FICCI

Contents

India: Surging to a smarter future

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Foreword

India is the third-largest economy in the world in terms of purchasing power parity (PPP) with a 6.4% share of the worldwide gross domestic product (GDP) on a PPP basis. The country also ranks second in terms of population, with more than 1.2 billion people, out of which, nearly one-third are urban dwellers. The urban proportion in the country has increased from 17.3% in 1951 to 31.2% in 2011. Over the last decade, Indian cities have witnessed a high rate of urbanisation with Delhi leading the race, registering a growth rate of 4.1%, followed by Mumbai and Kolkata with growth rates of 3.1 and 2% respectively.[i]

Urbanisation is now a global megatrend and by 2050, around 64% of the developing world and 86% of the developed world is expected to be urbanised. Rapid urbansiation is putting a strain on the infrastructure, environment and social fabric of cities. In addition, the existing physical, urban and social infrastructure is unable to meet and sustain city requirements and needs an overhaul.

The new Indian government has taken cognisance of this accelerating expansion. Investments required to stabilise, augment as well as build a robust urban infrastructure are at the forefront of the government's current agenda.

Indian policymakers are taking proactive steps in transforming their traditional city models for a balanced overall growth and are looking to achieve 'more with less'. Transformation strategies and implementation plans leveraging the smart city concept are being developed that entails utilisation of technology, streamlining existing as well as planned infrastructure investments in order to provide higher quality of living to residents, creating a conducive investment climate for businesses and optimising resource utilisation with transparency for government agencies. Budgetary allocations and announcements of smart city initiatives across various Indian cities have been made by the central and state governments.

The new Indian government is poised and determined to provide the right impetus and policy environment to take its smart city agenda forward. Venkaiah Naidu, Union Minister of Urban Development recently said, "Initiatives to set up 100 smart cities across the country by 2022 are underway and being implemented at a fast pace." This is a huge opportunity for progressive companies and solution providers to come, invest and contribute their knowledge, experience as well as value proposition in fostering the smart city transformation journey.

The objective of this knowledge paper is to provide an overview of the opportunity landscape for smart cities in India as well as facilitate global solution providers to take stock of the current situation and support the Indian government's smart city initiative. A strong and stable democratic government coupled with the relatively free play of market forces today makes India the most attractive investment destination.

This paper has been prepared for a seminar organised by the Federation of Indian Chambers of Commerce and Industry (FICCI) on 'Smart Cities: The Urban Challenge' to be held at Hannover Messe 2015 in Germany. The opportunity landscape for smart cities in India, presented in this paper, will drive conversations on where we are going with the smart city transformation in India.

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Setting the perspective

Urbanisation: A global megatrend

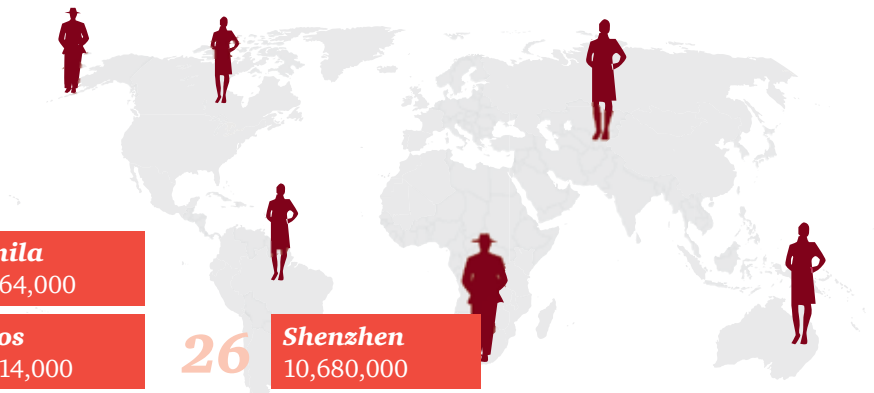
Globally, a large section of the population today lives in urban areas as compared to rural areas. Presently, over 50% of the global population lives in urban cities, up from nearly 30% in the year 1950.[ii] Urban clusters occupy 0.5% of the world's surface, but consume 75% of its resources. Every week, nearly 1.5 million people join the urban population, mostly through migration and childbirth.[iii] People mainly migrate to urban areas for better employment opportunities, healthcare and educational facilities as well as improved liveability and higher standard of living.

Inevitably, this rapid expansion and urbanisation is putting a strain on the infrastructure, environment and social fabric of cities. With the burgeoning population, the citizen's demand for basic amenities such as water, energy, infrastructure and clean environment is increasing correspondingly. This trend is projected to continue in the coming years.

In the coming decades, globally, most of the regions are likely to urbanise further, with Asia and Africa leading in terms of growth rates as compared to other geographies, and are forecasted to register an urbanisation rate of 64 and 56% respectively by 2050. Again, by 2050, urbanisation and population explosion are forecasted to add 2.5 billion people to the overall global population, with approximately 90% of the rise taking place in Africa and Asia.

Leading megacities with population-wise (2014)

1	Tokyo 37,833,000	10	Cairo 18,419,000	18	Manila 12,764,000	26	Shenzhen 10,680,000
2	Delhi 24,953,000	11	Dhaka 16,982,000	19	Lagos 12,614,000	27	London 10,189,000
3	Shanghai 22,991,000	12	Karachi 16,126,000	20	Los Angeles 12,308,000	28	Jakarta 10,176,000
4	Mexico City 20,843,000	13	Bueno Aires 15,024,000	21	Moscow 12,063,000	29	Seoul 9,775,000
5	Sao Paulo 20,831,000	14	Kolkata 14,766,000	22	Guangzhou 11,843,000	30	Lima 9,722,000
6	Mumbai 20,741,000	15	Istanbul 13,954,000	23	Kinshasa 11,116,000	31	Bengaluru 9,718,000
7	Osaka 20,123,000	16	ChongQing 12,916,000	24	Tianjin 10,860,000	32	Chennai 9,620,000
8	Beijing 19,520,000	17	Rio de Janeiro 12,825,000	25	Paris 10,764,000	33	Bogota 9,558,000
9	New York 18,591,000					34	Nagoya 9,373,000
						35	Johannesburg 9,176,000
						36	Bangkok 9,098,000
						37	Chicago 8,739,000



Source: UN Department of Economic and Social Affairs

■ *Indian cities*

Tokyo is the world's most populated city with an agglomeration of nearly 38 million inhabitants, followed by Delhi with approximately 25 million, Shanghai with around 23 million, and Mexico with approximately 21 million inhabitants. More than 60% of the top 20 populous cities are from Asia and this trend is set to continue till 2030, and further ahead till 2050. Three countries, India, China and Nigeria, together are expected to account for 37% of the projected growth of the world's urban population between 2014 and 2050. India is projected to add 404 million urban dwellers, China 292 million and Nigeria 212 million.

Urbanisation and the expansion of Indian cities

Rapid urbanisation is taking place in India and is following the global megatrend, which in turn, has paved the way for social and environmental challenges. The country's cities are characterised by strained infrastructure which manifests itself in terms of power cuts and water shortages, high cost of living, and unaffordable real estate, leading to urban sprawl and rise of slum areas, high volume of traffic, resulting in pollution and delays.

Urban resources and infrastructure are already stretched beyond capacity. As a result, they are plagued with issues such as air pollution, waste management, poor water and electricity supply, ageing infrastructure, resource scarcity and traffic congestion. Though the overall scenario and challenges vary across various cities, all urban areas have one obstacle in common, critical infrastructure is, inadequate, increasingly fragile, technologically outdated and incapable of meeting even the current needs of inhabitants. Moreover, with an increasing inflow of migrants, cities need to alter their way of functioning in order to disseminate public services.

	Population (in thousand)			Rank			Average annual rate of change (per cent)
Urban agglomeration	1990	2014	2030	1990	2014	2030	2010-2015
Delhi	9,726	24,953	36,060	12	2	2	3.2
Mumbai	12,436	20,741	27,797	6	6	4	1.6
Kolkata	10,890	14,766	19,092	7	14	15	0.8
Bengaluru	4,036	9,718	14,762	42	31	21	4.0
Chennai	5,338	9,620	13,921	30	32	24	3.0

Source: UN Department of Economic and Social Affairs

Transformation to smart cities

Despite its myriad challenges, rapid urbanisation is vital for a nation's economic development. It brings along with it, opportunities for economic growth and provides additional prospects of entrepreneurship as well as employment to the population. This enables faster inclusion of more people within the growth story of the country. Urbanisation has a direct correlation with the growth of a nation. However, if not efficiently managed, it can lead to a negative proposition.

