises basic furnishings of a table, bed, chair and refrigerator, apart from a private bath area. The 46 units in the complex have common kitchens, and each tenant gets a locker in the kitchen to store food. Typical leases span for a period of three months, after which it is accounted for on a monthly basis. Rents ranged from USD 500-USD 675 with a security deposit of USD 450 a month, and the rent is inclusive of all utilities and broadband internet.

The property has only six parking spaces off the alley, but is close to bus lines connecting downtown with other lines. The company's single occupancy units are aimed at young adults. The application process that also states qualification criteria is simplified and made available in the public domain. Although the cost information of the project is not publicly available, a local newspaper article estimated the cost at USD 2 million in total development for one of Calhoun's projects, which adds up to USD 37,000 per unit.

CHALLENGES: While the creation of micro homes has been described as smart, there are some issues that have been voiced. Under Seattle code, such projects do not trigger environmental and design review, public notice and a neighborhood comment period. As a result, any public concerns and comments that could have existed could not be raised or considered before the implementation of the project. Moreover, such units can impact neighborhood parking because builders only add minimal parking spaces.

CO-HOUSING MODEL

Concept : The concept originated in Denmark in 1964, in search of alternative housing concepts. Since then, the model has gained wider acceptance and has been implemented in several counties. Co-housing model encourages a participative process, where residents actively co-operate in the identification of land parcel, formation of the design and operation of their own neighborhoods. Residents share chores and responsibilities, come together for meals and other activities in a common house, and make decisions based on consensus, thereby encouraging social interaction and investment in the greater good. Members have private, self-contained homes that can be supplemented by communal facilities, such as a common house, playrooms etc.

Implementation: The concept of co-housing can go a long way in bringing together like-minded individuals, who share common interests. Indians have strong societal and familial relationships, which is slowly giving way to nuclear families. With changing demographics, wherein India will have the world's youngest population by 2020, co-housing can cater particularly to senior citizens and the elderly, with an emphasis on MIG and HIG. Developing a community with equal participation from all members could be motto of such a model. Groups of 20-30 households can employ services of an architect to come up with a design for their society and share facilities like recreational rooms, dining facilities etc. Although in a slightly varied form, India has already witnessed the success of such a model in different forms-through co-operative housing societies in cities and towns, and through daily functioning of villages who share resources with other community members.

Such a model would not only highlight the importance of living close to family and encourage social interaction, but also lead to efficient utilization of resources. Co-housing as a concept can be woven into specific lifestyles of the economically disadvantaged groups. Several small scale industries, and home based economic activities like cooking, sewing, childcare are common among lower economic groups. Women choose home-based activities as it allows them to contribute financially while tending to their stereotypical roles of child care and domestic activities. Even if the concept is not centered on a common economic activity, the design must include a space for generating home-based operations to make it more applicable to the Indian context. This concept needs to be re-examined to apply to specific communities and community participation needs to be actively integrated to develop a model that is feasible.

Challenges: Despite pooling of resources, members need to custom-design the community, apart from hiring architects and builders. Another aspect is the potentially steep membership dues and higher maintenance costs that may make co-housing unaffordable for most. Beyond monetary issues, there are other potential disadvantages that plague co-housing ownership. While most members enjoy the social benefits, co-housing can also be invasive and restrictive with regards to privacy and individualism. Additionally, owners may not have complete control over their property should they decide to sell since many communities have right to first buying refusal.

N-STREET HOUSING

Sacramento, USA

OVERVIEW: In this housing plan, 13 out of 16 houses in an existing suburban site were transformed into a co-housing concept. Part of one of the houses in the neighborhood was transformed into a common community space.

DESIGN & OPERATIONS: A large kitchen, living room and dining area were part of this common space and all the houses were connected by primitive walkways. This community comprised of a young population who were highly educated. N street housing held two monthly meetings, and some of the major issues dealt with were the operation and maintenance of the common house. Common house management, outdoor, food, tool, children, outreach and orientation were some of the committees that were organized within the community. Sharing a common meal, laundry activities, watch care brought the community together. The residents were generally happy with their private spaces and through the shared use of common space, they developed a close relationship with one other.

SOUTHSIDE PARK COHOUSING

Sacramento, USA

OVERVIEW: This community consists of 25 households occupying 1.37 acres within a 15 minute walk of downtown Sacramento, California.

DESIGN & OPERATIONS: The dwelling size ranges between a 640 square feet (sf) single bedroom unit to 1,475 sf five-bedroom unit. Initially, a core group of 11 households hired a project manager and consultant to search for a site in downtown. Then, the group hired an architect and a co-housing company to establish site plan, three years after which the construction began. Now, the community has been developed as mixed-income complex with low-income (5 units), moderate-income (6 units) and market-rate (14 units) filling out the unit mix. Homes are grouped around shared facilities for dining, recreation, laundry and gardening. As residents reduced costs by deciding on amenities early in the process, the homes feature hardwood floors, wood siding and porches. Every owner/member files a work contract on a regular basis, describing the responsibilities they are willing to undertake to keep the community functioning. Responsibilities are voluntarily shared or rotated by the participants in small and/or large groups.

RENTAL HOUSING

Concept: Rental housing entails providing housing options to individuals/households that cannot afford houses. Rental housing is imperative to address the requirement of low-cost housing in India, wherein rapid urbanization is resulting in migration of youth population with low income.

Implementation: Rental housing can be a preventive measure against proliferation of slums that have so long provided informal housing to those who cannot afford to buy. Developers could look at providing housing options to this population that has long been ignored. This could be done through the concept of 'rooming houses' that exist in countries like the U.S. and Australia. A rooming house consists of a single-room occupancy wherein most of the washing, kitchen and laundry facilities are shared between residents, which may also share a common suite of living rooms and dining room, with or without board arrangements. Although in the U.S., rooming house lease agreements typically run for very short periods, usually week to week, or a few days at a time, this could be tweaked in India by comprising a longer lease period, providing furnished or semi-furnished rooms so that tenants need not keep transferring fixtures.

With increasing pressure on urban centres, which are already facing a paucity of quality space, there is immense scope for promoting rental housing in the country. To promote rental housing, the Government should provide incentives to investors, such as lowering interest rates, and providing tax breaks as the Indian market yields tepid rental incomes. This would give a significant boost to rental housing segment in the country, and help increase rental supply in the metros. There is some silver lining seen in the form of the Model Tenancy Bill, 2015, drafted by the Housing and Urban Poverty Alleviation Ministry that attempts to ward off some archaic rules that govern this sector. It proposes an independent authority for registration of all tenancy agreements and a separate court for resolving disputes, a major problem in a country where thousands of rent-related litigations are pending in courts. This move would further encourage rental housing in densely populated areas.

Challenges: Lack of comprehensive Rental Housing Policy promoting the concept has hindered developments. The mindset of developers who primarily build properties for sale need to be changed by incentivizing them in a market scenario where cost of capital is high and sales volumes are relatively low.

KOREA LAND & HOUSING CORPORATION

South Korea

OVERVIEW: South Korea government policy encourages rental housing development through legislative measures and organizational support. The government oversees the development and management of rental housing through its agency- Korea Land & Housing Corporation (KLHC).

OPERATIONS: In 2008, KLHC supplied 80,000 rental housing units for the urban poor. For making these rental accommodations affordable for the urban poor, KLHC sets rental rates that are discounted by 5-40% to the prevailing market prices. The agency strongly promotes private sector partnership. Furthermore, the legal instruments encourage rental housing as an option amongst home seekers and provide a formidable development of private sector rental business. These include (i) the Tenant Protection Law that reinforces tenant's rights to adequate living accommodation, (ii) Apartment Management Law that facilitates effective management of multifamily housing complexes and (iii) Rental Housing Construction Promotion Law that promotes private sector led large scale rental housing units including incentives to potential investors. The country also has a well-established Industrial Policy that mandates every Company towards obligatory function in constructing hostels and sponsor accommodation to their workers so as to increase productivity and reduce travel time for their workers.

CHALLENGES: The policy fails to take into account the regional and household characteristics in the assistance criteria. This has led to inequitable distribution of the benefits from public rental housing in the country.

Limited space and soaring costs in urban centres need to give way to imaginative thinking by the government, planners and the private sector. Abroad, countries have adopted temporary living arrangements to solve immediate needs of the people. For example, the United States has witnessed the mushrooming of accessory dwelling units, under which a separate housing space is created, along with an existing one. It relates to having a second small dwelling on the same grounds that is attached to a regular single-family house, such as an apartment over the garage, a tiny house in the backyard, or even a basement apartment. Another interesting way of optimizing space has been seen in Japan, where a high number of the unemployed population live off internet cafes that offer accommodation and a permanent address which is cheap.

There is immense scope for a wide array of collaborative efforts between the public and private stakeholders that can address inherent structural challenges. Apart from adopting innovative housing models, the Indian real estate landscape can further evolve once developers start incorporating technological innovations in construction.

INNOVATION-BASED HOUSING MODELS

The central government's ambitious project 'Housing for all by 2022,' is a daunting task, given the current slow pace of developments and the usage of conventional construction methodology. Technology can play a pivotal role in bridging the gap between housing demand and supply. Innovation driven by modern technology can help in achieving the target of "Housing for All" and at the same time reduce the harmful impact on the environment, paving the way for sustainable living. Additionally, with the adoption of modern technologies in housing sector, the life of citizens can be made much simpler and safer. Some of the

technologies which are being used currently across the world are prefabricated construction, 3D printed apartment construction, passive houses and smart homes. These are more predominantly used in developed regions such as Europe and North America.

In India, modern technology for the housing sector though available, is implemented selectively owing to limited awareness. Significant investment needs to be made in adapting modern construction technology to achieve economies of scale, which in the long run can be very fruitful for a sustainable living environment. Although most technology innovations are expensive to adopt for affordable housing in India, once the pace of adopting these technologies increase, their cost could be relatively economical. Some of the innovative methodologies driven by technologies and design which are being implemented in real estate sector across the world are described below:

PREFABRICATED CONSTRUCTION METHODOLOGY	3D PRINTED APARTMENT CONSTRUCTION	PASSIVE HOUSES	SMART HOMES	BAMBOO HOUSES	EARTHQUAKE-RESISTANT DEVELOPMENT
					

PREFABRICATED CONSTRUCTION METHODOLOGY

Concept: Prefabricated construction technique involves pre-casting major components of the structure (such as the roof, walls etc.) either in factories or at the temporary plants located at the project sites. The precast components are transported to the site where these are hoisted together to form a complete structure. It involves Computer Integrated Manufacturing (CIM) which integrates the production process by using computers in a controlled environment. The concept of prefabricated housing has been around since the early 19th century. However, it remained a prototype for many years due to high costs involved, lack of consumer demand and building regulations. The world's first prefabricated apartments were pioneered in Liverpool, and became popular during the Second World War due to the need for mass accommodation for military personnel. The technique underwent continuous enhancements to meet building standards, after which demand picked up in Europe and USA after the year 2000.

