

Mishra, Mukesh Kumar

**Working Paper**

## Smart Cities in the Era of Globalisation

*Suggested Citation:* Mishra, Mukesh Kumar (2020) : Smart Cities in the Era of Globalisation, ZBW – Leibniz Information Centre for Economics, Kiel, Hamburg

This Version is available at:

<https://hdl.handle.net/10419/216813>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# SMART CITIES IN THE ERA OF GLOBALISATION

“Sustainable cities through integrated approaches”

Dr. Mukesh Kumar Mishra<sup>1</sup>

---

## ABSTRACT:

The world is in the midst of a massive wave of urban growth. World is urbanizing rapidly, and this can bring negative consequences to the environment. Against this backdrop, governments are looking for ways to ensure cities' environmental sustainability. An urbanizing world means cities are gaining greater control over their development, economically and politically. Cities are also being empowered technologically, as the core systems on which they are based become instrumented and interconnected, enabling new levels of intelligence. In parallel, cities face a range of challenges and threats to their sustainability – across their business and people systems and core infrastructures such as transport, water, energy and communication – that they need to address holistically. To seize opportunities and build sustainable prosperity, cities need to become “smarter.” At the same time, it has been noted that residents of cities and their surrounding environments are increasingly connected through intelligent or smart technologies.

*Keywords: Smart Cities. Smart Technology, Digital Governance, Smart Economy*  
*JEL Code: O18, O19*

---

## INTRODUCTION

Smart cities are a network of interconnected technologies that communicate, transfer and analyse important data to maintain/improve urban operations. Today, such technologies are required in every urban infrastructure including transportation, energy, economic and social development, traffic, environment, health etc. In the real context, if smart cities wish to operate flawlessly at every level of the private and public sector, it is essential to deploy Internet of Things (IoT) and Cloud computing together. In fact, it is being witnessed that smart cities that are embracing both IoT and Cloud together are gaining better results.



Figure Source: Siemens

---

<sup>1</sup> Secretary General, Krityanand UNESCO Club, Jamshedpur, India. [knunesco@yahoo.com](mailto:knunesco@yahoo.com)

It explores the opportunities, challenges and implications of smart initiatives in areas such as transportation, health and education, urban and environment-friendly planning, energy efficiency, digital infrastructures, entrepreneurship, as well as democratic processes, governance and transparency at a municipal or regional level. A vision of smarter cities should be based on how cities can lead the way into a prosperous and sustainable future? The private sector can play a significant role in this by helping city leaders gather key data, use that information effectively and develop a clear, long-term strategy.



A city is considered to be “smart” when it can collect and analyze mass quantities of data from a wide variety of industries, from urban planning to garbage collection. In a smart city, a complex network of interconnected sensors, devices, and software must be built and maintained. This should allow the city to become a more sustainable and efficient environment for its residents.

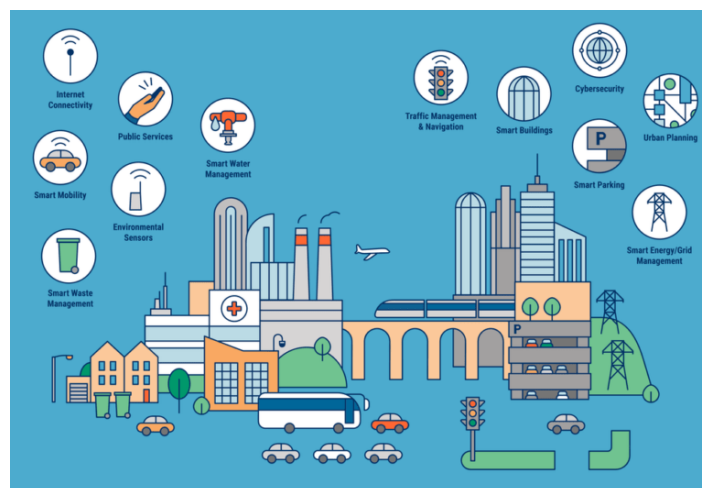


Figure Source: Research Brief

Smart cities are supported by several types of technologies, including:

- Information and communications technology (ICT)
- Connected physical devices using the Internet of Things (IoT) network
- Geographical information systems (GIS)

Each works together to collect and contextualize massive amounts of data that can be used to improve the components and systems running within a city. The ICT framework, for example, is made up of various machines and sensors that are all connected to the IoT network, and can instantly transmit data using wireless technology and the cloud. Traffic in a given area, for instance, can be monitored using sensors. Around the world, governments are making cities “smarter” by leveraging data and digital technology to build more efficient and liveable urban environments, boost economic growth, foster well-being and facilitate citizen engagement. Indeed, as digitalisation evolves, smart cities are increasingly viewed as unprecedented opportunities to drive economic growth and enhance citizen well-being in cities<sup>2</sup>.