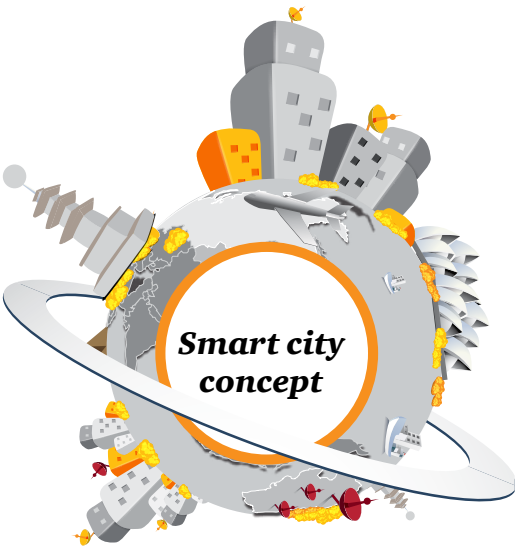
In the recent past, India has seen a natural progression in its development story, with its villages turning into towns, and towns transforming into cities. Urbanisation challenges are propelling several cities across the globe as well as in India to explore smarter ways of management. The time has arrived for India to transform its **cities into smart cities and achieve its vision of smart urbanisation**.

Globally, cities are seen as engines for sustainable economic growth. Growth achieved by cities will be strongly linked to their ability to address the issues related to urbanisation and associated social, environmental and economic issues in a holistic manner, while making the most of future opportunities.

Governments across the globe have created strategies for transformation to smart cities in order to improve operational efficiencies, maximise environmental sustainability efforts, and create new citizen services.

The smart city concept can be looked upon as a framework for implementing a vision of advanced and modern urbanisation. This vision envisages achievement of three goals, social equitability, economic viability, and environmental sustainability.

Smart cities leverage technology and utilise existing and planned infrastructure investments to provide a higher quality of living to residents, a conducive investment climate for businesses and allow maximisation of resource utilisation and transparency for governments. They can be considered as organic integration of systems, IT infrastructure, physical infrastructure, social and business infrastructure. These systems work collectively so as to generate intelligent and actionable information for decision-makers.



The inclination to adopt the smart city model is driven by the need to surpass the challenges posed by traditional cities. Overcoming these critical challenges in a systematic manner is crucial for cities, exploring a shift towards sustainable city development measures among all stakeholders: citizens businesses and the government. The quality of delivery from the foundational elements of traditional cities is enhanced by leveraging technology.

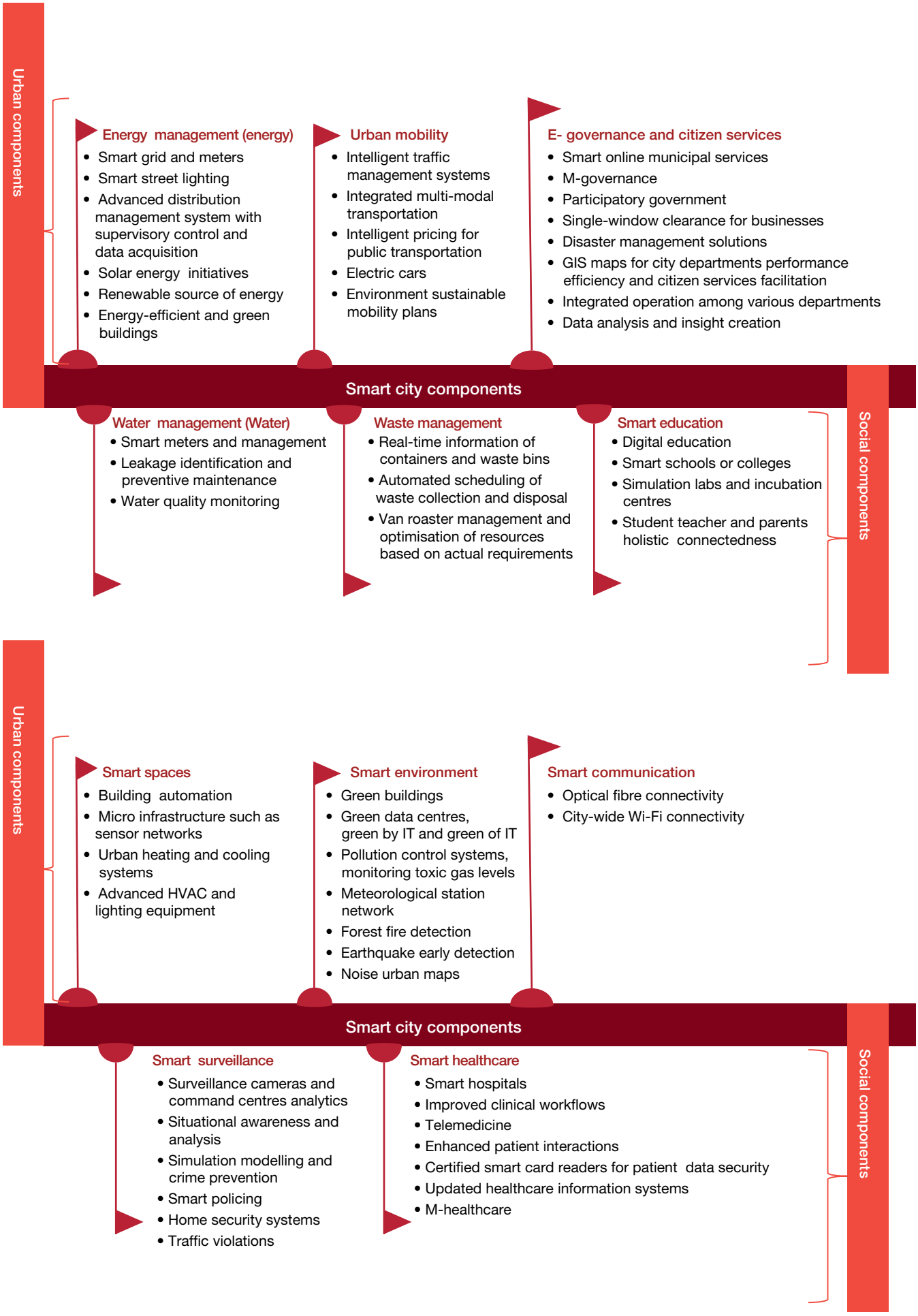
However, merely investing in improving a city's infrastructure is not sufficient. Projects that primarily focus on expanding capacity are not necessarily the most effective way of serving community needs, and neither are they sustainable in the long-term. Absence of a viable business model and oversight will challenge the economic feasibility as well as the effectiveness of such investments.

Such projects will require a constant inflow of funds and assistance from the government as well as external agencies, and will still not ensure quality. For urbanisation to be successful, three goals need to be achieved where the benefits have to be the following:

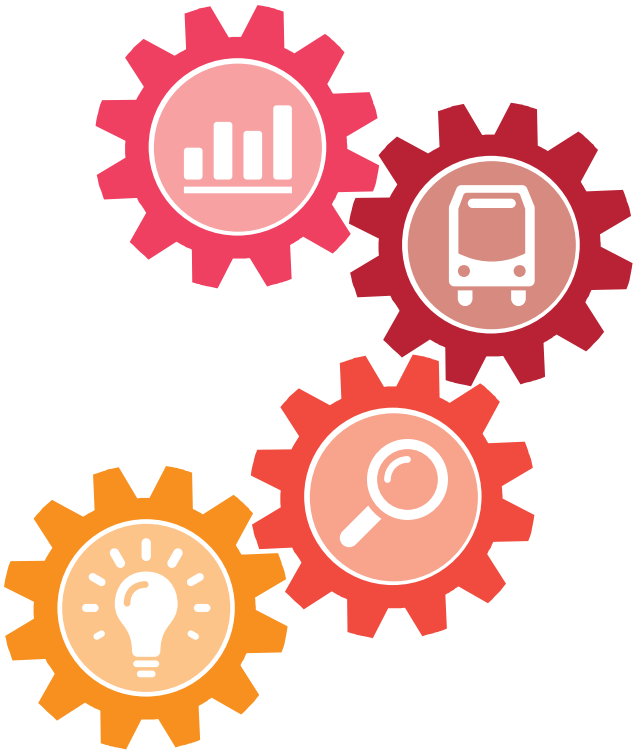
- Socially equitable
- Economically viable
- Environmentally sustainable

Smart cities have an integrated system for collecting, measuring, collating, broadcasting city data and making it easily accessible to stakeholders for efficient, effective development, governance and management. This model will maximise services to citizens as well as businesses for social, economic and environmental benefits.

Smart city model: Key components



Smart cities leverage ICT to mitigate most of the challenges attributable to rapid urbanisation. They offer the promise of a better and more sustainable lifestyle to citizens in the following ways:



Better safety and security

Smart cities leverage integrated public safety and security solutions such as smart cameras, pattern recognition, remote monitoring as well as red flagging through heuristic platforms in order to ensure a secure and safe environment for citizens.

