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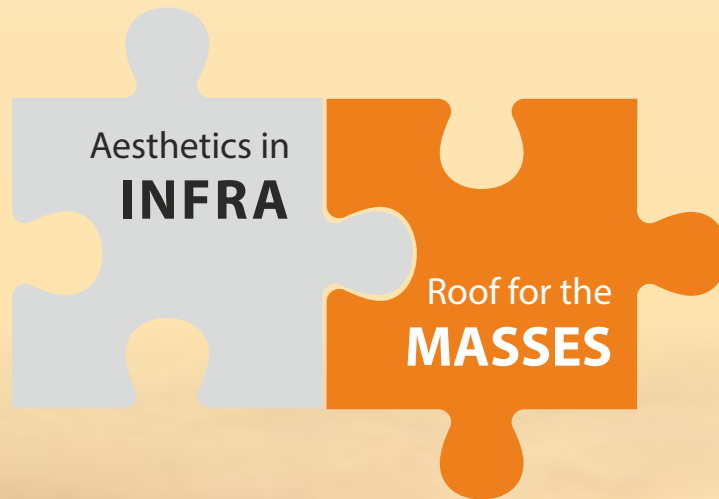
WHITE PAPER

Aesthetics in
INFRA

Roof for the
MASSES

About the Author

SAON BHATTACHARYA is a senior business editor and writer with 20 years' experience in handling communication across industries—including urban design, development and infrastructure, sustainability, real estate, retail, social development, education, media and publishing. She is currently engaged as a freelance editorial consultant with various firms such as ICRA Limited, BBC Media Action, Bloomsbury India and Amazon India. Over the years, she has worked with Penguin India, Pearson Education, NACO, AECOM India, CBRE South Asia and Cushman & Wakefield India.

Language is her forte, and creative writing her passion.
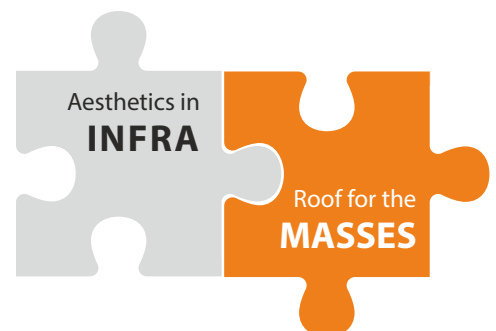
Foreword

Infrastructure and mass housing are envisioned to be the 'temples' of a new India.

Along with the Prime Minister's grand visions of a 'Digital India' to be 'Made in India', are also his visionary missions of the growth of a 100 'Smart Cities' and 'Housing for All by 2022'. This report explores the necessary relationship between aesthetics and public infrastructure in India, as well as the measures needed to close the massive supply–demand mismatch in India's affordable housing sector.
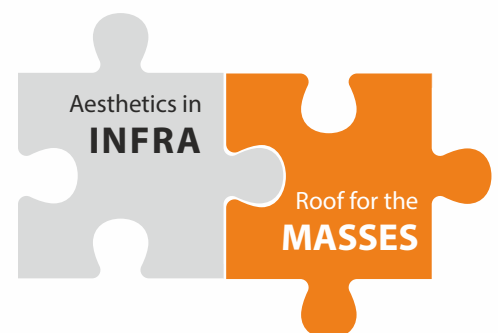
Down the ages, our built environment, especially our public infrastructure, has lost its connection with citizen users as well as with a city's urban character. The buzzwords for infrastructure creation has increasingly become: 'bigger', 'better', 'faster', and 'cheaper'. Devoid of 'design', however, such infrastructure merely mirrors a lifeless sum of physical assets.

This was not how we always built our cities. Architecture and design was more than a 6,000 year-old process that India excelled at, but has sadly lost sight of over the years. The good news today is that we may have again stumbled upon our traditional 'integrative design' process with smart technology and citizen participation.

As far as India's citizens are concerned, housing is a basic human requirement that sadly eludes many of our fellow citizens. We face a paucity of formal housing options in our cities, because of a large low-income population with low affordability levels. To tackle this very real need, the Government of India has identified the housing sector as a focus area, with urban mass housing under the Pradhan Mantri Awas Yojana (PMAY) scheme, as a key agenda.