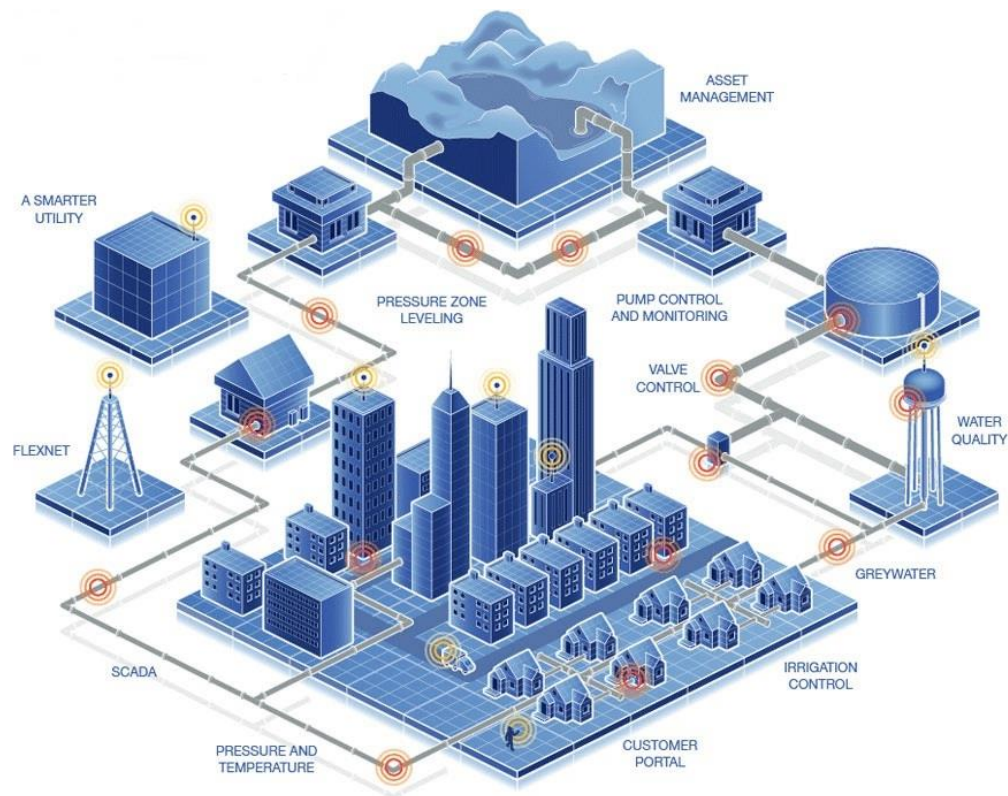
Cloud-based IoT applications can then receive, analyze, and manage that traffic data in real-time. This data can also be used to better understand and respond to a city’s constantly changing needs over time, and can even be used to better optimize for safety. Smart cities can also leverage GIS for planning and mapping purposes, as well as for improved development of cities. As a result, urban areas are able to better manage issues from water management to excessive energy consumption to insufficient waste management, and more.

The opportunities created by digital innovation in urban areas are well-documented both in the literature and from concrete practices. Examples of innovation include: smart grids that improve the management of energy consumption; smart meters and pipes that help track water quality and detect leaks; smart sensors that improve traffic flow, transport efficiency and garbage truck routes; e-career platforms that provide broader access to job opportunities; telemedicine and video-consultations that improve health outcomes and lower healthcare costs; mobile applications that allow citizens to report problems in real-time and engage directly with city services.

---

<sup>2</sup> *Economic Outlook For Southeast Asia, China And India 2019 – Update, Oecd 2019.*





*Using GIS for smart water management. Source: Ceinsys Tech*

Smart cities may also utilize artificial intelligence and block chain technology for certain systems. Some companies, for example, are working to make parking easier and more efficient using AI-directed facilities. Other companies allow city dwellers to buy and sell energy to their neighbours via block chain technology.

## DEFINITIONS OF SMART CITIES

- A city can be defined as ‘smart’ when social capital, traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life (Adapted from Caragliu et al. 2009).
- A definition of a smart city is required prior to the brief description of the city model. Several definitions exist in which organizations emphasise the aspects they find more relevant. GICI has defined the smart city concept from an innovative point of view, focusing on sustainability and on improving citizens’ quality of life. Therefore, “a smart city is a city that ensures energy, environmental, economic and social sustainability in order to improve citizen’s quality of life and encourage business activity by incorporating innovative technologies, processes and services”.
- Smart city as a high-tech intensive and advanced city that connects people, information and city elements using new technologies in order to create a sustainable,

greener city, competitive and innovative commerce, and an increased life quality. (Bakıcı et al. (2012)).

- A city is smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance. (Caragliu et al. (2011)).
- Smart Cities initiatives try to improve urban performance by using data, information and information technologies (IT) to provide more efficient services to citizens, to monitor and optimize existing infrastructure, to increase collaboration among different economic actors, and to encourage innovative business models in both the private and public sectors.( Marsal-Llacuna et al.) 2014.
- The UK Department for Business, Innovation and Skills (BIS) considers smart cities a process rather than a static outcome, in which increased citizen engagement, hard infrastructure, social capital and digital technologies make cities more liveable, resilient and better able to respond to challenges.
- The British Standards Institute (BSI) defines the term as “the effective integration of physical, digital and human systems in the built environment to deliver sustainable, prosperous and inclusive future for its citizens”.

### **Data-driven definitions**

- IBM defines a smart city as “one that makes optimal use of all the interconnected information available today to better understand and control its operations and optimize the use of limited resources”.
- Cisco defines smart cities as those who adopt “scalable solutions that take advantage of information and communications technology (ICT) to increase efficiencies, reduce costs, and enhance quality of life”.

