

Local Perception Towards Global Smart City Development.

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Abstract: India is dealing with the **smart city development**, this is needed in India for focusing and resolving the problems of core infrastructure services like clean water supply, sanitation, waste management, mobility and transportation, IT (information and technology) connectivity smart building development- which has the quality of NZE (Net Zero Energy) building and it should have sustainability towards the environment and housing facility for the poor people.

Smart development is **promoting IT sectors and Digitalization rather than focusing on the architectural and urban development** which has the impact on the civilization for many decades, which can generate energy through non renewable energy resources, could develop a building with eco-friendly environment with the help of good site orientation, use of eco-friendly material and sustainable building construction techniques. But if we talk about Digitalization then there is lot of maintenance and upgradation required for this digital world. So smart building doesn't mean the digital and mechanical control over it or over an urbanization.

SMART means **Simple, Manageable, Accessible, Reliable and Transferable and communicable**. So this development should be so **simple** that a small kid or an elder can enjoy the smart amenities without any hesitation of less knowledge about it, these development should be **manageable** by everyone or in other sense every type of management in an urban settlement like waste management, water and sewage treatment etc. could be managed easily. Profit of this smart amenities should be **accessible** to everyone living anywhere in the country. It should be so **reliable** that all the person can easily rely on these services, and also it Should complete the basic need of the human settlement which is **transportation and communication**.

As Government of India has announced in 2015 about smart development in 100 cities, what are their major scope and aim about this and what exactly our environment needs to be done by us is going to be discussed in this paper with the help some case studies on smart development in other countries than we will discuss upon the perception and notion of the Indian people towards smart city development.

Keywords: Architecture, Digitalization, Net Zero Energy (NZE), Sustainability, Smart City and Urban Development.

I. Introduction to smart cities and its concept

Smart city is an urban development to control the management system of urban areas through integration of information and communication technology for a better control and an efficient delivery for all the services. This development will help the people to get any information at any time at any place. It will be an open ended system which can be changed with the change in technology. It would be so flexible and sensitive that it will enable a better quality of life with

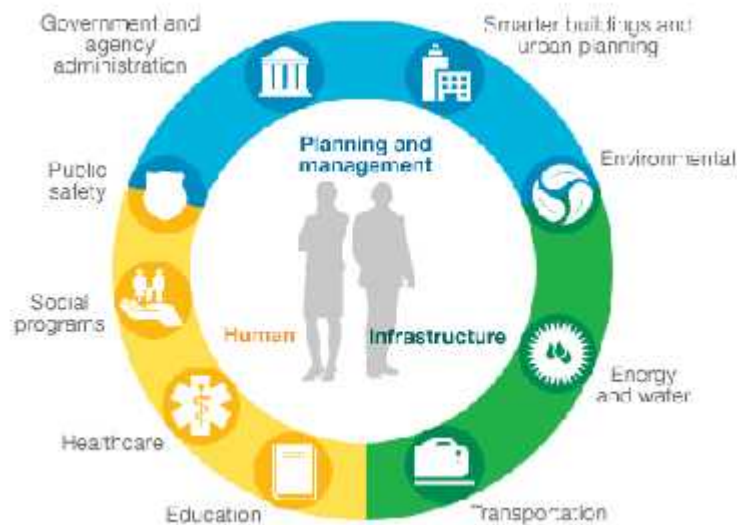


Fig 1: Smart City Concept (ref: A Nation Of Smart Cities)

the help of smart governance, smart transportation and traffic management, smart healthcare facilities, water and waste management, smart building or smart architecture, and innovation on urban agriculture.

Concept of smart city was evolved to reduce the non renewable energy consumptions so that eventually it will reduce the pollutants on the earth. Smart doesn't mean a concrete jungle with networking facilities, smart means to promote green architecture and sustainability and to generate an eco friendly environment that will give the comfort in a natural way.

Smart means using vernacular

techniques with the innovative technologies that is so called neo vernacular, for example if we make a house with vernacular technologies then it will genuinely reduce the energy consumption cost because of the orientation and design of the house and because of the eco friendly material. ICT is only for enhancing the quality and performance of urban services to reduce cost and consumption of services and to reduce the communication gap between the government and citizens. But smart city doesn't mean that it is only the digitalization rather than a green city development, both the things have to be parallel for the sake of a better future.

