India's Smart Cities Programme

The UK offer to build together

BUSINESS IS GREAT

BRITAIN & NORTHERN IRELAND

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1. Executive Summary

1.1 Background

India has an ambition to create 100 new smart cities, and the UK can help. UKTI wants UK companies to be aware of the opportunities, and to profit from them.

The market is complex, with regional diversity, unexpected delays, price competitiveness, land acquisition issues, etc. Hence, UK companies need to demonstrate to India that they understand Indian needs and have strengths to offer, and present the opportunities clearly to Indian partners or the Indian authorities to get them interested.

Based on an analysis of UK strengths against the current skills gap in Indian smart cities, indications are that there are significant opportunities for UK companies to engage in the Indian Smart City market.

Currently, the Programme is in a concept stage. This report has been prepared on the basis of concept documents and is liable to change as the programme progresses.

1.2 Scope of the Research

The scope of this project includes a detailed overview of India's 100Smart Cities Programme and opportunities for UK businesses. The government of India plans to roll out the broad spectrum of all smart city ventures into this programme and hence, the report focuses on the following parameters of this programme.

- Overview of Indian interpretation of Smart cities
- Estimating addressable market by sub-sectors
- UK strengths and capabilities in the Smart Cities Sector
- Examples of Anglo Indian SMART collaboration
- List of possible Indian/Global partners active in the Programme
- Foreign countries and organisations with announced partnerships with Indian Government

The UK opportunities in the report would be focused on the following smart city dimensions, Physical (infrastructure including mass transport, water, waste management, built environment), Digital (ICT, data, software, analytics and smart metering), Commercial (professional services, regulatory standards, financing and legal), and Social (Municipal services, community-led designs and services, e-governance, healthcare), which is in line with the four pillars mentioned in the Government of India's draft framework for Smart Cities.

Please note the current market outside the smart city programme is very small and immature and is hence not been covered in the scope of this research.

1.3 Approach

Overall report: This report is the result of comprehensive primary and secondary research conducted from across different databases, and governmental websites. Several sources have been used to prepare this report, which include Draft Concept Note on Smart Cities (and various other details/documents) from Indian smart cities website, several analyst reports (including Future Cities Catapult UK Capabilities report and BIS Smart Cities Research Paper), press articles, other Government website such as Ministry of Urban Development.

Estimating addressable market: The size has been arrived at based on the High Powered Expert Committee's estimate of urban investment requirement through 2012-2031 and detailed cost breakup of one of the ongoing Greenfield projects. Reasonable assumptions have been made while estimating the addressable market by sub-sector.

Potential UK companies: The potential UK companies were identified by three approaches:

- Companies that have already played a role in smart city formation.
- Companies that have worked with the UK government on few major projects or a number of projects.
- Leading companies by Revenue/size of business in sectors identified according to 'Smart city concept draft'.

Further details provided in the document 'Potential UK companies'.

Throughout the report exchange rate of 1US$=0.6GBP has been used.

1.4 Abbreviations used in the report

Abbreviation	Full form
RFE	Request for Empanelment
CDP	City Development Plan
MoUD	Ministry of Urban Development
NUDM	National Urban Development Mission
ICT	Information and Communications technology
GoI	Government of India
NASSCOM	National Association of Software and Services Companies
DMIC	Delhi-Mumbai Industrial Corridor
SIR	Special Investment Region
L&T	Larsen & Toubro
ULB	Urban Local Body
CRF	Citizen Reference Framework
SCDP	Smart City Development Plan
ESP	Environmental Sustainability Plan
PMU	Programme Management Unit
EOI	Expression of Interest
DPR	Detailed Project Report
VGF	Viability Gap Funding
PPP	Public Private Partnership

Abbreviation	Full form
PMDO	Pooled Municipal Debt Obligation
REITs	Real Estate Infrastructure Trusts
HPEC	High Powered Expert Committee
NURM	National Urban Renewal Mission
SCF	Smart city framework
ISCT	Indian Smart City Targets
DMICDC	Delhi Mumbai Industrial Corridor Development Corporation
AMRUT	Atal Mission for Rejuvenation and Urban Transformation (It has replaced Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and will be a 10-year programme)

2. Overview of the Smart Cities Programme

2.1 Foreword: An Opportunity for UK Businesses

The Government of India has recently pledged to create 100 new Smart Cities in the country. It has a sense of urgency – the first 20 cities will be selected for funding with development beginning in 2015-16.

The smart city project in India is part of a $1.5tn global market opportunity. This can be seen as a source of great potential for UK businesses in providing products and solutions to this programme particularly because the UK government has been supporting UK business through national funding of Smart City proposals where the funding is subsequently flowing from the cities to UK industry who have already been developing relevant skills and knowledge. The following article describes the Glasgow example which is one of many: http://www.theguardian.com/public-leaders-network/2015/apr/21/glasgow-the-making-of-a-smart-city/.

Overall, India is anticipating a strong investment trend – Smart Cities are a rapidly growing market. A lot of countries have already expressed their intent to invest huge amounts in the smart cities programme. The UK Government has set a target of 10% for UK ownership of the global Smart Cities market which is estimated to exceed GBP900bn by 2020.The target could be achievable, as Smart Cities rely on exactly the kind of knowledge-intense, service-oriented sectors that are thriving in the UK.

This report provides a description of many of the planned and published initiatives that are evolving as part of Prime Minister Modi's plan for creating 100 Smart Cities. There are two characteristics of the entire plan outlined below which create an opportunity for UK industry and are not part of the publicly published plan.

First is the reality of what is actually happening. Although the plan is for the central government to publish its plan and standards to be followed by 'everyone', there are a significant number of initiatives already well into the planning stage particularly some of those involving the very large Indian development firms.

The second point is the sheer scale of the Programme. This report includes a chart on page 21 showing an expected total cost for the entire 100 Smart City project as GBP445b. This takes into account ~91 'brownfield' cities at an estimated cost in the range of GBP2.4-4.8bn each. This chart has been included because of the weight it carries currently but it is believed that it may be significantly understated. For instance, the budget for brownfield revitalisation of Waterfront Toronto into the world's leading '2014 Smart City' is estimated to be as high as GBP16b. More work needs to be done as to size, expectations and comparisons but our expectation is the overall cost will be substantially higher than the one estimated per brownfield site and the total of GBP445b. The market for UK opportunities will be even larger than anticipated, details of which are described in the report. A summary of some expected opportunities to emerge in high end planning and monitoring for UK firms is as follows:

Latest Update on Opportunities with Government of India:

1. *Empanelment for City Development Plan (CDP) preparation:*

   MoUD shall be floating a Request for Empanelment (RFE) sometime in mid-2015, for empanelling consultants to prepare a fresh City Development Plan (CDP) for cities shortlisted under two major projects:

   a. 'Smart City' initiative:

      The expected budget of around GBP0.5mn is for project preparation activities (including procuring consultancy services) and a total of about GBP100mn shall be allotted to each proposed Smart City for planning, procurement, implementation of proposed initiatives.

   b. National Urban Development Mission (NUDM):

      MoUD is also contemplating to empanel consultants exclusively for the projects under the new NUDM, likely to be rolled out soon.

2. *Empanelment for Project Development and Management Unit (PDMU):* (from conceptualising to implementation and monitoring) Another RFE shall be floated for empaneling consultants for PDMU at state level, for implementing various projects under:

   a. 'Smart City' initiative

   b. NUDM

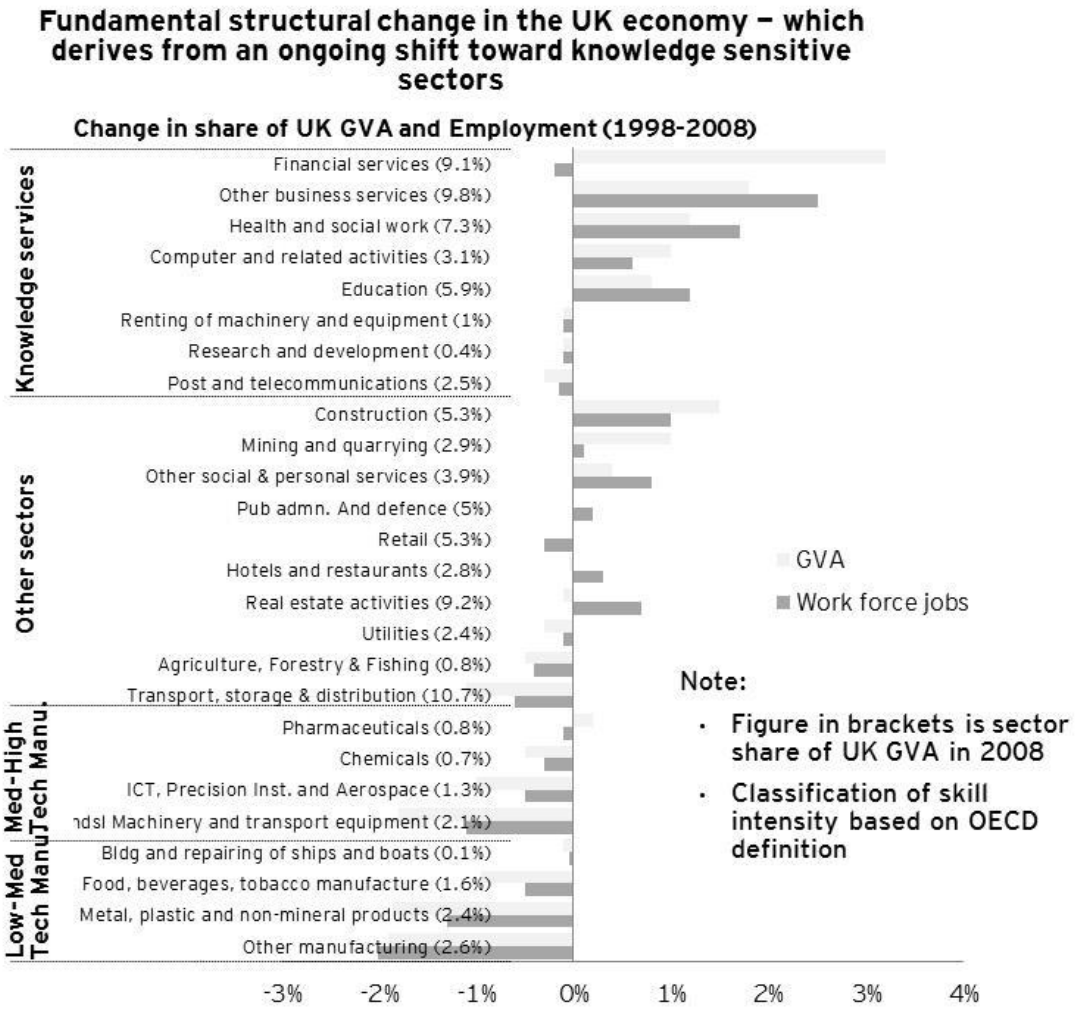
      This RFE is expected to be floated shortly after the CDP RFE.

3. Similarly, MoUD is planning for *empaneling consultants for third party monitoring* of government-funded urban development projects, rolled out under Smart City initiative and NUDM. This RFE is expected to be floated in third quarter of 2015.

Opportunities with International Financing Institutions (IFIs) and Donor agencies:

Several IFIs and donor agencies (from countries such as the US, Qatar, France, Russia, etc.) have approached MoUD to provide assistance in the 'Smart City' initiative. These agencies are likely to adapt a few cities and will assist Central/state governments in project development activities, direct procurement of consulting services for preparation of project concept/reports, besides funding the initiative in these cities. There is an opportunity to reach out to these agencies to explore business opportunities.

With respect to UKTI strategy, a list has been provided enumerating several UK firms who are qualified to become involved as partners. One of the strengths of UK in smart cities was the creation of Catapult, which is an initiative of the UK Smart Cities programme. It is essentially a UK Smart City Innovation Centre located in London. Satellites of Catapult could well be established in India and could give the UK brand and companies a big boost when competing for Smart City business.



India's new '100 Smart Cities' programme is an ideal opportunity for UK businesses. It is significant and it is new. The programme arose within months of Prime Minister Narendra Modi's recent election, when he made a commitment to build 100 smart cities throughout India. His urban agenda aims to help create 100 rapidly developing satellite cities and major urban centres that will become the magnets of foreign investment and jobs and symbols of efficiency, speed and scale.

3. The concept of Smart Cities – Indian perspective

3.1 India's Programme in a Global Context

Mass population migration to cities and urban transformation through the application of new information and communications technology, 'ICT' are creating several challenges and immense opportunities, respectively. In 2014, more than half of the world (54%) became urban although it is only around 31% in India today. Globally, one million people are moving into cities every week. In India alone, every minute, 30 country dwellers move permanently to a city.

This has led to an active demand for 'smart city' approaches to solve challenges of urbanisation, which if not met threaten to strangle city life. The limitations include, choking traffic, slowing waste removal, generating pollution, and smothering the social responses of government, education and business.

How Smart Cities can break through such challenges?

- Optimise resources through better information on the resource use cycle
- Use information to better manage utilities
- Enable consumers to make more informed use of resources, and lower their consumption, thereby reducing utility operating costs and extending operating life of existing infrastructure
- Provide opportunities for new services to citizens through smart technologies

The market for Smart City products and services is forecast to be more than GBP900bn by 2020, equivalent to 12th largest nation on earth, in terms of GDP. Further, it is estimated that the top 750 smart cities will generate two-thirds of the world's GDP by 2030.

Smart Market would be 12th largest GDP

US	$16.6
China	$9.1
Japan	$4.9
Germany	$3.7
France	$2.8
UK	$2.6
Brazil	$2.2
Italy	$2.1
Russia	$2.0
India	$1.9
Canada	$1.8
Smart Cities	$1.5
Australia	$1.5
Spain	$1.3

Factors that have led to surge in demand for 'Smart' services

- 84% of the world is literate (vs 56% in 1950)
- 'Information pressure', i.e., the need to solve problems using data is increasing as 33% of the world has access to Internet. This has resulted in rapid development of 'Internet of Things' and driven the need to put monitors and meters on devices and plug them in to the network.