### **Citizen-focused definitions**

- UK citizens tend to consider a smart city as clean, friendly and have good transport connections. Other words they associate with smart cities (although less frequently) include “technology”, “connected”, “internet” and “modern”.
- According to the Manchester Digital Development agency, “a ‘smart city’ means ‘smart citizens’ – where citizens have all the information they need to make informed choices about their lifestyle, work and travel options”.

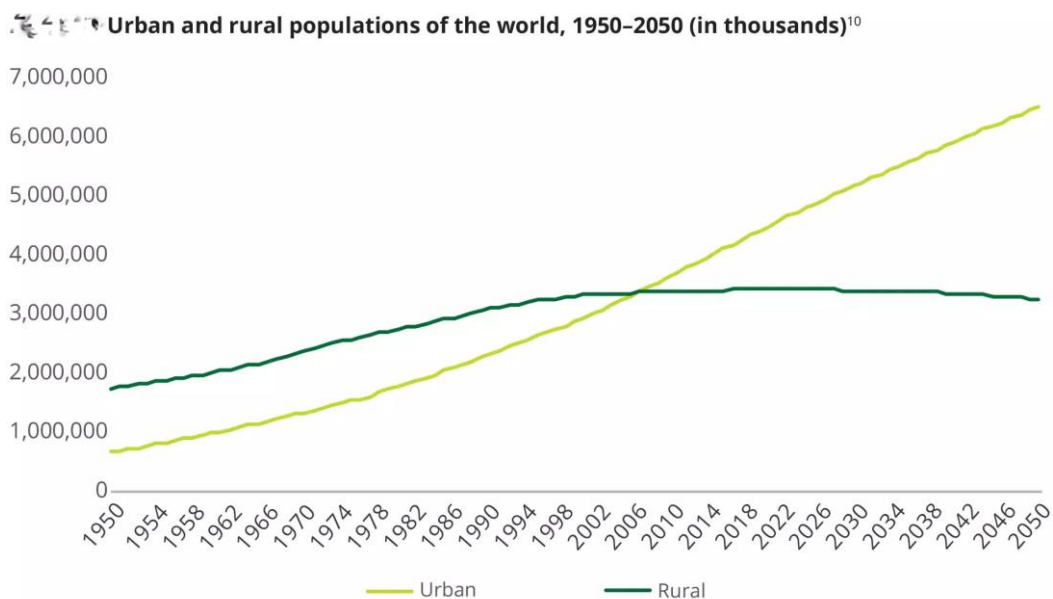
- The government's focus is correct on developing sustainable and inclusive development in compact areas. Equally important is the ability to create programmes and projects that are replicable across both the city and beyond its boundaries in other aspiring cities. The core infrastructure elements in a smart city are set out below. The typical features of comprehensive development in a smart city are described by the government as:

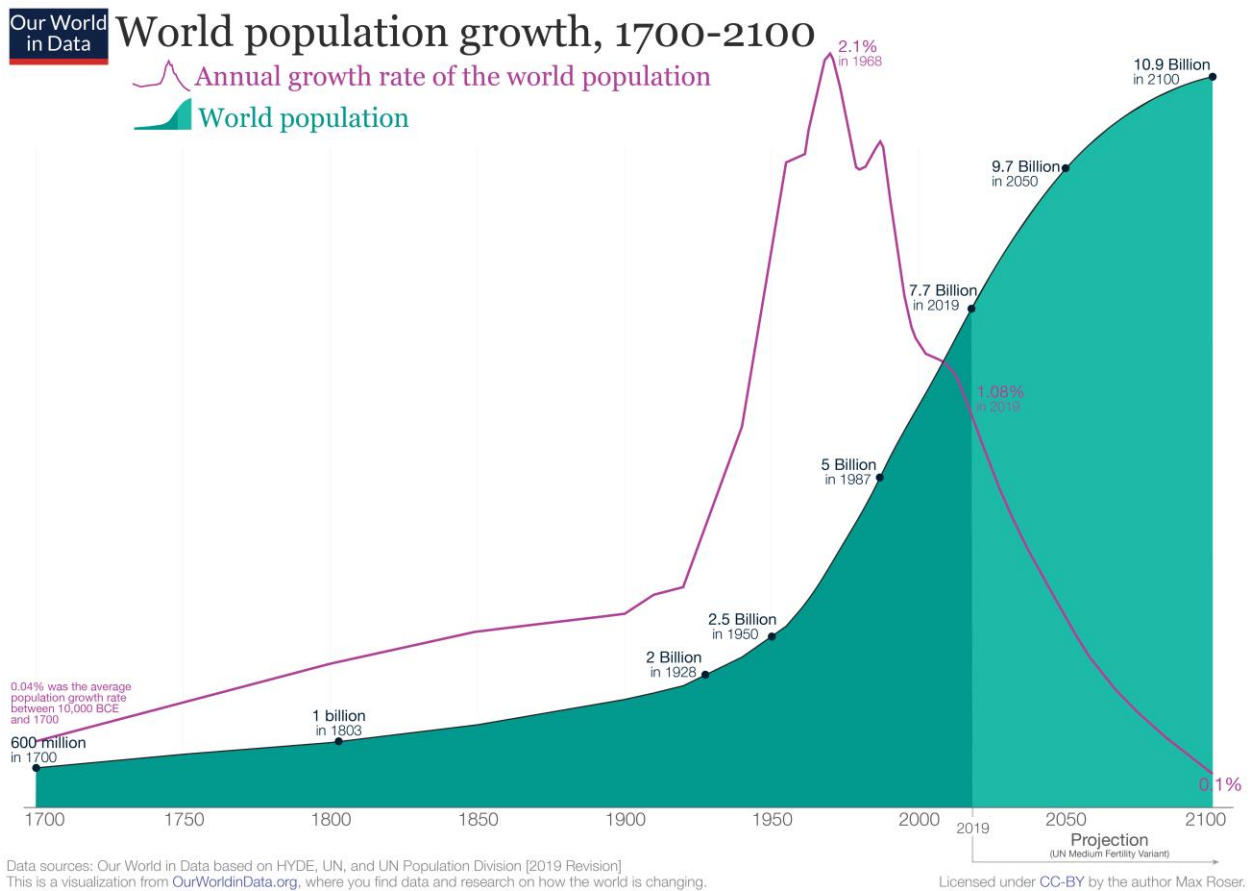
- Promoting mixed land use in area-based developments
- Housing and inclusiveness
- Creating walk able localities
- Preserving and developing open spaces
- Promoting a variety of transport options
- Making governance citizen-friendly and cost effective
- Giving an identity to the city

