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SMART CITIES

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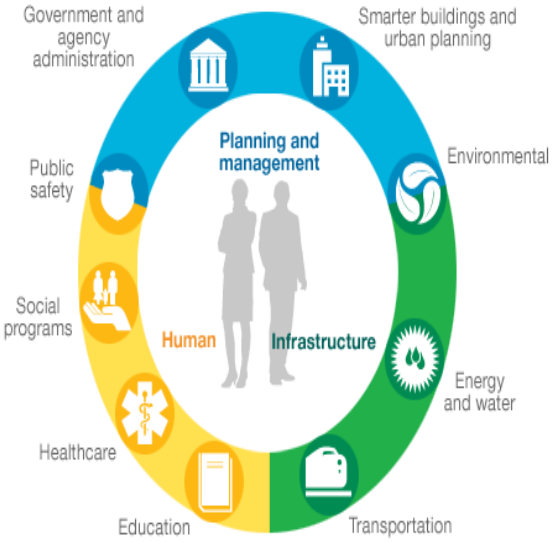
Introduction

The concept of Smart Cities originated in a U.S. information technology company IBM. The CEO Sam Palmisano put forward this concept of smart earth in the roundtable in January 2009. The idea that smarter planet building would lead a new generation of economic investment and acknowledged such concept as the information superhighway plan has since received wide and positive affirmation and creation of smart cities is receiving policy focus in countries throughout the world.



One reason is that across the world, the stride of migration from rural to urban areas is accelerating numerically. By 2050, about 70 per cent of the population will be living in cities, and India is no exception. It will need about 500 new cities to accommodate the influx. Smart Cities offer a conceptual and practical tool box to deal with unprecedented urbanization.

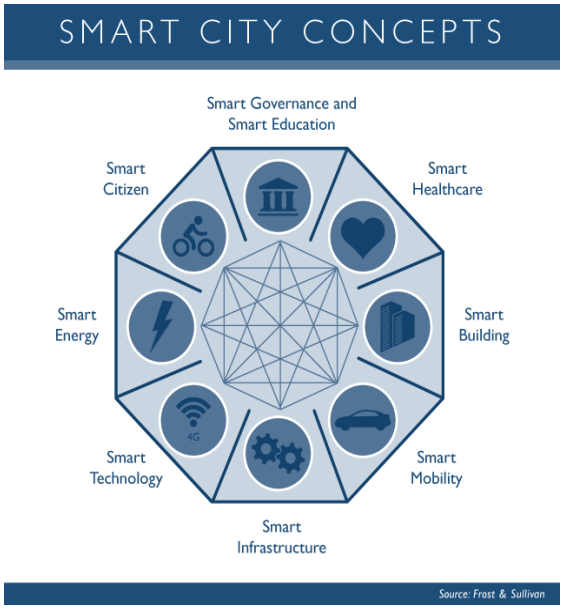
Urbanization in India has historically been viewed as a by-product of failed regional planning. It is only now that it is being realized that it is inevitable. However, the policy and practice surrounding urbanization will only change when the benefits of urbanization overtake the costs involved, it is an opportunity for achieving faster growth.

The problems arise immediately. What is a smart city? In ideal terms a working definition may be that a 'smart city' is an urban region that is highly advanced in terms of overall infrastructure, sustainable real estate, communications and market viability. It is a city where information technology is the principal infrastructure and the basis for providing essential services to residents. There are many technological platforms involved, including but not limited to automated sensor networks and data centers. Though this may sound futuristic, it is now likely to become a reality as the ‘smart cities’ movement unfolds in India.

In a smart city, economic development and activity is sustainable and rationally incremental by virtue of being based on success-oriented market drivers such as supply and demand.

The Concept of Smart Cities

The consolidated view on smart cities is, however, more tentative. Wikipedia defines Smart Cities as "*an emerging conceptual view of a city that promotes the use of* ***Information and Communication Technologies (ICTs)*** *to engage with citizens to develop social capital and intellectual capital, to make better use of hard infrastructure (physical capital), reduce usage of environmental capital and support smart growth (sustainable economic development).* However, there is no strict definition of a 'smart city'. We may define Smart Cities as those cities which have atleast five of the eight parameters listed in the diagram.



Smart Governance

Smart Governance includes political and active participation, citizenship services and the smart use of e-Government. In addition, it often relates to the use of new communication channels, such as e-government or "e-democracy".

New Technologies enable the introduction of a new relationship between Local Governments and citizens; in particular regarding the introduction of public on-line services and the use of New Technologies to improve the participation of citizens in public decision-making. In general, e- Government can be considered as a concept that consists in improving public governance and the provision of public services through the use of ICT (e-Government), improving the consultation and decision-making processes using ICT (e-democracy) and improving public policy making, with the use of ICT, incorporating more critical agents throughout the process (e-Government).

In all these aspects, the role played by citizens has a special impact. The new relationship emerging from e-Government has led to the emergence of a new kind of citizen, the e-citizen.

Smart Citizen

"The role played by citizens has a special impact as the differentiating element between a digital city and a smart city is Smart People. The new relationship emerging from e-Government has led to the emergence of a new kind of citizen, the e-citizen. "

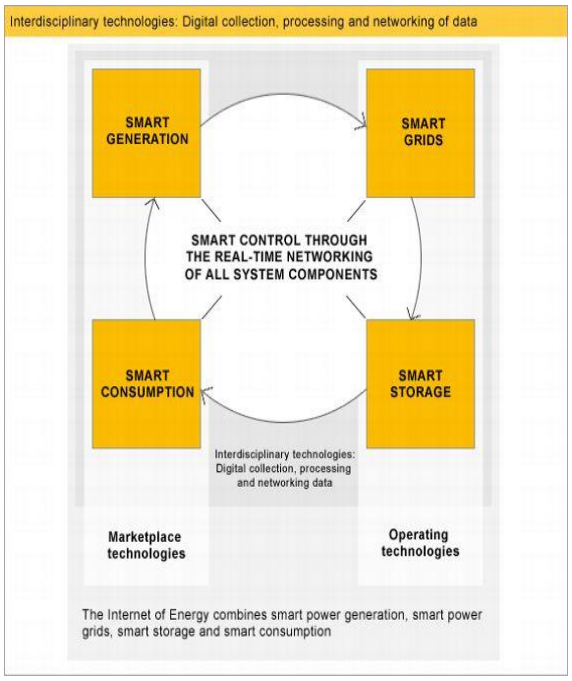
The differentiating element between a digital city and a smart city is Smart People. People are smart in terms of their skill and educational levels, as well as the quality of social interaction in terms of integration and public life and their ability to open to the outside world.