Enhanced quality of life

Smart cities will leverage ICT in order to integrate as well as expand its vision for creating robust links between education, industry and government. They will provide superior amenities in terms of housing, schools, hospitals, institutions as well as entertainment and retail outlets to provide an enhanced quality of life to citizens.

Optimised usage of resources

With the paucity of non-renewable resources, governments and citizens are increasingly adopting renewable and alternate modes of energy to minimise the depletion of fossil fuels and non-renewable energy sources. Also, it is becoming imperative to use ICT and advanced technology solutions for optimising the consumption of resources such as power, fuel and water. These technology solutions, when adopted in energy, transport and waste domains, lead to direct economic and environmental benefits. This can be corroborated by customised energy consumption through instances such as smart metering, micro-grids, and dynamic pricing.

Connected and transparent public services

In the past, the efficiency of public and citizen services was driven by siloed e-governance initiatives. For instance, imagine a scenario wherein you have shifted to a new city and for municipal services, applications are sent out to multiple government departments for power, electricity and piped natural gas (PNG) connections.

What if, you applied for a PNG connection and your location information automatically gets updated in the city database. This feed is simultaneously sent out to post offices, electricity as well as water departments, police records, banks, schools, and taxation databases and they reach out to you for new connections. Such scenarios are gradually becoming a reality as the focus shifts towards connected delivery of government services so as to ensure a better experience for citizens. This integrated record management will also facilitate the delivery of holistic health services for citizens. Heath records of all citizens will be maintained on a central city database, thereby facilitating health practitioners to access medical history records easily.

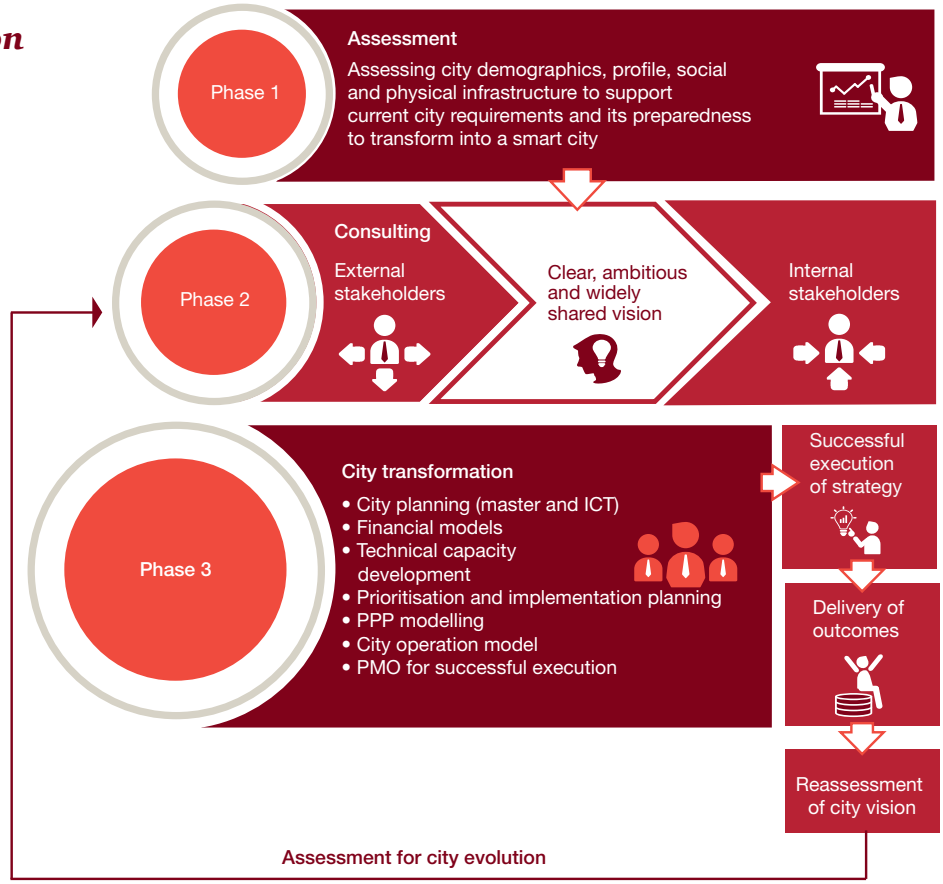
Ready access to services as well as their performance serves the cause of transparency and equity in city governance.

Smart city transformation strategy

City governments as well as administrators need to develop an implementable strategy on ways to achieve the future development goals of a sustainable and competitive urbanisation that can address social, environmental and economic issues in an integrated manner. However, the most pressing issue for many cities and their respective administrators is the implementation of these goals and transforming city strategies into a reality.

Prior to the articulation and development of any strategy, it is important to take stock of the current structure of a city and its expectation, going forward. We are of a firm belief that assessment is the cornerstone of developing a successful smart city strategy.

The next step for a city should be to formulate a clear vision which captures its strategic ambition. Chalking out an overall vision enables a city to prioritise, invest in and strategically manage the building blocks or 'capitals' needed by any city for long-term prosperity, social, environmental, cultural, intellectual, infrastructural, ICT and political participation. In order to channel all resources towards accomplishing the vision, the city's management has to develop multiple internal capabilities: an inspirational leadership, a resilient city brand and an ability to learn from other cities through social intelligence. It needs to manage its finances effectively. In addition, it needs to have the capability to manage the city's key programmes and projects, its performance risks and its assets, including the human capital employed in performing any city's functions. Of course, all of this must also be executed in a way that is sustainable and through collaboration and partnering with citizens, the private sector, academia and non-governmental organisations (NGOs).



Opportunity landscape

In India, the urban population currently constitutes 31% of the total population and contributes approximately 60% share in India's GDP. It is projected that in the next 15 years, urban India will contribute nearly 75% of the national GDP. There is an immediate need for cities in the country to get smarter so as to deal with large-scale urbanisation and find new ways to manage complex processes, increase efficiency and improve the quality of life for citizens.

With various announcements and budgetary allocations, the Indian government is increasingly focussing on the creation of various smart cities, industrial corridors and several rejuvenation projects in order to address rapid urbanisation. This opens up several avenues in planning, execution and management of each of the components. Rapid urbanisation brings major implications for businesses as they refocus their offerings, marketing and distribution models towards an increasingly urban customer base with distinct needs and consumption habits.

Each project under the new government will create opportunities for foreign capital to enter into new territories. In order to ease the entry of large foreign investments into projects, the government provides for a single-window clearance system. Also, many of the proposed smart cities are either designated as special economic zones (SEZs) or will house SEZs in them, and thus, will be geographical enclaves which will have many exemptions from the regular tax laws, customs and excise duties and labour laws. Therefore, the promotion of the new initiatives such as smart cities can be seen as an effort by the Indian government to promote international corporations to invest and operate within sanitised spaces, bypassing the multiple complexities that otherwise characterise urban India.

With promising prospects for smart cities in India and an array of benefits for city stakeholders, smart solutions are expected to further drive growth in conventional engineering and design services as well as new services. This is likely to expand the market prospects for global vendors in India and provide a platform for them to export their services.

Some of the initiatives taken by the government are listed in subsequent pages. These initiatives, covering multiple domains, not only provide an avenue of growth to cities but also to investors and stakeholders involved in the creation of such cities.

Smart city initiatives undertaken by Indian cities and their execution status

Opportunities / Smart city initiatives	100 smart cities	HRIDAY	GIFT City	Delhi smart city	NRDA	Industrial corridors	DDA smart city	Varanasi-Kyoto agreement	Resilient cities	Namami Gange	Wave City	Lavasa	Palava
Smart energy management	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart water management	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart waste management	●	●	●	●	●	●	●	●	●	●	●	●	●
Urban mobility	●	●	●	●	●	●	●	●	●	●	●	●	●
e-Governance and citizen services	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart environment	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart spaces	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart surveillance	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart healthcare	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart education	●	●	●	●	●	●	●	●	●	●	●	●	●
Smart communications	●	●	●	●	●	●	●	●	●	●	●	●	●