To sum up, technological improvements will enable cities to become healthier, safer and more attractive environments for economic, cultural, educative and professional development, and will improve their energy and environmental sustainability. Central to the ambition of a smart city are people. The focus must be on delivering improvements to cities that benefit citizens, improving the quality of life, health, opportunity as well as enabling them to engage more effectively in their communities. The benefits of smart technology must be real and felt by citizens.

## NEEDS

Currently, more than half of the world's population lives in towns and cities, and by 2050 this number could swell to about 66 percent, adding more than 2.5 billion people to the urban population.





The 7-fold increase of the world population over the course of two centuries amplified humanity's impact on the natural environment. To provide space, food, and resources for a large world population in a way that is sustainable into the distant future is without question one of the large, serious challenges for our generation<sup>3</sup>.

There's a **global** and **national** need for sustainability! Everything on our planet is **connected**. Humans, plants and animals depend on each other and there is an urgent need to *change our behaviour* to preserve these vital links. This interdependency is crucial for the long-term survival of the human race. Even on a national scale – in our own cities – there is a need for sustainability.

Today's metropolitan cities consist of innumerable, interconnected systems. They need to continuously operate at peak efficiency to enable the mobility and well-being of its inhabitants, energy, water and waste management, communication and information distribution as well as emergency response – to name a few of them. Our Solution can help to tackle these challenges and make all our lives more secure every day.

<sup>3</sup> <https://ourworldindata.org/future-population-growth>



Smart cities represent the future of urban development in Emerging Asia as more and more cities and countries resort to smart technologies to build more efficient and liveable urban environments, boost economic growth, foster well-being and facilitate citizen engagement. Policy makers in the region have adopted plans to develop and promote the use of technology to organise and run urban areas. Governments have also provided significant financial backing to smart city projects, acknowledging the importance of public support in this field. The development of smart cities offers significant prospects to tackle enduring issues faced by Emerging Asian cities in policy areas such as transport, the provision of public services, education, healthcare and utilities<sup>4</sup>.



Figure Source: IBM

The smarter city's system of systems: *The modern city boasts a variety of high-volume systems operating in close proximity to one another. In a smarter city, these systems can form interconnected networks that serve as a powerful intelligence engine, capturing real-time insight about how the city is functioning*<sup>5</sup>

As cities grow in both numbers and population, they are taking their place on the world's centre stage, with more economic, political and technological power than ever before. Economically, they are becoming the hubs of a globally integrated, services-based society.

Politically, they are in the midst of a realignment of power – with greater influence, but also greater responsibility. From a technology standpoint, advances are underway that can provide them with better understanding and control of their operations and development.

---

<sup>4</sup> OECD

<sup>5</sup> IBM

Operationally, cities are based on six core systems composed of different networks, infrastructures and environments related to their key functions: people, business, transport, communication, water and energy. As a result, cities have assumed a central role in the urbanized world of the 21st century. They are wielding more economic power, developing greater political influence and increasingly employing more advanced technological capabilities to enhance their operations. So in brief as the population of our cities continues to grow at an alarming rate, so does the demand for them to provide and maintain the highest possible quality of life for citizens. Currently, just less than 80% of a country's population lives in cities. This puts an incredible amount of pressure on cities to be able to accommodate their growing population in the best way possible. A vast range of obstacles can prevent governments and businesses from being able to deliver efficient systems that provide some of the most basic human needs such as food, water, energy, healthcare, safety and transportation. This is often due to out dated infrastructure, limited budgets, rapidly depleting resources and an increase in demand for environmental responsibility.

## Cities Systems

Cities are based on a number of different systems – infrastructures, networks and environments – central to their operation and development: people, business, transport, communication, water, and energy. The effectiveness and efficiency of these systems determine how a city works and how successful it is at delivering its goals. These systems are not discrete and must be considered holistically, as well as individually.