Education and Training

A key element in the development of cities is having well-educated citizens. In addition to having well-educated citizens and a university with a major presence in the city, another priority is to adapt the educational offer, especially considering the changes that society is going through due to globalization and the advancement of new technologies.

e-Learning

New technologies are evolving at breakneck speed; therefore, it is important to design digital development plans in classrooms that mainly focus on closing the digital divide, promoting the digital skills of teachers and incorporating the new generation of digital learning resources. New technologies contribute to improving people's education and training and, in that sense; virtual education offers many benefits, such as reduced costs, flexible hours and greater interaction.



Source: Federal Ministry of Economic affairs and Energy, Germany

Smart Energy

The variable nature of power generation from renewable energy sources requires that networks, generation and consumption are connected in an efficient and intelligent way. To date, power supply has been governed by the consumption-oriented generation model. Because power will be increasingly generated from renewable energy sources in the future it is necessary that we move to a model based on principles of smart power generation, smart power grids, smart storage, and smart consumption.

Smart Technology

Technological development, supported by Innovation, is essential to offer competitive products and services. In addition to Research & Development, we must also promote innovation,

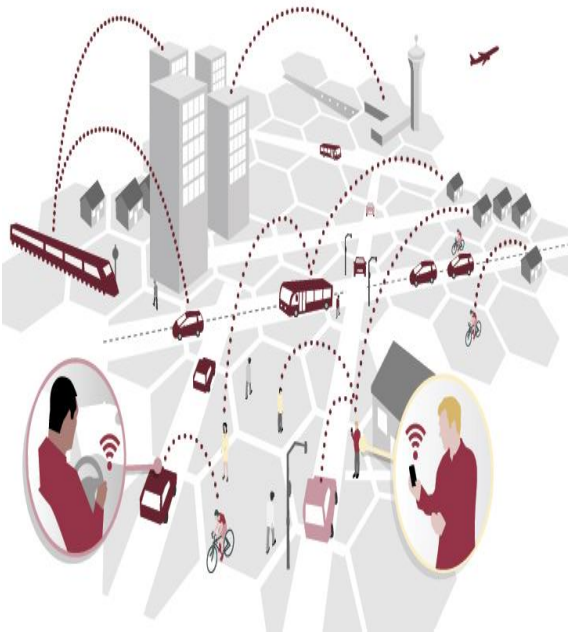
which includes areas such as new means of marketing and more efficient organizational and managerial systems.

Smart city technologies are being developed to address a range of issues, including energy management, water management, urban mobility, street lighting, and public safety, for example. These innovations are underpinned by general developments in areas such as wireless communications, sensor networks, data analytics, and cloud computing. The smart city concept is also driving new integrated approaches to city operations.

"Smart city technologies are being developed to address a range of issues, including energy management, water management, urban mobility, street lighting, and public safety. These innovations are underpinned by general developments in areas such as wireless communications, data analytics, and cloud computing."

Smart Infrastructure

Smart Infrastructure designs will need to be anticipatory and proactive to be truly sustainable. Much like an ecosystem, these will contain many small-scale, networked elements that serve a multitude of uses, rather than one single guiding purpose for their existence. Urban community garden plots, for example, not only provide food for urban dwellers, but serve as storm water management systems, allowing water and waste to be recycled at the smallest scale with real-time sensors telling the centralized system how much less will have to be processed downstream.



Cities will need to accurately measure current conditions, and model the future. Sensors and technological controls embedded within new and retrofitted urban designs could monitor existing conditions and provide real-time feedback in case modifications are needed.

Smart Mobility

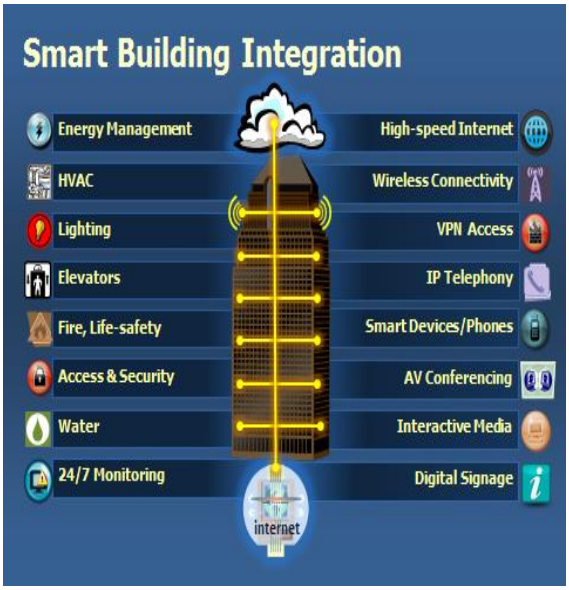
Smart Mobility aims to improve operational efficiency through linking traffic road information, the vehicle condition, real-time data acquisition and integration of urban traffic capacity, thus achieving smooth flow of traffic running with RFID automatic toll collection technology and other data gathering instruments.

Data are collected mainly through the embedded RFID chip on public transport vehicles and private cars, through video monitoring, coil monitoring, radar monitoring, floating car technology in real-time data acquisition, and GPS positioning.

The data processing system offers decision making suggestion based on comprehensive data collected, providing forecasts or

optimization instructions based on corresponding databases, model bases, and knowledge bases. Upon this basis, a further development of application can be used for traffic control, coordinating among the police, control center personnel and drivers.

Smart Building



At the most fundamental level, smart buildings deliver useful building services that make occupants productive (e.g. illumination, thermal comfort, air quality, physical security, sanitation, and many more) at the lowest cost and environmental impact over the building lifecycle. Reaching this vision requires adding intelligence from the beginning of design phase through to the end of the building's useful life. Smart buildings use information technology during operation to connect a variety of subsystems, which typically operate independently, so that these systems can share information to optimize total building performance. Smart buildings look beyond the building equipment within their four walls. They are connected and responsive to the smart power grid, and they interact with building operators and occupants to empower them with new levels of visibility and actionable information.