This report aims to present actionable intelligence to help support the Government in its mission to provide a roof for the masses, as well as to crowd-source design ideas for our urban built environment.

- **"Rajaneesh Dasgupta, Director General"**

Aesthetics in
INFRA

The importance of design in
India's infrastructure planning process

Our built environment, especially India's public infrastructure, has for long been imbued by the overarching principle of 'form following function' with no connection with citizen users or even a city's urban landscape. Down the decades, post independence, the buzzwords for infrastructure creation has remained 'bigger', 'better', 'faster', and 'cheaper'. Devoid of 'design', however, such infrastructure merely mirrors a lifeless sum of physical assets, failing to fully facilitate the daily exchange of goods and services as needed by any functioning urban community.
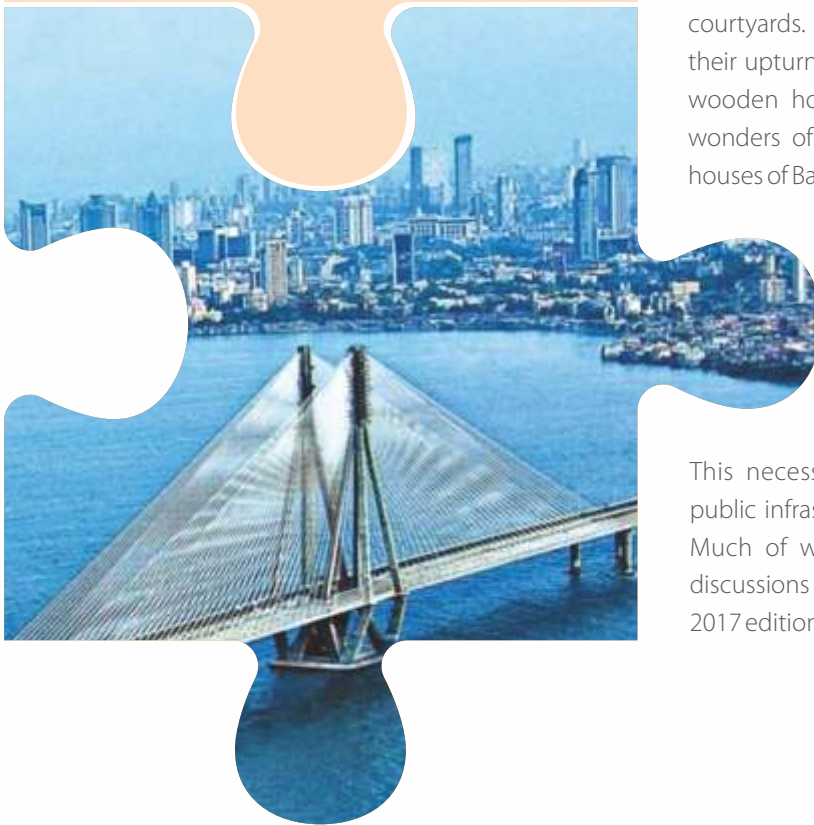
This was not how we always built our cities. Even if it were possible to have forgotten our more than 6,000-year-old legacy of town planning in Harappa and Mohenjo-Daro, what of the spectacular structures that came after? It is in India that the Ajanta and Ellora caves were created, Hampi came up, and Khajuraho was built. The stupas at Sarnath and Sanchi, the milk-white visions of Ranakpur, the opulent Meenakshi temple, the beauty of Fatehpur Sikri, not to mention the ethereal Taj Mahal. And even if we discount these structures as those meant for religion and royalty, what of the aesthetics of our everyday structures?

Think of our beautiful baolis or step-wells, the bhulbhulaiyas or mazes, and the old havelis and mansions with their lace-like stone façades, filigreed windows, hanging balconies, ornate doorways and measured courtyards. The traditional homesteads of Kerala with their upturned boat-shaped roofs, the intricately carved wooden homes of Himachal Pradesh, the terracotta wonders of Central Bengal and the pretty, red-roofed houses of Bangalore have all been lost along the way.