Implementation: Prefabricated construction method is much faster and durable as compared to the conventional method of construction that requires skilled labor force in huge numbers, which may not be always available. Hence, the prefabrication technology (which involves computer integrated manufacturing and reduces dependence on manual labor) can help in speedy construction and thereby result in timely delivery/completion of projects. The buildings constructed through this method can also be built to address specific requirements such as making them fire, water and sound resistant. In densely populated regions in cities such as Delhi, Kolkata and Mumbai, the use of this technology can result in less hassle and reduced air and noise pollution at the construction site and nearby residential developments. The technology can be used on a large scale for rehabilitation of slum dwellers and redevelopment of residential colonies such as Katras in Old Delhi, Baiganwadi, Geeta Nagar, Ambedkar Nagar and Dharavi in Mumbai which are some of the largest slums in the world.

Challenges: The prefabricated construction technique requires large scale production of prefabricated modules to keep the costs

under check. As prefabricated structures are similar in design, the technique offers limited customization and flexibility which a customer looks forward to in a high-end or luxury apartment. Also, it may sometimes get difficult to transport large prefabricated modules to a construction site located in

congested areas with narrow roads. Additionally, it requires skilled labor force to use the heavy engineering machines and equipment, along with the technical expertise required in factories to operate and supervise the manufacturing process.

MINI SKY CITY

Changsha, China

OVERVIEW: The Broad Sustainable Building Co. in China has built an entire 57-storey, 1.9 million square feet (msf) building in mere 19 days. The project comprises 800 apartments and office space for 4,000 people.

DESIGN: The environment-friendly project has 19 atriums, each 10 metres tall. Before the construction began at the site, the company spent four and a half months to fabricate the 2,736 modules used in the building. Then these large modules were taken to the project site to be stacked on top of each other to complete the structure. The power, heat and cooling systems have been integrated along with a three stage air purification system. This leads to lower particulates with seven air changes per hour and 100% fresh air, which then runs through heat recovery ventilators. The indoor air is claimed to be 100 times cleaner than outside air. The project is expected to result in 12,000 tons of carbon dioxide reduction annually and at the same time 80% more energy efficient. The building, which is earthquake resistant, is equivalent to 6.6 lac tree plantation in terms of its environmental impact. The project construction by this method led to reduction of 15,000 trucks of concrete transportation. The same company is planning projects in similar category and using same technology at a larger scale with even taller skyscrapers to cater to the growing need to build residential and commercial office spaces in less time.

PRAGATI AT PAREL

Mumbai, India

OVERVIEW: Pragati, a residential project which is a joint venture between Omkar Realtors and L&T Realty was developed to rehabilitate slum dwellers. The project, which is India's first prefabricated high rise residential development, is located at Bhoiwada, Parel with a total built up area of 1.2 msf.

DESIGN: It was a challenging task to build the 24-storeyed residential towers using precast large wall panel system as the location falls in seismic zone -3 where the probability of earthquakes is high. EDRC (Engineering Design & Research Center) has adopted the precast concrete construction method for the housing sector by establishing a dedicated engineering team for providing design support in co-ordination with architectural, structural and MEP teams from Singapore, Finland and USA designed the structure for this significant project. This marks the success and viability of using precast technology for residential buildings in India. By 2013, the company handed over about 3,500 apartments to slum land owners. Erection of superstructure elements of three towers was completed in 12 months. The superstructure consisted of 1,012 dwelling units in total and the average erection time was three dwelling units per day. The company completed the project on time since the prefabricated modules were manufactured in factories in a controlled environment, which led to 30% lesser construction time, compared to the conventional construction methodology.

3D-PRINTED APARTMENT CONSTRUCTION

Concept: The process of constructing a physical object from a three-dimensional (3D) digital model has been touted as the trailblazer of the future. Additive manufacturing, or 3D printing – the process of fabricating solid objects from digital models – has been around for more than two decades. In an additive process, an object is created by laying down successive layers of material until the entire object is created. Each of these layers can be seen as a thinly sliced horizontal cross-section of the eventual object. This virtual design is made in a CAD (Computer Aided Design) file using a 3D modelling program (for the creation of a totally new object) or with the use of a 3D scanner (to copy an existing object). A 3D scanner makes a 3D digital copy of an object.

Implementation: 3D printing involves creating a 3D digital design and sending it to the printer, where it is translated into a code file that slices a 3D design into thin layers. The printer also contains the building material like cement. The material is melted or liquefied within the printer, and the printer follows a layer by layer path until the object in the 3D digital design is completely constructed. The layers build upon one another and solidify as they cool. While there has been a raging debate whether 3D printing can help bridge the world's housing shortage, last year a Chinese company claimed to have printed 10 houses in 24 hours. Earlier this year, the company unveiled a 3D-printed 1,100-square-metre villa – and a five-storey apartment building. This process is said to save about 30-60% of construction waste, lower production time by 50-70%, and decrease labor costs by 50-80%.

The Indian market would have to wait and study the implications of such a futuristic technology process. If deemed successful, 3D printing of construction of homes can go a long way in bridging the gap between supply and demand in various parts of the world. The cost savings from this process could help developers focus on the much-needed low-cost housing in the country. Additionally, in times of calamities, these printed structures could lead to speedy construction of temporary homes for the affected people.

Challenges: Concerns regarding the endurance of the structure need to be evaluated to understand the efficacy of the process. As of now, 3D printing cannot assure of the consistency in quality of the output produced. Apart from the highly advanced level of machines and printers required, 3D printing developers may not be able to benefit from economy of scale. The real test for 3D printing would be the degree of cost savings, how culturally appropriate the end products would be and how they compare to similar, locally-made alternatives.

WINSUN DECORATION

China

OVERVIEW: Chinese company WinSun Decoration Design Engineering Co. claimed to have used a 3D printer to construct 10 houses in 24 hours last year, using a proprietary 3D printer that uses a mixture of ground construction and industrial waste, such as glass and tailings, around a base of quick-drying cement mixed with a special hardening agent. Earlier this year, they built the highest 3D printed building, a 5-storey residential house and the world's first 3D printed villa. The villa measures 1,100 square meters and even comes complete with internal and external decorations.

DESIGN: The company claims its success is due to their unique and leading techniques – including their exclusive 3D printing 'ink,' which is a mixture of recycled construction waste, glass fiber, steel, cement and special additives. According to the company, waste from recycling construction produces carbon emissions, but with 3D printing, the company has turned that waste into brand new building materials. This process also means that construction workers are at a lower risk of coming into contact with hazardous materials or work environments. The 3D printing villa was specially designed for Tomson Group, one of the most well-known Taiwanese-owned real estate company. The total costs attached to printing this villa amount to more than 1 million yuan (USD 161,000).



PASSIVE HOUSES

Concept: Passive House is a building which is energy efficient, comfortable and at the same time affordable. The basic idea behind passive design is simple but an effective Passive house requires meticulous detailing during designing and construction.

More than 80% of India falls under hot-dry, hot-humid and composite climate. The vernacular architecture refined for centuries had several passive design elements to provide comfort. However, rapid urbanization led to design of buildings that requires significant usage of artificial lighting and air conditioning leading to increased carbon emissions. While including energy-efficient systems can reduce a building's need for electricity, it may involve considerable spending at the onset. Passive design techniques are usually very low-cost and require small changes during the design process itself.

Implementation: In a passive house, the heating/cooling cost is significantly lower as compared to a normal house, while maintaining a better indoor climate at the same time. A passive house reduces the carbon footprints to a great extent and

thereby helps in creating a sustainable environment. It makes efficient use of the sun and local wind flow patterns, to reduce the usage of conventional cooling systems, even during the hottest months. During hot and humid weather and in the summer season, passive cooling techniques such as strategic shading are used to keep the house comfortably cool. Despite significant research in vernacular and contemporary passive design elements, some technical, social and economic aspects along with the lack of awareness in modern society severely limits the implementation of passive houses. To promote Passive houses, the government should devise a methodology to incentivize the private sector for developing such projects by providing tax benefits or lower interest rates for developers to raise funds. Similarly end users can also be given tax benefits to opt for such homes.

Challenges: One of the major challenge is that passive design elements are not addressed with the same detail/gravity as active measures in building codes. Therefore it is necessary to develop benchmarks by addressing technical, social and economic hurdles for increasing the number of truly passive and climate-responsive buildings.

KANCHANJUNGA APARTMENT

Mumbai, India

OVERVIEW: Located in the tony Cumballa Hill area of South Mumbai, Kanchanjunga Apartments is a 32-storeyed reinforced concrete structure with open terraces. Designed by the Late Charles Correa, the building was constructed on the basis of Mumbai's climate and its culture.

DESIGN: In Mumbai, a building has to be oriented east-west to catch prevailing sea breeze and to open up the best views of the city. However, the hot sun and heavy monsoon rains typical of the region affect the same direction. To sort this, the erstwhile bungalow provided a ring of verandas running around the living areas. Correa provided the apartment tower with very deep, garden verandas, suspended in the air to achieve a similar effect. The apartment tower design involves interlock of four different apartment typologies varying from 3 to 6 bedrooms each with smaller displacements of levels. It also has typical open floor plans with double heighted living room for cross-ventilation. The central core is composed of lifts and provides the main structural element for resisting lateral loads. The central core was constructed ahead of the main structure by 'slip method'; a technique that was used for the first time in India for multi-storeyed buildings.

SANGATH

Ahmedabad, India

OVERVIEW: Designed by B.V.Doshi, Sangath which means "moving together through participation" is an architectural office that includes a research centre and community related facilities. The building which has spaces for design studio, reception area, library, workshop, conference room and other ancillary spaces, has been designed to suit the local climate.