- *People*: A city's people system refers to its human and social networks. These include public safety (fire, police and disaster recovery), health, education and quality of life.
- *Business*: A city's business system encompasses its regulation and policy environment and includes planning regulations, openness to foreign trade and investment, and labour and product market legislation.
- Transport*: A city's transport system includes all aspects of its road network, its public transport network and its sea and air ports, from provision to pricing.
- *Communication*: A city's communication system includes its telecommunications infrastructure, including telephony, broadband and wireless. The ability to access and communicate information is central in a modern economy and key to a smarter city.
- *Water*: A city's water system is an essential utility that includes the entire water cycle, water supply and sanitation.
- *Energy*: A city's energy system, as essential as its water resources, includes its power generation and transmission infrastructure, as well as its waste disposal. These core systems are interconnected and must be treated as such. Understanding one system and making it work better means that cities must comprehend the bigger picture and how the various systems connect. Cities are being empowered at a time when they face significant *challenges*

and *threats to sustainability* in each of the six interrelated systems and must act now to secure future prosperity.

## Dimension of Smart Cities

The world is in the midst of a massive wave of urban growth. At the same time, it has been noted that residents of cities and their surrounding environments are increasingly connected through intelligent or smart technologies. All of these changes offer a higher likelihood of improved wellbeing and prosperity, while challenges at the complex intersection of technology and society are emerging. This track aims at exploring how society is managing and dealing with urban challenges, in search for innovative solutions leading to a better quality of life and sustainability in cities. It explores the opportunities, challenges and implications of smart initiatives in areas such as transportation, health and education, urban and environment-friendly planning, energy efficiency, digital infrastructures, entrepreneurship, as well as democratic processes, governance and transparency at a municipal or regional level.

Becoming a smart city is not a goal in and of itself. Smartness is simply a tool to help cities better serve the people who live and work in them. It is therefore important to understand how that tool can improve the quality of life. The Smart City Maturity Model is grouped into five dimension areas, each representing a major aspect of a Smart City transformation. The first four dimension areas allow a city to assess capabilities that are necessary for the city to become a truly Smart City, whilst the final dimension allows the city to assess how far it has already integrated the notion of ‘smartness’ into the different aspects of city life.

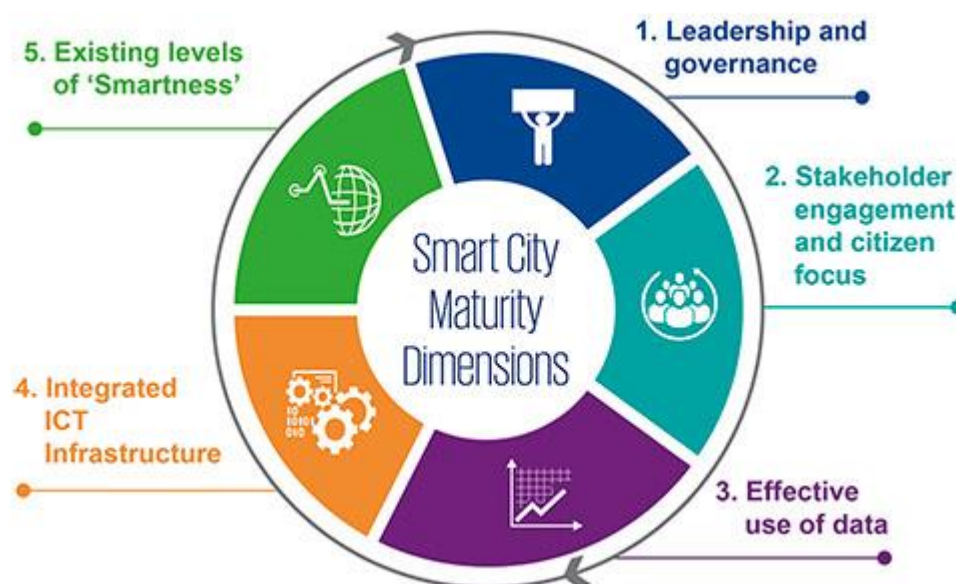


Figure Source: KPMG

Smarter cities make their systems instrumented, interconnected and intelligent.

- Instrumentation, or digitization, of a city's system means that the workings of that system are turned into data points and the system is made measurable.
- Interconnection means that different parts of a core system can be joined and “speak” to each other, turning data into information.
- Intelligence refers to the ability to use the information created, model patterns of behaviour or likely outcomes and translate them into real knowledge, allowing informed actions.

## Way to Build Smart Cities

What makes a city smart? Smart city solutions contribute to the effective management of urban areas, improving connectivity, sustainability, and liability. Across all areas of city life, technology and data are used to analyze and optimize, thus enhance outcomes and improve quality of life. Cities are home to more than half of the world's population, and they are expected to add another 2.5 billion new residents by 2050. They face increasing environmental pressures and infrastructure needs—and growing demands from residents to deliver a better quality of life and to do so at a sustainable cost<sup>6</sup>.

While smart cities earlier focused on connecting infrastructure for better insights, the spotlight is slowly shifting to better engaging governments, citizens, and businesses with the goal of providing improved city services and a higher quality of life. What exactly is Smart City 2.0? The next generation of urban evolution is here. Moving beyond just connected infrastructure and smarter things, the smart cities of tomorrow engage governments, citizens, visitors, and businesses in an intelligent, connected ecosystem. The goal: better city services and a higher quality of life. This evolution, *Smart City 2.0*, enhances citizens' experience and city decision-making using the 3Ds—data, digital, and (user) design.