This necessary relationship between aesthetics and public infrastructure in India is explored in this chapter. Much of what follows are echoes of thoughts and discussions held at the session on "Aesthetic in Infra" in the 2017 edition of the InfraConclave.

India's lost legacy of design

It took the Occident some 200 years to reach the stage where most of its urban, and even rural, landscapes were informed by modernist, followed by post-modernist, design concepts. The western world had reached that level of ubiquitous design stage through focussed intent.

Take San Francisco, for instance, where artists are given licences to use any infrastructure in the city as their canvas / medium for creating art. As a result, as you traverse the city, it is already talking to its citizens and tourists, telling its own story.

Coming to the Orient, and to India in particular—design in this part of the world was more than a 6,000 year-old process that we excelled at. Down the ages, we have sadly lost sight of our rich legacy.

Like many towns and cities in the European Union, our cities used to follow colour schemes as well. The delicate salmon pink to the darker coral shades of Jaipur, the startlingly blue cityscape of Jodhpur, and the honey-gold fort with its golden sandstone houses in Jaisalmer are all part of India's traditional design aesthetics.

> "Design has a process and a time cycle. For it to sit comfortably and take root, you need to take away the in-built obsolescence that marks much of our built environment today. When you take pride in what you do, you develop an emotive connection with your audience."
>
> **– Dr Ajantha Sen**
> **International Director,**
> **Solar Projects**

In this context, it is appropriate to quote the veteran social reformer and freedom fighter, Kamaladevi Chattopadhyay, who drew a parallel between the western concept of 'form following function' and the role of the craftsman in India. Indian craftsmen traditionally devised products, including the spaces and the environment where such goods or services were sold, knowing what the end-users wanted because the craftsmen themselves were also the end-consumers.

According to Chattopadhyay, this 'integrative design' process would start with the 'shilpi' or the craftsman and his team, before moving on to what she called 'shilpan' or the creative skill and conceptualisation that went behind the creative process, to culminate into the final 'designed' product or the 'shilpa'.

As described above, we were privy to this very integrated design process that was far more integrated than the 'form following function' concept; but we chose to abandon it when we became colonised.

Traditionally, creators and artists in India have remained anonymous, with the creation always taking precedence over the creator. That was the level of importance given to 'design' and creation in the sub-continent, historically. It is this lost legacy that we need to revive today.

By happy coincidence or serendipity, however, today we may have stumbled upon our traditional 'integrative design' process once again through the use of smart technology and citizen participation.

Executable Ideas:
Smart Tech For Smart Designs

Thanks to smart technology, today there is an increasing interface of infrastructure design with technology and software screens, especially for way finding and signages. Especially art and design for way finding are increasingly coming in handy for Smart City projects across the country. For instance, by thinking through such design elements in digital displays.

Young and indigenous design firms have been trying to drive such elements of modern design and technology into India's Smart City strategies in recent years. Such exercises have ushered in the introduction of façade changes as part of streetscapes, for example. A case in point would be the recent façade changes on the shops lining the little road leading to the Golden Temple in Amritsar.

When faced with incompatible issues of design and infrastructure creation in India today, it would be advisable to approach the issue in a holistic manner by asking the right questions on behalf of the end-users. There are various instances to prove how willing people are today to interface with simple technology platforms to voice their needs from their cities. Think of the million possibilities of upgrading the heritage streetscape of Varanasi, for instance, with crowd-sourced design elements to engage and inform citizens and global tourists alike.

The possibilities of creating aesthetic and smart design by using technology with citizen interfaces are endless. Town planning in Sweden, for example, makes use of citizen participation. Citizens take actively part in designing their own towns and cities through a software platform fed with the original master plan shared by the municipal authority.

"Cities need spend very little amounts of money and change their visual experiences. It is not about expensive technology, but about creatively marrying various traditional formats and modern digital platforms together, to create a pleasing experience that also serves a purpose."