Smart Healthcare

The application of new technologies in ways that affect health care, from diagnosis to monitoring patients, including the management of the organizations involved in these activities, is defined as Smart Healthcare. Smart Healthcare provides citizens with considerable advantages in terms of information, and even favors the availability of alternative diagnoses and of remote treatment or tele-assistance.

Through the use of new technologies, citizens can enjoy a number of on-line medical services, including key services such as requesting an appointment on-line or the possibility of having a digital record.

Smart Cities – The Indian Perspective

The Importance of Smart Cities in India

"600 million of Indians will be living in cities by 2030, up from 290 million as reported in the 2001 census. With about 30 village dwellers moving every minute from villages to become city dwellers, not many villages will be left India at the end of this century."

India's is urbanizing at an unprecedented rate, so much that estimates suggest nearly 600 million of Indians will be living in cities by 2030, up from 290 million as reported in the 2001 census. With about 30 village dwellers moving every minute from villages to become city dwellers, not many villages will be left India at the end of this century.

Today's cities face significant challenges – increasing populations, environmental and regulatory requirements, declining tax bases and budgets and increased costs. Moreover, the cost of Information and Communication Technologies has plunged making it economical for the government to implement them. Citizens are increasingly getting instant, anywhere, anytime, personalized access to information and services via mobile devices and computers. And they increasingly expect that same kind of access to city services.

With increasing urbanization and the load on rural land, the government has now realized the need for cities that can cope with the challenges of urban living and also be magnets for investment. The announcement of '100 smart cities' falls in line with this vision.

"McKinsey Global Institute study estimated that cities would generate 70% of the new jobs created by 2030, produce more than 70% of the Indian gross domestic product and drive a fourfold increase in per capita incomes across the country."

Alongside the hordes of Indians go the jobs and the money as well: a McKinsey Global Institute study estimated that cities would generate 70% of the new jobs created by 2030, produce more than 70% of the Indian gross domestic product and drive a fourfold increase in per capita incomes across the country.

Progress So Far

The cities with ongoing or proposed smart cities include Kochi in Kerala, Ahmedabad in Gujarat, Aurangabad in Maharashtra, Manesar in Delhi NCR, Khushkera in Rajasthan, Krishnapatnam in Andhra Pradesh, Ponneri in Tamil Nadu and Tumkur in Karnataka. Many of these cities will include special investment regions or special economic zones with modified regulations and tax structures to make it attractive for foreign investment. This is essential because much of the funding for these projects will have to come from private developers and from abroad.

"Gujarat International Finance Tec-City (GIFT), Ahmedabad, will be country's first smart city and will feature remote management of utilities from a single command center, use of data analytics and real-time monitoring of services."

Gujarat International Finance Tec-City (GIFT), Ahmedabad, to be developed over 900 acres, is billed to be one of the country's first smart cities. It will feature remote management of utilities from a single command center, use of data analytics and real-time monitoring of services. It will provide high-quality infrastructure to woo finance and technology firms from places such as Mumbai, Bangalore and Gurgaon. It will have a special economic zone, an international education zone, integrated townships, an entertainment zone, hotels, a convention center, an international techno park, Software Technology Parks of India units, shopping malls, stock exchanges and service units.

Kochi Smart City is another such initiative, albeit over a smaller area of 100 hectares. It has a special economic zone that seeks to replicate Dubai's smart city project.

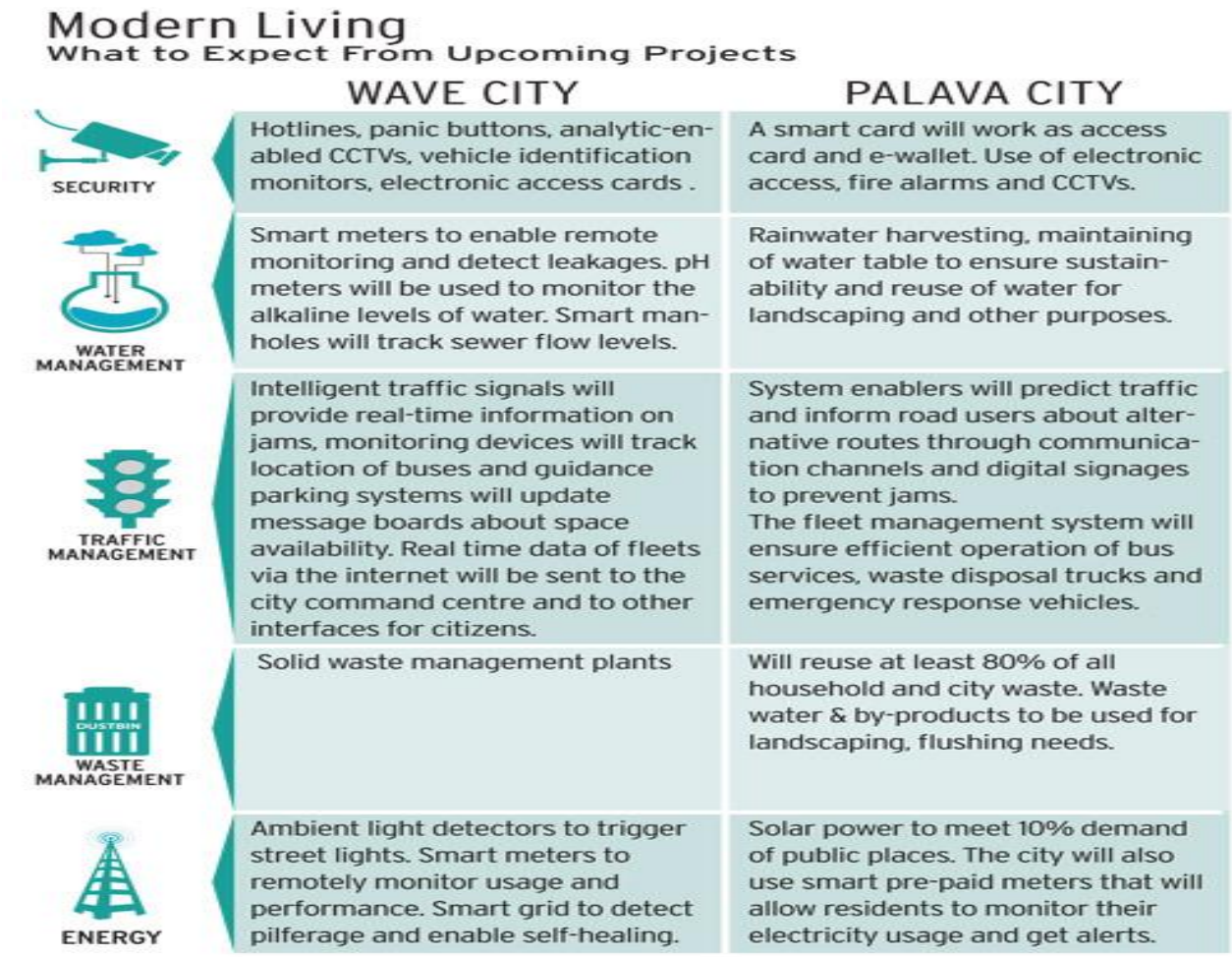
Naya Raipur is also being built as a smart city. There are also plans to build seven smart cities along the Delhi-Mumbai Industrial Corridor.