In India the smart city concept is also including the housing facilities for poor to empower them and to increase the quality of their life. The major parameters of a smart city are:

- Innovation in economy
- Smart urban infrastructure
- Smart governance

According to the smart city council, a smart city is one that uses ICT to enhance its livability, workability and sustainability. A smart city uses the following three simple processes:

- It collects information about itself through sensors, other devices and existing systems
- It communicates that data using wired or wireless networks
- It analyses the data to understand what's happening now and what's likely to happen to next.

This smart city concept by smart city council is totally unacceptable by the conditions in India because India is facing the problem of urban sprawl, waste management, affordable housing, pollutants like SOX and NOX, and open green spaces. So firstly India has to develop the master plan for the major cities then it has to design the green buildings and then it has to accept the ICT networking because every architectural innovation impacts the civilization first then the other

technologies like mechanical and electrical comes later, for example the civilization of Mohenjo-Daro and Harappa.

II. Case Study: London As A Smart City

"London is one of the greatest cities on earth. A world centre of commerce and a global cultural hot spot, London is diverse, connected, international and cosmopolitan. Its dynamic economy - with renowned strengths in creativity and design, science and technology, banking and finance - offers the most competitive and productive business environment in Europe. London is a centre of knowledge production, invention and entrepreneurship, with more technology companies than any other European city. London is a world leader in healthcare delivery for its citizens, and in diagnosing, discovering and providing treatments to tackle the pressing needs of global cities."^[1]

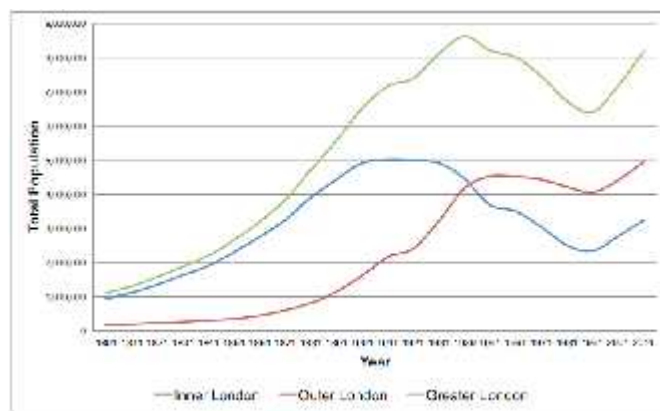


Fig 2: Demographic growth of Inner and outer London

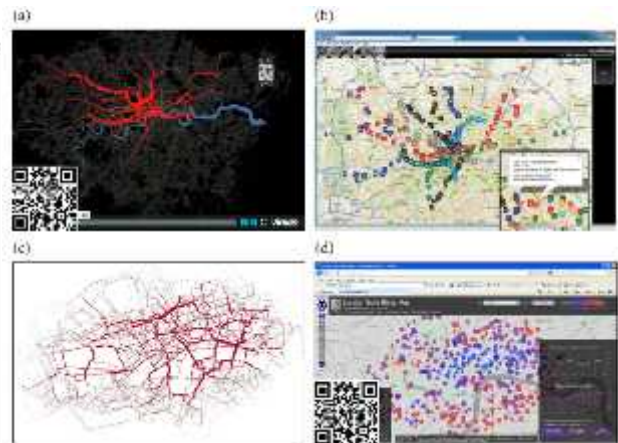


Fig 3: Visualizing Smart London 2012
(transportation flows a. public b. tube train c & d. bike flow)

A. London Facing Growth Challenges

There was a sudden hike in the population of London in last two centuries, the current population of London is **8.674 million** and it is increasing with a growth rate of 1 million people in a next decade. Every Londoner is facing the problem of **70 hours of traffic jam** annually, and there is a lot of demand in city infrastructure and congestion on road network is the main problem of the city.

This city is also facing the problem of health social care and educational needs, beside this the projected **population by 2030 is 10 million** so will increase stress not only on healthcare and transport, but the management of energy and utilities - such as water, electricity and heat, and the need to deal with growing waste and pollution and also the job demand would also be increased by 641,000 jobs. So for a better quality of life this city approaches to some smarter solutions for a new **Smart London**.

B. Smart London Approach

This City brings people, technology and data together to find out the new solutions for the increasing challenges in the city. Concept of smart city is different for everyone and Smart London is about how an information and communication technology will help to create an interface between every system and functions- whether it would be a labour market or financial

market, it will also create a unity between local government to education, healthcare, transportation and utilities through a digital grid. This integration will provide efficiency from a city level to an individual level - for the benefit of its inhabitants and visitors.