The focus of any smart city should be its people, providing benefits such as:

- A better quality of life for residents and visitors
- Economic competitiveness to attract industry and talent
- An environmentally conscious focus on sustainability

---

<sup>6</sup> Smart Cities: Digital Solutions For A More Livable Future, 2018, Mckinsey Global Institute



Source: Deloitte.

Deloitte Insights | [deloitte.com/insights](https://deloitte.com/insights)

These three goals—quality of life, economic competitiveness, and sustainability—can provide the foundation for a smart city initiative.

## SMARTER CITY MANAGEMENT AND INFRASTRUCTURE

City leaders need to understand their current performance and generate strategies for driving more effective operations. They need to integrate and coordinate all city operations while delivering exceptional service to their citizens.

### 1. Smarter Operations

Every day, cities around the globe face an increasing number of operational issues that affect the quality of services delivered to their citizens. To ensure public safety and provide water, electric, transportation and other services, cities need to access an ever-increasing amount of information, facilitate real-time communication and collaboration across city agencies, and address potential problems before they occur. For these cities, needs critical information for operations. Smarter Cities is designed to address these challenges. The IBM Intelligent Operations Centre solution offers integrated data visualization, real-time collaboration and deep analytics that can help city agencies prepare for situations, coordinate and manage response efforts, and enhance the on-going efficiency of city operations.



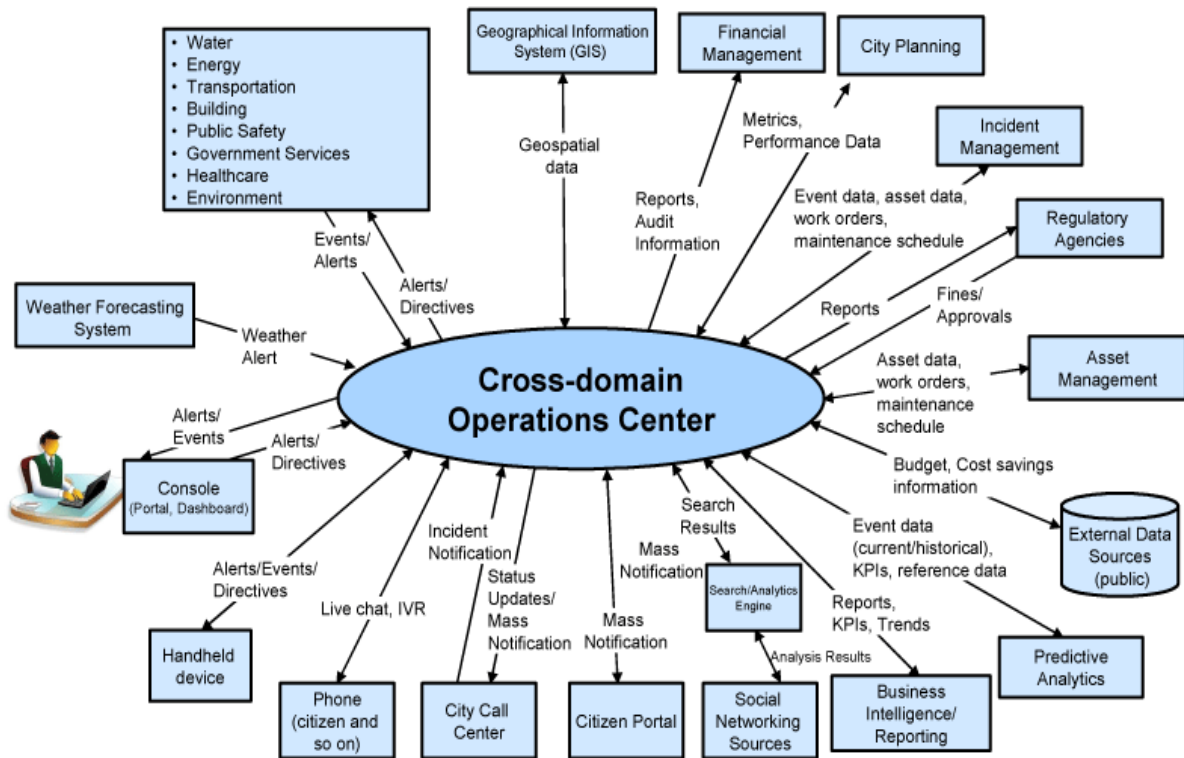


Figure Source: IBM

Intelligent Operations Center for Smarter Cities enables city leaders to apply global best practices across city agencies.



#### Public Safety

- Predict, monitor and mitigate crisis situations
- Coordinate multiagency responses
- Minimize impact of emergencies



#### Transportation

- Improve traffic management
- Optimize roadway capacity
- Enhance travel experience



#### Water Management

- Analyze water use and consumption patterns
- Predict asset failures to reduce costs
- Optimize work orders to improve service

## **2. Smarter Transportation**

Population growth also makes it harder for cities to have efficient public transportation systems, as distances increase and there's more demand on the system. There's a need for new lines and for more efficient planning of how resources are used.

Transportation is the vital means of connecting people, goods and services. The smooth operation of a transportation system can directly determine the level of economic activity and output of a given city. Consequently, it has the potential to affect both the quality of life for citizens and the economic vitality of a city. A cloud-based solution is to be a single source of information for vehicles, road infrastructure, and people so that hazard alerts can be shared in real time with road users and incident managers.