3.2 State of affairs that necessitated launch of Smart Cities Programme

High Indian population is setting the groundwork to become a knowledge-based society. While urban population is, currently, around 31% of the total population, it contributes more than 60% of India's GDP. It is projected that contribution will increase to nearly 75% of the national GDP in the next 15 years.

From global experience, it is ascertained that a country's urbanisation up to a 30% level is relatively slow but the pace of urbanisation speeds up thereafter, till it reaches about 60-65%. Taking a cue from this, India is at a point of transition and needs to plan its urban areas well.

Among the top ten mega-cities in India, not one single Smart City appears in the list of first four mega-cities of Greater Mumbai, Delhi, Kolkata and Chennai. These cities, especially Greater Mumbai, contribute a significant share to country's GDP, and it is probable that converting these mega-cities to Smart Cities may yield a higher contribution to the current GDP.

Currently, cities face significant challenges

- Increasing populations
- Environmental and regulatory requirements
- Declining tax bases and budgets
- Increased costs of Information and Communications technology (ICT)

To prepare cities to cope with the challenges of urban living and also attract investment, the Government of India (GoI) announced a '100 Smart Cities Programme' and allocated GBP720mn in budget 2014-15 for the development of trunk and internal infrastructure. A smart city employs high-end technology infrastructure that includes comprehensive IT infrastructure, a network of sensors, cameras, wireless devices and data centers for efficient and effective delivery of essential services such as electricity, water supply, sanitation, recycling, managing traffic, transportation systems, etc. Broader elements to be incorporated into a smart city include Smart Energy, Smart Environment, Smart Transportation, Smart IT and Communications, Smart Health, Smart Education, Smart Building and Smart Governance. The main focus of government behind the development of smart cities is to transform India into a digitally empowered economy.[1]

* [1] 'Smart Cities,' Resurgent India

3.3 Pillars of a smart city[2]

- Institutional Infrastructure refers to activities pertaining to governance, planning and management of a city. ICT has provided a new facet to this system making it citizen-centric, efficient, accountable and transparent.

- Physical Infrastructure refers to its stock of cost-efficient and intelligent physical infrastructure such as the urban mobility system, high speed broadband infrastructure, the housing stock, the energy system, the water supply system, sewerage system, sanitation facilities, solid waste management system, drainage system, etc. which are integrated through use of technology.

- Social Infrastructure relates to components that enable development of human and social capital, such as the education, healthcare, entertainment, etc. It also includes performance and creative arts, sports, the open spaces, children's parks and gardens.

- Economic Infrastructure pertains to developing proper infrastructure that generates employment opportunities and attract investments. This would generally comprise the following:

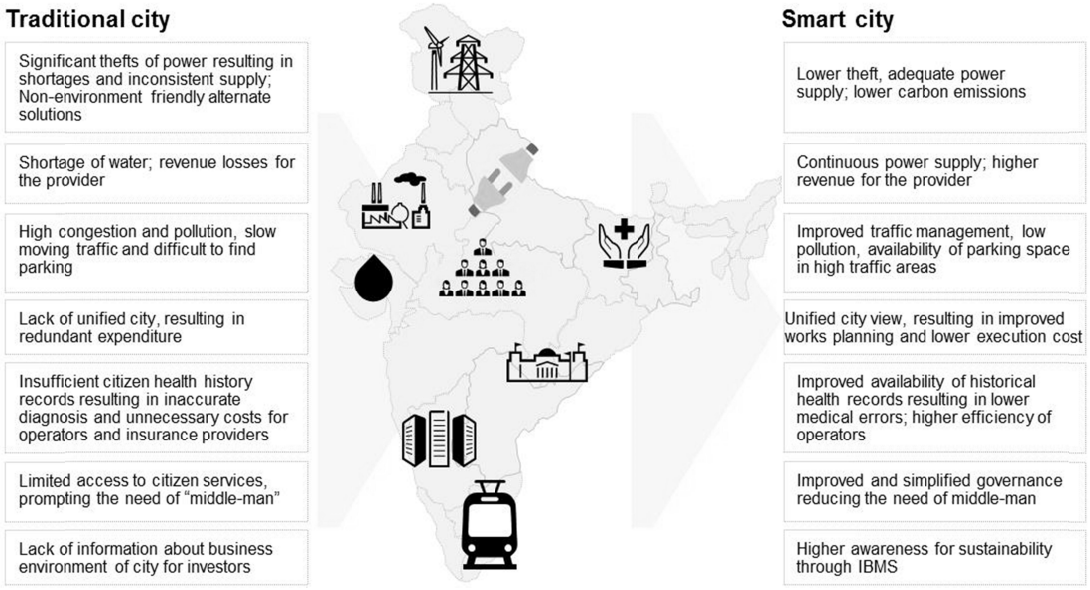
  - Incubation Centers
  - Skill Development Centers
  - Industrial Parks and Export Processing Zones
  - IT/BT Parks
  - Trade centers
  - Service Centers
  - Financial Centers and Services
  - Logistics hubs, warehousing and freight terminals

[2]According to the Draft Government Concept note on Smart City Scheme, *"Smart Cities are those cities which have smart (intelligent) physical, social, institutional and economic infrastructure while ensuring centrality of citizens in a sustainable environment. It is expected that such a Smart City will generate options for all residents to pursue their livelihoods and interests meaningfully and with joy."*

Transition of traditional cities to Smart Cities

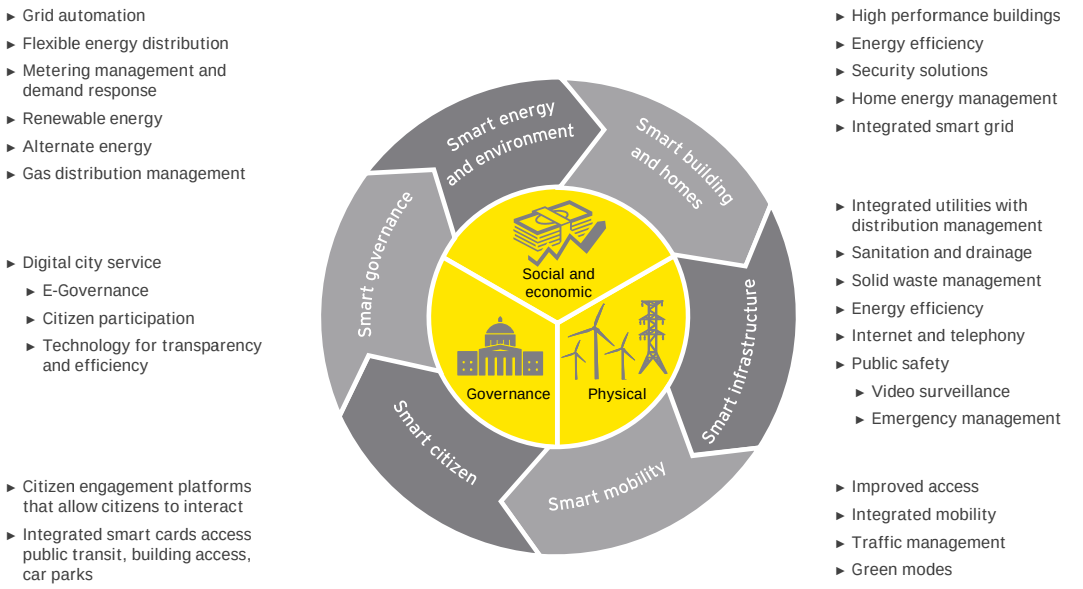
The evolution of a city from being a traditional city to a Smart City is expected to surpass challenges posed by former, in a systematic manner, thus improving the quality of delivery by leveraging technology.

Source: NASSCOM



A city can only be efficient if it has intelligent physical, social, institutional and economic infrastructure while ensuring centricity of citizens in a sustainable environment.[3]

Source: EY



[3] "Modi's vision of 'smart cities' takes shape as government commits to delivering first three hubs by 2019," Dailymail.co.uk, 29 August 2014, http://www.dailymail.co.uk/indiahome/indianews/article-2738057/Modis-vision-smart-cities-takes-shape-government-zeroes-scores-sites-country.html#ixzz3U3n5ks8b, accessed 11 March 2015; 'Real estate – making India: Adapting Indian real estate to evolving avenues,' EY, November 2014; 'Government- draft concept note on Smart City Scheme,' 3 December 2014

3.4 Targets for Smart Cities in India[4]

Government of India (GoI) has laid down targets for Smart Cities in its Draft Concept Note. Those indicators when compared with parameters and benchmarks stated under 'ISO Standard for Sustainable Development for Communities: Indicators for City Services and Quality of Life' are on par and in-agreement on:

- Baseline performance expected for urban services in Smart Cities
- The need to build and embed a focus on resource efficiency, once the use of Smart City infrastructure begins

The targets for Indian Smart Cities are as follows:

Transport

- A travel time of maximum 30 minutes in small and medium size cities and 45 minutes in metro cities
- Unobstructed footpath at least 2mn wide on either side of all street with RoW[5] at least 12mn
- Dedicated bicycle tracks with a width of at least 2mn, one in each direction, should be provided on all streets with carriageway larger than 10mn
- High quality and high frequency mass transport within 800mn (10-15 minute walking distance) of all residences in areas over 175persons/ha of built area
- Access to para-transit within 300mn walking distance

Spatial Planning

- 175 persons per Ha along transit corridors
- 95% residences should have access to retail outlets, parks, primary schools and recreational areas within 400mn walking distance
- 95% residences should have access to employment and public and institutional services by public transport or bicycle or walk
- At least 20% residential units to be occupied by economically weaker sections in each TOD[6] Zone 800mn from Transit Stations
- At least 30% residential and 30% commercial/institutional in every TOD Zone within 800mn of Transit Stations

Water supply

- Round the clock water supply
- 100% household with direct water supply connections
- 135 litres of per capita supply of water
- 100% metering of water connections
- 100% efficiency in collection of water related charges

[4] 'Government- draft concept note on Smart City Scheme,' 3 December 2014
[5] Right of way
[6] Transit Oriented Development

Education

Pre-primary to secondary education

- 1 Pre Primary/Nursery school/2,500 residents
- 1 Primary School (class I to V)/5,000 residents
- 1 Senior Secondary School (Cass VI to XII)/7,500 residents
- 1 integrated school (Class I to XII)/0.1mn population
- 1 school for physically challenged/45,000 residents
- 1 school for mentally challenged/1mn population

Higher education

- 1 college per 1.25 lakh population
- 1 university; 1 technical education center/1mn population
- 1 engineering college/1mn population; 1 medical college/1mn population
- 1 paramedical institute/1mn population; 1 veterinary institute

Fire fighting

- 1 fire station/0.2mn population/5-7km radium
- 1 sub – fire station with 3-4km radius

Sewage and sanitation

- 100% households should have access to toilets
- 100% schools should have separate toilets for girls
- 100% households should be connected to the waste water network
- 100% efficiency in the collection and treatment of waste water as well as collection of sewage network

Solid waste management

- 100% households to be covered by daily door-step collection system
- 100% collection of municipal solid waste
- 100% segregation of waste at source – bio-degradable and non-degradable waste
- 100% recycling of solid waste

Storm water drainage

- 100% coverage of roads with storm water drainage network
- Zero number of incidents of water logging in a year
- 100% rainwater harvesting

Electricity

- 100% households have electricity connection
- Round the clock electricity supply
- 100% metering of electricity connections
- 100% recovery of cost
- Tariff slabs that work towards minimising waste

Telephone and Wi-Fi connectivity

- 100% households have a telephone connection including mobile
- 100% of the city has Wi-Fi connectivity with 100 Mbps internet speed

Health care facilities

- Availability of telemedicine facilities to 100% residents
- 30 minutes emergency response time; ·1 dispensary/15,000 residents
- Nursing home, child, welfare and maternity, center – 25 to 30 beds/0.1mn population
- Intermediate Hospital (Category B) – 80 beds/0.1mn population
- Intermediate Hospital (Category A) – 200 beds/0.1mn population
- Multi-Specialty Hospital – 200 beds/0.1mn population
- Specialty Hospital – 200 beds/0.1mn population
- General Hospital – 500 beds/0.1mn population
- 1 Diagnostic center/50,000 residents; 1 Veterinary Hospital/0.5mn residents
- 1 Dispensary for pet/0.1mn residents

3.5 Cities that will be part of the Programme

In April 2015, Union Cabinet approved India's Smart Cities Program for development of 100 smart cities and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) of 500 cities with outlays of GBP4.8b and GBP5b respectively.

To identify the 100 cities for development, the states and UTs were asked to nominate names of cities for 'Smart City Challenge Competition' and selected cities were to get a central fund of GBP10m each year for next five years. The aim of this competition was to link financing with the ability of the cities to perform to achieve the mission objectives. As per the plan, 20 cities were to be selected in 2015 for the first phase.

The evaluation parameters of selecting these cities were based upon four key areas – existing service levels, institutional systems and capacities, self-financing capabilities and past track record of reforms.