Private Smart City Projects

"Private Smart Cities propose facilities such as automated traffic signals, electricity and water meters custom-made to reduce bills, buses which will send text messages to inform residents of their arrival, mechanized garbage control, fiber optic connectivity, 24X7 security, panic buttons and CCTV surveillance systems."

Wave Infratech is building a 4,500-acre smart city on NH-24, the newest suburb of Delhi, which will be managed by a central command center. The proposed facilities include automated traffic signals, electricity and water meters custom-made to reduce bills, buses which will send text messages to inform residents of their arrival, mechanized garbage control, fiber optic connectivity, 24X7 security, panic buttons and CCTV surveillance systems.

The 400-acre Amanora township in Pune seeks to integrate e-governance and security by having a dedicated internal portal and a multi-use smart card for identification, access and cashless payments. The card will also have the person's medical records for emergencies.



"India's Smart City plan is part of a larger agenda of creating Industrial Corridors between India's big metropolitan cities in India. These include the Delhi-Mumbai Industrial Corridor, the Chennai-Bangalore Industrial Corridor and the Bangalore-Mumbai Economic Corridor."

The Bigger Picture

India's Smart City plan is part of a larger agenda of creating Industrial Corridors between India's big metropolitan cities in India. These include the Delhi-Mumbai Industrial Corridor, the Chennai-Bangalore Industrial Corridor and the Bangalore-Mumbai Economic Corridor. It is hoped that many industrial and commercial centers will be recreated as "Smart Cities" along these corridors. The Delhi-Mumbai Industrial Corridor (DMIC), which is spread across six states, seeks to create seven new smart cities as the nodes of the corridor in its first phase.

Interestingly, these corridors are developed by the Indian Government in collaboration with foreign governments who are keen to find their domestic private enterprises new avenues of investment. Japan is helping India develop its smart cities by

investing $4.5 billion in the first phase of the DMIC project through lending from the Japan International Cooperation Agency (JICA). JICA has also taken up master planning for 3 "smart cities"- Ponneri in Tamil Nadu, Krishnapatnam in Andhra Pradesh and Tumkur in Karnataka - in the Chennai-Bangalore Industrial Corridor. The United Kingdom (UK) is collaborating with India for developing the Bangalore-Mumbai Economic Corridor project with the help of private companies from Britain. India has also got into an agreement with Singapore to use its expertise in smart cities and urban planning for developing the 100 Smart Cities.

"IBM prepared the Integrated Communication Technology (ICT) Master Plan for Dighi Port Industrial Area in the DMIC that also provides for the establishment of an Intelligent Operations. In Bangalore, Cisco is converting a 5 sq. km area around Electronics City, the IT-Hub in the city's peripheries, into a Smart City."

Partnership with Technology Firms

Also instrumental in the development of Smart Cities are partnerships with technology firms like IBM and Cisco. IBM prepared the Integrated Communication Technology (ICT) Master Plan for Dighi Port Industrial Area in the DMIC that also provides for the establishment of an Intelligent Operations Center which uses IBM's Smarter Cities software to integrate data from various agencies at one command center. Meanwhile, Cisco has already prepared the ICT Master plan of four smart cities under the DMIC project- Dholera in Gujarat, Shendra in Maharashtra, Manesar in Haryana and Khushkera in Rajasthan.

In Bangalore, Cisco is converting a 5 sq. km area around Electronics City, the IT-Hub in the city's peripheries, into a Smart City. Cisco has entered into a partnership with the Electronic City Industrial Association (ELCIA) to establish an Internet of Things (IoT) innovation hub that would help companies develop software applications that can be deployed in the 100 smart cities. The first phase of the project at Electronics City is expected to be rolled out in January 2015. Cisco aims to leverage the experiments it carries out in the "Living Lab" in Electronics City for its projects in other Smart Cities.

"The Government plans 100 new cities and has allocated INR 70.6 billion for the year 2014-15"

Government Initiatives

India plans 100 new smart cities and will develop modern satellite towns around exiting cities under the smart city program. Government of India has allocated Rs. 70.6 billion (USD 1.2 billion) for Smart Cities in budget 2014-15.

Some of the key highlights under various parameters are listed below.

Smart Governance

- USD 83 million allocated for Digital India Initiative
- PPP model to be used to upgrade infrastructure in 500 urban areas
- Plans to develop atleast 2 smart cities in each of India's 29 states
- Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC) plans seven smart cities along the 1500 km industrial corridor across 6 states with total investment of USD 100 billion.

"PPP model will be used to upgrade infrastructure in 500 urban areas.