DESIGN: Located in Ahmedabad where the summer temperature easily crosses 45 degrees centigrade, the building has been designed to naturally manage the interior environment. The building is largely subterranean to use earth mass for natural insulation. The vaulted roof form not only creates an efficient surface/volume ration but it also acts as an insulating layer by using locally made clay fuses. Deep external walls with hollowed out spaces provide storage space as well as improve insulation. To maximize daylight and to diffuse heat and glare, light is received in indirect manner by diffusing it. Microclimate is managed through extensive use of vegetation around the building. Rainwater and overflow of pumped water from the roof tank are harnessed through roof channels that run through a series of cascading tanks and water channels to finally end in a pond from where it is recycled back or used for irrigation purpose. The above measures along with several other design elements ensure excellent climate control in terms of keeping the inside cool (temperature difference of about 8 degrees centigrade) and increasing the time-lag for heat transfer.

SMART HOMES

Concept: A smart home can be referred to a well-furnished home with networking technologies & communication systems such as energy management systems, security & access control systems, Heating, Ventilation and Air Conditioning (HVAC) control systems, entertainment control systems, and health monitoring systems. All these devices help to connect the key electrical appliances with mobile devices such as smartphone and allow the users to remotely control, monitor, and access their residence. In short, a smart home refers to one which includes technology to allow the devices and systems to be controlled automatically.

Implementation: Smart homes are reliable and provide greater privacy, safety and security to residents as compared to a normal house. They help in reducing the carbon foot-prints and thereby make the living environment more sustainable for long term. As per a research done by Berg Insight, smart homes in North America and Europe together reached 10.6 million mark

at the end of 2014. Of this, major chunk (75%) are concentrated in North America alone. In contrast, in India there exists a few thousands of smart homes as of now. However, the smart home trend is likely to increase in the coming years as the government has set the target of developing 100 smart cities across India which would primarily be located along the industrial corridors. Going forward, research & development in Artificial Intelligence is likely to play a vital role in creating smart homes, which could help in the development of smart cities in India.

Challenges: Smart homes are an expensive option in comparison to normal homes. Due to its high cost, they are accessible to only the niche target segment which is the high income group. Another challenge is that upgrading an existing conventional home to a smart home could be difficult as the technology of various appliances or products can become conflicting and thereby may need to be replaced and integrated which would further escalate the cost. Use of technology itself can sometimes become complicated for home users.

GRANT PARK VILLAGE

Portland, USA

OVERVIEW: Every apartment in this building is installed with all the Internet of Things (IoT) technology. An IoT is the network of physical objects or things embedded with electronics, software, sensors, and connectivity to enable objects to exchange data with the manufacturer, operator, vendor and/or other connected devices. It allows objects to be sensed and controlled remotely across existing network infrastructure creating opportunities for further direct integration between the physical world and computer-based systems, to enhance efficiency, accuracy and economic benefit.

DESIGN: The apartment's home automation system works as per preset rules which are like programming the appliances which gets automatically generated as per the behavior, habits and characteristics of the members of the home. About 10 such rules are preset/preinstalled and additionally the system will start suggesting some rules after observing the lifestyle of the members. Although the apartments are not equipped with smart thermostats, the company is working on integrating that aspect too.

BEVERLY HILLS ESTATE

California, USA

OVERVIEW: This is a luxury property spread over an area of 23,000 sf and had to be constructed in just 14 months with all home automation systems in place. The cost of the property is a whopping USD 85 million.

DESIGN: VIA, a smart home automation system company has installed fully-integrated home automation system which still allowed the new property owner the possibility of further customization. The equipment racks were built offsite at VIA's Center of Excellence in Salt Lake City and then shipped to California. The property has a Crestron-automated home control system that includes lighting control, 24 audio zones, 18 climate zones, and two separate pool and spa controls. The private home theater with a seating for 18 people, is completely acoustically-treated inside and also acoustically isolated from the home's structure for sound abatement. Three high definition CCTV cameras are installed on the roof to project images of the spectacular view onto three 90" televisions installed into a recessed mirror in the basement lounge/bar area. The whole home can be controlled by just simple touch of a button. The shading, automated lighting, security, and other automation systems are customized as per the needs of the owners.

BAMBOO HOUSES

Concept: Houses are made of bamboo instead of other building materials such as steel, iron, brick and wood which makes them comparatively cheaper.

Implementation: Given the rising cost of construction, there is a dire need to identify and develop alternate, sustainable, safe houses at an affordable cost. Construction of houses using bamboo can be 20-25% cheaper as compared to conventional homes. Also, it is reliable, flexible and reduces deforestation and thereby creates a sustainable living environment. In India, such houses can be developed on a large scale in coastal states such as Andhra Pradesh, Maharashtra, West Bengal to name a few.

Challenges: Laws in some states regarding prohibition while transporting and harvesting of bamboo is a major challenge in making Bamboo Houses viable at a commercial level. One of the major disadvantages of bamboo is its short life due to its poor resistance to fungi and bacteria and if not preserved and treated properly, it can get damaged. Hence, investments have to be made in the research and development to increase the longevity and strength of bamboo.

FUNBAMBU

Costa Rica

OVERVIEW: In order to reduce and prevent deforestation in Costa Rica, the federal government in 1988 established the National Bamboo Project to introduce bamboo as a new construction material. The project operated by nonprofit organization FUNBAMBU promotes the cultivation of bamboo, develops bamboo housing, and produces bamboo furniture, crafts and raw material for industrialized products like ply-bamboo and bamboo fiberboard.

DESIGN: Under the project more than 3,000 bamboo homes have been built throughout the country, while continuing to build 1,500 homes annually which is about 6% of total homes built annually in Costa Rica. More than 500 people get permanent employment through this project. The construction cost was reduced by around 20-25% as compared to conventional homes. These homes are earthquake resistant and restrict deforestation and enhances protection of river basins since bamboo is used as a replacement to wood.



EARTHQUAKE-RESISTANT DEVELOPMENT

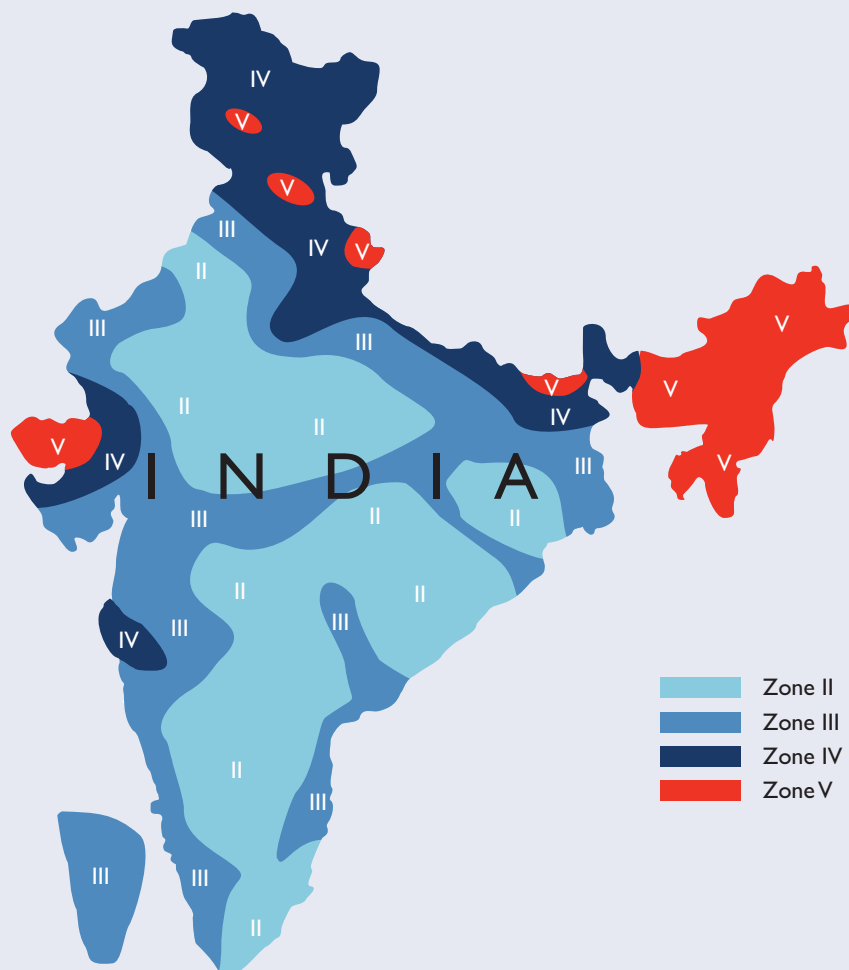
Concept: The impact of earthquake as a natural disaster in terms of human and economic losses has gained significant recognition in the recent past. As per European-Mediterranean Seismological Centre (EMSC) there have been 22 earthquakes of magnitude over 6.0 in 2015 itself. The recent earthquakes in Japan, Pakistan and Nepal wreaked havoc and have highlighted the importance of disaster preparedness. Although, it is not possible to either predict or stop an earthquake, it is important to prepare ourselves for an eventuality and in the process mitigate its effects. Seismic engineering helps design, construct and maintain structures which withstand the seismic effects while sustaining an acceptable level of damage. Basic goal of earthquake engineering is that a building should be able to endure a rare, very severe earthquake even with significant damage but without

totally collapsing. However, the building should remain operational while sustaining more frequent and less severe earthquakes.

Implementation: The Indian subcontinent has witnessed numerous earthquakes of severe intensity. The primary reason is that the subcontinent is grinding into the Asian mainland. As per the Geographical statistics, almost 54% of the land in India is vulnerable to earthquakes. A report by the World Bank and United Nations estimates approximately 200 million people residing in urban areas in India to be exposed and vulnerable to storms and earthquakes by 2050.

Based on the geology and the expected severity of earthquakes, the Indian Standards has categorized the entire country into four zones (as shown in the map). According to the present zoning map, Zone V expects the highest level of seismicity whereas

SEISMIC ZONES OF INDIA



Source: Indian Meteorological Department

Zone 2 is associated with the lowest level of seismicity. Delhi and Mumbai i.e. the administrative capital and financial capital of the country are both categorized as Zone 4, indicating exposure to high level of earthquake risks.