– Dr Sumit Chowdhury
Head, GAIA Smart Cities
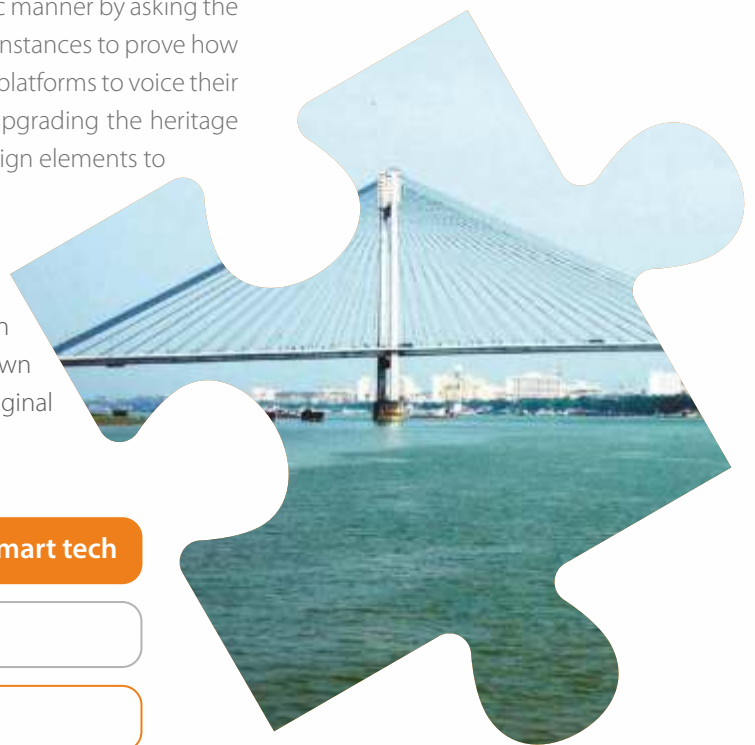
Revival of India's integrative design process via smart tech

- Information gathering

- Via crowd-sourced content

- Creation of big data

- Sense making through tangible sensory interactions

- Hard-core experiential products

Creation of Urban 'Brands' through Human-Centric Design

Executable Ideas:
Citizen Participation

Maybe not at the speed hoped for, but today an appreciation of good design in infrastructure is slowly, but surely taking place. The good news is that today it is possible for invested parties to share ideas on possible infrastructure change with state and city-level planning bodies. This has been possible largely because of the use of smart technology.

Whether such invested parties are citizen groups or the private sector, today there is a greater effort to sensitise the public sector towards the uses of good and innovative design in infrastructure. The other good news is that smart technologies have also brought back India's integrative ethos into the design process, by involving citizen participation via real-time, crowd-sourced data.

An example of such a process would be the Freedom Park in Bangalore, where a competition was thrown open to the public for design ideas. Many more such design competitions are being initiated today, especially for Smart City projects that involve the visualisation of urban development and re-development from citizen users.

"When we talk about aesthetics and infrastructure, what we're trying to gently suggest is that citizens don't consume infrastructure in data or in scale. They do not care how long the Mumbai sea link is, but they know that the experience of driving through it is beautiful, because it is a beautifully detailed structure. Built with care and with citizen experience in mind."

– Ms Sarita Vijayan
Founder Director,
FYI Creative Marketing Agency
& Founder,
India Under Construction

In another recent design competition called India Next, held by UltraTech, the winner had designed a Green walkway above Mumbai's Bandra Station. The designer had envisioned it as a green lung for his city.

Or take the case of Pune, where the Municipal Commissioner has decided not to sanction a single road for the next 5 years, because he rightly feels that Pune is a 'walking city'. Pune has decided to build better walkways instead, since the Commissioner knows that that is how citizens have been accessing their city.

There is hope, therefore, that the realisation of the need for design elements in infrastructure projects is growing in India today, along with the realisation of the need for citizen participation.

Executable Ideas:
White Topping of Urban Roads

One of the banes of urban infra has been the pothole ridden roads. These potholes in the bitumen roads form as a result of deficiency of design, execution, ingress of moisture leading to deterioration, lack of or inadequate maintenance etc. These roads not only create ugly spots but are also a safety hazard. One of the technologies well accepted in developed countries is the white topping of the roads which is nothing but providing a layer of concrete above the existing bituminous roads to a designed thickness. These roads, when designed properly and executed well are virtually maintenance free, pothole free, last for at least 25 years and hence an aesthetic as well as sustainable solution. Since the surface is light coloured, the 'heat island' effect is mitigated and also there is reduction in the amount of street lighting required. Estimates of life cycle costing prove that white topped roads are cost effective solutions too. Cities like Mumbai, Chennai, Bengaluru, Nagpur and Hyderabad have taken lead in adopting this solution.