● Yes
● Partial
● No

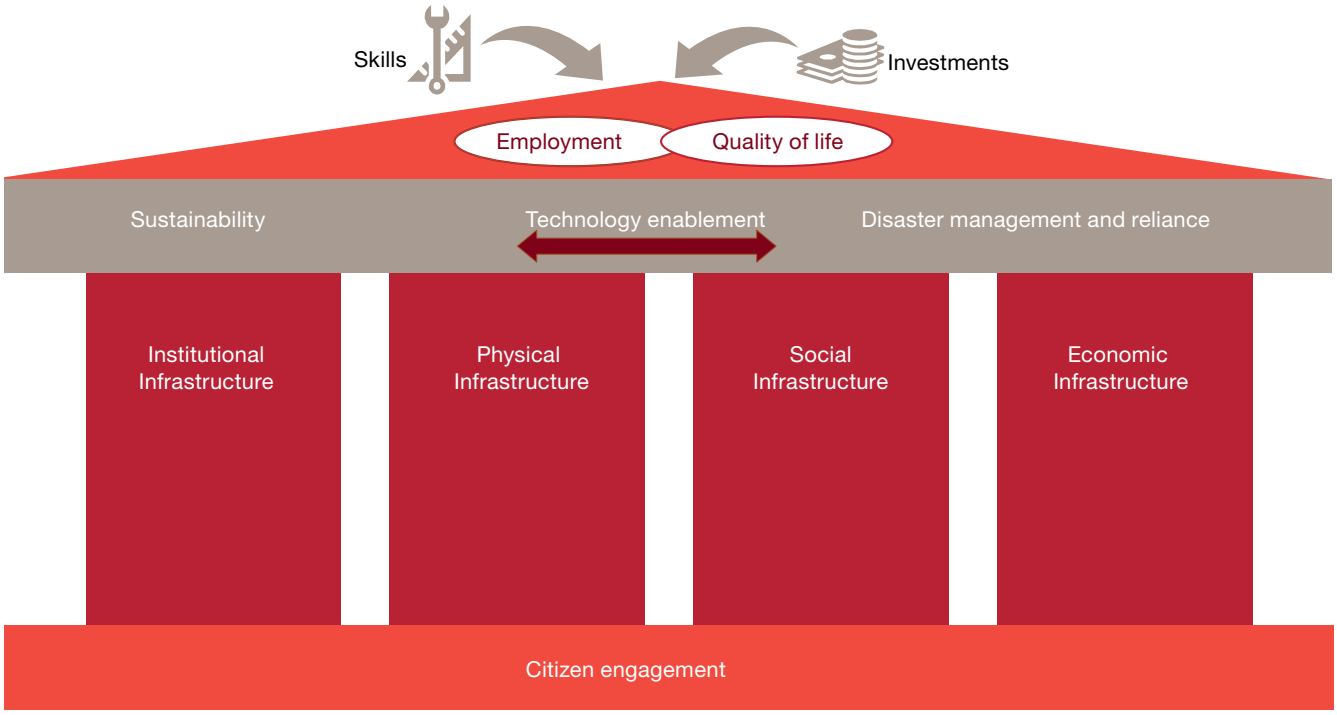
Execution stage
Design stage
Concept stage

The Indian government's 100 smart city initiatives

In January 2015, the secretary to the Ministry of Urban Development (MoUD) made a presentation which clearly stated that the Indian government's mission to roll out 100 smart cities across the country is a national priority.[iv] These smart cities will leverage innovation and technology for e-governance and the Digital India initiative. Also, they will focus on employment generation, involve citizens in decision-making and policy execution, as well as improve the quality of life. Moreover, with renewed efforts for a clean and green India, these upcoming smart cities will be modelled on the *Swachh Bharat* initiative and zero emission policies.

Shortlisting of cities	
• **Economic criteria**	
– Cities accounting for 54% of incremental GDP till 2025	69
• **Geographic inclusivity**	12
– All state capitals (not included above)	8
– Tourist or religious heritage cities (not included above)	4
– Hilly and coastal areas	7
– Mid-sized cities	
Total	100

Comprehensive development: Four pillars of a smart city



- Precedent conditions
  - Municipal reforms
  - E-governance
  - Zero emission: Solid and liquid waste
  - Master plan based on spatial mapping or GIS
- Strategy and approach
  - Pan-city development
- Citizen engagement and reference framework
- Capacity building
- Zero emission
- E-governance
- City development plan based on GIS, spatial mapping, information and communications technology (ICT) and environmental sustainability
  - Exemplary development through 'city challenge'
    - Retrofitting – more than 500 acres
    - Redevelopment – over 50 acres
    - Green-field development – more than 250 acres
  - Pan-city two-three main infrastructural projects

Retrofitting development	
Where?	• Existing developed area • Minimum 500 acres in size
What?	• Zero emissions: Solid and liquid discharge • Quality electricity and water supply: Smart metering • High-speed, high-bandwidth connectivity • CCTV surveillance of all public areas • LED lighting, intelligent traffic and parking management • Pavements, cycle tracks and roads
How?	• Implementation in three years • SPV (ULB, state, centre) • Selection through competition – “City Challenge”

Redevelopment	
Where?	• Existing urban sprawl (including railway, bus stations, etc.) • Minimum 50 acres in size
What?	• In addition to all retrofitting components • Higher floor area ratio (FAR) and lower ground coverage • Green and energy-efficient buildings • Wide roads, recreational facilities and open spaces
Conditionalities	• Mixed land use and higher FAR • Maximum 50% ground coverage • Maximum 40% commercial, minimum 10% institutional and minimum 10% for parking • MoU with states, ULB, developers
How?	• Implementation in five years • SPV (public or private developer) • Equity participation by the central and state government and ULBs • Selection through competition – “City Challenge”

Greenfield townships	
Where?	• Vacant land • Minimum 250 acres for each township
What?	• In addition to all redevelopment components • Quality infrastructure for education, health and recreation • Multimodal transport • Trade facilitation, incubation, skill development centres
Conditionalities	• In addition to all redevelopment conditions • High speed rail and road connectivity • MoU: States, ULBs and developers
How?	• Implementation in five years • SPV (public or private developer) • Equity participation by the central and state government and ULBs • Selection through competition – “City Challenge”

69 cities: 54% of GDP	
Andhra Pradesh	Visakhapatnam, Vijaywada
Bihar	Patna
Chattisgarh	Raipur, Durg
Gujarat	Ahmedabad, Surat, Vadodara, Rajkot
Haryana	Gurgaon, Faridabad
Jharkhand	Jamshedpur, Dhanbad, Ranchi
Karnataka	Bengaluru, Mysore, Hubli-Dharwad
Kerala	Kochi, Kozhikode, Malappuram, Thrissur, Kannur, Thiruvananthapuram, Kollam
Madhya Pradesh	Indore, Bhopal, Jabalpur, Gwalior
Maharashtra	Mumbai, Pune, Nagpur, Nasik, Vasai, Aurangabad, Solapur, Bhiwandi
Orissa	Bhubaneshwar
Punjab	Ludhiana, Amritsar, Jalandhar
Rajasthan	Jaipur, Kota, Jodhpur, Bikaner
Tamil Nadu	Chennai, Coimbatore, Madurai, Tiruchirapalli, Salem
Telangana	Hyderabad
Uttar Pradesh	Lucknow, Varanasi, Ghaziabad, Kanpur, Agra, Meerut, Allahabad, Moradabad, Bareilly, Aligarh, Noida, Gorakhpur, Saharanpur
West Bengal	Kolkata, Asansol
Others	Delhi, Goa, Chandigarh, Pondicherry

12 state capitals

- Agartala
- Aizawl
- Dehradun
- Dispur
- Gangtok
- Imphal
- Itanagar
- Jammu, Srinagar
- Kohima
- Shimla
- Shillong

8 tourist or religious heritage cities

- Amaravati
- Ajmer
- Badami
- Dwarka
- Gaya
- Mathura
- Puri
- Warangal

National Heritage City Development and Augmentation Yojana (HRIDAY)

The MoUD has launched the National Heritage City Development and Augmentation Yojana (HRIDAY) in January 2015. This scheme aims to preserve and revive the rich cultural heritage of some India's cities. Towards this, 12 major heritage cities have been planned to be covered in the first phase of this project namely Varanasi, Amritsar, Warangal, Ajmer, Gaya, Mathura, Kanchipuram, Vellankanni, Amravati, Badami, Dwarka and Puri.

Key highlights

- The scheme aims to bring about systematic urban planning, economic growth and heritage conservation for the identified heritage cities.
- It will focus on the beautification of heritage cities, with an emphasis on cleanliness, livelihood, skills, safety, security, accessibility and faster service delivery.
- It will also look at the preparation of a heritage management plan for the identified cities in order to outline heritage resources and develop policies to guide their conservation, restoration, future use and development.
- The scheme will aim to improve last-mile connectivity to these heritage sites.
- The focus will be on an integrated, inclusive and sustainable development of heritage sites, including maintenance of monuments and on advancement of the entire ecosystem.
- The scheme is funded by the central government in order to create infrastructure and provide facilities around the heritage sites for promoting tourism.
- The goals and objectives of this scheme to be accomplished through partnership of the government, academic institutions and the local community by combining affordable technologies.