The Bureau of Indian Standards first published a code for buildings in 1962 - 'Indian Standard Criteria for Earthquake Resistant Design', which was later revised in 2005. Very few buildings follow the codes prescribed and most of the buildings that do are more or less perfunctory in nature.

Challenges: Unwillingness to spend extra towards provision for earthquake safety or sometimes even total ignorance itself are

the biggest challenges in the development of earthquake resistant buildings in India. Currently, earthquake resistant design includes detailing of reinforced cement concrete structures for better ductility. Provision of earthquake resistant design could lead to extra costs of 3-15% of the cost of superstructure depending on the building specifications and the seismic zone. However, base isolation using which is an effective method of protection against earthquakes leads to addition of only 3-5% of the total cost of construction. Raising awareness about such low-cost and innovative techniques would help in higher acceptance and inclusion of earthquake resistant design in buildings in India.

PACIFIC TOWER

Christchurch, New Zealand

OVERVIEW: New Zealand is one of the earthquake prone countries and has a higher occurrence of earthquakes because it is at the juncture of two tectonic plates compounded by the fact that one plate is diving beneath the other. Based on data by US Geological Survey (USGS) Earthquake Hazards Program, New Zealand is expected to experience one earthquake of magnitude between 4.0-4.9 every day, 4 per month of magnitude between 5.0-5.9 and 2 per year of magnitude 6.0-6.9. Located in Christchurch, the 22-storey Pacific Tower was completed in 2010, to achieve seismic resilience.

DESIGN: To address seismic loading, the building has eccentrically braced steel frames which have been integrally cast with composite metal slabs. This involves a mix of eccentric K-braced and D-braced frames oriented in a tube shape along the center of the building. The tubular form of building added to the stiffness and reduced torsional stress. Moment resisting frames were used at ground floor level to allow for exclusion of braces in the building elevation. The building withstood the earthquake of 2011 with only one of the active link requiring replacement. A steel-framed structure allows any damaged component to be removed and replaced rather easily and at a faster pace than traditional brick-n-mortar structures leading to higher operational efficiency.

MORI CONSTRUCTIONS

Japan

OVERVIEW: As Japan experiences nearly 30% of the world's earthquakes, seismic engineering is of utmost importance in the country. Japan has had a long history of earthquakes and seismic activity. It is an area of high seismicity because it is located near major tectonic plate boundaries and is situated on the Pacific Ring of Fire. Usually a combination of techniques which otherwise are individually sufficient in less prone regions are employed together in the buildings in Japan.

DESIGN: Mori constructions in its buildings employ seismic isolation using lead plug laminated rubber bearings and high-strength laminated rubber bearings are inserted between the building and the points of contact with ground below. This helps in isolation of superstructure and thus reduces transmission of seismic energy to the building. Seismic damping is also used to dissipate the energy of vibrations in the buildings. Seismic damping walls have highly flexible, viscous core injected into a steel plate box structure. As the steel plate moves, the core provides resistance and the damper absorbs the energy. Mori constructions also use concrete filled steel tube columns to prevent concrete columns from cracking and falling.

Exploring different ways to drive technology-related advancements is of pivotal importance that would benefit various stakeholders in the real estate industry. To live a life that is sustainable, yet efficient, a step as basic as an attempt to reduce carbon emissions could go a long way in reducing environmental hazards. For example, adopting tiny/micro homes can help to

reduce electrical usage in part due to illumination of smaller space. With the efficient use of ambient light during the daylight hours, it is possible to further minimize the need for electricity use. To overcome challenges, developers not only need to think beyond the usual housing models, but also strive to make best use of technological advancements to provide sustainable solutions for households.

LIFESTYLE APPROACH-BASED HOUSING MODELS

A large number of Indians today are well-travelled and are exposed to various cultures. This has led to greater consciousness among consumers as to the kind of house they want to live in. This group constitutes of people who have higher disposable incomes and purchasing power, comprising entrepreneurs and senior executives in corporate India.

Developers, on their part, have caught on to the trend as they look to cater to rising aspiration levels of consumers. Branded residences, theme-based projects and second homes are some concepts that developers have been focusing on, which offer an edge over the conventional housing projects. While some models have been around for many years, it is only in the last one decade that big realtors have concentrated on them earnestly.

BRANDED RESIDENCES

Branded homes are associated, designed and/or endorsed by prominent and well-known celebrities, renowned international and domestic brands/architects that offer exclusive products providing comfort by way of modernized designs, specialized services, designer homes and technology. It gives the project visibility and acceptability among buyers who associate their homes with their favourite brand or celebrity. The last few years have seen many developers partner with designers to offer luxury apartments across cities like Delhi-NCR, Mumbai, Bengaluru, Pune and Chennai.

At a time when the real estate market is marked by sluggish housing sales, developers are focusing on branded residences by offering modern, exclusive homes that are designed by renowned

designers. Buying a home is a huge financial investment for consumers and the dream to own a home is an emotional decision for many Indians, most of whom spend their life savings for home ownership after a lot of research and due diligence on their part, something which cannot be replicated through celebrity endorsements. Presence of an eminent personality to launch new projects lends some credibility to these projects and the property developers are able to publicize their projects to a wider end-user base. For regional developers eyeing a bigger chunk of national revenues, brand ambassadors help create a brand recall value as consumers connect with the glamorous and successful image and lifestyle of movie actors and sports personalities easily. Hospitality chains have also jumped into the fray, by partnering with real estate builders to offer luxury homes replete with concierge services, daily house-keeping, chauffeurs on call and other lavish services.

Whilst the premium varies, typically there is an escalation in the range from 5-25% in comparison to projects in similar location, depending on the brand value or even location/city. Since most of the projects are under construction, it is difficult to state an accurate estimate however maintenance charges are estimated to be 15-20% higher, as compared to luxury apartments.

Challenges: Since branded residences typically target the HIG, it is of utmost importance that the developers get a suitable land parcel. It is often a challenge for developers to find land that is in the centre of the city, with robust physical and social infrastructure, supplementing the overall luxury experience. Finding an appropriate designer can often take a long time as the tie-up between the builder and designer has to be the right fit in terms of the quality of services offered, construction etc. Moreover, if developers are looking to import construction material, there may be costs overruns.

Earlier this month, the Ministry of Urban Development approved a proposal to allow building of residences in hotels in Delhi as a part of its review of Master Plan of Delhi-2021. Developers will be allowed to use up to 40% of the floor area ratio (FAR) for commercial offices, retail and service shops and residential purposes. Earlier, hotels were allowed to use only 20% of the FAR for commercial purposes. However, the proposal also states that residential units can be built only on 20% of this FAR, or 8% of the total space. This move will encourage development of the globally popular concept of branded hotel residences in Delhi. In such branded residences the biggest attraction besides exquisite and impeccable interiors is access to all facilities that a start hotel accommodation provides.

The proposal pertains only to hotels that are outside the restricted Lutyens' Bungalow Zone and fall under the area that comes under the Delhi Development Authority (DDA). Further, the ministry has stated that the transfer of ownership of such residential units built in hotels would be permissible only if the hotel land is freehold. If the land is leasehold, transfer of ownership would be allowed only after DDA frames rules for this purpose.

THE W HOTEL & RESIDENCES

New York, USA

OVERVIEW: Built in 2010, The W New York Downtown Hotel and Residences is a 58-story, 400,000 sf mixed-use luxury development in lower Manhattan. Located in one of the most prominent areas near the World Trade Center Memorial, it is one of the first globally-branded luxury hotel and residences of its size and scale in downtown New York, and the first W Hotel with a residential option in Manhattan.

DESIGN: The property is managed by world renowned hotel chain Starwood Hotels and consists of a 217-room and suite W Hotel, 159 branded unfurnished condominium residences with their own private residential lobby, and 64 branded furnished condominiums that ranges from 400 to 1,175 sf. The residences begin from the 23rd floor of the building and rise to the 56th floor. The top floors of the 'The W' boast of the City's highest roof deck garden enjoying unparalleled panoramic views of the Manhattan skyline, Statue of Liberty, Verrazano Narrows Bridge and Midtown

Manhattan including the Hudson river. Anchoring the southern side of the World Trade Center Memorial site, the interiors of the project are designed by the Berlin-based Graft Studio, an award winning full service architectural and interior design firm. The interior design of the building is based on the idea of a "ripple effect" or wave of energy, creating internal movement that will resound through the surrounding Downtown area. The inspiration behind it was to create a new and fresh look at the concept of comfort and luxury in its most contemporary and even futuristic sense. Expansive wall-to-wall window frames provides unparalleled views offering exceptional light and include integrated window treatment pockets. The residences have an individual thermostatic control in each room so that one room may be cooled while another is heated. The residents have access to 24-hour concierge service, housekeeping, a fitness center, a media room and a private, residents-only rooftop terrace. Owners also have preferred dining reservations at the hotel's Living Lounge and the BLT Bar & Grill Restaurant.



THEME-BASED DEVELOPMENTS

Theme-based housing is among the newest trends seen to attract specific set of customers. Exposure to global trends and changing mindsets of consumers has led to developers introducing residential projects that would focus on particular hobbies or interests of consumers. These houses are positioned to tap into new-age buyers, who want a home address that would match their changing lifestyle. Real estate developers are at a stage where they have to match up to the evolving tastes of consumers. In India, the last few years have seen the mushrooming of sports-based projects that have been launched even in mid segments. These sports-based projects intend to create dynamic and vibrant communities with a focus on health consciousness and a participative lifestyle. Golf-based projects have been popular in cities like NCR, Pune etc.

Apart from sports-based projects, developers can also look to tap into cultural residential projects to cater to consumers who

have an artistic bend of mind. Such a project could house artists, painters and sculptors while supporting and showcasing their art. The project could have a demarcated space in the form of a gallery for showcasing arts. The artists, living in the same community can pool in their resources, thereby creating an atmosphere that is conducive for arts and other cultural activities. Such a project could be developed in the city peripherals, away from the hustle and bustle of big cities, where the land rate is lower. The cost of creating an ambience is usually subsumed in the cost of the unit, therefore, making it a safe bet for developers.

Challenges: The pricing of such units is the key to the project's success. Hence, the location needs to be chosen depending on the average capital values that would help developers in creating their pricing strategy. It is important for developers to do adequate market research to gauge the enthusiasm and preferences for such projects.