Roof for the
MASSES

Realising the prime minister's vision of Providing 'Housing for all by 2022'

Although India's housing segment accounts for almost 80% of its real estate and construction sector in terms of volume, we continue to face a housing shortage of nearly 19 million units, according to the Ministry of Housing & Urban Poverty Alleviation (MoHUPA), Government of India. A large part of this unmet demand is centred around low cost and affordable housing, of which over 95% lies among the Economically Weaker Section (EWS) and Low Income Group (LIG) categories of urban India. Assuming an annual growth rate of 3%, based on our urban population growth between 2001 and 2011, India's urban housing shortage is expected to increase to 25 million by 2021[1]. Assuming an average ticket size of Rs.25 lakh, this translates into a market potential of Rs. 6.25 trillion .. ,

"According to the mission, more than 4 crore houses need to be built in the next 5 years, wh ich means that the size of construction is massive and time is short. Monolithic and/or Precast Construction is the only way forward"

**– Dr Manamohan Kalgal
President,
Indian Concrete Institute &
Technical Advisor,
Ultratech Cement Limited**

This chapter explores the ways and means of realising the Prime Minister's dream and the Government's mission of closing this supply–demand mismatch in India's housing sector. It closely follows the relevant discussions held at the session on 'Roof for the Masses' in the 2017 edition of the InfraConclave.

Housing is universally recognised to be a basic human requirement. India, however, faces a paucity of formal housing options in its cities, because of a large low-income population with low affordability levels. The lack of access to formal credit along with high priced home loans and debt, leave the bottom of the housing market pyramid with little more than urban slums and unauthorised settlements by way of affordable accommodation.

To tackle this very real need, the Government of India has identified the housing sector as a focus area, and the 'Housing for All by 2022' programme for urban areas under the Pradhan Mantri Awas Yojana (PMAY) scheme, as a key agenda. Highlighting its commitment, the Government has laid out an elaborate policy for affordable housing over the last couple of years. It plans to achieve its mission through a mix of appropriate policy interventions and credit availability, including interest subventions, where necessary.

The Government has already taken a number of measures to promote demand as well as supply side interest in affordable housing projects among homebuyers and development firms alike. These include infrastructure status to affordable housing, direct tax benefits under the Income Tax Act, relaxation in Foreign Direct Investment (FDI) and External Commercial Borrowing (ECB) proposals, reduction in holding period for long-term capital gain benefits and standardised usage of carpet area definition.

Here we look at actionable intelligence to help support the Government on its mission to provide a roof for the masses.

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[1]*India Real Estate Industry report from ICRA Ltd., "Affordable Housing: Immense Potential, but Challenges Galore", December 2016*

First approach to Affordable Housing: Planning

With 'affordability' being a relative concept, its definition varies according to the home price, which is also a function of a city's real estate market, the size of the dwelling, facilities offered, and the household income of the target group. The reality of developing affordable housing is that it only works in terms of volumes. Although the segment offers stable return on investment, profits are minimal. **It's a volume game.**

The low initial capital requirement of the segment, however, together with the relatively shorter execution time, helps in supporting overall return on capital employed (RoCE). A development firm's ability to execute a project without any budgeted time and cost over-runs, therefore, remain critical for such projects. While land cost remains a function of the project location, no-frill, basic amenities and standardised design parameters help to control construction cost.

Land is the single-most critical issue that affects the 'affordability', and hence the viability, of low-cost, mass housing. Over the years, keeping the 'land' factor in mind, players in this arena have developed city-centric affordable housing models, as well as models for peripheral locations.