Following is the list of 98 cities which would be taken up for development as smart cities, based on the list released by India's Union Minister of Urban Development, Mr. Venkaiah Naidu on 27th August, 2015:

State	Proposed Smart Cities	State	Proposed Smart Cities
Andhra Pradesh	Vishakhapatnam, Tirupati, Kakinada	Madhya Pradesh	Bhopal, Indore, Gwalior, Jabalpur, Ujjain, Satna, Sagar
Andman & Nicobar Islands	Port Blair	Maharashtra	Navi Mumbai, Nashik, Thane, Greater Mumbai, Amravati, Solapur, Nagpur, Kalyan-Dombivali, Aurangabad, Pune
Assam	Guwahati	Manipur	Imphal
Bihar	Muzaffarapur, Bhagalpur, Bihar Sharif	Meghalaya	Shillong
Chandigarh	Chandigarh	Mizoram	Aizawl
Chhattisgarh	Raipur, Bilaspur	Nagaland	Kohima
Dadra & Nagar Haveli	Silvasaa	Odisha	Bhubaneswar, Rourkela
Daman & Diu	Diu	Puducherry	Oulgaret
Delhi	New Delhi Municipal Council	Punjab	Ludhiana, Amritsar, Jalandhar
Goa	Panaji	Rajasthan	Jaipur, Ajmer, Kota, Udaipur
Gujarat	Ahmedabad, Surat, Vadodara, Rajkot, Gandhinagar, Dahod	Sikkim	Namchi
Haryana	Karnal, Faridabad	Tamil Nadu	Tiruchirappalli, Salem, Tirunelveli, Dindigul, Thanjavur, Tirrupur, Vellor, Coimbatore, Madurai, Erode, Thoothukudi, Chennai
Himachal Pradesh	Dharamshala	Telangana	Greater Hyderabad, Greater Warangal

State	Proposed Smart Cities	State	Proposed Smart Cities
Jammu & Kashmir	J&K Government has asked for more time to decide on the potential smart cities.	Tripura	Agartala
Jharkhand	Ranchi	Uttar Pradesh	Moradabad, Aligarh, Shaharanpur, Bareilly, Jhansi, Kanpur, Allahabad, Lucknow, Varanasi, Ghaziabad, Agra, Rampur and another 1 city to be shortlisted in the future
Karnataka	Mangaluru, Belagavi, Shivamogga, Hubbali-Dharwad, Tumakuru, Davanegere	Uttarakhand	Dehradun
Kerala	Cochin (Kochi)	West Bengal	New Town Kolkata, Bidhannagar, Durgapur, Haldia
Lakshadweep	Kavaratti		

3.6 Progress so far

GoI's 100 Smart Cities Programme is still in a conceptualisation and planning stage. Before the launch of this programme, some of the state governments had initiated development and building of Smart Cities. Progress on some of those initiatives is as follows:[7]

- Gujarat International Financial Tec (GIFT)

  GIFT, spread over 886 acres, is situated at a distance of 18km from Ahmedabad airport. The city is expected to be a front-runner in Smart Cities Programme. The city has been conceptualised as a global financial and IT services hub, whose construction began in 2011. Two towers and few banks, among others, have already signed up. The city is expected to generate 0.5mn direct jobs and an equal number of indirect jobs. GIFT City will have a command center with ICT infrastructure to manage everyday chores.

  It's a JV between the state-owned Gujarat Urban Development Company and Infrastructure Leasing and Financial Services (IL&FS), involving total investment of GBP8bn in three phase development. The three phases are expected to be completed by 2026, with first phase to be completed by 2016.

  Some instances of modernisation include

[7] 'Smart Cities,' Resurgent India; 'First smart city project to get boost at Vibrant Gujarat Summit 2015,' Indiantollways.com, 12 January 2015, http://www.indiantollways.com/category/smart-city/, accessed at 12 March 2015; EY analysis; 'Shendra-Bidkin among first two smart cities,' Timesofindia.com, 15 November 2014, http://timesofindia.indiatimes.com/city/aurangabad/Shendra-Bidkin-among-first-two-smart-cities/articleshow/45153781.cms, accessed 13 March 2015; 'DDA proposes 'Smart City' project in Outer Delhi: Realty impact,' Commonfloor.com, 6 November 2014, http://www.commonfloor.com/guide/dda-proposes-smart-city-project-in-outer-delhi-realty-impact-47574.html, accessed 11 March 2015; 'eGovWatch: Gujarat International Finance Tec-city- A Smart GIFT,' Express Computer, 16 March 2015, via Factiva; *"Modi's GIFT City achieves Phase I financial closure for Rs. 1,157 cr,"* The Hindu, 3 June 2014, http://www.thehindubusinessline.com/news/modis-gift-city-achieves-phase-i-financial-closure-for-rs-1157-cr/article6078474.ece, accessed 18 March 2015; "Naya Raipur woos builders; eyes 'smart city' tag," 20 January 2015, The Economic Times, http://articles.economictimes.indiatimes.com/2015-01-20/news/58268238_1_rs-350-crore-100-smart-cities-200-crore, accessed 18 March 2015; 'Naya Raipur: Here`s how to make a smart city,' Governance Now, 20 September 2014, via Factiva; 'Govt to finalise the guidelines for smart city project soon,' Accord Fintech, 4 May 2015, via Factiva; 'Cabinet approves Smart City Project, Atal Rejuvenation Mission,' Kashmir Images, 20 April 2015, via Factiva

*(Ahmedabed-Dholera (Gujarat), Shendra-Bidkin (Maharashtra), Manesar-Bawal (Haryana), Khuskhera-Bhiwadi-Neemrana (Rajasthan), Dighi Port Area (Maharashtra), Dadri-Noida-Ghaziabad (Uttar Pradesh) and Pithampur-Dhar-Mhow (Madhya Pradesh))

- Solid waste management system: solid waste will be sucked out from homes and offices through pipelines leading directly to a waste processing plant

- Parking: IL&FS is developing a multi-level car parking facility, developed on BOOT basis. The parking shall have 16 floors, with capacity of around 5400 car parking spaces.

- The city will have 1,000 MW electric supply, piped natural gas, centralised AC system, international fibre landing system. It will also house integrated multi-modal transportation system (MRTS/LRT/BRT), aiming to achieve 90% share of public transport.

- Kochi smart city

  Kochi Smart City, spread over 246 acre, is an IT township project, promoted by UAE based Dubai Holdings and Government of Kerala. It is expected that the project will be completed by 2020 and will create around 90,000 jobs. The first phase of the project is expected to be completed by March 2015. This project envisions at least 8.8mn sq. ft. of built up space of which at least 6.2mn sq. ft. will be specifically for IT/ITES/allied services.

  Kochi's master plan includes IT offices, retail and F&B, hotels, residential apartments, schools, colleges, hospitals, parks and open green spaces.

- Naya Raipur smart city

  Naya Raipur, a new city, at a distance of 20km from existing city of Raipur, is being developed as the state capital of Chhattisgarh. The government has planned to build it as 'Green City.' The authority is adopting systems for water harvesting, waste water recycling and use of non-conventional sources of energy and traffic management.

  The plan comprises of 3 phases – Core Zone, Peripheral Region and Airport Zone. The development plan includes an area of 80.13km, which will house 500,000 inhabitants by 2031. The first phase completed in 2012 and the Secretariat shifted to this city.

  Tenders for 400 acres of land are expected to be floated in by mid-2015 for real estate developments.

- Delhi-Mumbai Industrial Corridor (DMIC)

  DMIC is a mega infrastructure project of GBP54bn with the financial and technical aids from Japan, covering an overall length of 1,483km between Delhi and Mumbai. There are plans to build seven smart cities* along DMIC, by respective states. The first two smart cities have been identified as Dholera and Shendra-Bidkin.

  - Dholera Special Investment Region (SIR) has initiated the tendering process and issued request for qualifications (RFQ's) for building trunk infrastructure.

  - GoI is expected to invite bids for Shendra-Bidkin industrial zone in Maharashtra, by mid-2015. The central and state governments have signed a MoU in this regard. The area is deemed to be ahead of schedule in completing major land deals. The state government has spent significant amount for land acquisition at Shendra-Bidkin.

The first phase of both of the above mentioned projects are expected to be completed by 2019.

- Cities such as Hyderabad, Surat, Coimbatore, Bengaluru, Mangalore, Jamshedpur, Kanpur, Delhi, Mumbai and Chennai have launched initiatives related to the deployment of advanced communications systems, metro rail systems, traffic management systems, smart meters, GPRS for solid waste management, GIS to manage property tax, online water quality monitoring, online building plan approval schemes, among others.

3.7 Private Smart city projects[8]

Private Smart City projects are being exclusively funded by corporate players and do not involve Government in any phase of development. Some of such projects are Wave Infratech's 4,500-acre smart city (Wave City) on NH-24 and Lodha Group's Palava City, spread over 4,500 acres and located close to upcoming Navi Mumbai International Airport.

The private developers float tenders and invite companies to support on different aspects of the project. UK companies can participate in such tenders and be a part of private Smart City projects.

Wave City

- Developer roped in SBI Bank to fund its projects, who will conduct due diligence of customers, before financing projects
- Tied-up with IBM to develop Smart City
- Awarded contract of GBP90mn to construction major Larsen & Toubro (L&T) to build residential towers

Private Smart Cities projects are offering facilities such as automated traffic signals, electricity and water meters customised to reduce bills, buses which send text messages to update residents of their arrival, automated garbage control, fiber optic connectivity, 24X7 security, panic buttons and CCTV surveillance systems.

	Wave City	Palava City
	Hotlines, panic buttons, analytic-enabled CCTVs, vehicle identification monitors, electronic access cards	Smart card to work as access card as well as e-wallet, fire alarms, CCTVs
	Smart meters to enable remote monitoring and detect leakages, pH meters to be used to monitor alkaline levels of water; Smart manholes to track sewer flow levels	Rainwater harvesting, maintaining of water table to ensure sustainability and reuse of water for landscaping, etc.

[8] 'Stay Smart,' Businesstoday.com, October 2014, http://businesstoday.intoday.in/story/smart-cities-in-india-as-property-investment-destinations/1/210791.html, accessed 13 March 2015; 'Wave-SBI inks deal building 4,500 acres project,' NBM & CW, 14 July 2013, via Factiva

	Wave City	Palava City
	Intelligent traffic signals to provide real-time info on jams, monitoring devices to track location of buses, guidance parking systems will update message boards about availability of space; Real time data of fleets via internet will be sent to city command center	System enablers to predict traffic and inform road users about alternative routes through communication channels and digital signage to prevent jams; Fleet management system to ensure efficient operation of bus services, waste disposal trucks and emergency response vehicles
	Solid waste management plants	Reuse at least 80% of household and city waste; Waste water and by-products to be used for landscaping, etc.
	Ambient light detectors to trigger street lights; Smart meters to monitor usage and performance; Smart grid to detect pilferage and enable self-heating	Solar power to meet 10% demand of public places; city to use smart pre-paid meters that will allow residents to monitor electricity usage and get alerts

3.8 Challenges and Measures[9]

Challenge	Measures required
► A smart city could take 8-10 years to build from scratch and even more time to attract businesses and people. Therefore, the initiative requires long term commitment and persistence on part of the government. ► Relevant parties need to be aware of the latest technologies, which can also be tailor-made and used effectively taking into account the topography, location and natural resources of the area. ► Provision and use of technology in smart townships and buildings is expected to face initial challenges. Customers accepting mechanised systems as comfort-enhancing features, coupled with their readiness to pay a premium, could be one such challenge.	► Setting up of a central planning authority that would manage and provide single window clearances, monitor progress of such projects and ensure compliances. ► Provide incentives in form of long-term tax holidays and other tax sops to attract businesses to newly developing smart cities. ► Involve private sector as well as global urban planning groups who have experience in executing smart city concept elsewhere in Asia. ► Considering wide demographic divide in India, careful due diligence to determine profile of end users is required, to provide suitable technology to them.

[9] 'Real estate – making India: Adapting Indian real estate to evolving avenues,' EY, November 2014; 'Smart Cities,' Resurgent India

4. Stakeholders involved in planning and execution of Smart Cities Programme

4.1 Planning and monitoring

GoI will invite State governments to share their views and suggestions, while deciding upon the list of Smart Cities. Detailed guidelines would be issued with regard to preparation of proposals. However, Urban Local Body (ULB)/parastatal are required to take the following steps:-

Citizen Reference Framework (CRF)

- CRF to be evolved through professional agencies
- It is a structured document capturing aspirations and expectation of residents/citizens of the town/city
- Developed through wide consultation of citizens – focussed group discussions, seminars, workshops, etc.
- MoUD to identify agencies to take up work related to citizen engagement

Smart City Development Plan (SCDP)

- Develop SCDP based on CRF;
- Preparation would be based on – GIS mapping, Spatial mapping, ICT mapping and Master Plan
- Should comprise of financial requirements of the city and the sources of funding; Financial requirements of the city should be based on Gap Analysis

Environmental Sustainability Plan (ESP)

- Each of the proposed Smart City need to prepare an ESP, which will outline the plan and actions for ensuring adoption of energy efficient and green technologies, among others
- Such ESPs to be audited by credible agencies such as TERI

An investment of GBP500mn is estimated to be required to prepare Reference Frameworks based on CRF, SCDP and ESP. This would also include setting up of a Programme Management Unit (PMU) at State and Urban Local Body (ULB) level.

Further, cities to be part of project are expected to be picked by a competition. One of the key criteria's would be how well they have implemented some of the Prime Minister's campaigns – including the 'Swacch Bharat' and Make in India. Other parameters could be infrastructure, quality of life, and citizen-centric services and detailed guidelines will be issued gradually.[10]

[10]' Smart Cities to be Picked Through Competition,' NDTV.com, 29 January 2015, http://www.ndtv.com/india-news/smart-cities-to-be-picked-through-competition-735659, accessed 19 March 2015

As per the current plan,

1. The GoI would provide financial resources as well as aid State Govts/ULBs/parastatal by empanelling professional agencies centrally so that they do not go through bidding processes at individual levels. This will shorten the procurement cycle.

2. State Govts/ULBs/parastatal will be able to select one of the empanelled agencies for each of the aforementioned plans.

3. Each of the three plans, prepared by professional agencies, will be appraised by regional hubs/agencies in consultation with the respective State Govts/ULBs/parastatal.

4. The ULBs/parastatal will have to get Detailed Project Reports (DPRs) ready through their PMUs and consulting agencies. GoI would prepare a list of empanelled consulting agencies to assist ULBs/parastatal.

5. Each of the DPR has to be appraised by the PMU at the ULB level and thereafter be appraised/approved by the Regional Hubs/GoI through Empowered Committees.