The MoUD has provisioned nearly 5,000 crore INR for the initial phase of this project. This budget has been allocated to 12 heritage cities which are targeted to be improved. The tentative division of funds allocated by the ministry are as follows:

- Varanasi (UP): 89.31 crore INR
- Amritsar (Punjab): 69.31 crore INR
- Warangal (Telangana): 40.54 crore INR
- Ajmer (Rajasthan): 40.04 crore INR
- Gaya (Bihar): 40.04 crore INR
- Mathura (Uttar Pradesh): 40.04 crore INR
- Kanchipuram (Tamil Nadu): 23.04 crore INR
- Vellankanni (Tamil Nadu): 22.26 crore INR
- Amaravati (Andhra Pradesh): 22.26 crore INR
- Badami (Karnataka): 22.26 crore INR
- Dwarka (Gujarat): 22.26 crore INR
- Puri (Orissa): 22.54 crore INR

Smart city projects at the implementation stage

GIFT City

The Gujarat International Finance Tec-City (GIFT City) has been rolled out and is being executed as the first financial tech city of Gujarat. It is a 886 acre global financial hub, one of its kind in the country, with a state-of-the-art infrastructure for transacting various international and domestic services such as banking, finance, insurance, information technology and information-technology enabled services. This project was initialised in 2011 and is expected to be concluded by 2021.

The government of Gujarat (GOG), through its undertaking, the Gujarat Urban Development Company Limited (GUDCOL) and the Infrastructure Leasing and Financial Services (IL&FS) have established a joint venture company, the **Gujarat International Finance Tec-City Company Limited (GIFTCL)** to develop and implement the GIFT City project.

GIFTCL leveraged the public private partnership model for encouraging significant private sector participation into specific viable components. In addition, special purpose vehicles (SPVs) were established to implement the critical utility components through major private sector participation.

The complete project will be implemented in the following four phases:

- **Phase 1:** The phase will include the development of an area covering 10 million sq ft which will cover:
  - Two commercial towers, each of 29 floors called GIFT ONE and GIFT TWO
  - Building basic infrastructure
- **Phase 2:** This phase includes development of an area covering 22 million sq ft comprising of the construction of high-tech buildings and development of services.
- **Phase 3:** This phase will cover an area of 30 m sq ft and is planned to be developed.
- **Phase 4:** This phase termed as 'The Enpeoplement', will look at opening up the planned city for commercial and labour operations.

Key components

- Core infrastructure: Site development and basic infrastructure will be established, including the latest in construction technology. Some of the key infrastructure development areas are as follows:
  - High-quality physical infrastructure (electricity, water, gas, district cooling, roads, telecoms and broadband)
  - Special economic zone (SEZ)
  - International education zone and integrated townships
  - Entertainment zone, hotels and a convention centre
  - International techno park and software technology parks of India (STPI) units
  - Shopping malls, stock exchanges and service units
- Utilities: SPVs have been set up to implement critical utility components through major private sector participation. Each SPV presents a separate business case modelled to meet the demand of the GIFT community. These include the following:
  - GIFT District Cooling Systems Limited
  - GIFT SEZ Limited
  - GIFT Power Company Limited
  - GIFT Water Infrastructure Limited
  - GIFT Waste Management Services Limited
  - GIFT ICT Services Limited

Delhi smart city

The Delhi government has planned to develop Delhi as a smart city with the vision of integrating the geospatial data of all city departments so as to enable them for better coordinated analysis, planning, governance and management of resources for maximising their respective services to the citizens for overall social, economic and environmental gain. Towards this, the Delhi government envisages to integrate the data of all the city departments on a single map and provide single-window services to its citizens and businesses. An estimated budget of 20 crore INR has been sanctioned for the initial phase.

The new geographical information system will be an integrated solution wherein cross-department layer access will be possible for better information-sharing and analysis. The following key objectives are envisaged under the current transformation:

- Geoportal offering geographic information system(GIS) services to line departments and citizens as cloud-service provider
- Advanced applications in the areas of disaster management, land management system, property tax facilitation
- Data and application integration platform, 3D visualisation
- Advanced visualisation of utility lines to support planning of utilities

Naya Raipur Development Authority

The state of Chhattisgarh was created in the year 2000 and Raipur was declared its capital city. Raipur, with its growing importance as the major node in trade network and a host of industries, has immense potential; however, the city is constrained by lack of land availability, spaces and basic infrastructure. Considering the growth potential of the city and with a view to decongest the city, a new city—Naya Raipur—is being developed. It is considered as the green field capital city and is located about 17 kms from the existing Raipur city. Its core area measures 8,013 hectares.

The new city was selected based on the following criteria:

Connectivity to NH-6 and NH-43	Maximum government land	Minimum forest cover and wild life
Railway link to Visakhapatnam, Mumbai	Land unsuitable for agriculture, mining and quarrying	Water availability and planned drainage system
Close proximity to airport and major urban centres	Land with least number of existing human settlements	Soil with good bearing capacity for economic construction

Government of Chhattisgarh provisioned 16,000 crore INR for developing Naya Raipur as a smart city. Out of this, 6,000 crore INR has been utilised for urban planning and development and the rest is to be used for its further developments. The new city is envisaged to be developed in phases for an estimated population of 5.6 lakh by the year 2031.

The project is divided into following section–smart utilities, transport, surveillance, governance, centralised command and control centre and computing infrastructure.

The city has been planned to achieve the following objectives:

- Emerge as an agent of economic change and for social transformation in the state
- Create an efficient engine of growth and prosperity
- Build a servicing hub not only for manufacturing of goods but also for information technology and bio- technology sectors
- Emerge as the financial centre of the region.
- Grow into a hub for trade and hospitality sectors
- Turn into aa center of cultural services to supplement local economy
- Become a hub for affordable and high-quality medical services
- Rise as the hub of quality educational facilities and emerge as a knowledge base

Industrial corridors

To promote economic activity in India, six new industrial corridors are in the offing:

- Delhi-Mumbai Industrial Corridor
- Amritsar-Delhi-Kolkata Industrial Corridor
- Bengaluru-Mumbai Economic Corridor
- East Coast Industrial Corridor/ Visakhapatnam-Chennai Industrial Corridor
- Chennai-Bengaluru Industrial Corridor
- Bhopal Indore Corridor

Each industrial corridor will have several key nodes developed on smart city principles using Public Private Partnership (PPP) model

Delhi-Mumbai Industrial Corridor

The Delhi Mumbai Industrial Corridor (DMIC) is India's most ambitious infrastructure project aiming to develop new industrial cities as smart cities and integrating next-generation technologies across infrastructure sectors. The DMIC, a state-sponsored industrial development project of the government of India with an outlay of 100 billion USD, aims to develop industrial zones spanning across six states in India to spur economic development in the region and develop industries. The project entails major expansion of infrastructure and industries, including industrial clusters, with rail, road, port and air connectivity and utilities along the corridor route.

The project work has commenced and is progressing at a quick pace with 2017 as the completion target. Five states are covered under this corridor.

- Delhi
- Uttar Pradesh
- Haryana
- Rajasthan
- Maharashtra
- Gujarat

Key highlights of DMIC

- World-class connectivity between ports, nodes and Delhi Freight Corridor
- Development of six logistics parks
- Covers 62% of the total area of Gujarat
- 18 out of 26 districts fall within the influence area
- Major cities on DMIC: Ahmedabad, Vadodara, Surat
- Estimated employment: 8 lakh
- Gujarat's ports to cater to foreign and hinterland markets
- Out of the total 24 industrial nodes planned along the DMIC, six nodes (two investment regions and four industrial areas) have been proposed for the state of Gujarat.
- Dholera Special Investment Region (SIR) is the first such node, taken up for development by the Gujarat government.

Key targets of developing this corridor

- Quadruple exports from the region in five years (31.95% CAGR)
- Triple industrial output in five years (24.57% CAGR)
- Double the employment potential in five years (14.87% CAGR)

Amritsar-Delhi-Kolkata Industrial Corridor

The Amritsar Delhi Kolkata Industrial Corridor (ADKIC) is a proposed economic corridor in India between the cities of Amritsar, Delhi and Kolkata to be developed by the government of India. It is an ambitious project aimed at developing an industrial zone spanning seven states in India and will benefit 20 cities in these states.

The states covered in this corridor are:

- Punjab
- Haryana
- Uttar Pradesh
- Uttarakhand
- Bihar
- Jharkhand
- West Bengal

The ADKIC will extend from Ludhiana in Punjab to Dankuni near Kolkata. It will also leverage the inland waterways system being constructed along National Waterway 1 which extends from Allahabad to Haldia.