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The Power Grid Corporation of India has planned to invest USD 26 million in the next 5 years

The Government of India and the World Bank have signed a USD 500 million credit for the Rural for the Rural Water Supply and Sanitation (RWSS) project in the Indian states of Assam, Bihar, Jharkhand and UP"

Smart Energy

- Establish smart grid test bed and smart grid knowledge center
- Implementation of 8 smart grid pilot projects in India with investment of USD 10 million
- Addition of 88,000 MW of power generation capacity in the 12th Five Year Plan (2012-2017)
- The Power Grid Corporation of India Limited has planned to invest USD 26 billion in the next five years.
- Installation of 130 million smart meters by 2021

Smart Environment

- Ministry of New and Renewable Energy has plans to add capacity of 30,000 MW in the 12th Five Year Plan
- The Indian Ministry of Water Resources plans to invest USD 50 billion in the water sector in the coming years
- The Yamuna Action Plan Phase III project for Delhi is approved at an estimated cost of USD 276 million
- The Government of India and the World Bank have signed a USD 500 million credit for the Rural for the Rural Water Supply and

Sanitation (RWSS) project in the Indian states of Assam, Bihar, Jharkhand and Uttar Pradesh

Smart Transport

- Ministry of Urban Development plans to invest more than USD 20 billion on the metro rail projects in coming years
- India's first monorail project at Mumbai will cost around USD 500 million, of which USD 183 million has been spent on phase I

"Ministry of Urban Development plans to invest more than USD 20 billion on the metro rail projects in coming years"

Smart Information and Communication

- Broadband connections to 175 million users by 2017
- Under the flagship "Safe City" project, the Union Ministry proposes USD 333 million to make seven big cities (Delhi, Mumbai, Kolkata, Chennai, Ahmedabad, Bangalore and Hyderabad) to focus on technological advancement rather than manpower

Smart Buildings

- India is expected to emerge as the world's 3rd largest construction market by 2020, by adding 11.5 million homes every year
- The Intelligent Building Management Systems market is around USD 621 million and is expected to reach USD 1,891 million by 2016
- Smart Buildings will save up to 30 per cent of water usage, 40 percent of energy usage and reduction of building maintenance costs by 10 to 30 per cent

"Intelligent Building Management Systems market is around USD 621 million and is expected to reach USD 1,891 million by 2016"

Funding the Smart Cities

The amount deployed by the Government is by no means a small amount, but the funding requirement for the smart cities is expected to be pretty huge, requiring not just Central and State Government and local body funding, but a big role to play by the private sector as well, through public private partnership projects.

Some of the options being evaluated include a green tax on fuel purchase, betterment charges payable on sale of property,

urban tax on purchase of new vehicles, etc. The investment figure would vary widely depending on whether the development is green-field or on the back of an existing city.

Greenfield Smart Cities

Investment in greenfield smart cities can be significantly higher as new cities require development of smart urban infrastructure from scratch. In most green-field projects, bulk of the financial resources are mobilized through sale of land or built-up commercial or residential space, with user charges helping meet recurring operations & maintenance costs.

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Existing Cities

In the case of existing cities, on the other hand, user charges constitute the primary means of servicing the investments made since the scope for new residential/commercial space development is usually limited. User charges are levied in various forms.

For example, local governments in various US states like Michigan (in the city of Detroit) and South Carolina charge tap fees to cover the cost of installing water meters and sensors for monitoring water supply and quality. These fees, which are usually over and above normal water usage charges based on consumption, are usually charged on a flat-rate basis based on either the diameter of the pipeline or the built-up area of the house.

Challenges and Measures

The concept of smart cities has its challenges, especially in India. For instance, the success of such a city depends on residents, entrepreneurs and visitors becoming actively involved in energy saving and implementation of new technologies. There are many ways to make residential, commercial and public spaces sustainable by ways of technology, but a high percentage of the total energy use is still in the hands of end users and their behavior.

Key Challenges

- A smart city could take between 8 to 10 years to build from scratch and even more time to attract businesses and people.
- Such an initiative requires commitment and persistence on part of the government over a long period of time.
- The authorities need to be aware of the latest relevant technologies and the technologies have to be tailor-made and used effectively taking into account the topography, location and natural resources of the area.

"A smart city could take between 8 to 10 years to build from scratch and even more time to attract businesses and people. This requires commitment and persistence on part of the government over a long period of time"

Measures Required

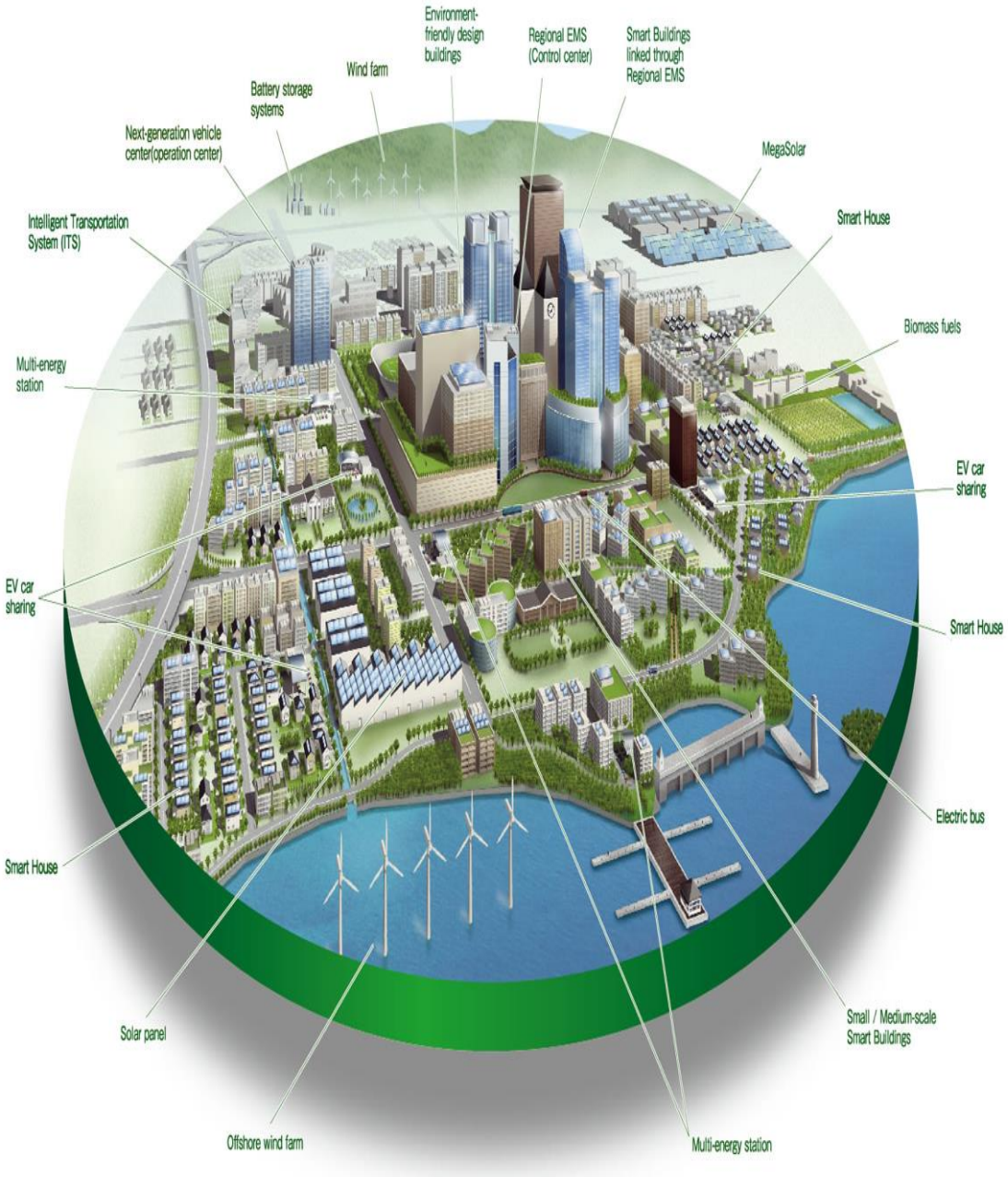
- Setting up of a central planning authority that would manage and provide single window clearances, monitor progress of such projects and ensure compliances.
- To attract businesses to newly developing smart cities, incentives in the form of long-term tax holidays and other tax sops need to be given.
- In order to develop smart cities at par with global standards, the government needs to involve the private sector as well as global urban planning groups who had implemented the concept of smart city elsewhere in Asia.