4.2 Execution

Once DPRs have been duly approved:

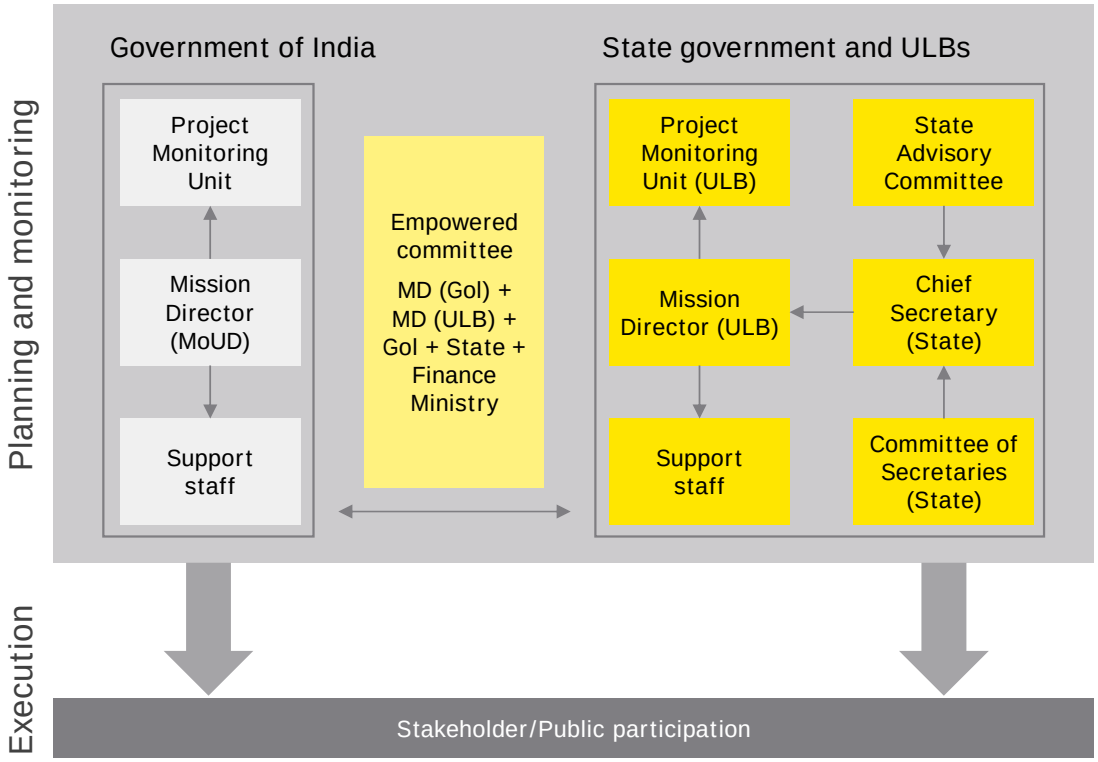
1. The ULBs/parastatal would be required to invite Expression of Interest (EOI) bids and take a final decision. The bid management will be carried out through PMUs at ULB level (Indicative roles of Central PMUs, ULB PMUs and that of Regional Hubs will be detailed out later.) Similarly model concessionaire agreements[11] for each of the sector such as drinking water, power supply, sewerage, sold waste management, metro, elevated road/underpasses, cyber connectivity, communication and information technology, security is expected to be detailed out later).

2. The proposals received will be scrutinised by Empowered Committee, supported by a multi-disciplinary PMU at the Central/Regional level. Regional level hubs would undertake handholding of the cities and appraisal of projects. Empowered Committee of Experts including senior level officers at the Central Govt/State/ULB, duly supported by a PMU at the national level, will provide a final sanction of the projects.

3. The SCDPs and DPRs to be prepared, thereafter, would need to be vetted by professional agency such as TERI on environment sustainability.

[11] Concessionaire agreements detailed out in Appendix

4.3 Implementation Framework



(Source: Draft Government Concept note on Smart City Scheme)

- PMUs will be constituted at both Central and Regional level (state and ULB).
- Mission Directors will be appointed from both MoUD and ULB, who will lead their respective PMUs as well as support staff.
- An Empowered Committee of Experts will be instituted, having representation from all bodies – Central Govt/State/ULB. This committee will have the ultimate authority to approve/disapprove a project.

For instance a Task Force has been set up to develop Ajmer (Rajasthan) into a smart city. It comprises: Divisional Commissioner, Ajmer(Chairman), Secretaries of Town and Country Planning and Municipal Affairs, Government of Rajasthan, District Collector of Ajmer, Administrator of Urban Improvement Trust, Ajmer, Municipal Commissioner of Ajmer, Mayor of Ajmer besides Joint Secretary, MoUD, GoI and representatives of Ministry of External Affairs and USTDA.[12]

[12] 'India: Smart City Task Forces for Ajmer, Allahabad and Visakhapatnam set up,' New Vision, 5 March 2015, via Factiva

4.4 Financial structure for Smart Cities

Smart cities will be developed through collaboration between Central, state and urban local bodies. The funding will be through own sources, grants, viability gap funding (VGF) and public private partnership (PPP). The Central Govt. will provide VGF. Of the total VGF allocated to each Smart Cities by Central:

- Approximately 60% will be allocated for investment in infrastructure
- 10% for e-governance initiatives
- Remaining funds will be in form of equity contribution of the government in two integrated township projects (in partnership with a private developer), as well as one greenfield project and one redevelopment project

GoI has advised cities intending to participate in the smart city programme to develop a financing plan along with their SCDP and DPRs. Such plan could consider resources from multiple government agencies and departments.

- City managements can use credit ratings for assessing current level of borrowing capacity, along with other performance parameters including economic base, service levels and recovery of user charges and sustainability of proposed investments.
- It may develop an investment and financing strategy and identify projects open to innovative financing such as accessing bond market or structuring projects as PPP.

Apart from, budgetary resources available with various levels of government, resources would need to be leveraged for the sector from both domestic and overseas investors. Initially, the GoI may establish a fund consultation with other ministries, multilateral, bilateral developing agencies and banks. This fund may blend grant funds from:

- CSS (Central Government allocation),
- Borrowings from multi-lateral and bi-lateral agencies; For instance, ADB has firmly committed to support India's Smart Cities Programme[13]
- Bonds subscribed by national and state level land development agencies (e.g., HUDA, PUDA, DDA, etc.)

The pooling of funds from several sources is expected to reduce borrowing cost and lengthen tenor. The fund may provide Viability Gap Funding (VGF) as well as provide credit guarantees to municipal bonds and term-loans to leverage debt resources from financial markets.

[13] 'Asian Development Bank says committed to supporting smart cities in India,' The Economic Times,' 5 February 2015, http://articles.economictimes.indiatimes.com/2015-02-05/news/58838041_1_adb-president-takehiko-nakao-asian-development-bank-new-climate-deal, accessed 19 March 2015

Other financing sources could include:

Use PPPs where feasible in smart city projects to leverage private sector financing.

Fostering PPPs in the urban sector provision for incentives could be explored; however, this needs to be discussed with the relevant ministries of the GoI and concerned departments in the Central/State Governments.

Pooled Municipal Debt Obligation (PMDO) facility was set up in 2006 with the participation of several Banks to promote and finance infrastructure projects in urban area on shared risk basis.

Current corpus of the facility is GBP500mn.

It is proposed to enlarge it to GBP5bn by 2019.

Real Estate Infrastructure Trusts (REITS): GoI intends to provide incentives for REITS, which will have pass through for the purpose of taxation.

These are expected to make available fresh equity and attract long term finance from foreign and domestic sources including the NRIs.

Infrastructure debt funds (IDFs): They could be directed to invest in highly rated municipal bonds/green bonds.

They could be used as a means to re-finance debt taken during the construction phase as well as additional cash for financing operations.

Tax-free municipal bonds: Creditworthy local govts. issuing tax-free municipal bonds to bring down the cost of borrowing

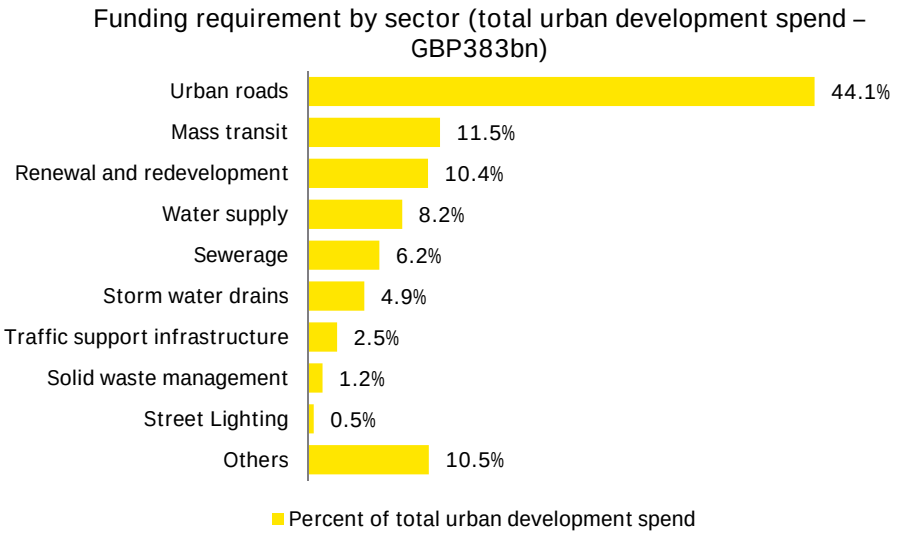
Source: Draft Government Concept note on Smart City Scheme

5. Estimating the addressable market[14]

5.1 Modern urban systems: HPEC estimates

In 2012, the High Powered Expert Committee (HPEC) estimated urban investment requirement, between FY12 and FY32 (20 years), at GBP383bn. This encompassed both existing urban infrastructure shortages and future development for projected population growth.

Source: Working Group Report on Financing Urban Infrastructure for fifth Five Year Plan



Caveats associated with the aforementioned estimate include:

- These figures do not take into account the cost of land and therefore are underestimated
- Assessment did not build a 'Smart Cities Programme' into their estimations

5.2 Incorporating '100 Smart Cities Programme's' investment requirement

5.2.1 Within HPEC estimates

The Government of India's Centre's Expenditure Finance Committee has set the stage for one of the biggest urban renewal programmes to modernise India's cities in recent times, with a top government panel approving some GBP40bn to develop 100 smart cities and upgrade basic civic infrastructure in another 500 cities during the next 10 years.

The Committee cleared GBP10.8bn for developing smart cities and GBP18.6bn for the National Urban Renewal Mission (NURM). It aims at improving water supply, sewerage, and drainage and transport infrastructure in 500 cities.

The two programmes would take off simultaneously and complement each other. For instance, projects to improve basic amenities like providing water to households would be taken up while under the smart cities programme initiatives like introducing 24x7 water supply and smart meters could also be taken up.

[14] 'Shaping New Age Urban Systems,' Sustainability Outlook, October 2014, http://sblf.sustainabilityoutlook.in/file_space/SBLF%20Summit%20Presentations%202014/FINAL%20Smart%20Cities%20MI%20Template.pdf, accessed 24 March 2015; 'India Equity Strategy,' Jefferies, 6 May 2014, via Thomson One; EY analysis

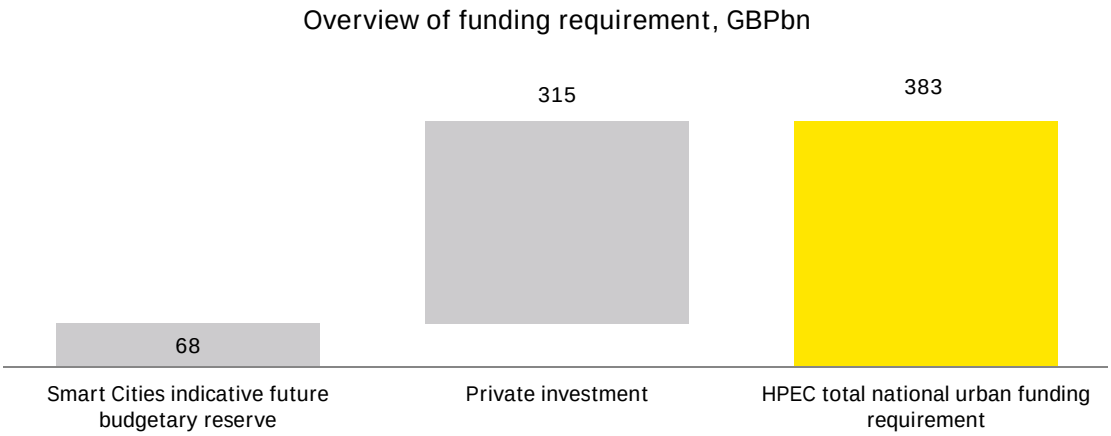
To start with, the ministry plans to develop 20 smart cities by upgrading their physical, social and economic infrastructure during 2015-16, to bring about an overall improvement in the quality of life of city residents. As noted, the cities would be selected through a 'city challenge' competition. Cities which have a clear road map and meet the benchmark set for urban reforms like implementing e-governance and municipal reforms would be selected. The government will spend GBP10.8mn on each city while the rest of the investment would have to come from the private sector.

The Smart Cities project clearly requires private sector partnership with GoI to build robust cities. Indian Government's Indicative Future Budgetary Reserve is expected to be GBP68bn over 20 years. It is expected that most of the infrastructure will be taken up either as complete private investment or through PPPs.