Some of the smart approaches are as follows:

- **Enterprise** - spurring innovation, creating new markets, creating new jobs.
- **Skills and training** - access to knowledge and the information that will enable everyone to take part.
- **Infrastructure and the environment** - absorbing additional pressure, reducing environmental impact.
- **Health and well being** - new and better ways of responding to Londoners' diverse needs.
- **Transport** - planning and managing journeys, reducing congestion.

We are limiting our paper to describe only the architecture and planning part of the smart development in London, so that we can justify the architectural and planning aspects of smart development. As government of London has decided to make the infrastructure and city planning part there first approach of development, so here are the following brief of that approach:

- **Embedding computers to embed technologies, information and cities:** by connecting the computers from each other people of London can easily get the information like: road connectivity map, building location map, weather information or the people of the city can get to know about the new projects going on.
It will also help the government to get to know the city problem and there solution by the citizens only, these technologies will help everyone to know the exact carbon footprint and pollutants in the city, it will help to get the route map of cab and buses. This combination will help the drivers to know the present situation on road or other routes like water routes air or rail routes.
- **Resolving the planetary pressure on the London city:** This city has problem with the rising sea level due to global warming and city has many flood prone zone, so to solve these problems they are making a good drainage and water restoration areas so that there would be no issues of clean water during the time of flood.
As we all know that at the time of rapid infrastructure development London hasn't concern that it is making the concrete jungle rather than making a green city with eco-friendly environment for all. So now this city has many areas with **urban heat island effect** so to reduce these effect and carbon footprint in the city, they started making green building and started increasing plantation in the city.
- **Future proofing London via Architectural and Urban development:** It is an undeniable fact that minimal rise in global warming is also affecting the environment vary badly. As London has seen a 1°C temperature increase since 1970 (UKCP09, n.d). In the last 15 years London experienced the four hottest years on record, with 2006 exhibiting the highest temperatures in 350 years (UKCP09, n.d). When a prolonged heat wave hit the country in 2003, England and Wales suffered 2000 heat related deaths (an increase of 16%) (UKCP09, n.d), with the greatest impact in London (Beizaee, 2013). So London is targeting a **Net Zero Carbon City by 2050** and for this it is making such a bye laws for architectural design so that the CFC gas or carbon produced by a house will be reduced through sustainable building design.

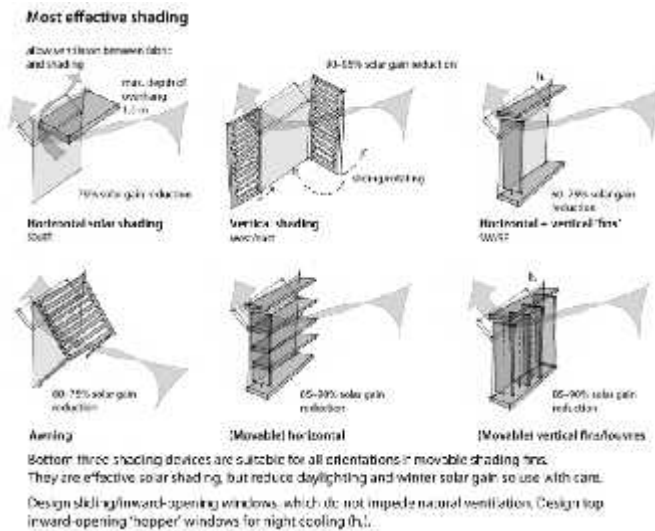


Fig 4: Natural ventilation through Openings

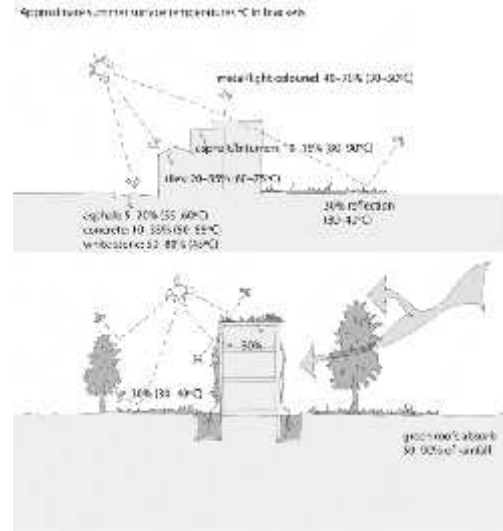


Fig 5: Reduction of Heat Island Effect through green roofing and vegetation

High fabric energy efficiency in the form of increased insulation and air tightness are key measures in the current climate for a sustainable built future, generally resulting in reduced space heat demand, increased thermal comfort and reduced fuel poverty. In the cold climate the high insulation material will help to reduce the heat loss and a good design of opening will help the natural ventilation in summers. **This is the overheating preventions at the building scale.**