Depending upon the need of the homebuyer to remain near urban workplaces or settle for a well-connected suburb with excellent and cheap commute and communication facilities—both affordable housing models attract demand. In case of the city-centric mass housing model, say in a locality like Chembur in Mumbai, a typical project may involve a multi-storied development with 5,000–6,000 units, priced below Rs 50 lakh. A peripheral location of a tier-I or metro city, on the other hand, may offer larger land tracts at a much cheaper rate. In such cases, a development firm could construct G+2 or G+1 structures for 1-room kitchen (1RK) units with a saleable area of ~300 sq. ft. at the price of around Rs 5 lakh.

"To construct an EWS house in Rs 2–3 Lakh, offered to the end-user at Rs 5–5.5 Lakh, your ratio of land cost to construction cost should ideally be either 4:1 or 3:1. My concept is all for a low-rise, walkable structure in a peripheral location— provided both physical and social infrastructure are in place."

**– Mr Pramod Adlakha
Managing Director,
Adlakha Associates**

As stated earlier, completing such project construction within the budgeted time and cost is of paramount importance. This is where smart construction technology comes in, with savings on time and cost.

Future of Affordable Construction:
Pre-casting, Monolithic & GFRG technology

Some of the best tried and tested technologies for scaling up construction speed, especially for affordable housing projects are pre-cast and monolithic construction. For mass production, pre-casting is the way to go. It has been in use around the world for the last 70-odd years. Pre-cast technology would require meticulous planning, to the last engineering and architectural detail. Monolithic construction in which the entire floor consisting of one or more houses is cast in flowable concrete in in go has also been successfully used in recent times by many housing agencies in Gujarat, Karnataka, Maharashtra etc.

Advantages of using pre-cast and monolithic technology for affordable housing:

- **It is perfect for fitting in modularity into any construction project, which is a requirement for affordable housing as well**
- **Offers much better quality control and hence strength and longevity to building structure.**
- **Monolithic concrete structure acts like a rigid box and hence very robust against natural calamities like earthquake, cyclone etc.**
- **Almost 10% more cost effective than most other construction technologies in the long run**
- **Offers 30-35% savings on construction time**

"According to the latest CPWD circular, both pre-casting and monolithic construction have been approved for any development project above Rs. 100 crore. This is an opportune time, therefore, for such technology players to come into the regular construction mechanism in the country, especially for affordable housing projects."

**– Mr Suresh Chandra Tripathi
Vice President, Supertech Ltd.**

India's top technology institutes have also been experimenting with suitable technologies for mass housing construction. IIT Chennai has recently conducted an experiment with a G+2 affordable housing prototype, by using what is known as the Glass Fibre Reinforced Gypsum (GFRG) building system. The prototype was built inside the IIT campus in a matter of 15 days.

The GFRG technology essentially replaces the use of bricks with pre-fabricated gypsum boards reinforced with glass fibre. The construction panels are pre-manufactured at remote facilities before being fixed to the building structure. Once a foundation is laid through the conventional, concrete method, the panels are erected on the foundation. Unlike a normal brick and mortar wall, GFRG walls do not need to be plastered or painted.

Although a number of viable construction technologies exist, the issue with mass construction is capacity building. So far, players offering pre-cast, monolithic or GFRG support are few and far between, and certainly not enough for addressing a segment need across the country. What is needed are more firms establishing pre-cast and/or GFRG factories or

capabilities for monolithic construction across the country. The establishment of a pre-cast plant can generally cater to the construction needs of projects within a radius of 200 km. What is more, all of these are sustainable building practices as well.

'EDGE' certification for Affordable Housing:
The future lies with masses going green

Often in our efforts to speed up and reduce cost of construction, we overlook the sustainability aspect of building construction.

According to the World Bank, about 70% of India is yet to be constructed! Surprisingly, however, of all the new construction taking place right now, only 3-4% follow sustainable principles. Which means that nearly 96% of new construction in India today is not sustainable for the environment.

This is where the International Finance Corporation (IFC), a member of the World Bank Group that focuses on the private sector, has come in with an 'EDGE' to address challenges faced by emerging markets, such as lack of affordable green housing. Excellence in Design for Greater Efficiencies (EDGE) is a green building certification system focused on making buildings more resource-efficient.

With the EDGE certification for the affordable housing industry, green building is now available for all. Green initiatives under EDGE have created a 20% saving on water, energy and embodied energy, saving consumers from high utility costs. IFC created EDGE to respond to the need for a measurable solution to prove the financial case for building green and help jumpstart green buildings.