The GoI has indicated that it will provide incentives in form of a CAPEX subsidy for projects via VGF mechanism –

- 90% VGF for cities in hilly areas
- 40% VGF for cities in plains

Source: Compiled from Report of the Working Group on Financing Urban Infrastructure (12th Five Year Plan) and Smart Cities Concept Note



Since the aforesaid assessment of urban spend was completed in 2012, before launch of Smart Cities Programme (2014), it does not take into account some of the key aspects of this concept. The investment would vary widely depending on whether the development is green-field or on the back of an existing city (brownfield) –

- Investment in Greenfield smart cities is expected to be significantly higher as new cities require development from scratch
- In the case of Brownfield smart cities, existing cities will be built taking into account parameters of smart cities. In such cases, the scope for new residential/commercial space development is usually limited. The investment is expected to be less when compared to Greenfield projects
- Cost of ICT has not been accounted in HPEC estimates

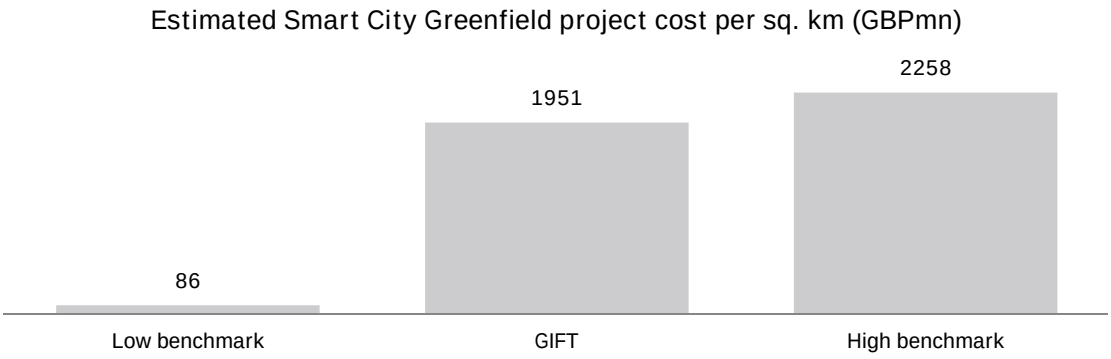
5.2.2 Allowing for Greenfield and brownfield projects and other aforementioned factors

The associated Capex per sq. km of built 'Smart City' environment varies widely due to specific urban locations as well as some Smart City specific aspects.

Illustration

Of the three pilot projects underway (Pavala by Lodha Group & IBM; GIFT City and Dholera Investment Region as part of DMIC), the Greenfield project costs per sq. km vary significantly.

Source: Sustainability Outlook, Briefing paper



Our estimate of percentage of cost for greenfield and brownfield project is based on 'Dholera project estimate,' HPEC break-up, ICT cost estimate by government and some missing components such as Surveillance solutions.

Modus Operandi of our assessment (all numbers are in GBP billion, unless stated otherwise)

Category	Sub-category	Estimated cost per city (GBP bn)	Number of cities	Total cost
Greenfield cities	Greenfield	[15]	6	35
	Satellite cities	4.8	9	43
Brownfield cities	With 1-4mn population	4.8	44	211
	State capitals	4.2	17	71
	Tourist places	3.6	10	36
	Less than 1mn population	2.4	20	48
Total investment				445

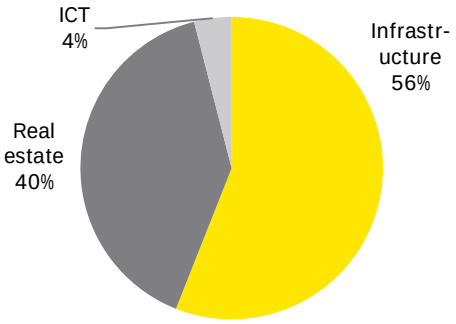
Dholera	GIFT	Naya Raipur	Others (~3)
12	7	4	12

The total investment opportunity in '100 Smart Cities' is GBP445bn. Of this total, infrastructure constitutes 75% (GBP334bn), real estate 21% (GBP94bn) and remaining ICT.

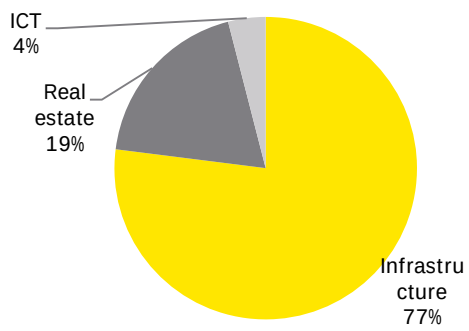
While, real estate constitutes 40% of total cost for Greenfield projects, it will be only 19% for brownfield cities. Infrastructure costs constitute more than 3/4 of the total cost for brownfield projects and more than half in case of Greenfield projects.

[15] [TBU]

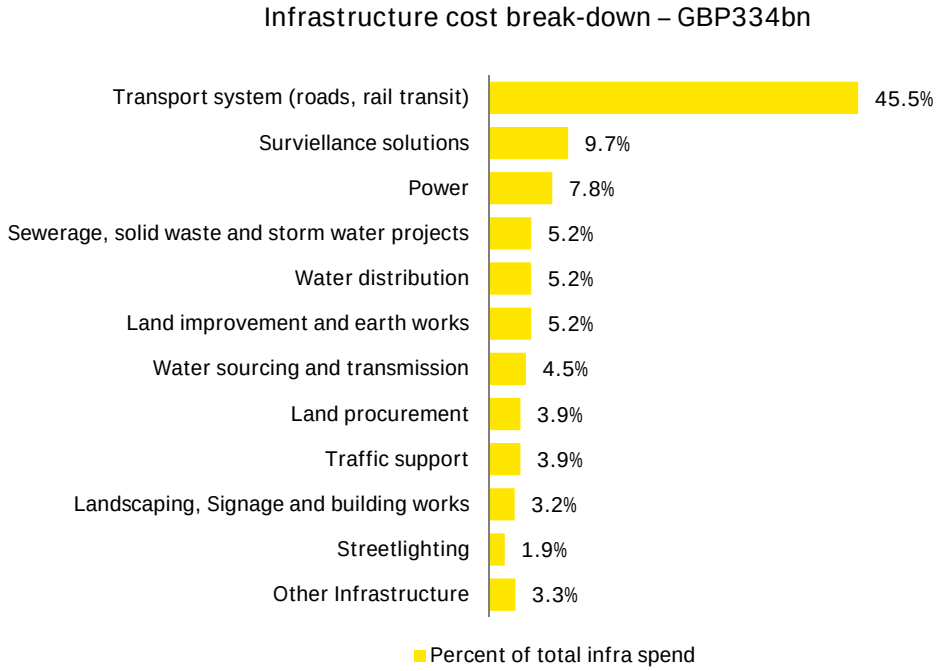
Greenfield and satellite cities project cost breakdown



Brownfield project cost breakdown



Transport system constitutes 45% of overall infrastructure costs, followed by surveillance solutions (10%) and Power (8%). For both Greenfield and brownfield projects, these constitute top three components.



With the exception of Greenfield cities, all other categories comprise building upon existing cities. The estimated costs, however, differ as they are based on size, population, etc. Our detailed workings to arrive at the estimate of GBP445bn is as follows:

	(A) Greenfield and satellite cities	(B) Breakup of total cost	(C) Brownfield	(D) Break up of total cost	(B)+(C)
Infrastructure development cost	56%	44	77%	282	326
► Transport system (roads, rail transit)	26%	20	35%	128	149
► Traffic support	2%	2	3%	11	13
► Street lighting	1%	1	2%	5	6
► Land procurement	2%	2	3%	11	13
► Water sourcing and transmission	3%	2	4%	13	15
► Power	5%	4	6%	22	26
► Land improvement and earth works	3%	2	4%	15	17
► Waterdistribution	3%	2	4%	15	17
► Sewerage, solid waste and storm water projects	3%	2	4%	15	17
► Landscaping, Signage and building works	1%	1	3%	9	10
► Surviellance solutions	6%	4	8%	27	32
► Other Infrastructure	2%	2	3%	9	11
Real estate	40%	31	19%	70	101
► Renewal and development			10%	37	37
► Housing	33%	26			
► Commercial	3%	2			
► Retail	2%	2	3%	11	13
► Hospitality, Recreation, Education, etc.	2%	2	6%	22	24
ICT(including internet connectivity)	4%	3	4%	15	18
Total		78		367	445

(Source: EY analysis)

Disclaimer: The actual addressable market may vary since the smart cities initiative is only in concept stage and after the framework for each city is laid out, the scope of the definition of smart city for each city may change and the investment required for each sub-area may vary depending upon the revised targets or existing infrastructure in each city to be converted into a smart city.

Exchange rate used for all calculations is 1 US$= 0.6 GBP

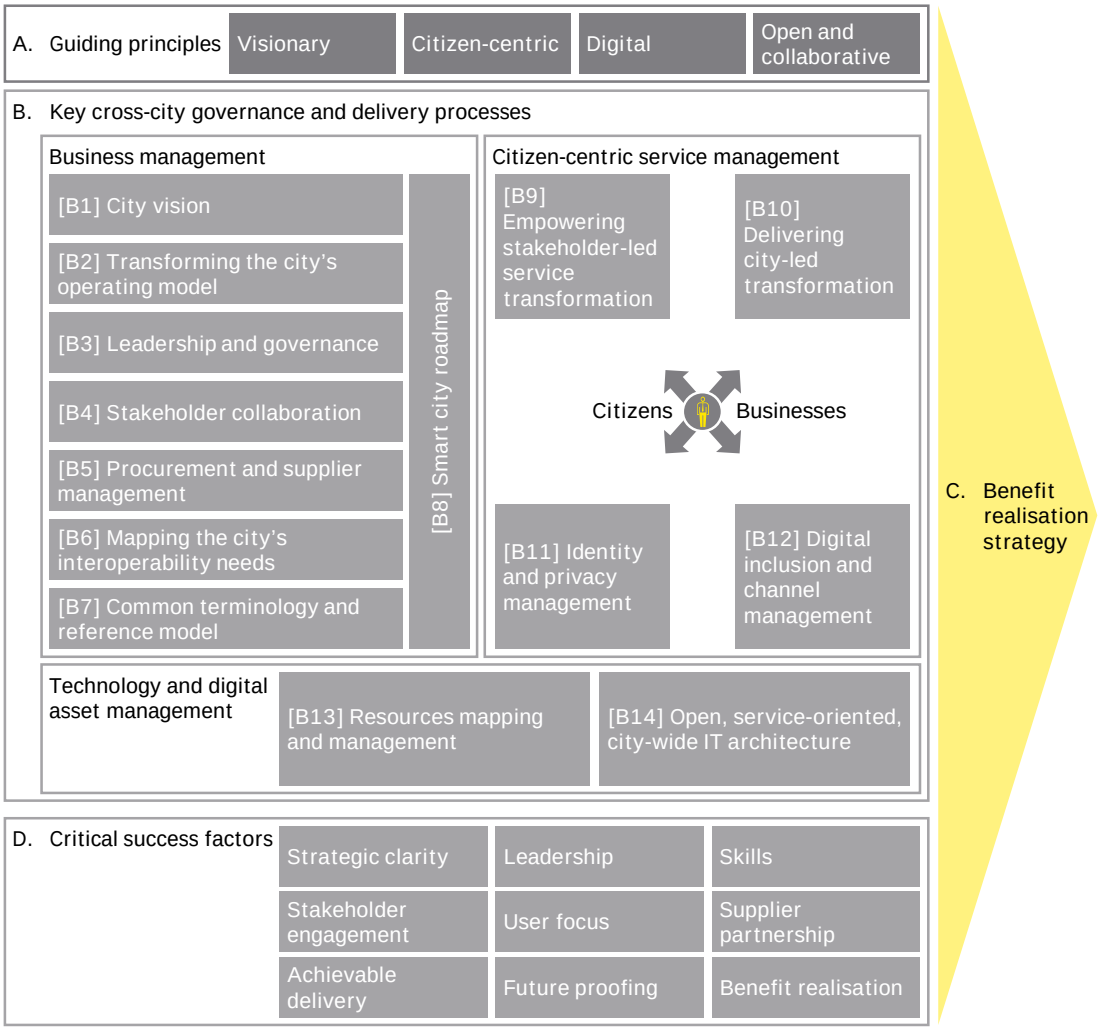
6. Comparing Indian Smart Cities parameters with International standards

6.1 British Standards Institute's Smart City Framework – a guiding force for smart city programmes

British Standards Institute has developed a Smart city framework (SCF). It provides practical, 'how-to' advice, reflecting current good practices identified by several public, private and voluntary sector practitioners engaged in facilitating UK smart cities. The SCF has been developed to bring together good practices in responding to these challenges in an integrated way.

It may serve as an important guide in development for smart city programmes around the globe, including the Indian smart city programme, if they were to adopt the same.

High level structure of SCF



6.2 Comparison of Indian smart city targets with ISO standards

ISO 37120# establishes a set of standardised indicators to steer and measure performance of city services and quality of life. It has laid down 46 performance indicators that participating cities will need to track. This standard is important as it is the first ISO standard for smart city indicators. Relevant indicators from ISO 37120 have been mapped to the Key Parameters and Benchmarks proposed by Indian Government Smart City Framework, to enable a comparison

	Indicators	ISCT	ISO
Economy	► City's unemployment rate ► % of city population living in poverty	✗	○
Education	► % of female school-aged population enrolled in school ► % of students completing primary/secondary education ► Primary education student/teacher ratio	✗	○
	► # of Nursery/Primary/Senior Secondary school per X residents ► # of Schools for Physically/Mentally challenged per X residents ► # of College/university/engineering college/paramedical institute per X residents	○	✗
Energy	► Total residential electrical use per capita (kWh/year) ► Energy consumption of public buildings per year (kWh/m²) ► % of total energy derived from renewable sources, as a share of city's total energy consumption	✗	○
	► % of city population with authorised electrical service	○	○
	► % metering of electricity connections	○	✗
Environment	► Fine particulate matter (PM2.5) concentration ► Greenhouse gas emissions measured in tonnes per capita	✗	○
Finance	► Debt-service ratio	✗	○
Fire fighting	► # of firefighters per 100,000 population	○	○
	► # of fire related deaths per 100,000 population	✗	○
Governance	► Voter participation in latest municipal election (as a % of eligible voters) ► Women as a % of total elected to city-level office	✗	○
Healthcare facilities	► Average life expectancy ► # of physicians per 100,000 population ► Under age five mortality per 1,000 live births	✗	○
	► # of in-patient hospital beds per 100,000 population	○	○
	► % residents to whom telemedicine facilities is available ► Emergency response time ► # of dispensary/diagnostic centre/Veterinary Hospital per X residents	○	✗
Safety	► # of police officers per 100,000 population ► # of homicides per 100,000 population	✗	○
Solid waste	► % of city population with regular solid waste collection (residential) ► Total collected municipal solid waste per capita ► % of city's solid waste that is recycled	○	○
	► 100% segregation of waste at source – bio-degradable and non-degradable waste	○	✗
Wastewater	► % of city population served by wastewater collection ► % of city's wastewater that has received no treatment ► % of city's wastewater receiving primary/secondary/tertiary treatment	○	○

	Indicators	ISCT	ISO
Telecommuni-cation and innovation	► # of cell phone connections per 100,000 population	○	○
	► % of city has Wi-Fi connectivity with 100 Mbps internet speed	○	○
	► # of internet connections per 100,000 population	✕	○
Shelter	► % of city population living in slums	✕	○
Transportation	► Kilometre of high capacity public transport system per 100,000 population ► Kilometre of light passenger transport system per 100,000 population ► Annual # of public transport trips per capita ► # of personal automobiles per capita	✕	○
	► A travel time of X minutes in small and medium size cities and X minutes in metro cities ► Unobstructed footpath ► Dedicated bicycle tracks ► High quality and frequency mass transport within X minute walking distance ► Access to para-transit within X walking distance	○	✕
Urban planning	► Green area (hectares) per 100,000 population	✕	○
Water and sanitation	► % of population with potable water supply service	○	○
	► % of population with access to improved sanitation ► Total domestic water consumption per capita)	✕	○
	► Round the clock water supply ► % metering of water connections ► % efficiency in collection of water related charges ► % households to have access to toilets ► % schools to have separate toilets for girls	○	✕

Source: India Smart City Targets

Based on ISO 37120 indicators, Indian is on-par and in agreement on

► Baseline performance expected for urban services in Smart Cities; and

► The need to focus on resource efficiency, while using Smart City infrastructure

The concept of smart city means very different things to different cities. From the implementation of individual traffic or waste management solutions to the integration of city-wide services through the use of ICT come under the umbrella of 'Smart City'. Therefore, intuitively, each pilot city comes from a different starting point, with a different set of social and economic preconditions, natural and geographic settings, economic structures, experience with technological solutions, maturity of infrastructure, etc. Consequently, the level of maturity of any India Smart City project (initiated in 2015) would differ from the level of an advance city such as Bristol.