AL BARARI

Dubai

OVERVIEW: Al Barari estate is an integrated development with an investment of USD 3.2 Billion which consists of about 650 luxury villas and apartments designed in distinct architectural themes such as Balinese, Mediterranean and Woodland.

DESIGN: The villas and apartments are built in the form of a fairy-tale Arabian village, each of which has its own garden, pool and outside massage area. Residents will have access to Al Barari boutique hotel that provides world class cuisines, high class lounge bars and a unique shopping experience. Additionally, they will also have access to the ultra-modern facilities of the wider Al Barari development including Body Language health club, The Farm restaurant and a signature destination spa- Heart & Soul. Buyers can opt for full customization from one of the four existing shell and core villa designs to fully furnished villas, allowing buyers the opportunity to express individuality in choosing and fully customizing the interior layout and exterior landscaping of their property. The other attraction point is the landscape which is a natural reserve and contains the region's largest privately-owned plant nursery, producing 700 varieties. All the villas are likely to have solar panels on the roof to partially meet the energy demands for a sustainable living environment, and will face the skyline of Dubai with views of Burj Khalifa.

LOST CITY

Dubai

OVERVIEW: The Lost City once complete, will depict a series of old lost cities from different parts of the ancient world which were discovered after centuries of them being lost and forgotten; in the form of villas, town houses and apartments. The project, which recreates a series of old lost cities complete with the old style of architecture from all over the Arab world and other regions such as the Southern Continent, North Africa and Persia.

DESIGN: The Lost City which is being laid out in a 560-hectare area in Jebel Ali is organized under five distinct village areas such as - The Lost City Hotel Village, The Souk Village, The Gateways Village, The Gardens Village and The Hilltop village. The Lost City will cater to wide variety of customer tastes, needs, preferences and income brackets, targeting those people who want to own a piece of their history and heritage in Dubai. Investors can choose between a variety of elevations for their villas and townhouses, from ancient Jordanian to the old Egyptian theme or from predominant construction styles which were used in ancient Iraq, Syria, Lebanon, Palestine which are considered part of the Fertile Crescent, in addition to old themed elevations from the Arabian Peninsula and lands as far away as Morocco and Mongolia. The properties inside The Lost City are expected to have an old-world charm, having fresh water streams flowing near one's home, as was the case in the ancient days. However, The Lost City also caters to the modern needs and requirements of its tenants, including schools, swimming pools, themed streets and walkways, cycling and jogging trails and an 18-hole championship class golf course designed by the eminent Australian golfer and course designer, Greg Norman.

SECOND HOMES

Weekend and holiday homes can be developed in the city peripherals, close enough to primary place of residence that can offer an alternative home for consumers for weekends or small breaks. These homes can be in the form of apartments and villas – either modern or built in the traditional way, comprising lush green space, close to hills or sea.

Second home buyers have favored places like Lonavala, Alibaug, and Matheran from Mumbai; Pondicherry, Mahabalipuram and Nellankarai and Uthandi along east coast road from Chennai - as their second homes that can be reached in a few hours. Most of the projects celebrate the wilderness of the place, and special care is taken in reviving the natural surroundings--water bodies, trees and the flora and fauna of the place, as they develop villas, row houses or apartments.

The concept of second homes was mostly restricted to the super-rich till some years back. Over the past decade, developers are concentrating on the emergence of a new group that has higher disposable income, and an increase in their purchasing power. This group may look at using such houses as their retirement homes. Apart from weekend homes, holiday homes in hill stations like Ooty, Kasauli and Nainital have seen a surge in demand.

Challenges: The returns on such houses may not be too high for consumers, along with unstable rental incomes. However, owners have now begun to capitalize on the emerging popularity of bed and breakfast homes, which are expected to bring in higher income.

MARBELLA

Spain

OVERVIEW: Marbella, Spain is known specifically for its golf clubs, including Almenara, Atalaya and La Quinta, all of which are PGA courses. Marbala has one of the most expensive villas which costs around €90 million (\$140 million) estate just 80 meters away from the famous Alhambra Palace overlooking the city of Grenada, Spain, prove so popular.

DESIGN: The 15th-century old property has a garden courtyard with a fountain, as well as a vineyard. The estate provides complete privacy but it's still close enough to the center of town that a buyer won't feel isolated. Buyers prefer southern Spain because here they can get everything from all the big shops, pleasant weather and some of the world's best golf courses and most importantly great sea-beach views along the coast of the Mediterranean Sea.



SERVICE APARTMENTS

A service apartment is often a fully-furnished accommodation which is available for short-term or long-term stays, primarily for corporate travelers. These apartments come with basic amenities for daily use, which include a kitchen with cooking range, kettle, microwave, a washing machine etc., as well as complimentary breakfast, laundry in some cases.

Although service apartments came into existence in India in the late 1990s, it is only in the last few years that they have gained traction in the big cities. People are increasingly travelling inter-state for both, business and leisure and they are seeking long-term, cost effective accommodation options. These apartments are particularly popular in Delhi-NCR, Mumbai and Bengaluru, which are seeing a rise in the number of professionals often on the move. Key demand drivers for service apartments are IT/ITeS, biotechnology, services sector, BFSI and medical tourism.

Some developers have incorporated service apartments in some wings of their residential projects, so as to reap benefits from both – conventional residential projects and service apartments. Additionally, developers are also seen to be partnering with brands in the hospitality sector to offer premium service apartments. A service apartment earns 10-15% more than properties rented out to regular tenants.

Challenges: Developers need to choose the location carefully, as the location of service apartment needs to be in the hub of corporate activity. Individual home owners, who wish to let out their apartment to corporates, may witness higher rental income, but need to bear in mind the increase in maintenance costs, and taxes.

ASCOTT THE RESIDENCE

Singapore

OVERVIEW: Service apartments provide hotel - like amenities and is relatively lesser expensive than hotel stays. They can range from budget to deluxe, and rooms range from studio apartments to two- or three-bedroom apartments. The increase in travel especially across borders created the need for such facilities. It may not only provide more space but are also convenient while on vacation with family or on business trip.

Singapore's Ascott – The Residences are one of the most sought after service apartments and has won award for “Leading Serviced Apartment Brand” in World Travel Award for consecutive year's - 2013 and 2014. It is located in the financial district and is close to shopping districts and international restaurants. It was built on a heritage building which was restored and hence provides a distinct experience blending art and modern cityscape.

Ascott The Residence offers great flexibility by having suits ranging from 48 to 148 sqm. It offers a range of amenities from housekeeping services and babysitting to gymnasium and business centre services. Moreover, Ascott is not only safe and comfortable compared to private flats, but also offers cost benefits of around 25%, as compared to hotels.



SPECIALIZED HOUSING MODELS

Adopting such a specialized approach would address the different housing needs of citizens at various stages of their lives.

Developers can, thus, focus on specialized amenities, instead of offering a whole range of facilities that could lead to increased efficiency of their projects. In India, developers predominantly focus on the “working population,” not providing as much attention to other life-cycle stages. By catering to different age-groups, developers not only can gain specialized experience to construct and operate particular home formats, but also expect some cost rationalization as a whole gamut of facilities need not be provided. Some of the housing models are discussed below.

STUDENT HOUSING

Concept: Globally, student housing is an alternate form of accommodation provided to higher education students by private developers or service providers. In recent years, student housing has undergone a transformation, with an increasing number of private developments resembling high-end apartments, having a number of amenities rather than traditional dormitories. Over the past decade, the student housing market has started to emerge as a mainstream investment sector in developed countries such as the United States and United Kingdom.

Types of student housing models:

- **B2B model:** These involve establishing partnerships with institutions and ensuring commitment from the same. The facilities could be both on-campus and off-campus.
- **B2C model:** These are typically off-campus facilities spread across several localities which are in close vicinity to the university leased to individual student on per room or per bed basis. Previously family-owned homes are also provided, with provider being responsible only for managing ongoing operations.

Implementation: Historically, accommodation for students has been provided by colleges and universities themselves in India. However, inability of the rapidly increasing number of institutions to accommodate the growing student population has led to greater reliance of students on the private rented-market. Thus, the current student housing sector in India consists of hostels – both on and off campus and paying guest facilities close to the campus.

Demand for student housing in India is robust, only expected to be stronger based on the government's mandate of 'Education for All.' The Indian Higher Education System is one of the largest in the world having 700 universities with more than 35,000 affiliated colleges with more than 21 million students. The government is targeting a Gross Enrollment Ratio (GER-used by the UN in its Education Index to determine the number of students enrolled in school at several different grade levels) of 20 by 2020. The consequent widening of the demand-supply gap will result in huge deficit in student housing, creating entry and growth opportunities for the private sector. With few private developers operating in this segment, this segment remains relatively untapped and presents a huge opportunity for developers. High demand potential in the segment that is not directly impacted by macro-economic factors, would lead to low risks for developers. The development can take place focusing on tier II cities that have seen an influx of student population as a number of higher education institutes set up base there. Developers can take advantage of the relatively lower cost of land in such cities to offer affordable housing for the student population.

Challenges: The student housing market in India is highly fragmented. There are no standard policies regarding leasing rates and tenure. Moreover, leasing of student housing is done during a narrow window of time which requires the private players to begin marketing early to ensure full capacity.



UNIVERSITY OF MISSOURI

Columbia, USA

OVERVIEW: More than 35,000 students enroll every year in the University of Missouri. The huge number of students getting admitted into the university each year has led to a spurt in demand for student housing. This led to enlisting professional help in managing the demand for student housing. A growing supply of upscale student apartments is the result of private developers meeting the demand that the university could not keep up with. Developers have created more than 3,800 beds of student housing in the town since 2011, according to public data available.

OPERATIONS: The university has several on-campus buildings or hostels managed by service providers who are responsible for day-to-day management of facilities. Students of the University of Missouri (MU) have several off-campus housing choices as well, many within walking distance of MU and some several miles away with shuttle or bus lines providing connectivity with campus. The District, a cultural and entertainment center is located in downtown Columbia just a few blocks from MU. With retail, restaurants and residential developments, the District also attracts students to live in the downtown area. The Lofts at 3085 Ninth – located in downtown and one mile from MU, is a five-storey, 64 unit apartment building complex meant for students. Likewise, another project 'The Grove – Campus Crest developed this 632 bed apartment project. The project has a lot of amenities and is located approximately two miles from MU.