Opportunities for Housing Providers and Developers

The Government has announced a slew of measures to give a boost to the real estate sector, including an allocation of Rs. 7,060 crore for the development of 100 smart cities, a reduction in the size of projects eligible for FDI from 50,000 sq. meters to 20,000 sq. meters and halving the minimum investment limit for FDI to $5 million. The opening up of FDI will bring in opportunities for cheaper capital for smaller projects as well, improving quality and delivery of low cost and affordable housing projects. At the moment a large number of projects are not eligible for foreign direct investment because they do not fulfill the minimum threshold conditions. This has meant only big projects, usually on the higher side of the price range, are able to attract attention from foreign private equity funds.

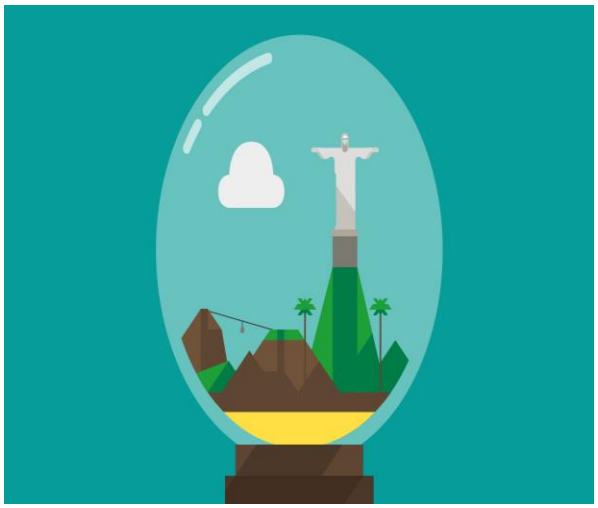
"Measures such as reduction in the size of projects eligible for FDI from 50,000 sq. meters to 20,000 sq. meters and halving the minimum investment limit for FDI to $5 million will bring in opportunities for cheaper capital for smaller projects as well, improving quality and delivery of low cost and affordable housing projects."

The government will also provide the necessary incentives for real estate investment trusts (REITS) which will have a pass-through for the purposes of taxation in effect avoiding double taxation. REITS are expected to provide relief to several liquidity starved real estate companies that currently have a high level of debt on their books.



Case Study

While all cities are unique, they also have common objectives and face common challenges. We will see two cases on how these cities are addressing their challenges, and how they are adapting their organizations to deliver new digital services to their citizens.



Rio De Janeiro, Brazil

When the current city government came into administration in 2009, Rio faced significant challenges. The city was one of the most violent in Brazil, and there were significant political and economic challenges. The new administration made a very strong fiscal re-alignment in the first two years of government. The previous budget was not seen as sustainable and the city was unable to meet its operational needs. The first fiscal action was to cut all spending in the city by 20%, and to re-negotiate all City contracts. This re-focusing was a key enabler for developing new, more effective ways of operating the city, and incorporating new smart city technologies.

Projects Implementation

- **Centre of Operation**

The Centre of Operations was initially created to respond to natural disasters. The new Centre of Operations houses representatives from over 30 different departments at any one time. This has taken huge organizational change from the previously segregated city departments. It was built from scratch in eight months in partnership with IBM and Oracle, and is used by decision makers in the city to operate general city services, but especially to coordinate emergency response.

Over time, the administration has begun to develop routine operational uses for the Centre of Operations. For example the garbage trucks are coordinated through GPS, so in an emergency the trucks can be re-purposed for other tasks. This helps the city manage resources and improve efficiency of response.

- **Open Data**

"One of the key requirements of a smart city is Transparency and this can be achieved by making significant amount of data freely available to the public"

One of the core principles of the center of operations was that it was to be transparent. Rio has made a significant amount of their data freely available to the public. Largely these datasets fall into two categories:

- The data portal data – which provides in-depth city information, such as crime rates, mortality rates etc.
- Centre of Operations data – which holds information for everyday management - e.g. congestion, weather etc.

Funding

Rio is trying to tackle its funding constraints by importing innovative ideas and management styles from the private sector, and keeping on top of innovations that come out of the private sector. Performance - related pay is an example of this.

35% of the investment managed by the municipal government is from private investors. Public Private Partnerships (PPPs) are being newly exploited in Rio to manage these investments. In the past, PPPs had been extremely difficult to execute due to bureaucratic barriers, but regulation has since been changed to facilitate public-private relationships.