This report describes a Smart Cities Maturity Model (SCMM, details in Appendix), which lays down a common platform to compare preparedness of Future Smart Cities against these aspects. Based on the same, Indian smart city targets have been compared to Bristol and Haidan cities on certain parameters to see how it compares to smart cities in a developed and a developing nation.

	Basic urban services				Average			Advanced		High urban resilience
Transport and traffic management	✓	✓	✓		✓	✓		✓		✓
Spatial Planning	✓	NA	✓		NA			NA		NA
Water Supply	✓	✓	NA	✓	✓			✓		
Sewage and sanitation	✓	NA	✓		NA	✓		NA		✓
Solid waste	✓		✓							
Storm water drainage				✓	NA	NA				
Energy and Electricity	✓	✓	✓	✓	✓	✓		✓		✓
ICT and system intelligence	✓	✓	✓		✓	✓		✓	✓	✓
Economy, Finance, Education and health	✓	✓	✓	✓	✓	✓	✓	✓		
Environment	×	✓	✓		✓					

Disclaimer: The actual maturity level of any city may vary since the above analysis is based on secondary research related to variety of initiatives, taken in these regions, to evolve as a Smart City. The level of maturity of Indian Smart Cities is based on the targets stated by GoI in the Concept Note, which is still in a developing stage.

The evolution and rapid uptake of IT, sensing, big data and information-based products and services has shifted the way in which people live in cities. Below mentioned are some initiatives taken in Haidian and Bristol for the development of city vis-à-vis ISCT.

ISCT	Bristol	Haidian District
► Segregation of recyclable and non-recyclable waste as well as wet and dry waste at the source so that there can be 100% recycling of solid waste ► Use of technology for treatment of waste at decentralised locations ► An effective collection and disposal system	► 'Bristol is Open', a partnership between the city and the University of Bristol, is an open data portal. The university and city council will manage R&D projects, through the data collected, and find innovative uses for real-time data to improve the city's liveability. Congestion, waste management, and energy areas will also be addressed through this portal. ► 3e-Houses is a project consisting of integrated common ICTs into social housing to allow homes to save energy, shift their consumption from peak to off-peak hours and reduce CO2 emissions.	► Beijing Development Ltd. established a company with Lvhaineng for the investment, construction and operation of a renewable energy power generation plant in Haidian District. The Project is estimated to have a capacity of processing wastes of 2,500 tonnes per day.
► A 100 Mbps internet speed coupled with 100% coverage of the area by cell phone towers. ► Local service providers should have multiple service kiosks accessible by people for evaluating public services and accessing public information. ► Some other features include, fibre optic connectivity to each home, Wi-Fi in all public places and educational institutions.	► A high spread broadband research network, citywide Wi-Fi and RF mesh network. The City Council also runs its own data centres, emergency control centre including CCTV and telecare, traffic control centre. ► A 30 Gigabit per second fibre broadband network is being laid down in the city. ► Bristol Smart City Programme focuses on Smart Energy (smart metering, smart grid, smart public buildings), Smart Transport (traffic control centre, electric vehicles, freight consolidation centre), Smart Data (city open data platform, innovation work with SMEs, communities, art projects, etc.)	► By end of 2012, the fibre network household coverage reached 62.78%, and the wireless communication network coverage was 97.1%. It, currently, has 2700 video cameras, and has built a district spatial data sharing platform. China Mobile has launched 4G services. ► Offers free Wi-fi to its citizens
► ULBs to make effective use of ICTs in public administration to connect and coordinate between various departments. ► Ability to seek and obtain services in real time through online systems and with rigorous service level agreements with the service providers. ► Public participation in governance to be made possible through social media and making all information available in public domain.	► Has B-Open Data Store, whose aim is to promote transparency and increase public and neighbourhood engagement, and make it easier to share information with citizens, encouraging them to work with information and data to create applications, websites, mobile products or installations.	► Achieved government data exchange, business collaboration and resource sharing by carrying out intelligence application system construction in government administration, urban management.

7. Local/global partners for UK-based companies[16]

Companies already engaged in the Smart City Programme

The GoIs decision to develop 100 smart cities in India has generated a lot of interest among leading multinational companies active in this field. Players such as Dassault Systems, IBM, Cisco, GE, Schneider Electric and Bosch are looking to participate in the programme. These players are expected to offer their expertise through products and solutions ranging from connected lighting and connected networks to simulating smart cities and building management solutions.

Sector	Company
Technology	IBM, Cisco, Intel Corp, Dassault Systems, Sterlite Technologies, Honeywell International Inc., 3M Company, Infosys Ltd., Microsoft Corporation, Wipro Ltd, SAP
Infrastructure and construction	IL&FS Engineering and Construction Co., Larsen & Toubro Ltd., Lodha Group, Bentley Systems, Inc. Siemens AG
Electric instruments and capital goods	Schneider Electric SE, Robert Bosch GmbH, General Electric, Hitachi Ltd., Timken Co

Potential global partners

The Smart City Programme represents several opportunities for companies operating across sectors such as urban and inter-urban transportation (metros), energy-efficient public buildings and smart grids, water, sewage and ICT. Many American and European companies such as Bombardier, Alstom, Texas instruments, etc. are reinforcing their Indian operations and creating separate business units to grab opportunities provided by the Programme.

Sector	Company
Urban Mass Transit system	Metropolitan Transportation Authority, MTR Corporation Ltd, Alstom S.A., Bombardier Transportation GmbH, Confidex Ltd.
Infrastructure and construction	Isolux Corsan Servicios Sa, CIMIC Group, Vinci, IJM Corporation Bhd, Aecom
Electric instruments	Taiwan Semiconductor Mfg. Co. Ltd, Gemalto NV, Texas Instruments Incorporated, STMicroelectronics NV, Flextronics International
Solid Waste Management	Casella Waste Systems Inc, Waste Connections, Inc, Waste Management, Inc
Technology	Koninklijke Philips NV
Consulting	Rebel Group International BV, Catapult Realty Consultants, Deloitte, Eptisa Servicios, Exeltech Consulting Incorporate, KPMG, Mckinsey & Company, The Boston Consulting Group, Bain & Company, Accenture Plc, Black & Veatch, GHK Consulting Inc., Grant Thornton LLp, Royal HaskoningDHV, Modulex, WSP Global Inc., Proinso

Potential Indian partners

It is pragmatic to believe that the Smart City Programme is likely to benefit local players the most in terms of business opportunities and revenue generation. India has few players across the spectrum with the kind of expertise and exposure required for such an ambitious project. This is expected to lead to increased possibilities of cross-border collaboration and partnerships with the leading global companies. Some of the prominent global players such as ABB, Siemens and Alstom already have a strong presence in the Indian market. Their

[16] Details pertaining to business description, revenues of companies are given in Appendix

presence not only creates a healthy eco-system in the local market but also promotes completion with the local players.

Sector	Company
Urban Mass Transit system	Delhi Metro Rail Corporation, Urban Mass Transit Company Limited (UMTC), Delhi Integrated MultiModal Transit System (DIMTS) Ltd.
Infrastructure and Construction	Hindustan Construction Company Ltd, Gammon India Limited, GMR Infrastructure Ltd, GVK Power and Infrastructure Ltd., Simplex Infrastructures Limited, Reliance Infrastructure Ltd, IL&FS Transportation Networks Ltd, Sadbhav Engineering Limited, Srei Infrastructure Finance Limited, Feedback Infra Pvt. Ltd., Tata Consulting Engineers, IPE Global, Punj Lloyd Limited
Water supply and waste treatment	IVRCL Infrastructures & Projects Limited, Ion Exchange (India) Ltd, SPML Infra Limited, VA Tech Wabag Ltd, Spectron Engineers Pvt.
Building construction – Residential and Commercial Segments	Shapoorji Pallonji & Co. Ltd., Ahluwalia Contracts India Ltd, BSEL Infrastructure Realty Limited, Man Infraconstruction Limited, Supreme Infrastructure India Ltd, Vascon Engineers Ltd., B L Kashyap & Sons Ltd, TATA Housing Development Co. Ltd.
Electronic instruments and capital goods	Bharat Electronics Ltd (BEL), Tata Elxsi Limited, Anchor Electricals Private Ltd., Hpl Electric & Power Pvt. Ltd., C&S Electric Limited, Ntl Electronics India Ltd., Su-Kam Power Systems Ltd.
Solid Waste Management and electronic instruments	Vermigold Ecotech Pvt Ltd, IL&FS Environmental Infrastructure & Service Limited, Ramky Group
ICT	Infosys Ltd., Object Technology Solutions India Pvt Ltd.,
Consulting	Mehta & Associates, CRISIL Risk & Infrastructure Solutions Ltd., DRA Consultants Pvt Ltd., LEA Associates South Asia, Tandon Urban Solutions Pvt Ltd, Mukesh and Associates, Shah Technical Consultants (P) Ltd., ICRA Management Consulting Services Limited, MaRS Planning & Engineering Services Private Limited, Dorsch Consult India Private Ltd., Royal HaskoningDHV, Archohm Consults Private, All India Institute of Local Self Government, Alia Consulting Solutions Pvt., Aarvee Associates Architects Engineers and Consultants, IIDC Limited, Centre for Good Governance, Voyants Solutions Pvt. Ltd., Infrastructure Development Corporation (Karnataka) Limited, NSS Associates, Arcop Associates Pvt Ltd, Jones Lang Lasalle Property Consultants India Private Ltd., Engineers India Limited, Dataworld India Private Limited, NCPE Infrastructure India, DDF Consultants Pvt Ltd, The Energy and Resources Institute, Knight Frank (India) Private Limited, Icf Consulting India Private Limited, Arup India Pvt Ltd, Sycom Projects Consultants Pvt., Auctus Advisors Private Limited, WAPCOS Ltd., Cyient Ltd., CRP Risk Management Ltd., ARKITECHNO Consultants (India) Pvt. Ltd, Sundaram Architects Pvt.Ltd, N.K. Buildcon Pvt. Ltd., Egis India Consulting Engineers Private Limited, Urban Management Centre (UMC),

8. Strengths of UK companies by sub-sector

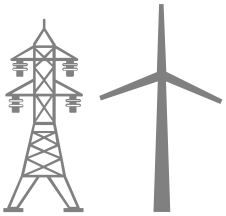
The UK is strongly placed to provide products and services required to develop future cities. The UKs strengths for this market include the following:

- Multidisciplinary approach
- Project delivery
- Urban planning and reinvention
- Digital creativity
- Urban data, visualisation and modelling
- Human-centred design and standard setting

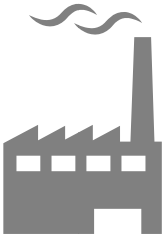
To ensure that the UK can make the most of opportunities relating to smart cities, in 2013 the Government established the Smart Cities Forum and Future Cities Catapult (FCC) – to bring together cities, industry, sector experts and government departments to identify and address any barriers to development and deployment. FCC is a member of the UK Department of Business, Innovation and Skills Smart Cities Forum, and the official host of Smart Cities Forum meeting papers. It is an innovation centre on urban innovation, where experts from multiple disciplines working alongside to remove barriers to innovation, developing solutions to the future needs of the world's cities.