The heat island effect in urban areas increases the temperature by 4-5°C than the temperature of countryside so **overheating preventions on London scale** will require the natural shading devices i.e. trees and vegetations and the choice of building material and green roof will let the environment comfortable for living.

Flood prevention on London Scale can be done by saving minimum 5% space for storage of flood water, or by green spaces, water squares and increased permeable surfaces can also help, for they not only reduce local summer air temperatures, but collect rainwater and aid water runoff. This can reduce localized flash flood risk and acts as an amenity for city dwellers.

Flood prevention on a building scale can be done by designing a proper dwelling with a good plinth height for flood water prevention or by doing a proper water proofing at the ground level or by making floating buildings and with this a house is also needed a proper drainage and sewage channels.

- **A better infrastructure for a better quality of life:** London has 30 nuclear power plant which is generating electrical energy for the city but it also giving radioactive pollutants to the nature, so Government of London is going to make renewable energy grids by solar-thermal or PV panels, and all of the private cars are going to be electric that can be charged in the home by the owner and with the full tank of liquid electrolyte it can cover 1000 km or more. So it will reduce the carbon footprint and SO_x and NO_x gases, and eventually it will stop the climate change. Than housing and building design by BIM (building information modeling) software will help to analyze the green building

efficiency of the building and eventually we will have the Net Zero Energy buildings in the city.

III. India as a rising smart city

India is witnessing a rapid pace of urbanization, which is expected to continue with passing time as well. People are migrating to the urban areas in need of resources, education, healthcare and other such amenities. Studies reveal that by the year 2030:

- 40% of India's population will be residing in urban areas
- 70% of new employment opportunities will be generated in urban areas
- 68 cities will have population exceeding 1 million

It is estimated that on an average about 75% of the global economic production takes place in cities, Indian urban areas are following the trend and account for nearly 70% of the country's GDP by 2030. About 5 years from now, housing shortage will reach about 30 million dwelling units due to increased population which will also require 200 million new water connections and, 250 million people will have to be given access to the sewage. Overall 160GW of power generating capacity will have to be added and there will be increase of vehicles on urban roads about 5 times the present number.

Hence for the development of smart cities, the proceedings will be along two streams. The initial focus will be on developing and implementing practical solutions that can work optimally with legacy systems and infrastructures via involving the modernization and overhaul of existing cities. The other stream involves the creation of new smart cities by adopting new international practices. Infrastructure, Operations and people are the three main goals which are required to be achieved for an approach towards smart cities.

IV. Smart Indian Approach



Fig 6: Smart Approach towards smart Development (Source: 100 Smart cities in India Facilitating implementation.)

With a huge number of people migrating to the urban areas, there is an increase in population density. Facilities such as electricity, better infrastructure, education, healthcare, etc are some of the major attractions which lead to increase in urban population rates. With increasing crowd the requirement of resources such as land, water, electricity, etc also increases. People are developing themselves on an individual level and end up building structures meant only for

themselves without keeping their surroundings and by-laws in mind, which results into a concrete jungle and land extensions are developing in such a way which results into urban sprawl because authority is not doing the land division properly with a proper future vision. All we can say is that the natural resources ends up being exploited to a larger extend. Increased population also leads to an increase in carbon footprint of the whole urban scenario due to lack of planning.