"35% of the investment managed by the municipal government is from private investors. Public Private Partnerships (PPPs) are being newly exploited in Rio to manage these investments. Rio now has the three largest PPPs in Brazil, including the port renovation area, a $4 billion PPP."

Rio now has the three largest PPPs in Brazil, including the port renovation area, a $4 billion PPP. Previously legislation had prevented private investment in the area, so policy mechanisms and urban regulations have been introduced to ensure that private investment could support local development. Rio sees PPPs as being able to deliver virtuous schemes where the contractors are paying extra for the construction rights, and contributing to regenerating the area.

The Olympic Park will also be built using private money. The contractors will be building the Olympic buildings, which they will own and sell to the market. The city has therefore been able to concentrate public money on the public spaces, infrastructure, and facilities like transportation.

The Centre of Operations was a PPP with IBM who invested a significant proportion of the finance as a demonstrator of the concept. The city now has a service contract with them to support the system.

Conclusion and Measuring Impact

The major problems faced by Rio, steps taken to transform the city and their impact is shown in the table below.

Past Problems	Measures Taken	Result
Lack of Coordination between various authorities	Setting up of new Centre of Operations houses representatives from over 30 different departments at any one time.	Traffic management, and the response time and coordination of emergency incidents have all improved. Residents also have access to daily data feeds from the command center, where they can get updates on weather and traffic and receive suggestions for alternative routes when large events such as soccer matches are taking place.
Lack of Transparency	Open Data Project	The data portal provides in-depth city information, such as crime rates, mortality rates etc.
Slow response time to Natural Disasters	A command center was built which set up a high-resolution weather forecasting and hydrological modeling system — which can predict heavy rains as much as 48 hours in advance. Transportation issues can be better monitored through real-time data culled from sensors and video cameras.	Better response time to Natural Disasters. Garbage trucks are coordinated through GPS, so in an emergency the trucks can be re-purposed for other tasks. This helps the city manage resources and improve efficiency of response.
Lack of Smart Infrastructure	Re-negotiation of all City Contracts and awarding new contracts	Enabled the city to incorporate new smart city technologies and developed more effective ways of operating the city.

In the first year of government the new administration created a strategic plan, and a Public Management Office (PMO) to ensure they were making tangible steps to achieving their goals. This group monitors activities and has two main purposes:

1. To monitor project progress (time and cost). The Mayor himself spends a few hours every Monday ensuring that core projects are running to plan.

2. To ensure that these projects have the impact and citizen value that they wanted to achieve. The PMO office investigates the real impact of investment on people's lives, rather than simply the physical outputs.

One of the challenges in creating smart city investment metrics is that it takes time to create a system that is easy to use, transparent, and understandable. Rio employs 15,000 public sector staff, and a core challenge is to align all stakeholders in the same direction. This takes clear leadership, cultural change, and time.

City workers have performance-related pay, meaning that if the departments reach their targets (say, over mortality rates reduction, etc.) they get a bonus. This incentive scheme runs across the whole public sector from the front-line staff such as teachers and doctors, to back end roles in the city administration.

Seoul, South Korea

Officially "Seoul Special City", Seoul is the capital of South Korea and the country's largest metropolis with a population of over 10 million people. Having hosted the Olympic Games, the FIFA World Cup, and 2010's G-20 summit, Seoul is world renowned as both a highly-advanced economy and leading tourist destination. Seoul is however best known as one of the most tech-savvy cities in the world, retaining its No.1 ranking in the UN e-Government Survey since 2003.

Background

Smart Seoul 2015 was announced in June 2011 to uphold Seoul's reputation as a global ICT leader by boosting its sustainability and competitiveness through smart technologies. Strictly speaking, Smart Seoul is not Korea's first attempt to incorporate ICT in city-development strategies.

In 2004, Korea initiated the u-City project whereby ubiquitous computing technologies were applied to strengthen cities' competitiveness.

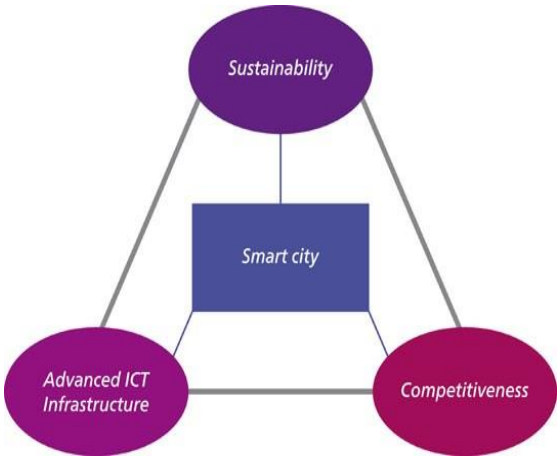
The smart city achievable today differs fundamentally however, in that today there are ways to simultaneously enhance a city's sustainability, competitiveness and citizen happiness. A smart city emphasizes the continued maintenance, protection, reinforcement and regeneration of its attractiveness in the future no less than it prioritizes its short-term competitive edge.

Smart Seoul 2015 was adopted to overcome the limitations of u-Seoul which applied ICTs only to existing traditional city infrastructure. u-Seoul improved the delivery of services such as transportation and safety, but failed to produce material improvements in the quality of life enjoyed by Seoul's citizens.

Smart Seoul 2015 is a more people-oriented or human-centric project; and Seoul now aims to implement as many smart technologies as possible, but also to create a more collaborative relationship between the city and its citizens.

The three pillars of Smart Seoul

- **ICT Infrastructure:** Securing next-generation ICT infrastructure is critical to the success of emerging smart-city services. Efforts



to develop ICT infrastructure must anticipate future service demands, rather than respond only to those most apparent.

Integrated City-management Framework: A well-defined 'integrated city-management framework' is essential. The many integrated subsystems, meta-systems and individual, building-block systems of a smart city will work in harmony only through the strictest adherence to common standards.

Smart Users: ICTs are the tools to enable a smart city, but are of no use without smart-tech users able to interact with smart services. Increasing access to smart devices and education on their use, across income levels and age groups, must remain one of a smart city's highest priorities.