Some of the key strengths of UK in Smart Cities Programme is as follows:

Automotive and Transport 	► Experience in Congestion Management
	  ► Central London Congestion Charging, Regent Street Consolidation Centre (80% reduction in delivery vehicles)
	► Experience in Electric Vehicles
	  ► FREVUE (Validating Freight Electric Vehicles in Urban Europe)
	► Experience in logistic technology facilitating distribution process
	  ► Efficient Consumer Response by The Institute of Grocery Distribution
	► Established Research groups, Training centres and Universities to carry out research and development in Transport sector
	  ► Transportation Research Group, Engineering & Physical Sciences Research Council, The Industry Doctoral Training Centre, University of Newcastle, Leeds ITS Studies, and Imperial College London
	► UK education sector highly regarded around the globe for provision of world leading research, and development of innovative technologies for the smart transport sector.
	  ► The University of Westminster is recognised as a global leader in the field of urban logistics and Cranfield University is a global leader in supply chain work.
	► UK has extensive experience in designing, managing and retrofitting underground transport systems.
	  ► London Underground
	► Various government initiatives to encourage smart transport system space
	  ► Transport Systems Catapult, technology and innovation centre which will enable UK businesses to benefit from the rapidly growing market for innovative transport systems and services
	► UK can be considered a world leader at early stage concepts and system integration

Waste Management 	► Experience in Smart Public Realm Bins ► Big Belly Solar UK is a company that produces a street waste collection bin that is a self-contained compactor powered by the sun. The smart angle is that when these bins are 85% full they send an email or text message alerting the collection contractor. This results in a reduced number of collections which saves on collection costs and GHG emissions from collection vehicles. ► Experience in Refuse Collection Vehicle GPS Tracking (GPS enables RCV fleet operators to track their vehicles with regards to their location, speed and historical routes). This information is useful for monitoring, analysing and improving the efficiency of their operations. ► In Sevenoaks, Kent the Verdant Group Plc (a specialist municipal services provider) installed GPS tracking in 200 refuse and recycling vehicles ► Experience in creation and management of mobile phone applications in public realm management around waste. ► The Love Clean London initiative uses mobile phone and 'apps' technology to enable members of the public to report environmental quality issues such as graffiti vermin, poor waste storage and fly-tipping to their local authority. ► Government of UK has taken a number of initiatives around waste management. ► Department for Environment, Food and Rural Affairs (Defra) has already invested some £600mn in its Waste Infrastructure Delivery Programme, and will invest a further £3bn in 29 PFI projects over the next 28 years in order to meet EU targets. ► WRAP – was set up in 2000 to help recycling take off in the UK, initially by creating markets for recycled materials. Planning Policy Statement 10: Planning for Sustainable Waste Management (2011): This policy sets out the Government's policy to be taken into account by waste planning authorities and forms part of the national waste management plan for the UK.
Electricity 	► UK micro-generation management technology is predicted to grow between 1 and 4mn units by 2020 ► The UK Government published its action plan for micro-generation in June 2011 ► UK power standards are aligned with the EU market and with several major Commonwealth economies such as Singapore, Hong Kong, India and Pakistan. This makes entry into these markets easier for UK industry and experience ► This is particularly helpful for SMEs who would otherwise struggle with redesign costs to enter other markets with less similar regulatory regimes. ► UK has very strong policies, programmes and incentives geared at energy efficiency in the built environment ► UK is carrying out a national roll out of smart meters and is promoting large scale energy efficiency retrofit through initiatives such as the Green Deal ► UK is a key player in green finance ► It is host to organisations such as the Green Investment Bank, the London Energy Efficiency Fund, the Climate Bonds Initiative, and Climate Change Capital ► UK has internationally recognised experience in skills that are necessary for innovation in the market; namely, product design, user interface design, and service design ► HEMS in the domestic environment. Product design is a traditional strength for the UK36 especially when tied to the UK's solid mechanical and electrical engineering expertise ► UK has world-leading academic institutions that are into research and education in this sector ► The strengths of product design and engineering skillsets in industry are backed by world-leading academic institutions such as Imperial College London, the Royal College of Art, and Central Saint Martins ► UK SMEs hold some dominance in the HEMS (Home energy management systems) market ► Many SMEs offer relatively innovative products and have developed delivery partnerships with large utilities in the UK and abroad

	► The UK has an active market of demand response aggregators, based on National Grid's STOR37 programme. ► This gives the UK a good footing to build upon when developing more extensive demand response services in a smart grid. E.g., EnerNOC UK, and new entrant KiWi. ► UK has established regulators and government agencies to manage energy market ► UK energy market regulator, Ofgem, coordinator of a regulated marketplace, is in a strong position to override any market failures and drive innovation in the energy market.
Healthcare Facilities 	► UK's strengths in this sector lies in product design, life sciences and the role of the National Health Service ► The Department of Health's 3mnLives programme is a key cross-industry initiative for the UK market ► UK is transforming towards Big Data, use of healthcare systems which begin to collect and mine their data. The power of Big Data in healthcare is only just becoming apparent and is likely to have a positive impact on the effectiveness of ALTs. ► E.g., the recent announcements by the UK Department of Health to make some patient data available for research ► There has been a shift in policy in England according to the report 'Workforce development for Assistive Technology, Telecare and Telehealth' towards the delivery of services which can offer greater control over lives, promote enjoyment of a good quality of life which is tailored to focus on prevention, an individual needs and low level support from social care and health when possible ► E.g., personalisation, re-ablement, self-care and management, efficiencies, independent living, extra care housing, QIPP, housing ► In Scotland, personal care is free at the point of contact. The Scottish Centre for Telehealth and Telecare which sits within NHS 24 provides guidance, support, standards, protocols and processes to support telehealthcare solutions. ► For example, Managing Long Term Conditions (Scottish Executive 2007), Better Health, Better Care: Action Plan (Scottish Executive 2007), Seizing the Opportunity: Telecare Strategy 2009-2010 (Scottish Government 2008), Caring Together: The Carers Strategy for Scotland 2010-20 ► UK is one of the fastest growing market in Europe for Assisted Living Technology (ALT) ► Government recognises the importance and advantages of these technologies. This resulted in significant improvements in the adoption rate of ALT in healthcare ► Scotland has key experience in Assisted Living Technology because of its industrial and academic base but also due to proactive government policies ► Medical technology is one of the key life sciences subsectors in Scotland with a significant company base in this sector that spans large companies such as LifeScan Scotland to small dynamic start-ups such as SureSensors ► Scotland has specialised institutes and groups researching in ALT and a significant research base in areas of electronics, optoelectronics and sensors, and informatics. ► E.g., Strathclyde Institute of medical devices, The Institute for medical Science and Technology, The Care Technology Research Group. ► UK has strong industry involvement in EU initiatives which is likely to allow UK industry easier access to European healthcare market ► Government has undertaken a lot of initiatives and laid out funding mechanism in Healthcare technologies ► The Whole System Demonstrator (WSD) programme was established in 2008 by the TSB and Department of Health as the world's largest randomised control trial for telecare and telehealth. ► 3mn Lives (3ML) was established in January 2012 on the back of the WSD findings. 3ML is a pioneering partnership established by the Department of Health with NHS stakeholders, industry, trade bodies and third sector organisations. This cross-industry partnership is aimed at the whole-system transformation of health and social care through the use of telecare and telehealth technologies and services.

Water, Sewage and Sanitation 	► Pioneer in advanced pressure management solution. The system automatically optimises and remotely controls water pressure in a network ► i2O, a water technology company based in Southampton is recognised as worlds' first in advanced pressure management ► UK water utility companies are moving to 'smart water' ► In UK, 34 privately-owned companies provide water, sanitation and drainage services to 50mn household and non-household consumers in England and Wales ► UK companies has been adopting real time technologies for water and waste water management ► Government of UK has been taking a number of initiatives around water management ► Government looking to optimise work planning cycles in conjunction with Ofwat, DEFRA and water utility companies ► The Department for Environment, Food and Rural Affairs (DEFRA) manages all aspects of water policy in England, including water supply and resources, and the regulatory systems for the water environment and the water industry ► Extensive research conducted in this sector in the form of reports, white papers, etc. facilitated by government ► UK has cheap sensors with potential for wider adoption and capacity within networks
Infrastructure 	► UK construction and civil engineering firms lead major urban infrastructure developments worldwide ► Architecture and civil engineering firms' in UK contributed £16bn to UK GVA in 2012. Examples include London's Olympics, regeneration in Doha, etc. ► UK has experience in Urban design, planning and architecture ► UK developed BREEAM green building standards and Building Information Management (BIM) software used internationally ► UK firms provide innovative user-centred service design solutions worldwide ► UK cities and civic organisations are reinventing citizen engagement with city-making processes ► UK Industry associations and government organisations have developed world-leading standards for urban design, open data, public service delivery and community governance ► Standards such as BREEAM for green buildings and the BSI's Smart City standards ► UK has developed experience in transforming brownfield sites and using existing infrastructure in new combinations to address contemporary challenges
ICT 	► UK is a world leader in urban open data and spatial data analysis, modelling and visualisation ► Space Syntax uses urban data, spatial technology and predictive analytics to forecast the effects of planning and design decisions on the movement and interaction of people ► Software developers, product designers and architects have experience in developing apps for urban navigation ► CityMapper is a smartphone app that provides journey planning information in a way that is comprehensive and intuitive. Developed in London and launched in 2012, the app was built using transport data released by the UK government and Greater London Authority's open data platforms ► UK's diverse creative services and digital sector cover a range of complementary capabilities, from product and graphic design, to software and media development and advanced manufacturing ► A UK start-up, SpaceHive, provides an online funding platform for civic projects. Since launching in 2012, SpaceHive has been replicated by communities, businesses and city governments around the world to fund local public developments

R&D 	► UK consultancies are highly regarded internationally across sectors and are well placed to help bridge the gap between Universities and industry, enabling faster development of research ideas ► Law firms such as Bird and Bird and Berwin Leighton Paisner provide legal services on transactions, deal structures and procurement of major development and infrastructure projects. International consulting giants such as Accenture and Deloitte have a major presence in London ► UK universities, research centres, businesses and the public sector are all collaboratively using each other's strength cross-disciplinary to accelerate urban innovation and service world's cities ► The Building Research Establishment (BRE) trust is the UK's largest charity dedicated to build environment research and education. Over its 90-year history it has supported innovation in the building and construction industries

9. Examples of Anglo Indian SMART collaboration

9.1 UK India Business Council (UKIBC)

UK India Business Council is a leading business-led organisation promoting mutual trade and investment between the two countries. Its objective is to help in increasing the trade between the UK and India through business to business dialogue. UKIBC plays an influential role in creating and sustaining an environment in which free-trade and investment flourishes. Through the facilitation of partnerships and with an extensive network of influential corporate and individual members, UKIBC provides the resource, knowledge and infrastructure support vital for UK companies to make the most of emerging opportunities in India.

The origins of the UKIBC date back to 1993, when the Indo-British Partnership (IBP) initiative was mooted by the Prime Ministers of both countries. In 2005, IBP evolved into a private limited company, Indo-British Partnership Network (IBPN). Acknowledging the vast opportunity for business in the UK-India corridor, in January 2007, former Prime Minister, Mr. Gordon Brown, increased the funding to IBPN. In September 2007, UKIBC was created with a clear mandate to increase bilateral trade and investment.

UKIBC Advisory Council

UKIBC Advisory Council is comprised of members from prominent companies and institutions representing both the countries. These include British Airways, University of Cambridge, Standard Life, Hindustan Construction Company, Standard Chartered, Biocon, Diageo Plc., Hero Group, Manipal Global Learning, Max India Ltd., Trent Ltd., Murugappa Group, Arup, etc.

UKIBC focuses on opportunities in the following sectors of India:

- Infrastructure
- Digital innovation
- Advanced engineering
- Life science and healthcare
- Retail, lifestyle and logistics
- Skills and education

Partnership with UKTI

UKTI and UKIBC work together to provide expert assistance and advice to UK companies looking at or operating in the Indian market. They provide businesses with tailored advice and practical support, including market information, identify and make introductions to potential partners, key market players or customers and hold networking events to establish business partnerships.

In this endeavor, UKIBC has come up with a number of report and analysis covering variety of areas to support the UK companies explore and leverage opportunities in India. Some of their noteworthy reports include:

- Meeting India’s education challenges through e-learning (January 2015)
- Fashion and Beauty Sector India: Market Entry Opportunities for UK Companies (2014)
- Route to the Indian market: Opportunities for UK manufacturing SMEs (July 2013)
- Road to India’s Consumer Market (April 2013)
- UK-India collaborations in Life Sciences and Healthcare (July 2012)

9.2 India-UK Joint Economic and Trade Committee (JETCO)[17]

India – UK JETCO was formed in 2005 jointly by the Government of India and Government of United Kingdom with the objective of strengthening economic relationship between the two countries. It was conceived as a mechanism to develop business led vehicles for enhancing bilateral trade and investment through business to business relationships.

Under the JETCO mechanism, business cooperation is promoted through formation of focused sectoral Joint Working Groups (JWGs). The JWG meetings are organised under the co-leadership of a co-chair each from India and the UK and the feedback from these meetings are given to the ministers (of the concerned sectoral ministry) from both sides at a meeting. The JWG meetings are held once in a year alternatively at New Delhi and London.

The discussions at JETCO meetings are based on two pillars of market access issues and enhancing business to business relationships. The event is designed to provide a forum for companies to develop new partnerships and expand existing collaborations between India and the UK.

Recently, its 10th meeting on 'Smart Cities' was held on 19-20 January, 2015 in London. The meeting had a sectoral focus, covered sectors viz. urban infrastructure, urban planning, infrastructure, infrastructure financing, ICT, homeland security, geospatial technology and energy from the point of view of smart cities. The meeting saw both industry and government come together for productive discussions in the three Working Groups constituted on the themes of Education& Skill Development, Smart Cities and Technological Collaboration, Advanced Manufacturing and Engineering.

The Smart Cities Working Group agreed to focus on the Infrastructure Finance; exploring a model which empowers the local authority while exploiting opportunities presented by carbon reduction; Good governance and best practice standards as applied to smart city frameworks; arrange a follow up business to business workshop in India to look more closely at the key themes and issues that have emerged around integrated planning and sectors in a nominated city/town, using real life examples; Work with the education and skills working group to identify skills gaps and mobilise skills training providers and higher education institutions to address the skills gap[18].

The meeting was held to identify areas for collaboration between the UK and India in the following fields:

- Infrastructure Finance: Explore a finance model that empowers a local authority while leveraging the opportunities presented by carbon reduction, climate change and sustainability.
- Governance: Exploration of an optimum framework for governance and best practice standards as applied to smart city development framework.
- Business to business workshop: Arrange a follow up business to business workshop in India to delve deeper into some of the key themes and issues that emerged around integrated planning and sectors in a nominated town/city for exploring real life examples.
- Education and skills: Engage with the JETCO education and skills working group to identify any skills gap with a view to mobilising skills training providers and higher education institutions to address the skills gap.