The biggest challenge lies in the shortage of the affordable, no-frills housing close to campus that students want. Most of the developers present here market their projects as “luxury” student housing featuring private bathrooms, balconies, walk-in closets, and flat-screen high - definition television with digital video recorder and Apple TV etc.

UNIVERSITY OF TEXAS AT AUSTIN

Texas, USA

OVERVIEW: The University of Texas (UT) is home to over 50,000 students and 24,000 faculty and staff on a 350-acre campus situated north of downtown Austin. Although, the University strongly advocates living on-campus, many students prefer to stay off-campus for various reasons such as personal preferences, affordability, etc.

OPERATION: The University campus has several Residence halls which are grouped into communities. Off-campus, the primary concentration of undergraduate students is in the West Campus area, where they can either walk to campus or take a 3-10 minute shuttle. Graduate and professional students prefer the quieter neighborhood of North Campus and Hyde Park, also a short shuttle ride away from campus. South of downtown Austin, approximately five miles from UT Austin, are three student housing developments. All three projects, The Zone at East End, The Edge at East End and ION at East End are targeted to students with shuttle that operate from apartment communities to UT Austin. The Edge and The Zone at East End – With 522 units (1,494 beds) these communities were built in 1996 and acquired by Tribridge Residential in 2010.

SENIOR LIVING

Concept: Senior housing across the world has evolved from encompassing primary requirements of shelter, nutrition, convenience and security to senior citizens to imbuing wholesome wellness. For the same reason, senior housing is also being referred to as “Retirement Resort” in several places across the globe. The concept of “wellness” has expanded beyond just physical wellness to include mental, financial, cognitive social and environmental wellness.

Traditionally, Indians have never needed to think about where they go when they age – the family structure has, more often than not, provided for retired parents to live with their children and their families. But as increasing number of people from the younger generation move away for work, nuclear families have become more common. This change in societal functioning, as well as a globalized way of living have led to the acceptance of senior citizen projects by consumers, who are now willing to be a part of a community with like-minded people.

Implementation: The segment of senior living housing has a huge potential in India that has approximately 100 million senior citizens aged 60 and above in 2013. This number is expected to double by 2030. By 2050, it is likely to reach approximately 320 million, constituting 20% of the country's total population. The sharp increase in the number of seniors combined with the growing acceptance that well-managed senior living offers better living standards will help development of senior housing in India.

Depending upon the age, the requirement of ageing seniors change completely. Facilities which are sufficient for a physically and mentally fit senior will be gross insufficient for seniors requiring higher levels of medical care. Thus depending upon the age, senior living could be categorized into Independent Living, Assisted Living, Skilled or Nursing Care and Continuing Care Community.

Challenges: In contrast to senior living in the west, the concept of housing for seniors as a specific asset class in India faces several challenges. First of all, senior living has not yet attained full acceptance in a country like India that has traditionally been family-oriented. The affordability factor is another concern as most projects cater to the middle class and upper-middle class, making it out of reach of a majority of aged Indians. Also to offer quality facilities, it is imperative that these projects employ trained persons to take care of the senior citizens. Therefore, it is essential that the developer manages to find trained persons who could be involved for a sustained period of time.

Barrier-Free Community/ Township for disabled

Similar to seniors, persons with disabilities are mostly seen as people who need to be taken care of. An accessible/ barrier-free environment is one, which allows everyone to move around safely, independently, without any restriction. Creating a barrier-free environment would not only benefit persons with disabilities but also people who are temporarily disabled due to illness or accidents, the elderly, expectant mothers, and children.

Living in a safe, secure and accessible environment is a critical first step toward regaining stability and independence. A barrier-free community offers safe haven with a supportive environment necessary for people to gain the confidence and to move on in their lives.

India has millions of people with special needs. The Persons with Disabilities Equal Opportunities, Protection of Rights and Full Participation Act of 1995 is the first law that talks about the multiple requirements of people with special needs. The Act stipulates that the Governments, local authorities ensure provisions of barrier-free facilities in all new Government buildings and public utilities, roads and transport. Making a conscious effort for barrier-free design will go a long way in creating non-discrimination in built environment for the differently abled.



PICEA TOWN RETIREMENT COMMUNITY

Tianjin, China

OVERVIEW: Picea Town is one of the 406 senior living projects in Tianjin. The metropolis of Tianjin had, more than 2 million over the age of 60, of which 286,700 were above the age of 80 (registered) in 2014. Picea Town adopts senior-friendly, barrier-free design and “steward-style” services. It includes senior apartments, community hospital, modern farm greenhouse, hotel health club, nursing care facilities, senior college as well as special services like traditional spa, recreational activities and customized nutrition planning.

OPERATIONS: Picea Town Retirement Community allows residents to choose between membership that can rotate between different communities or permanently stay in one. The total gross floor area of the project is about 7.5 million square feet (msf) of which, over 2.6 msf is for rotating members. The community consists of 17 multi-storey residential buildings equipped with elevators and a total of 2,277 apartments. A community hospital specialized in geriatric medicine and a nursing facility is situated inside the community, which has a partnership with an affiliated hospital to provide treatment for common illnesses.

BELMONT VILLAGE HUNTERS CREEK

Houston, USA

OVERVIEW: Houston is one of the top five cities in population for Baby Boomers (those born between mid-1946 and mid-1964) in United States and as this generation ages, Houston is one of the frontrunners for demand in senior housing. Towards the end of 2014, more than 2,100 units were under-construction in the senior housing segment in the city.

OPERATIONS: Developed by Belmont Village Senior Living, Hunters Creek is present across 2 locations in Houston. The residents have easy access to premier shopping, dining and entertainment, along with world-class medical care. A variety of places of worship are also nearby, with complimentary scheduled transportation for all. Belmont Village Hunters Creek is a mid-rise community with 149 private Assisted Living and Memory Care apartments. Amenities include a professionally managed fitness center with wellness programs and therapy services, heated, salt-water swimming pool, technology center, and WiFi. A licensed nurse and well-trained staff are on-site around-the-clock. Residence plans include studio, one- and two-bedroom units.



AFFORDABLE HOUSING

Cost and speed of construction are two critical aspects that can make the affordable housing segment successful. Although definitions of affordable housing varies in different countries, it is largely similar and is primarily dependent on the disposable income. Predominantly, affordable housing should address the housing needs of the economically weaker section (EWS) along with the Low income group (LIG) and Middle Income Group (MIG) households. As per the Ministry of Housing and Urban Poverty Alleviation (MHUPA), affordable houses may be taken as houses ranging from about 300 square feet (built up area) for

EWS, 500 square feet for LIG and 600 square feet to 1,200 square feet for MIG, at costs that permit repayment of home loans in monthly installments not exceeding 30% to 40% of the monthly income of the buyer.

The central government has played a key role in establishing long-term goals at the country level and providing funds for the development of affordable housing. In most cases, the central government has collaborated with the state governments to provide monetary as well as on-the-ground support for better implementation of policies and initiatives related to housing creation.

SPECIFICATIONS AS PER THE MINISTRY OF HOUSING AND URBAN POVERTY ALLEVIATION

	SIZE	EMI OR RENT
EWS	• minimum of 300 sf built-up area • minimum of 269 sf (25 sqm) carpet area	not exceeding 30-40% of gross monthly income of buyer
LIG	• minimum of 500 sf built-up area • maximum of 517 sf (48 sqm) carpet area	
MIG	• 600 - 1,200 sf built-up area • Maximum of 861 sf (80 sqm) carpet area	

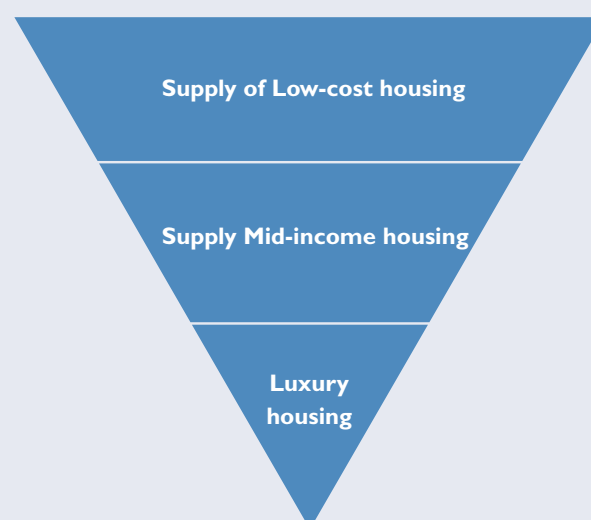
Source: Guidelines for Affordable Housing in Partnership, MHUPA, 2011

HOUSING MARKET DYNAMICS

CURRENT MARKET



IDEAL SUPPLY



Despite huge demand, affordable housing has not been very successful in India due to several structural and regulatory challenges like high cost of land, lack of infrastructure where land is relatively cheaper and cost escalation due to lengthy approval processes. Several challenges in the development of low-cost housing in the country are presented below:

- a) **Low Private sector participation:** Private sector's participation in the creation of low-income stock is limited, due to rigid institutional and regulatory frameworks. Additionally, slowdown in residential sales amidst high interest rates on loans has added to their woes as financial institutions became cautious to lend to real estate sector.
- b) **Limited availability of land:** Paucity of land bank (at suitable price levels) is detrimental to creating large-scale affordable housing stock in cities. There is limited availability of land (at suitable price levels) in Indian cities as a result of increased rate of urbanization. Incoherent development standards and zoning regulations result in haphazard development and irregular distribution of population densities. Due to these factors, development in core urban areas becomes an expensive proposition.
- c) **High construction costs:** One of the major determinant of total housing cost other than land is the cost of the construction. As the raw material costs increase over a period, it becomes difficult to provide housing at reasonable costs.
- d) **Regulatory Framework:** The existing regulatory framework involves lengthy, time-consuming procedures and approvals for developing housing. Hence, construction timelines are usually extended and by the time this stock becomes available, the requirement increases massively considering the significant rise in population. In addition, urban planning does not provide necessary guidelines and mechanisms for development activities that is financially and socially viable.