As on date, energy savings from EDGE certification translate into:

- **Energy savings of 47 million kilo watt / year**
- **Embodied energy savings of 7.3 million mega joules / year**
- **Water savings of 1 million cubic metres / year**

Ministry of Housing and Urban Affairs
Government of India

Affordable housing units sanctioned in Urban Areas

20,97,920

12,40,904

● PMAY(U)
2014-Till Date

● JnNURM
2004-14

#pmayurban
pmayurban

In a typical household, almost 40% of energy is spent on heating and cooling appliances. Savings of at least 20% would go a long way in sharing the benefits of sustainability with the masses. Moreover, with almost 4 crore houses to be built in the next 5 years, the concept of 20% savings in water, energy or embodied energy will enable us to capture a huge momentum via mass housing projects.
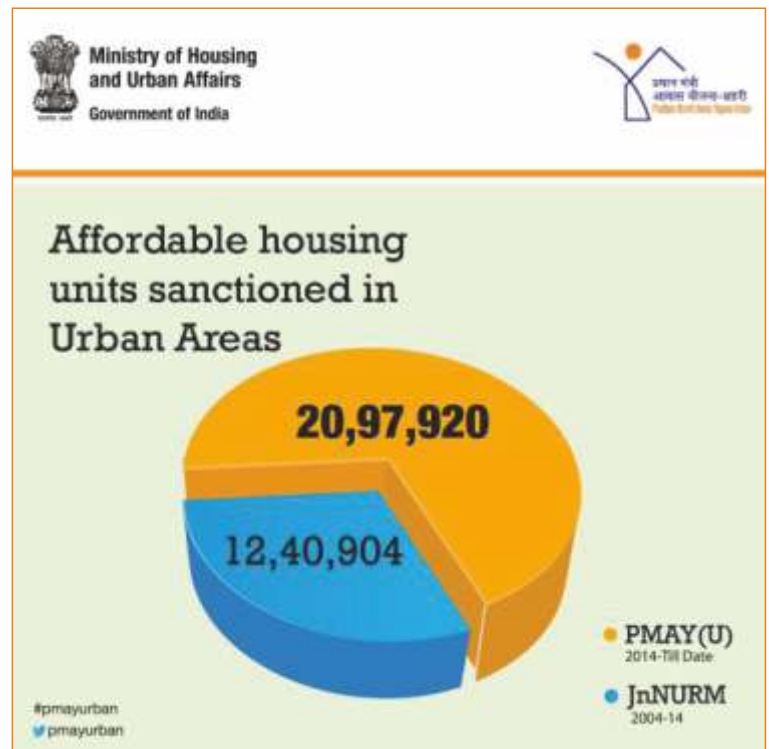
End Note

As per the latest meeting of the Central Sanctioning and Monitoring Committee (CSMC) held in November 2017, meanwhile, the Ministry of Housing & Urban Affairs has approved the construction of 1,12,083 more affordable houses for the urban poor under PMAY (Urban) at an investment of Rs. 8,105 crore, with central assistance of Rs. 1,681 crore. With that, the cumulative 'roofs' under PMAY (Urban) will now stand at 30,52,828 units, following approval from the CSMC. Moreover, after subsuming the projects of the earlier Rajiv Awas Yojana (RAY) scheme, the total number of housing units being funded under PMAY (Urban) stands at 31,94,676 houses.

Over 4 lakh houses have been constructed since the launch of the mission in June 2015; while more than 15 lakh houses are at various stages of construction (as of November 2017).

Top Actionable Intelligence for Affordable Housing

- **Easy, cheap, long-term, good quality capital to fund the working capital development of this huge affordable housing need**
- **Fully online approval process without any human intervention**
- **Sustainability linked with award of extra FAR for mass housing projects**
- **Taxation slab change for developers of affordable housing projects, as well as related industries supplying material and services to the segment**
- **Monolithic, Pre-cast and other off-site construction technologies to be brought into the regular construction process**
- **Indigenous technology innovation for mass housing construction**

Let's provide a roof over each Indian..
let's build a smart and sustainable India for all !