[17] 'JETCO meet to boost India – UK business cooperation,' FICCI Business Digest, 28 February 2015, via Factiva, Copyright © 2015 Federation of Indian Chambers of Commerce & Industry
[18] 'Visit of Smt Nirmala Sitharaman, Hon'ble Minister of State for Commerce & Industry, Government of India for the 10th India-UK Joint Economic and Trade Committee (JETCO) Meeting in London on January 19-20, 2015,' Media Center, High Commission of India, London, UK

Indian companies that participated in the meeting

- Fairwood Group
- IL&FS Ltd.
- Township & Urban Assets Ltd.
- L&T Ltd.
- Peninsula Land Ltd.
- Tata Realty & Infrastructure Ltd.

10. Foreign countries/organisations collaborating with India on Smart Cities Programme

Entity	Selected major investment plans in India
France	Plans to invest GBP1.5bn in development of three smart cities, including Puducherry and Nagaland
US	Anticipated GBP25bn private investment into India, partnership on clean water and solid waste management for 500 cities
Japan	GBP22bn – mix of private and public investment
China	GBP12bn – mix of private and public investment
Germany (KfW Bankengruppe)	GBP0.7bn on solar capacity for next 10 years
ADB	GBP1.6bn to establish five industrial zones for Andhra Pradesh; GBP39mn for North Karnataka Urban Sector investment programme

Collaborations to develop cities around industrial corridors

Smart City plan is a part of a larger agenda of creating Industrial Corridors between India's metropolitan cities. These include DMIC, Chennai-Bangalore Industrial Corridor and Bangalore-Mumbai Economic Corridor. Smart Cities are expected to be developed around such corridors in collaboration with foreign governments.[19,20]

- Japan is investing GBP2.8bn in first phase of DMIC project, to develop smart cities, through lending from the Japan International Cooperation Agency (JICA).
- The UK is collaborating for developing Bangalore-Mumbai Economic Corridor project with the help of private companies from Britain.

Other key partnerships/investment plans

- Sweden is keen to offer their expertise in development of Smart Cities in India. They intend to be a part of the Ahmedabad-Gandhinagar metro rail and BRTS projects in different cities
- Japan has proposed to set up hotels and smart cities in India. Among the projects proposed is setting up of Hotels by Toyoko Inn Japanese chain and developing smart cities by a Japanese Housing company-Daiwa House
- India signed MoUs with the US Trade and Development Agency for developing Visakhapatnam, Allahabad and Ajmer as smart cities
- Telangana Govt. intends to develop a smart city in Hyderabad in association with Smart City Dubai. Smart City Dubai is an integrated development featuring offices for IT companies along with residential and commercial space, technologically enabled

[19] 'Crafting 'smart cities': India's new urban vision,' Opendemocracy.net, 22 August 2014, https://www.opendemocracy.net/openindia/mathew-idiculla/crafting-%E2%80%9Csmart-cities%E2%80%9D-india%E2%80%99s-new-urban-vision, accessed 26 March 2015; 'BT Exclusive: Urban innovation key to smart cities, say Paris and Melbourne Mayors,' Bureaucracy Today, 20 April 2015, via Factiva
[20] 'Qatar prince ready to invest Rs 1 lakh crore in 10 smart cities,' BusinessStandard.com, 9 December 2014, http://www.business-standard.com/article/economy-policy/bumper-investment-comes-calling-from-qatari-prince-114120800849_1.html, accessed 24 March 2015

- Kerala Govt. has entered into a partnership with Smart City Dubai for developing a similar model in Kochi, where latter will be investing GBP413mn over the next eight years[21]

- Poland intends to partner in Smart cities and industrial corridors projects.

- Singapore is providing the master plan for the development of the new Andhra Pradesh capital city. It is also facilitating study visits to Singapore by Indian officials to share their urban management and governance experiences.

- Germany has agreed to partner with India in developing three smart cities

- Hamad Bin Nasser, Prince of Qatar, plans to investGBP10.4bn in at least 10 smart cities. He plans to invest in real estate, sea ports and airports projects.

Other countries showing interest in this project include Malaysia, Australia, Netherlands[22]

[21] 'Dubai keen to develop Hyderabad as smart city,' Indiantollways.com, 6 January 2015, http://www.indiantollways.com/category/smart-city/, accessed 26 March 2015; 'Poland eyes tie-up with India for smart cities,' The Times of India – Ahmedabad Edition,' 11 February 2015, via Factiva; 'Singapore President' Tony Tan Keng Yam's ongoing State Visit to India to expand partnership with an eye on investments and building smart cities to contribute to India's success story,' The Economic Times, 9 February 2015, via Factiva; 'eGovWatch: Germany to partner India in developing three smart cities,' Express Computer, 30 January 2015, via Factiva; 'A.P. capital will be one of world's best,' The Hindu, 27 January 2015, via Factiva; 'Japanese delegation offers Dr Jitendra proposal for hotels, smart cities,' Daily Excelsior, 5 December 2014, via Factiva

[22] 'Union, state, UT govts to brainstorm over future of smart cities,' Financialexpress.com, 30 January 2015, http://www.financialexpress.com/article/economy/union-state-ut-govts-to-brainstorm-over-future-of-smart-cities/36807/, accessed 26 March 2015

Appendix A Background of initiating a Smart Cities Project

Some of the initiatives already taken by GoI under various aspects of programme are:

Parameter	Measures so far
Smart Governance	► GBP50mn allocated for Digital India Initiative ► Private Public Partnership (PPP) model to be used to upgrade infrastructure in 500 urban areas ► Develop at least two smart cities in each of India's 29 states ► Delhi Mumbai Industrial Corridor Development Corporation Limited (DMICDC) plans seven smart cities along the 1,500km industrial corridor across six states with total investment of GBP60bn
Smart Energy	► Establish smart grid test bed and smart grid knowledge center ► Implementation of eight smart grid pilot projects in India with investment of GBP6mn ► Addition of 88,000 MW of power generation capacity in the 12th Five Year Plan (2012-2017) ► Power Grid Corporation of India Limited plans to invest GBP16bn in the next five years ► Installation of 130mn smart meters by 2021
Smart Environment	► Ministry of New and Renewable Energy plans to add capacity of 30,000 MW during 2012-17 ► Indian Ministry of Water Resources plans to invest GBP30bn in the water sector in the coming years ► Approved Yamuna Action Plan Phase III project for Delhi at a cost of GBP166m ► GoI and the World Bank have signed a GBP300mn credit for Rural for the Rural Water Supply and Sanitation (RWSS) project in states of Assam, Bihar, Jharkhand and Uttar Pradesh
Smart Transport	► Ministry of Urban Development (MoUD) plans to invest more than GBP12bn on the metro rail projects in coming years ► India's first monorail project at Mumbai to cost around GBP300mn, of which GBP110mn has been spent on phase I
Smart ICT	► Broadband connections to 175mn users by 2017 ► Under the flagship 'Safe City' project, the Union Ministry proposes GBP200mn to make seven big cities (Delhi, Mumbai, Kolkata, Chennai, Ahmedabad, Bangalore and Hyderabad) to focus on technological advancement rather than manpower
Smart Buildings	► Intelligent Building Management Systems (IBMS) market is around GBP373mn and is expected to reach GBP1,134mn by 2016 ► Smart Buildings to save up to 30% of water usage, 40% of energy usage and reduction of building maintenance costs by 10-30%

Appendix B Concession Agreement[23]

'Concession Agreement' or 'Concession' refers to a legal document or any arrangement in which a non-government entity obtains, from the government or a government agency, the right to either provide a particular infrastructure service or control access to (whether linked to obligations to develop, construct, renovate, operate and/or maintain or otherwise) one or more infrastructure facilities, effectively on an exclusive or dominant basis.

Concession agreements under various Indian statutes use the following principles:

- Agreement between a non-government entity and a government authority or government agency
- Relates to an infrastructure project; and
- Regulates private participation in the project

As per Indian legal framework, concessions could be granted using any of the following methods:

- Direct Negotiations between state agency and the proposed concessionaire
- Competitive bidding process
- Swiss challenge process

MoUD intends to issue Model Concession Agreements for all infrastructure services envisaged under the Smart City Programme, which would broadly include:

Preliminary details
Definitions And Interpretation
Scope Of Project
Grant of concession
Grant Of Concession
Conditions Precedent
Performance Security
Fees and Concession Fees
Obligations and undertakings
Obligations Of The Concessionaire
Obligations Of the Concession imparting Authority
Representations And Warranties
Disclaimer
Project development and operations
Performance Security
Access to Service Area
Construction of the Project Facilities
Monitoring And Supervision Of Construction
Completion Certificate
Change Of Scope
Operation And Maintenance
Safety Requirements
Monitoring And Supervision During Operations
Independent Consultant/Engineer

[23] Draft: ISGF approach paper on development of a standard framework for infrastructure domains of a smart city

Financing arrangements
Financial Close
Grants
Revenue Shortfall Loan
Escrow Account
State Support Agreement
Insurance
Accounts And Audit
Force majeure
Force Majeure
Suspension and termination
Material Breach And Suspension
Compensation For Breach Of Agreement
Termination
Divestment Of Rights And Interests
Miscellaneous
Defects Liability
Assignments And Charges
Change In Law
Liability And Indemnity
Rights And Title Over The Site
Dispute Resolution/Disclosure
Redressal Of Public Grievances
Advertising On The Site
Governing Law And Jurisdiction
Miscellaneous

These agreements would require customisation of various parameters depending on the mode of selection of the concessionaire, type of government support, service level agreements, etc. Some of these parameters have been briefly described in the following table (draft):

Parameter	Power	Drinking Water	Sewerage	Urban Mobility
Concessionaire	Distribution Utility, Project Developer	Urban Water Supply Company/Infra Construction Agency	Infra Construction Agency/O&M Contractor/Water Management Companies	Private Carriage, Integrated Public Transit System
SLA (draft)	► 24 x 7 reliable supply of electricity	► 24 x 7 supply of water ► 100% household with direct water supply connection	► 100% households should be connected to the waste water network ► 100% efficiency in the collection and treatment of waste water	► Maximum travel time of 30 minutes in small medium size cities and 45 minutes in metropolitan areas
Methodology for selection	► Direct Negotiation ► Competitive Bidding	► Competitive Bidding	► Competitive Bidding	► Competitive Bidding
Possible PPP Structures				
BOOT[24]	✓			✓
BOT[25]		✓	✓	✓
O&M[26]	✓	✓	✓	

[24] Build-Own-Operate-Transfer
[25] Build-Operate-Transfer
[26] Operation and Maintenance

Appendix C Smart City Maturity Model details

Smart Cities Maturity Model	Level 1	Level 2	Level 3	Level 4
Basic urban services			High urban resilience	
KPI's relate to …	Access	Efficiency	Behaviour	Systems Focus
Transport	Convenient and affordable access to light rail, high capacity transport and non-motorised pathways	Infrastructure metrics, load factors and route optimisation Efficient last mile transport options	Online, seamless, real time mobility services which enable mode-switching based on criteria (cost, time, footprint)	Shifting mobility from asset ownership to public transport or shared services models, as per type of trip
Spatial Planning	Availability of green space, Socially cohesive communities; Green building and sustainable physical infrastructure creation	Reduced mobility and congestion; Climate-resilient urban planning	Toolkits and behavioural practices to empower communities to become resource secure and efficient; Maintenance and upgrades of existing infrastructure	Opportunities for collaborative industrial and residential ecologies (e.g., common ETP, decentralised energy)
Water supply	Sustained access to potable supplies of water; Visibility of domestic and other water consumption	Water consumption, metering and collections; Smart grids for water; Standards for water efficient devices, storage and transport; Lost/unaccounted water; Water markets	Water re-charge metrics for groundwater; Preventative action on unintended pollution sources from goods consumed or practices	Location specific risk metrics and tracking, dependent on water sources; Real-time disaster response and monitoring for water security; Embodied value of water to GDP
Sewage and sanitation	Access to toilets; waste water collection and treatment services	Process efficiency KPIs on collections, treatment and recovery infrastructure	N/A	Closed loops for organic matter recovery and biogas
Solid waste	Solid waste collection; treatment and disposal services (incl basic recycling)	Efficient, aggregated and sustainable solid waste streams for processing	Reduction in waste through regulatory measures and behavioural support tools	Solid waste tracking, auditing, and recovery channels
Storm water drainage	N/A	Absence of water clogging	N/A	N/A
Energy and electricity	Reliable, sustained access to electricity; Access and share of non-electrical forms of energy	Energy efficient infrastructure, devices and standards; Grid control and grid infrastructure performance	Demand side management; Reduction of peak load, power consumption; Incentives for fuel switching;	Share of renewable energy for electricity; Share of renewable energy for non-electrified energy needs

Smart Cities Maturity Model	Level 1	Level 2	Level 3	Level 4
Basic urban services			High urban resilience	
KPI's relate to …	Access	Efficiency	Behaviour	Systems Focus
ICT and systems intelligence	Access to Telecom and WiFi/digital services which is convenient, affordable and non-exclusionary; Geospatially, real time access to services	Resource efficiency analysis; resource monitoring; scenario testing through reliable and secure data streams and integrated data platforms	Predictive resource load management; predictive risk management; enable negligible response time to failure-events. Open data to enable service innovation	Technology-enabled optimisation of urban service delivery, resource efficiency; immediate response; urban governance; and city performance management
Economy and Finance	Access to opportunities for affordable healthcare, education and financial services (e.g., insurance)	Labour force productivity, skills and talent distribution and growth; human health and savings growth	Performance metrics on the provision of services delivered	N/A
Environment	Institutional, technical, financial and R&D facilities to grow natural capital; track and manage pollution	Pricing of eco-system services and investment in natural capital; Efficient linkages and connectivity with other cities, rural and peri-urban areas	Regulation and legal enforcement to protect common environmental goods	System-based view of material, climate and energy flows between urban areas and peri-urban and rural linkages

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