Key highlights of ADKIC

- The corridor will be built along the 1,839 km long Eastern Dedicated Freight Corridor (EDFC) between Khurja and Mugal Sarai.
- The development of ADKIC will cover an area of 150-200 km on either side of the EDFC, in a phased manner.
- In the first phase, every state can promote at least one cluster of about 10 sq km area to be called Integrated Manufacturing Cluster (IMC), in which 40% of the area will be earmarked permanently for manufacturing and processing activities.
- The cities to be covered by the ADKIC project are Amritsar, Jalandhar, Ludhiana, Ambala, Saharanpur, Delhi, Roorkee, Moradabad, Bareilly, Aligarh, Kanpur, Lucknow, Allahabad, Varanasi, Patna, Hazaribagh, Dhanbad, Asansol, Durgapur and Kolkata.

Bengaluru-Mumbai Economic Corridor

The Bengaluru-Mumbai Economic Corridor is a proposed project to run between Mumbai and Bengaluru. The preliminary work on the corridor began in November 2013. Currently, Indian and British governments are working in collaboration to have a joint feasibility test of the project.

The Mumbai-Bengaluru corridor will pass through Pune, Satara, Kolhapur, Belgaum, Dharwad, Davangere, Haveri, Chitradurga and Tumkur. The government has envisioned at least four new cities to boost manufacturing activity across the corridor for which the detailed plan is yet to be finalised. A total outlay of 5,749 crore INR has been sanctioned for its development and Japan International Cooperation Agency (JICA) is also helping in the funding of this project.

East Coast Economic Corridor/ Visakhapatnam-Chennai Industrial Corridor

The Visakhapatnam-Chennai Industrial Corridor (VCIC) is a key part of the East Coast Economic Corridor and India's first coastal economic corridor. Four nodes have been selected for the corridor based on detailed location analysis.

- Visakhapatnam node
- Kakinada node
- Machlipatnam node
- Chittoor Tirupati node

The project is expected to be completed in two phases over a 10-12 years timeframe. The first phase will focus on conceptual planning and the second phase will involve the detailed regional planning of the corridor.

Phase 1 - Conceptual development plan for the Visakhapatnam-Chennai Industrial Corridor

- Industries for future development including MSMEs
- Nodes for industrial development
- Set of priority projects
- Recommendations on streamlining business and regulatory processes in the state

Phase 2 - Preparation of comprehensive regional perspective plan

- Transport strategy
- Energy strategy
- Urban strategy
- Funding requirement
- Implementation of highest priority interventions for improving policy and regulatory environment in the state

Chennai-Bengaluru Industrial Corridor

The Chennai-Bangalore Industrial Corridor (CBIC) is the fifth corridor being planned in the country. It will cover a distance of nearly 560 km and pass across three states:

- Andhra Pradesh
- Karnataka
- Tamil Nadu

Major highlights of CBIC

- The CBIC, envisaging upgrading infrastructure for industrial growth, will involve investment of over 12,000 crore INR including land acquisition.
- The corridor development will involve improvement of three national highways —NH 4, NH 7 and NH 46—with construction of roads to connect industrial hubs.
- The proposed Chennai Peripheral Ring Road, a 136-km road linking Mamallapuram, about 50 km south of Chennai to Ennore Port, which is 25 km to the north of the city, has been identified as a key project in the development.
- Ring Road will link important industrial hubs such as Singaperumal Koil, Sriperumbudur, Tiruvallur, Thamaraipakkam, Periyapalayam and Kattupalli.

Bhopal-Indore Corridor

This is the sixth corridor being planned in the country. The project is being developed in active cooperation between the Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC) and the Madhya Pradesh Trade and Investment Facilitation Corporation Limited (TRIFAC). Pithampur-Dhar-Mhow is the first DMIC node being developed in the state of Madhya Pradesh. One of the inherent strengths of this region is the presence of the existing Pithampur industrial area.

Key projects/early bird projects:

- Multi-Modal Logistics Hub at Pithampur Industrial Area
- Water Supply Project for Pithampur Industrial Area
- Economic corridor from Indore Airport to Pithampur Industrial Area
- Knowledge City near Ujjain

Highlights

- The corridor is being planned in the area of about 372 sq km
- The area has many industries mainly covering manufacturing, services and trading. Rubber and plastics, food processing, textiles, electronics, drugs and pharmaceuticals, chemical, basic metals and electrical engineering are the main sectors.
- Estimated population in this region will be around 1.2 million by the year 2041
- Project will be implemented with large private sector participation to harness the latest technology and efficiencies available in the world
- Broad cost estimates for trunk and city infrastructure of the investment region is around 300 billion INR (approximately 7 billion USD)

The project will be completed in three phases of 10 years each. The investment region lies about 25 km south-west of Indore, the largest city and commercial capital of the state. The site is well connected to state capital Bhopal and ports and cities of western India like Mumbai, Ahmedabad by important corridors– National Highway-59 and National Highway-3. Indore Airport connects the region with rest of the country, while the rail connectivity is being improved through the Indore-Dahod broad-gauge link to the Dedicated Freight Corridor and Indore-Khandwa to south India.

Cities covered under bilateral technical collaboration

Delhi Development Authority (DDA) smart city project with Barcelona

Delhi Development Authority (DDA) has planned to develop a smart sub city in east Delhi — Karkardooma. For the same, DDA has engaged with National Buildings Construction Corporation (NBCC) and has recently awarded 75 acres of land in Karkardooma to NBCC for a joint development. This project is to be completed within a budget of 4,500 crore INR in various phases. Initial phase is to be completed within 36 months.

The corporation is now in the process of laying down its plan for this smart city which is familiarised with the name 'East Delhi Hub' project. NBCC is also in the process of finalising the disposal methodology, phasing of disposal, period of disposal, rates thereof and other terms and conditions for disposal of the built-up space. The corporation shall be entitled to disposal fee at 1% of disposal price of such properties. However, DDA would retain authority for pricing and disposal of the property.

Karkardooma will be based on the Transit Oriented Development (TOD) norms and smart city principles. Transit Oriented Development (TOD) means mixed-use development, designed in a manner that there is access to public transportation such as metro rail in the locality and has walkable neighbourhoods.

Key features of Karkardooma project:

- Energy conservation
- Water harvesting
- Residential facilities
- Green cover
- IT-enabled services
- Housing to 3,000-4,000 families
- Commercial and recreational areas

USTDA adopted three cities: Ajmer, Allahabad, Visakhapatnam

The United States Trade and Development Agency (USTDA) has tied up with the Indian Sstate government and has extended assistance to develop smart cities in three states—Uttar Pradesh, Rajasthan and Andhra Pradesh. The organisation has signed three memorandums of understanding (MoU) on 25 January, 2015 with the state governments of the above mentioned states to develop smart cities.

Cities targeted in these states are:

- Allahabad in Uttar Pradesh
- Ajmer in Rajasthan
- Vishakhapatnam in Andhra Pradesh

Ministry of Urban Development has planned to set a dedicated task force for the three cities. These task forces have representatives of the Ministries of Urban Development and External Affairs, respective state governments and cities and the United States Trade Development Agency (USTDA).

These representatives will be creating a concrete action plan for the transformation of these cities into smart cities.

USTDA will also collaborate with other US government agencies like the Department of Commerce, the Export-Import Bank of the United States and other trade and economic agencies to promote greater US-India infrastructure development cooperation and to support the enlargement of smart cities in an efficient manner.

Varanasi-Kyoto agreement

Kyoto, Japan, has signed an agreement with the Varanasi city government to maintain and preserve the city's heritage. Kyoto, a heritage city itself, is recognised as a centre of Buddhist traditions and has successfully maintained its cultural heritage with technological interventions.

The Japanese team will lend their expertise to improve five core areas to help rejuvenate the holy city.

- Solid-liquid waste management
- Transport management
- Developing the Buddhist tourist circuit in and around Varanasi
- Industry-university interface
- Setting up of a convention centre on public-private partnership basis to boost cultural activities in the city

A budget of 80 crore INR has been sanctioned for Varanasi by the Ministry of Urban Development under the Heritage City Development and Augmentation Yojana (HRIDAY).

Urban Development Ministry has set up a 11-member steering committee to operationalise the 'Partner City Affiliation Agreement' between the cities of Varanasi and Kyoto. The steering committee is headed by senior officials from the Ministry of Urban Development and other senior officials from various departments. The steering committee will facilitate the action plan pertaining to the following:

- Modernisation of Varanasi, including upgrading water management and sewage facilities, waste management, urban transportation, etc, drawing upon Japan's expertise and technologies
- Application of Japanese practices, techniques and management for conservation of the rich heritage of Varanasi
- Exchange programmes between Kyoto University and Banaras Hindu University as well as religious organisations

Resilient cities project of Bengaluru, Chennai, Surat

The Rockefeller Foundation is planning to develop smart cities around the world with its 100 Resilient Cities (100RC) project. In the year 2013, the foundation committed to investing 100 million USD to build urban resilience worldwide. It is assisting cities around the world to become more resilient to the physical, social and economic challenges.