Moreover, low access to credit facilities is a huge hindrance to benefactors in the LIG. Accessibility to financial institutions needs to be addressed at a larger scale. According to the Nachiket Mor committee (2013), more than 60% of the adult population, both in urban and rural areas, is still excluded from basic services such as having a bank account for savings and remittance purposes. The country's banking sector needs to be seen as a potential active partner to generate the desired housing solution.

Over the years, central and state governments have initiated policies that enable development of low-cost housing. However, the implementation of many schemes have left much to be desired. Issues ranging from the methodologies adopted for identifying target beneficiaries, setting up of subsidy/ grant limits for the beneficiaries have been unclear. More importantly, in

some cases, the quantum of assistance provided in various schemes covers a low proportion of the total unit cost especially in urban areas. Some possible solutions could be adopted by the government to aid development of affordable housing in the country:

- a) **Incentivizing the private sector:** The Government of India needs to incentivize private sector in the form of cheap land, reduced raw material prices, additional FSI, etc. to increase their participation. The Private Public Partnership (PPP) model has not taken off in the affordable segment, as private developers have no incentive to operate in this segment. By providing tax exemptions and reduction in developmental costs, the government would be able to lure private developers. Additionally, a PPP project may help secure lending from institutional lenders at lower cost and ensure timely approvals. Typically, the public sector should look at aggregating land for project, whilst the private sector should focus on the construction, financing the project, etc. The model could also involve the private sector selling half of the units, while giving the rest to the government.
- b) **Strengthening regulatory bodies:** The local players in the public sector comprising the municipality and urban local bodies (ULBs) have to be activated to apply the larger vision at the local level through custom-made strategies. Before undertaking the exercise of regional planning, regulatory bodies need to be restructured at every scale (state, town/ city/ village) to allow greater collaboration between all regulatory bodies involved.
- c) **Priority Sector Lending:** Including EWS and LIG under the ambit of priority sector lending would help in disbursing loans where they are needed the most. Currently, banks are required to direct 40% of their total credit to the priority sector consisting mainly of agriculture and allied activities and small and medium enterprises. In the same way, RBI could make it mandatory for banks to give a specified proportion of their loans to EWS and LIG. The housing sector would be given a boost only if Indian and foreign banks are also directed towards this disbursement to ease availability of loans for affordable housing. While according to RBI guidelines, housing loans below INR 2.5 million (USD 39, 200) to individuals and families add up as priority sector lending, the average loan amount of some low-cost housing finance companies is only INR 0.45 million (USD 7,041).
- d) **Addressing financial exclusion:** Access to banking services is a constraint either due to difficult geography or unavailability of banking services altogether. The concept of mobile banking or banks on wheels, essentially provides door-to-door services to those excluded from the financial system. This needs to simultaneously occur, while building the end-users' trust in the banking system.

Due to high land prices within the cities, developers could explore locations that are at reasonable distances from the city centre that are attractive for people employed in the suburban areas. Some of them could be in close proximity to industrial nodes as well, which generates demand for such housing projects. Hence, although their distances from the city centers initially

seem large, these projects would be suitable for several people employed in industries or offices located near these areas.

Innovative use of construction technology is the need of the hour for developers to construct affordable housing. The use of prefabricated technique in comparison with reinforced concrete construction is presented below:

COMPARISON OF CONSTRUCTION METHODS	
PREFABRICATED CONSTRUCTION METHOD	ON-SITE REINFORCED CONCRETE CONSTRUCTION METHOD
Components produced off-site can often be manufactured to tighter specifications and using better raw materials than the same components built on-site.	Under this method, construction is done on the site. The Concrete is heavy in weight and requires large quantity of steel in the construction as the self-load is greater.
Prefabricated components speed up construction time, resulting in lower labor costs and reduced material costs. Also, off-site fabrication benefits from specialization and economies of scale.	The cost of the forms used for casting reinforced concrete is relatively higher.
Construction work under this method is not affected by weather delays like rain or heat since the construction is done in a controlled environment in factories. This leads to better quality than conventional methods.	The construction is done on site and concrete can expand or contract with the changes in temperature. This may lead to inconsistent quality of construction.
The technique offers limited customization and flexibility.	This method allows for greater flexibility in designing of housing units.

MOLADI CONSTRUCTION TECHNOLOGIES

South Africa

OVERVIEW: Moladi has been a pioneer in the development of alternative housing systems, since its inception in 1986, with housing projects having been built successfully in over 15 countries. The family-run business based in South Africa's Eastern Cape Province, is innovating construction methods to address the challenge of building sustainable housing for low-income communities. It utilizes a unique plastic injection molded technology to produce cast-in-place mortar structures. The process allows unskilled laborers to use indigenous materials to quickly and cheaply construct high standard permanent buildings that are earthquake, cyclone and tsunami resistant.

OPERATIONS: Using reusable molds, assembled from a system of 30cm x 30cm plastic panels, buildings are cast with an aerated mortar (stoneless concrete) for completed construction in as little as 24 hours. Each casting mold can be used up to 50 times, saving cost at a grander scale. Using the plan of the building, laborers can assemble the formwork, positioning services such as

electricity and plumbing, as well as block-outs for windows and doors in the wall cavity. After the mortar is poured, it dries overnight and the formwork is removed. The walls are then painted with a cementitious, water-based paint and the roof, windows and doors are installed. Finally, sanitary wares and lighting fixtures are installed.

BENEFITS: By simplifying the assembly and reducing the use of traditional building materials, this basic model reduces cost, complexity and the required skill, time and money typically associated with construction. Moladi claims to be able to control costs better than traditional construction firms by consolidating the supply chain. The cost savings, the company claims, can reach up to 35% compared to conventional building techniques. The streamlined building process is designed in such a way that the company can avoid expensive stoppages which are common on traditional building sites, where the builders have to wait for the electrician, then for the plumber. Finally, the speed of construction effectively reduces other costs related to the hiring of equipment, labor requirements and transport.

HOUSING DEVELOPMENT BOARD (HDB)

Singapore

CONCEPT: Public housing in Singapore is developed and operated by HDB, which is an intermediary between the government and the end-users. Since gaining self-governance, Singapore's comprehensive approach to developing housing has produced more than one million homes, housing more than 80% of the population. When Singapore's Housing and Development Board (HDB) was created in 1960, less than 9% of Singaporeans lived in government housing.

OPERATIONS: HDB first needed to acquire land, a scarce and costly resource in a country that is just over 700 square kilometers. The government passed a series of laws to expedite the process of acquiring private land that allows it to acquire property at the current use value, which is often below the market price since the current use is at low density levels and does not account for the full development potential of the land after densification and infrastructure improvements. HDB then acquires this land from the government at a further discount, allowing for a significant reduction in costs. Land is then rezoned to allow for significantly higher density and the government invests in infrastructure development in these areas. Furthermore, HDB recoups some of the land cost through leasehold sales, under which flats are sold under 99-year leases, with the government

retaining ownership of the land. HDB provides 25-30 year term loans at interest rates that are 1-5% lower than market rates. HDB uses a combination of subsidy, low-interest loans, and direct savings through the Central Provident Fund, a mandatory government savings account to fund social security payments. HDB offers mortgage loans to eligible buyers, which are funded by government and offered at the Central Provident Fund saving rate plus one percentage point.

BENEFITS: HDB has worked to reduce costs through technological innovation in construction, improved procurement, and better labor management. By making loans directly from guaranteed funds, the government is able to lower origination costs and the risk premium on housing loans. While some flats are available as rentals, HDB has offered the sale of 99-year leases under the Home Ownership Scheme since 1964, and nearly 90% of HDB flats are now owner-occupied. These leases are sold only to citizens of Singapore under certain income limits, but then can be resold on the open market under much looser eligibility requirements. HDB's partially privatized development arm, Surbana, plans, designs, and constructs housing developments. Surbana holds a near-monopoly on residential construction and builds on an industrial scale, using standardization, metal formworks, and pre-cast components, often with details and windows included. These practices have raised productivity dramatically. Pre-cast pieces now make up more than 70% of total components.

VALUE & BUDGET HOUSING CORPORATION (VBHC)

Bengaluru, India

OVERVIEW: This Bengaluru-based budget housing company uses Form-based construction technology to build affordable homes across the country. VBHC is one of the few developers in the country focusing on constructing low-cost housing and has simultaneous projects being lined up in Tier I, II & III cities to cater to the increasing demand for affordable housing.

DESIGN & OPERATIONS: Forms are prefabricated and engineered modules of shuttering panels and have a metal frame and thin contact surface made of aluminum or steel. A series of forms are joined edge-to-edge and spaced parallel to each other with a second series of forms. As per the structural design, steel reinforcement is placed inside the forms. Wet concrete is poured

into this space to make walls, floors and ceilings. Such a technology helps complete construction work with a significantly smaller workforce but speeds up construction, as per the company. It claims that innovation has helped in ensuring better quality, quick delivery and cost effectiveness. Besides using forms, the company introduced welded mesh for reinforcement, RMC concrete pre-validation kit for plumbing, electrical and other embedded work. VBHC is also implementing BIM (building information modelling), in which the design is rendered in 3D. This aids the planning by detecting any conflict between the architectural, electrical, plumbing and structural designs in the pre-construction stage itself. The company is in various stages of identification and procurement of land for developing affordable housing in the states of Rajasthan, Gujarat, Maharashtra, Tamil Nadu, Uttar Pradesh and Madhya Pradesh to expand its national footprint. VBHC has large scale expansion plans and promises to deliver 18,000 homes in the next 3 years as it expands its footprint across India.

Conventionally, in India and elsewhere land has been treated as a capital asset – expecting its price to appreciate, developers tend

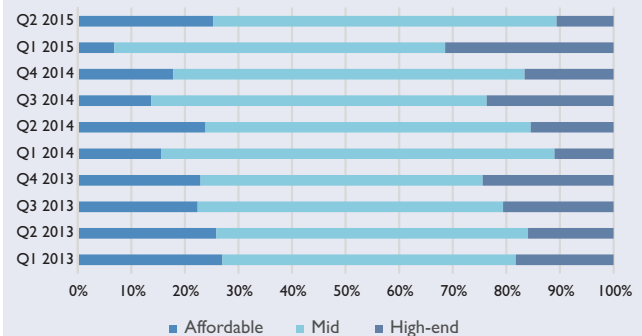
to hoard it. The change in developers' mindset towards land would come about when land is treated as a raw material.