Projects Implementation

- **Smart Devices for All**

Smart Seoul Infrastructure refers to the functional ICT framework essential to the provision of Smart Seoul's services. The development of Smart Seoul's services has to date been led by Seoul's Metropolitan Government, and Seoul is currently transferring a larger portion of this task to its citizens through the publication of the city's administrative information and the creation of open-source app-development models.

A smart city relies on an inclusive network of smart device users, with the city's inhabitants demanding or creating the services they most value. The inclusive network in Seoul encompasses high-speed broadband optical wire and wireless networks (including Wi-Fi, NFC technology, etc.). All citizens' voices should be heard in this effort, and a key pillar of Smart Seoul 2015 is to increase access to smart devices and to educate new users on their operation

- **Smart Work Center**

Seoul Metropolitan Government is piloting a "Smart Work Center" project, allowing the government's employees to work from 10 offices – Smart Work Centers – located much closer to their homes. As employees check-in to a Smart Work Center for their shifts they are permitted access to sophisticated groupware and teleconferencing systems, ensuring their

absence from City Hall in no way impedes their job performance.

The project has attracted the interest of the international community, and Seoul plans to offer Smart Work to 30 per cent of its government employees by 2015. The first Smart Work Centers opened in August 2011, and by the end of that year, 2,792 employees had made use of Smart Work (available to all government employees on request). Moreover, a Metropolitan Government survey found that 79 per cent of its employees believed this service was valuable, and 91 per cent expressed interest in working from a Smart Work Center in the future.

"Smart Work Center project, allows the government employees to work from 10 offices – Smart Work Centers – located much closer to their homes. As employees check-in to a Smart Work Center for their shifts they are permitted access to sophisticated groupware and teleconferencing systems, ensuring their absence from City Hall in no way impedes their job performance"

- **Community Mapping**

Seoul's open governance model seeks to extend citizens the opportunity to participate in the administration of the city, and "Community Mapping" was born with this pursuit in mind. Using ICTs such as geographical-information systems, the m.Seoul platform and social networks, citizens will be able to raise the issues of greatest concern to their neighborhood or community. Seoul sees great potential in the system and is focusing on applying Community Mapping to a wider range of citizens' concerns, empowering citizens to develop solutions to these concerns in collaboration with their peers.

"Smart meters provide home, office and factory owners with real-time reports of their electricity, water and gas consumption."

- **Smart Metering Project**

Seoul's Smart Metering Project aims to reduce the city's total energy use by 10 per cent, and in 2012, Seoul is piloted a program installing smart meters in 1,000 households.

Smart meters provide home, office and factory owners with real-time reports of their electricity, water and gas consumption. This information is presented in monetary units, and is accompanied by detailed information on a household's energy-consumption patterns and means of adjusting those patterns to reduce energy costs.

Conclusion and Measuring Impact

The table below highlights some of the key objectives of the Smart Seoul project and the measures taken by Seoul to transform the city into a Smarter City.

Objective	Measures Taken	Result
Realize a Smart government that actively interacts with citizens	Establish infrastructure for Smart administration, including building data centers based on energy-efficient cloud computing, and Smart work centers.	Increased participation of citizens in the city affairs and ways to build a two way communication between the citizens and the authorities
Customized Civil Administrative Services that Citizens Feel Useful	Established an integrated reservation system that citizens can conveniently use. Public service reservations, civil applications procedures, mobile safety services, real-time emergency messaging, and other public services will be provided based on the individual needs through mobile devices	30,000 different places providing reservation service by sectors such as education, sport, culture & tourism and medicine, and by organization such as bodies of the city, autonomous regions and affiliated institutes, causing inconvenience to citizens.
Smart Public Administrative Infrastructure	Developed a standard model of smart work for the pregnant and child-raising public employees as well as the private sector employees. It will also establish public-private work centers to be shared by the public and private sectors. Such work centers will be gradually increased in key locations of the city.	Allows the city to offer flexible and non-stop service to users even in case of system updates by allocating resources effectively.Cloud computing environment will save the city more than 30% of system operating costs by integrating systems, cutting bills for electricity, system setting, and SW maintenance.

ABOUT CREDAI

Established in 1999, the Confederation of Real Estate Developers' Associations of India (CREDAI) brings together more than 9000 Real Estate Developers from 151 city chapters across 23 states of India under a single umbrella. As the apex body for private sector developers, CREDAI has worked hard to make the industry more organized and progressive by networking closely with government representatives, policy makers, investors, finance companies, consumers, real estate professionals and developers.

CREDAI's code of conduct is adopted proactively by all its members and promotes self governance and ethical practices. CREDAI also updates its members about the latest industry data, technology advancements, industry benchmarks and international situation from time to time.

The major objectives of CREDAI are as–

- To perpetuate an ethical code of conduct, which is self – imposed & mandatory for all the member developers of CREDAI
- To maintain integrity & transparency in the profession of Real Estate Development.
- To represent the developers across India by communicating & representing with the government authorities for the formulation of proactive policies for this sector.
- To encourage & support the developers to increase their efficiency in the development /construction activities by introducing the latest technologies.
- To disseminate the data, statistics & other related information in this Decor.
- To promote the interest of construction workers & to educate them on the best practices.
- To encourage research in the profession of construction & real estate development
- To facilitate easy housing finance availability to the property purchases and construction finances to the developers by working in close coordination with the leading house finance institutions & banks.

About Resurgent India

Equity I Debt I Advisory

Resurgent India is a full service investment bank providing customized solutions in the areas of debt, equity and advisory. We offer independent advice on capital raising, mergers and acquisition, business and financial restructuring, valuation, business planning and achieving operational excellence to our clients.

Our strength lies in our outstanding team, sector expertise, superior execution capabilities and a strong professional network. We have served clients across key industry sectors including Infrastructure & Energy, Consumer Products & Services, Real Estate, Metals & Industrial Products, Healthcare & Pharmaceuticals, Telecom, Media and Technology.

In the short period since our inception, we have grown to a 100 people team with a pan-India presence through our offices in New Delhi, Kolkata, Mumbai, and Bangalore. Resurgent is part of the Golden Group, which includes Ginesys (an emerging software solutions company specializing in the retail industry) and SNC Associates (a full service accounting firm, specializing in taxation, auditing, management consultancy and outsourcing).

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