100RC programme supports the adoption and incorporation of a view of resilience which includes not just the shocks–earthquakes, fires, floods, etc–but also the stresses that weaken the fabric of a city on a day-to-day or cyclical basis.

Examples of these stresses include high unemployment; an overtaxed or inefficient public transportation system; endemic violence or chronic food and water shortages. By addressing both the shocks and the stresses, a city becomes capable in responding to adverse events and is better equipped to deliver basic functions to the city population.

Cities in the 100RC network are provided with the resources necessary to develop a roadmap to resilience by focussing on four main strategies:

- Offering guidance to establish an innovative new position in the city government—a chief resilience officer —who will lead the city's resilience efforts
- Support from expert teams for the development of a robust resilience strategy
- Access to solutions, service providers and partners from the private, public and NGO sectors to help develop and implement their resilience strategies
- Collaboration of a global network of member cities to learn from and help each other

Taking into account the core the issues of Indian cities, three major cities—Bengaluru, Chennai and Surat—have been selected under this programme to facilitate their development. Here is a list of the major problems faced by these cities:

Bengaluru

- Infrastructure failure
- Flooding (coastal, rainfall)
- Pollution, environmental degradation
- Poor transportation system

Bengaluru, also known as Bangalore, is one of India's major economic centers. With an annual population growth of 4%, the city is expected to reach 12 million residents by 2020. A considerable amount of this growth is driven by Bengaluru's strong investment in the tech support industry. However, disruptions to infrastructure, such as those caused by flooding during the monsoon season can have serious negative consequences for the industry and the city's economic stability. Flooding also overwhelmingly threatens poorer sections of the city, increasing the risk of disease and provoking class tensions.

Despite receiving regular rainfall, Bengaluru faces severe water shortage. Officials have warned that the worsening water supply situation could lead to evacuations or even abandonment of parts of the city. To resolve the situation, regular desalting projects and public awareness campaigns have been launched; however the city needs to develop a comprehensive water supply and recovery strategy.

Chennai

- Aging infrastructure
- Flooding (coastal, rainfall)
- Hurricanes/typhoons/ cyclones
- Overpopulation
- Pollution, environmental degradation

The recent rise in immigration has made Chennai the fourth most populous metropolitan region in the world. Informal peripheral settlements in low-lying coastal areas which lack access to infrastructure and services house many of these recent arrivals. To protect these vulnerable sections from high flood risk, officials have begun developing coordinate disaster response plans.

The city is budgeting resources to improve waste collection system to minimise its impact as an environmental threat and during flooding.

Surat

- Disease outbreak
- Aging infrastructure
- Flooding (coastal, rainfall)
- Pollution, environmental degradation
- Rising sea level and coastal erosion

Surat is one of the fastest-growing cities in the world, experiencing rapid industrialisation and migration. According to the World Bank Sustainable Development Network, it's also one of the world's most climate change affected cities. In the past 100 years, Surat has experienced 23 floods, including a significant one in 2013, and an outbreak of the plague in 1994. The city's most pressing urban resilience priorities are: learning lessons from past events; building community and social resilience for early response to floods; preventing vector-borne diseases, and improving nutrition, water management and the electric grid.

Cities will also get access to a platform of resources they can tap into. Hence, the cities will be able to get information on everything from big data analytics, infrastructure, databases, economic risk analysis and steps to mitigate them, handling natural disasters, cybersecurity et al.

Ministry of water resources: Namami Gange project

The government of India has launched the Ganga conservation mission 'Namami Gange' to improve the condition of the river Ganga. This project aims to clean the river by merging the ongoing efforts of different government ministries to develop a tangible action plan to revive the Ganga. This is related to smart cities as the intermediations at the ghats and river fronts will enable better citizen connectivity and set the plan rolling for a river centric urban process. The India government has allocated a budget of 2,037 crore INR for realising this mission.

Major activities outlined under this scheme:

- Rehabilitation and upgradation of existing sewage treatment plants along the Ganga
- Ensuring 100% sewerage infrastructure in identified towns alongside the Ganga
- In situ sewage treatment in open drains
- Support in preparing the detailed project report (DPR)
- River Front Management for ghat developments in selected cities and towns
- Industrial pollution abatement at Kanpur on priority
- Action plan for Char Dham Yatra: public amenities, waste disposal and sanitation plans
- Capacity building of urban local bodies (ULBs)
- Afforestation: conservation of flora
- Conservation of aquatic life with special attention on dolphins, turtles and gharials
- Disposal of flowers and other puja material
- Setting up of Ganga Vahini
- GIS data and spatial analysis for the Ganga basin
- Study of communities depending on the Ganga for their livelihood

Following sub-projects have been proposed under Namami Gange:

Nirmal Dhara—ensuring sustainable municipal sewage management

- Project prioritisation in coordination with the MoUD.
- Incentives for states to take up projects on the Ganga main stem by providing additional share of central grants for sewerage infrastructure.
- Uniform standards for both MoUD scheme and Namami Gange programme, 10 years mandatory operations and maintenance by the same service provider at par with the National Ganga River Basin Authority (NGRBA) programme and PPP, mandatory reuse of treated water.
- Expanding the coverage of sewerage infrastructure in 118 urban habitations on banks of Ganga. MoUD has estimated a cost of 51,000 crore INR for this.

Nirmal Dhara—managing sewage from rural areas

- Ministry of Drinking Water and Sanitation scheme for all Ganga bank gram panchayats (1,632) free from open defecation by 2022, at a cost of 1,700 crore INR as central share

Nirmal Dhara—managing industrial discharge

- Making zero liquid discharge (ZLD) mandatory
- Rationalised water tariff to encourage reuse
- Real-time water quality monitoring

Aviral Dhara

- Enforcing River Regulation Zones (RRZ) on Ganga's banks
- Rational agricultural practices, efficient irrigation methods
- Restoration and conservation of wetlands

Key Features

- Ensuring ecological rejuvenation by conservation of aquatic life and biodiversity
- Promotion of tourism and shipping in a rational and sustainable manner
- Knowledge management on Ganga through Ganga Knowledge Centre

Private cities

Wave City

Wave City, based on the IBM smart city concept, is a leading smart city of India with an area of 4,500 acres. The city, located in the NCR region, has wide roads, green cover, fiber optic connectivity, round-the-clock security and mechanised garbage control systems. In addition, the city has congestion-free transportation network so as to ensure seamless traffic flow, educational institutions, medical university and hospitals, multiplexes and malls among other facilities.

Core components of Wave City include the following:

- Smart water for optimal water usage
- Green parks for clean and healthy environment
- Command and control centre for city functions as well as maintenance and security
- BRT for smooth traffic flow and smart traffic system

The city focusses on different systems as well as sub-systems such as emergency services, transport, energy, water, and healthcare. These systems will operate in an integrated environment in order to improve city planning as well as operational efficiency. Wave City will be considered as a 'system of systems' by realising the benefits of coherence and integration among systems.

Lavasa city

Lavasa hill city, planned as well as implemented by Lavasa Corporation Limited in collaboration with Cisco Systems and Wipro Limited, is being developed near Pune. With an investment of nearly 4,000 crore INR, Lavasa intends to raise an additional 750 crores INR through initial public offering. The city will leverage ICT for effectively delivering municipal as well as other basic services to its citizens.

Core components of Lavasa city include the following:

- E-governance (integrated service systems)
- E-learning
- E-healthcare
- E-commerce
- E-homes
- E-utilities

Lavasa will have five towns, including Mugaon, Gadle, Dasve, Dhamanhol as well as twin towns of Sakhari-Wadavali. Dasve. The first town, is nearly complete and has 476 villas and 376 apartments. The city's master plan has been developed by HOK International, based in the US. Lavasa is expected to accommodate a population of approximately 2.4 lakh with an employment base for nearly 80,000 as well as facilities to host around two million tourists every year.

Palava city

Palava city, developed by the Lodha Group, is spread across 4,000 acres in the Mumbai Metropolitan Region. The city will leverage the best worldwide practices as well as intelligent technologies in urban planning. It will have an inclusive ecosystem with facilities for leisure, healthcare, sports, education, business, security and transportation.