Besides this the main problem is that the governing bodies are trying to incorporate the idea of smart city to the existing urban sprawl only, which ends up into a blunder and indirectly a promotion to the sprawl. Therefore for the framework of a smart city there is need of integration of a number of parameters as follows:

- **Smart living:** It is the way for a more improved and advanced ways of life through smart accessibility to facilities like housing, utilities, electricity, sanitation, etc. Most important is the safety of citizens which can be controlled using the mechanical methods. A proper and planned housing should be provided for each section of the society along with smart amenities. Water and electricity supply should be done in a controlled manner through mechanical controls so as to minimize the wastage of such resources. Electricity should be generated through renewable resources such as solar and wind energy. Sewerage and sanitation should be done in such a way that it doesn't affect any of the resources and gets treated in a proper manner. There should be proper measures taken to fight against any of the natural calamities, for e.g. a well maintained drainage system is required for storm water, similarly buildings should be constructed with proper structural strengths keeping in mind the earthquake zone they are falling into.
- **Smart governance:** Most important thing for a government is transparency and accountability, which allows every individual to know everything about its government and its activities. This would lead to a more healthy and corruption free system, with a proper and answerable management of the people's money. There should be a great exposure to the stakeholders in the involvement of policy making and its implementation, which is quite possible with the help of technologies. Revenue and grievance management are some of the other important duties which are required to be handled smartly in right manner for the progress of the whole nation.
- **Smart Economy:** The proper management of the revenues helps in higher economic growth and development, higher employment rate, and renowned investment platforms. A common platform to all the investors is one of the smartest ways to connect them with each other and expose every individual towards investing, leading to growth in their income levels, which will automatically result in rise of the poverty level in India which is one of the major problems of India.
- **Smart Environment:** All the resources we rely on are directly or indirectly a source from the nature, and therefore nature plays a very important role in a person's lifecycle, and hence it is our duty to preserve our nature and use its resources without exploiting them. Now-a-days pollution is increasing through vehicles, industries, and humans as well, which is required to be controlled and hence we are required to deal with terms like Recycling and Sustainable Development. Sustainability is required to be practiced in every field such as architecture, transportation, agriculture, etc. The green spaces are hugely beneficial in today's time and therefore balance is required to be attained between the built areas and the green spaces so as to avoid concrete jungle and pollution. Renewable energy should be promoted, so as for an optimized use of non-renewable resources which are the major cause of pollution.
- **Smart mobility:** The road and railway networks are the veins of the whole country which give movement to the whole population, and therefore they are one of the basic elements which are need to be customized for a smart mobility, which is possible with the fusion of proper planning and ICT.

- Smart people: People need their amenities to be more advanced and smart, weather education or healthcare everything is needed to have an essence of smartness in it. Education and healthcare, embedded with ICT will help people in a more systematic manner. They should be provided with a platform for participation at community level, for social interactions and for lifelong learning resulting in traits such as skill building and inclusive development.

V. Analysis & Proposals

- Many smart development aspects are the same in London and in India although we know that India is a developing country and London is developed, so how would be the proposals are same.
- London is developed yet it is focusing on infrastructure development first than the IT Sectors as it knows that infrastructure has a permanent impact on a civilization and India only has a few cities which are planned by eminent town planner but 90% of the city has evolved from an urban sprawl, but it is giving IT sectors the first important rather than correcting the situations first on urban and architectural level because an urban and architecture design hold the people, technology and services together.
- Most of the Indian cities should have a proper urban pattern to control over building and road network. Like Chandigarh has a grid planning (designed by Le Corb.) and Delhi has a radial planning (designed by Edward Lutyens).
- Most of the codes in NBC (National Building Code) is copies from International Building Code, so it has to be redefine with the Indian context because in India there are many climatic zones so how would be the construction by laws are the same. It should have some sustainable and vernacular measures into it.
- As we know that The housing and construction remains India's second largest employment generator. Real estate comprises 20-30 percent of this, contributing to 5 % of India's GDP so we have to promote this field so that people will get employment and our GDP would also increase.
- Indian government should have planning principles in three phases: in 1st phase there should be planning in an existing build up area of a municipal ward with citizen participation. 2nd phase would have replacement of existing built-up area and preparing a new layout plan with enhanced infrastructure by way of mixed land use. 3rd phase would have introduction of smart solutions in a vacant area using innovative planning.

VI. Conclusions

- Smart development in India will lead to a better rise in GDP, because it will be open-ended (to allow any changes to it) and flexible to be adopted by a normal citizen.
- It will lead India to a corruption free environment because every proposal & project will be visible to everyone, so there would be no questioning in money distribution and its usage by the local authorities.
- With the connection of every market or super market in a digitalized form, it will be easy to find any element, any time at any place. And also a person who wants to do a small business can also connect easily to the public via internet.