MID-SEGMENT HOUSING

Rise in disposable income of the Indian middle income group has had a dramatic impact on the demand of middle income housing across the country. Most cities are facing a short fall of supply especially in the mid segment which leads the gap in demand and supply, as developers are less keen on smaller ticket sizes on account of high land costs, surmounting construction costs and reduced profitability.

While developers have been active in this segment, the definition of the term mid-income is not too lucid in India. While the government's definition of MIG is household in the income bracket of INR 0.3-1 million (USD 4694-15,646), the private sector typically caters to a higher group in the name of MIG. Typically, for middle-income groups, the price of the dwelling unit has to be less than five times the household's annual gross income to remain in the affordability bracket. As seen in the table, launches in the mid segment have dominated total launches over the last two years.

MID-INCOME HOUSING LAUNCHES



Source: Cushman & Wakefield research; **Note:** The above values for Affordable housing are for units typically priced in the range of INR 2-5 million (USD 31,300-78,300); values for mid segment are for units in the range of INR 5-10 million (USD 78,300-156,600), except Delhi-NCR and Mumbai, where the range in mid segment housing is typically between INR 5-17 million (USD 78,300-266,200). High-end segment values are for units typically priced above INR 10 million (USD 156,600)

In order to make housing for the MIG more affordable, developers could look at reducing size of dwellings that could lead to lower ticket price. This way, developers would not witness any dent in their margins, while catering to the segment's demand.



THE WAY AHEAD...

Innovative housing models driven by technological advancements are currently seen to be adopted by a miniscule population in India. However, as consumers become more conscious and socially aware, there is likely to be greater acceptance of smart homes and innovative housing models. The change can already be

witnessed, where small groups of socially conscious people are promoting sustainable living and exploring alternative ways of living. Home solutions need to be more imaginative, having the potential to address structural problems such as lack of space, increasing development cost and poor infrastructure that are apparent in India, especially in the context of urban areas.

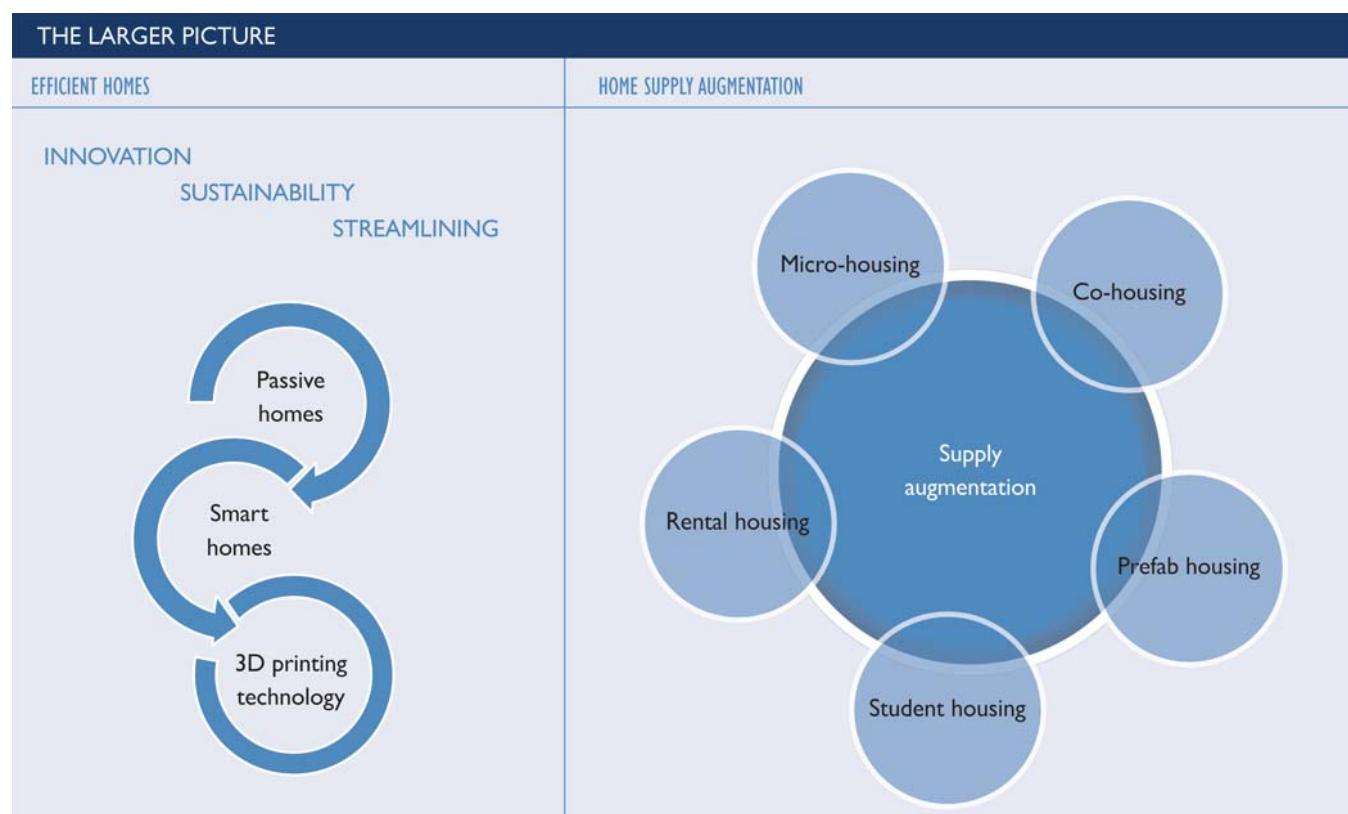
EVALUATION OF MODELS				
HOUSING CONCEPT	KEY / UNIQUE FEATURE (USP)	KEY CHALLENGES	COST COMPARED TO CONVENTIONAL	GREEN POTENTIAL
Micro Housing	Efficient usage of space aiding development of low-cost housing	Affordability of target segment	Similar	Potential depends on the design
Co-Housing	Participative process; Identification of land, design process led by community	Higher maintenance costs; can be invasive having little privacy	Similar	High potential as the community-driven process may include greater energy and water savings
Rental Housing	Aids low-cost housing	Lack of comprehensive rental housing policy in India; low incentives to develop rental housing	Similar	Potential depends on the design
Prefabricated construction	Involves computer-integrated manufacturing; offers speedy construction	Requires skilled labor; limited customization	Lower costs if constructed on a large scale	Potential depends on the design
Passive Houses	Energy efficient; low energy consumption	Limited awareness	Similar	High potential as building is designed to be energy efficient
Smart Homes	Well-furnished home with networking technologies & communication systems; allows users to remotely control, monitor, and access their residence	Requires strong technological ecosystem; upgrading to a smart home requires technology of various appliances or products to be integrated	Higher	High potential as digital technology can improve home energy efficiency
Bamboo Houses	Reliable, flexible and reduces deforestation and thereby creates a sustainable living environment	Some laws regarding prohibition of Bamboo transportation; short-life span if not preserved and treated properly	20-25% lower	High potential as such homes can maximize ventilation and daylight to keep energy costs low.
Earthquake resistance development	Involves designing, construction and maintenance of structures which withstand the seismic effects while sustaining an acceptable level of damage	Unwillingness to spend towards provision for earthquake safety; low awareness	Provision of earthquake resistant design could lead to extra costs of 3-15% of the cost of superstructure depending on the building specifications and the seismic zone	Potential depends on the design
Student Housing	Low risks as not directly impacted by macro-economic factors; strong demand	Highly fragmented; no standard policies regarding leasing rates and tenure	Similar	Potential depends on the design
Senior Living	Promotes community living; includes facilities to cater to mental, financial, cognitive social and environmental wellness	Not gained full acceptance in India; requires trained persons to assist the elderly	Higher	Potential depends on the design

In a large and diverse country like India, no two cities are similar. This calls for altering models for each city based on prevailing socio-economic conditions. To begin with, some models operating in foreign countries could be adopted to understand how best it could be modified to suit the Indian context. The source of public funding and incentives to the private sector needs to be established, apart from maintaining transparency in the system. The financial feasibility of each model needs to be evaluated to understand the various cost-efficiencies and the scale of implementation. Once certain models are frozen, the pilot models need to be worked upon, while inviting the private sector to participate and other partners.

Developers, on their part, need to understand the need of the hour. Going forward, to enable different kinds of housing models,

a thorough study of various markets need to be done to ascertain the demand at the location and scope for implementation, while searching for a suitable land parcel. Once these factors are considered, developers could identify suitable potential partners for development and locations can be finalized to begin the process of seeking governmental approvals. These plans should include proactive engagement of different stakeholders and identify potential partner organizations and sites.

Cushman and Wakefield Research estimates the current affordable housing demand of 535,400 houses across top seven cities (Delhi-NCR, Mumbai, Bengaluru, Chennai, Hyderabad, Kolkata and Pune). The initiative would present an opportunity of a whopping USD 11.8 billion for the public and private sector in India in the top seven cities³.



To implement technological solutions to housing, developers need to experiment with few models that would be viable for them. While innovations may always not be possible by developers themselves due to lack of expertise and high costs involved, they could partner with research organizations to enable new inventions in the field.

The solution lies in generating an array of customized solutions that could be adopted for a specific demographic and in a particular location, instead of replicating a successful model in all markets.

3. This opportunity is based on the demand as ascertained by Cushman & Wakefield for units in the range of INR 2-5 million (USD 31,300-78,300) in these cities, except for Mumbai where the price range is between INR 5-7 million (USD 78,300-109,700)



For more information about
Research Services, please contact:

Somy Thomas
Executive Director
Consultancy and Valuation & Advisory, India
+91 80 4046 5555
somy.thomas@ap.cushwake.com

Authors of the report:

Megha Maan
Regional Manager
Research, India
megha.maan@ap.cushwake.com

Vaishnavi Bala
Analyst
Research, India
vaishnavi.bala@ap.cushwake.com

Vineet Sharma
Associate
Research, India
vineet.s@ap.cushwake.com

Kamal Kumar Agarwal
Associate
Research, India
kamal.agarwal@ap.cushwake.com

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For more information about C&W, contact:

Sitara Achreja
Director
Marketing & Communications
+91 124 469 5555
sitara.achreja@ap.cushwake.com

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