Major features of Palava city include the following:

- Comprehensive city planning with spaces for businesses, universities, cultural zones as well as other citizen facilities. The city is designed to be pedestrian friendly and self-sufficient. In addition, the city has an olympic sports complex as well as multiple schools and centre for arts and culture among other facilities.
- The city has round-the-clock security as well as water and power supply. It has panic alarm systems, trained security forces, video surveillance, fire alarm systems as well as electronic access control systems for safety.
- Advanced transport hub, eco-drive buses, fleet management system for efficient functioning of public vehicles, parking management system as well as system enablers to prevent traffic congestion.
- Focus on the use of renewable energy sources as well as water and sewage treatment

European Union solutions for smart cities

[v]Majority of the EU-28 countries include cities that have become smarter by leveraging ICTs. In the year 2011, 240 among the 468 EU-28 cities, having a minimum of 100,000 inhabitants, had implemented at least one smart city component and thus can be classified as smart cities. The maximum absolute number of smart cities is found in Italy, Spain and the UK, while Austria, Italy, Norway, Denmark, Slovenia, Estonia and Sweden have the highest proportion of smart cities. Most of the smart city initiatives in these regions are in the initial phases of development. However, the larger cities are mostly mature, with a minimum of one completely implemented or rolled out initiative.

Majority of the smart city components in the EU-28 countries pertain to the resolution of public concerns. Smart environment, including smart energy, waste management, water management and mobility constitute 33 and 21% shares respectively of all the smart city initiatives in EU-28 countries. The remaining smart city components are addressed in nearly 10% of the smart cities, indicating the focus on region-specific weaknesses and strengths.

Smart living initiatives that cover safe and healthy living have been implemented across the EU-28, while initiatives focussing on other smart city attributes are less uniformly distributed. Another prominent trend is that the smart city initiatives are related to the size and population of a city. Smart cities with a single characteristic generally have a population of 100,000-200,000. Smart mobility initiatives are more prominent in non-Nordic Europe, Hungary, Italy, Romania and Spain as compared to Nordic member states. Smart governance projects, on the other hand, are primarily being witnessed in Italy and northern European regions such as Germany, Spain, France, Sweden as well as the UK. Smart economy, a key driver for business environment, has been aggressively implemented by British, Spanish, Italian and German cities.

Certain smart city characteristics are implemented holistically and cover multiple aspects. For instance, smart living covers smart healthcare, smart surveillance and citizen services, while the smart people initiative of smart cities covers smart education.

The table depicts various smart city components implemented by leading European cities during their transformation to smart cities. Smart city component implementation and overall progress is gauged in terms of the transition maturity as well as progressive technology interventions are leveraged.

Cities / Smart city initiatives	Barcelona	Amsterdam	London	Copenhagen	Vienna	Munich	Paris	Frankfurt	Stockholm	Berlin
Smart energy management	M	M	N	M	N	I	M	I	I	M
Smart water management	M	N	N	M	N	I	N	N	I	M
Smart waste management	M	N	N	M	N	I	N	I	I	I
Urban mobility	M	M	M	M	M	I	M	I	M	M
E-governance, citizen services	M	M	M	M	I	M	M	M	M	M
Smart environment	M	M	M	M	M	M	M	M	M	M
Smart spaces	M	I	N	M	I	M	M	M	N	M
Smart surveillance	M	M	M	I	M	I	I	I	M	I
Smart healthcare	I	I	I	N	M	M	M	I	M	N
Smart education	N	N	N	N	M	M	M	N	M	M
Smart communications	M	M	M	M	M	M	M	M	M	M

M: Mature; I: Intermediate, N: Nascent

The following tables depict various smart city initiatives undertaken by Barcelona and Amsterdam

Barcelona city snapshot Population—16,20,50 0, area – 101 sq km				
Smart city initiatives	**Project**	**Key objectives**	**Partner**	**Benefits/impacts**
Smart utilities-energy	Energy efficiency in buildings, urban heating and cooling network, distributed generation, smart metering, lighting cabinets, remote-controlled escalators, solar energy	Energy efficiency and management, energy storage, formulating new regulations and business models, zero carbon footprint, controlling climate change	Philips, Schnieder-Telvant, ETRA, BDigital, Elecnor, Tesyse, GDF Suez	Rationalisation of domestic energy consumption patterns, energy management, demand side management, energy storage and monitoring, greater savings, energy surplus, more efficient sustainable management
Smart utilities-water	Telemanagement of irrigation, SCADA	Efficient water usage, monitoring and savings	Agbar, Samcla, Elecnor	Water conservation, monitoring, savings, water surplus
Advanced mobility	Orthogonal bus network, smart parking, sustainable mobility, sustainable mobility plan; electric cars, travel time, prioritisation of traffic lights, hybrid taxi	Improved, efficient and sustainable urban mobility	Schnieder-Telvant, Indra, Ferrovial, OBA, ParkHelp, Trafficnow, Zolertia	Ease to Barcelona citizens and increase in use of public transportation
E-governance, citizen services	Barcelona Contactless, mobile apps, open government, open data portal, tourism management, iCity	To increase the transparency of the city council, to standardise data access, to promote innovation and the economic fabric	Telefónica, HP, Fastpay	Normalised public information to businesses and individuals, fostering citizen participation, standard formats that facilitate and universalise use, knowledge, creativity and innovation
Smart communication	Optical fibre, municipal Wi-Fi	Seamless connectivity, management of telecommunications network and infrastructure in the city	Telefónica, Abertis and Cisco	Wi-Fi for citizens and tourists, business-friendliness and attracting capital, communication and proximity with people
Urban platform	Barcelona sensor platform (Sentilo), city operating system, apps and services	Collection of city level data on open protocols	Wonderware, Telefonica, Indra, HP, Abertis, GDF Suez, Cisco	Aggregating and analysing the data being collected from all the sensors and gaining better idea of its city, data analytics, predictive analytics
City control centre	Incident, emergencies analysis/action, state of services, infrastructure, contact centre	Designing a comprehensive platform for the storage and analysis of meaningful data, monitoring operations and the evolution of incidents, and control of the city's strategic projects	IMI, Vista, Sitep, IBM, Cisco	Real-time and historical views in order to optimise operations at city level, centralised management to facilitate analysis and real-time monitoring. Generation of reports for urban operations and decision making, set priority order and alerts to create emergency command

Amsterdam city snapshot Population–8,00,00 0, area–220 sq km				
Smart city initiatives	**Projects**	**Objectives**	**Partners**	**Benefits**
Smart utilities	City-zen smart grid, city-zen, neighbourhood Geuzeveld, Energy Atlas, ship-2-grid, SCADA, smart metering	Energy management, better consumption of electricity, proper billing and revenue realisation systems; energy conservation and consumer as prosumers	Liander, KPN, Gemeente Amsterdam	Effective usage of electricity leading energy savings, enhanced billing and revenue realisation for utility departments, pollution-free environment, awareness among people to save energy, energy management-transferring surplus energy to grid, etc
Smart mobility	Vehicle-2-grid, smart traffic management, Digital Road Authority–incident management, air quality, smart parking, electric vehicles	To reduce traffic at hotspots, avoid accidents, saving time finding parking, reducing traffic for the emergencies like ambulances, etc	Mercure, Accor, BNP Paribas, TrafficLink, CWI, Coffley, Liander, ABB, Startupbootcamp	Effective traffic management, green city with fuel conservation and subsequent cost savings, less accident-prone areas
Surveillance systems	CCTV cameras, video cameras, alarming sensors	Overall security of Barcelona and protecting the city from crime and taking the appropriate proactive/ reactive action on notification	Information not available	Secure and safe areas, achieving zero/ less crimes, 24x7 surveillance, safe environments for city inhabitants
E-governance, citizen services	Amsterdamopent.nl, Amsterdam city dashboard, IJburg You Decide!	Open government data available to public, city services to be delivered to be online through portals	KPN, Liander, CWI, Coffley, IBM	Citizen engagement and opinions on government issues, policies, etc. Delivering services to citizens online such as licensing, passports among others
Smart communication	Amsterdam Wi-Fi, mobile technology, sustainable district heating, IJBurg Wiki TV	Seamless connectivity of Amsterdam through Wi-Fi and optic fibre, and then developing applications using the same	KPN, Liander, Gemeente Amsterdam, Hogeschool Van Amsterdam	Access to charge free Wi-Fi in most parts of the city, continuous networking, data from smart sensors is also made available through Wi-Fi, municipality operations automated through Wi-Fi and optic fibre
Smart spaces	Smart homes, IRIS, smart living showroom	Smart homes with automated controls of temperature, parking system, security, safety and house devices. Establishment of regulatory body for sustainable energy use and water utilisation and conservation	IBM, Liander, KPN, Hogeschool van Amsterdam	People living in smart and safe houses, saving energy and its proper utilisation, electric energy has been transferred to grid rather than being wasted, pollution free environment

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Our vision

To be the thought leader for industry, its voice for policy change and its guardian for effective implementation

Our mission

To carry forward our initiatives in support of rapid, inclusive and sustainable growth that encompasses health, education, livelihood, governance and skill development

To enhance the efficiency and global competitiveness of Indian industry and to expand business opportunities both in domestic and foreign markets through a range of specialised services and global linkage

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PD 356 - April 2015 India: Surging to a smarter future.indd
Designed by Corporate Communications, India