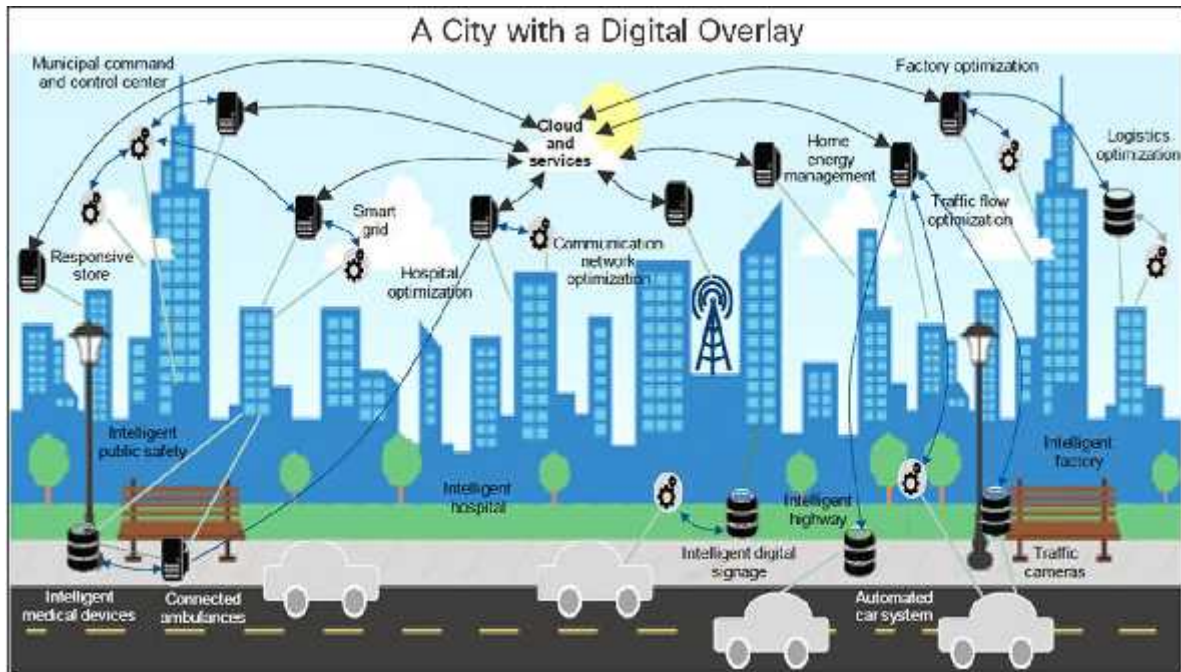


Fig 7: Digital overlay of a smart city (source: IDC Government Insights, 2013)

- It will help the people and government to connect with each other for a better solution of a better life.
- Smart security will reduce the criminal cases through smart innovations like surveillance, CCTV, biometrics and hi-tech scanners and also if the police station will connect the local people through apps and internet then it would be easy for the police to help the public and also it would secure the women.
- Smart disaster management systems are there to tell us about the upcoming natural disasters so that people would get time to save their families. It will also help to reduce the impact of disasters.
- Smart healthcare is the future of a city; it would make a patient's life so easy that he/she may get counseling from a doctor without going hospital every day. A doctor in a village can easily share the patient's report to an expertise sitting in a city via internet.
- Smart education will lead a distance learning program and conferences so easy that a student from a small town can get those teachings.
- This would reduce the energy cost because we would be able to use renewable energy extensively with the help of solar panels, hydro turbines, wind turbines, tidal energy, geo-thermal energy etc.
- It will provide a better life to the poor people via affordable housing, to empower them and to give them a better future.
- Smart infrastructure will lead to a better water supply and water treatment it will promote the RRR which recycle, reuse and reduce for water sanitation and for the treatment of sewerage, it will promote the organic waste to be reuse in form of composts or biogas.
- Smart building will have the sustainable qualities like it will be built by the eco-friendly materials which will eventually reduce the energy consumption cost, openings of the building and material usage will create a natural environment for a user in a house and BIM software will analyze the buildings and give credit to be a green building.

- Building bye laws will help to prevent the green and open areas, and if government of India will be strict towards it than nature would be saved by us.
- Smart transportation & communication will reduce the burden of carbon footprint from the heart of the Indian cities via CNG and electrical vehicles, and it will reduce the traffic congestion on the streets and roads via digital mapping and routes system.
- India will be able to get a carbon free and net zero energy country in 50 years if all these measures will be taken seriously by government and the citizens as well.

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