Intelligent transportation system is the application of sensing, analysis, control and communications technologies to ground transportation in order to improve safety, mobility and efficiency. Intelligent transportation system includes a wide range of applications that process and share information to ease congestion, improve traffic management, minimize environmental impact and increase the benefits of transportation to commercial users and the public in general.

### ***Needs of Intelligent Transportation System***

- Inadequate road development.
- Low speed, increased accident rates.
- It is not possible to build enough new roads or to meet the demand.
- Make transportation system more efficient, secure, and safer through the use of information, communications and control technologies.
- Improve the attractiveness of public transport.
- Tackle rising congestion which increases travel times and industry costs.
- Reduce the environmental impacts of transport.

### ***Advantages of Intelligent Transportation System***

- Reduction in stops and delays at intersections.
- Speed control & improvement.
- Travel time improvement.
- Capacity management.
- Incident management.

## ***Functions of Intelligent Transportation System Works?***

### **ITS combining technologies**

The technical core of intelligent transportation system (ITS) is the application of information and control technologies to transportation system operations. These technologies include communications, automatic control, and computer hardware and software. The adaptation of these technologies to transportation requires the knowledge from many engineering majors for example civil, electrical, mechanical, industrial and their related disciplines. The positive contribution of information technology is to offer better information to help people involved in the system to make synergistic decisions.



These days the number of vehicles is fitted with in-vehicles GPS. The GPS framework offers a two-way correspondence helping movement experts to find vehicles, check speeding vehicles, and give crisis administrations. Cell phones, portable applications, Google maps have turned out to be helpful devices in following them, knowing street quality, movement of vehicles and finding diverse routes and places.

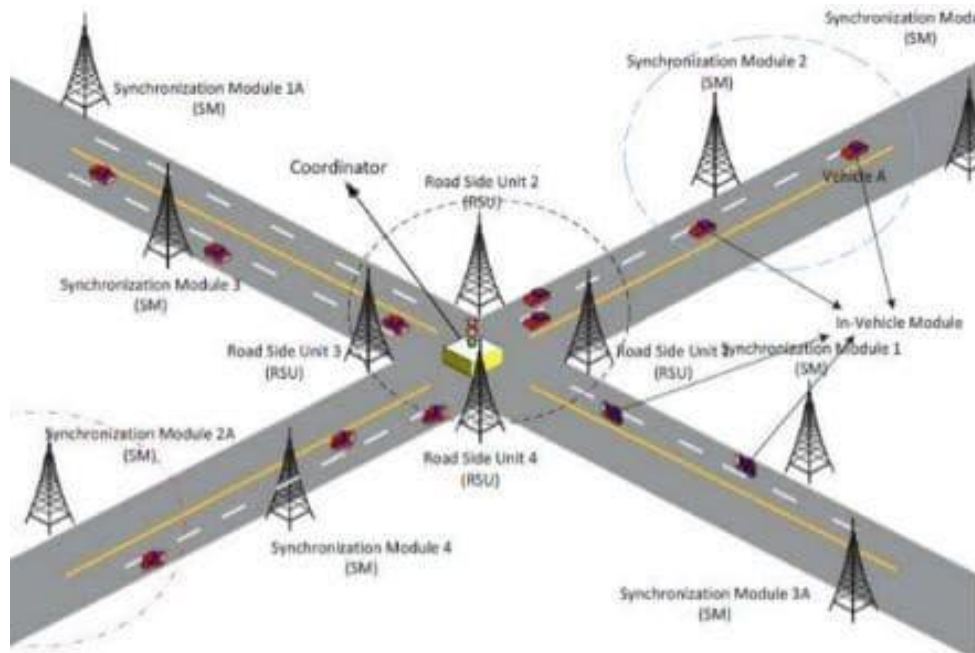
### **ITS Enabling Technologies**

There is a range of information and communications technologies that enables the development of ITS. Data Acquisition and Processing- It is possible to monitor traffics using several means such as inductive loop detectors, traffic sensor. Information collected at data

management centre required to be processed, verified, and consolidated into a format that useful for the operators. This can be done using data fusion process.

### Data Communications

Several ways can be used to convey messages for example wire line or wireless, Fibre optics, electronic toll collection (ETC), commercial vehicle operations (CYO), parking management, signal pre-emption, in-vehicle signing, in-vehicle traveller information, and beacon-based route guidance systems. Some of these data communication technologies are used by data management centre whereas others used from vehicle side.



*Wireless sensor network<sup>7</sup>*

Traffic and other related information can be distributed in various ways in order to improve transportation efficiency, safety, and environmental quality.

### Traffic management

Cities are investing in technologies to ease traffic congestion, and many different solutions have been implemented around the world. Siemens and IBM are at the forefront of this market. One example of such a solution is the traffic light management system developed by the city of Irvine in California. This system calculates the arrival time of a group of cars to guarantee that the next traffic light will be green when they arrive.

---

<sup>7</sup> <https://theconstructor.org/transportation/intelligent-transportation-system/1120/>



Smart Transportation System

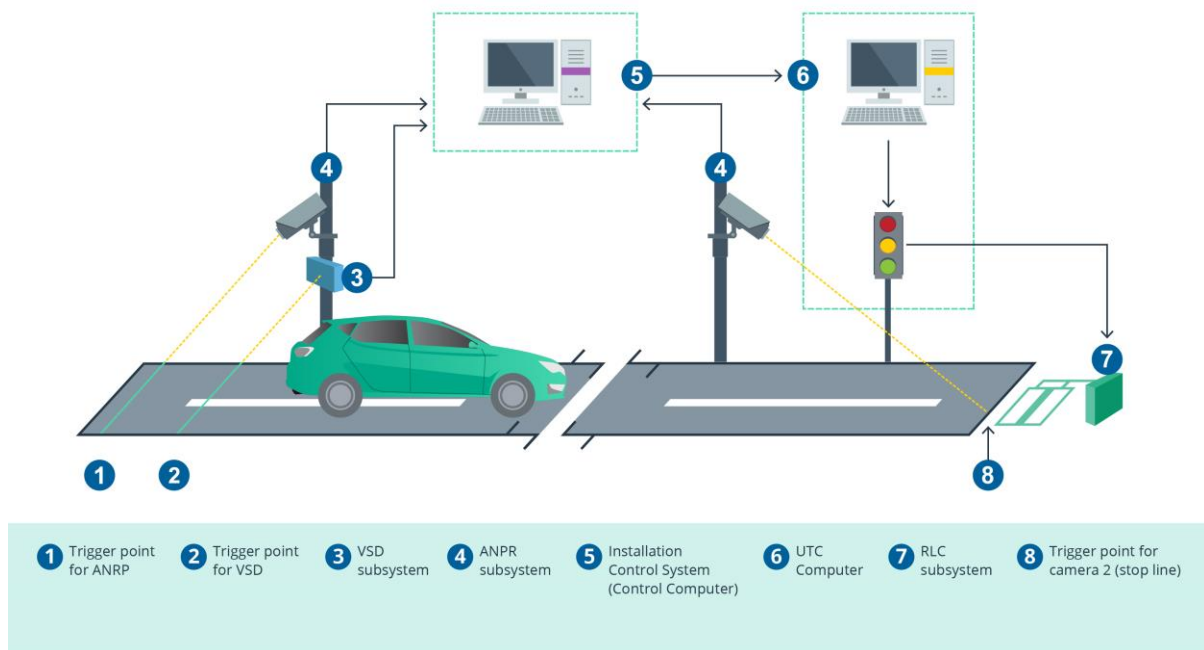


Figure Source: <https://www.itsinternational.com/>

In some cities, all the traffic lights are connected to sensors that control the number of cars stopped at each light and synchronize the light cycles to guarantee the best traffic flow. Just by doing this, cities are capable of greatly increasing the flow of traffic.

Cities of the future will have sensors that analyze all available data. By combining different sources, city management will be able to organize the demand for mobility in a way that will better the lives of residents. At the same time, it will help manage resources and optimize costs. This will have a big impact not only on city management but on people's lives, reducing stress and lowering the pollution index<sup>8</sup>.

<sup>8</sup> <https://www.intellias.com/intelligent-mobility-how-technology-is-solving-challenges-for-smart-cities/>



## Innovative trams, streetcars, and light rail vehicles



Light Rail Solutions for North America

Cities around the world are facing new challenges: parking space, traffic gridlock and stricter emission guidelines. Urban planners and transport companies are turning to trams and light rail as a powerful, environmentally friendly and also highly economical means of transport. Existing lines are being extended and whole new networks are in planning, often for the heart of busy urban districts. Low-floor concepts with low-level entrances, car floors without steps and the right level of comfort are the main criteria for such light rail vehicles<sup>9</sup>

### 3. Smarter Water Management

Water scarcity enforces humankind to find **new ways of smart water management**. 2.1 billion people do not have access to clean and safe drinking water at home, and there are huge inequalities between countries. **Water demand is expected to increase by 1/3 by 2050**, since climate change and population growth are the main challenges for water<sup>10</sup>.

Digital technology can improve data collection and analytics to support proactive decisions and increase the efficiency of water utilities. The water industry of the future will be smart and energy-efficient. Networked, intelligent systems will help make better use of energy, avoid unnecessary water losses and minimize the consumption of resources.

The intelligent linking of data from different sources, such as sensors, water meters or weather data, creates new opportunities for more efficient use of water in industry, agriculture and in municipal utilities, thus supporting sustainability. A precondition is the end-to-end networking of system engineering from commissioning through operation, maintenance, and on-going process optimization based on a data platform. Smart water management systems can provide a more resilient and efficient water supply system, reducing costs and improving sustainability. High-technology solutions for the water sector include digital meters and sensors, supervisory control and data acquisition (SCADA) systems, and geographic information systems (GIS). Smart technology can change

---

<sup>9</sup> Siemens

<sup>10</sup> <http://www.libelium.com/quick-report-smart-water-iot-solutions-to-fight-against-climate-change-and-scarcity/>

*“Smart Cities and Digital Governance in the Era of Globalisation”*

conventional water and wastewater systems into instrumented, interconnected, and intelligent systems.

- Instrumented: the ability to detect, sense, measure, and record data.
- Interconnected: the ability to communicate and interact with system operators and managers.
- Intelligent: the ability to analyse the situation, enable quick responses, and optimize troubleshooting solutions.



Smart cities start with a smart public infrastructure to deliver clean water, dependable power, safe gas, and efficient public lighting. The Internet of Things can help to improve water management issues such as consumption, water usage improvement and cost reduction.

## BENEFITS OF SMART WATER SOLUTIONS

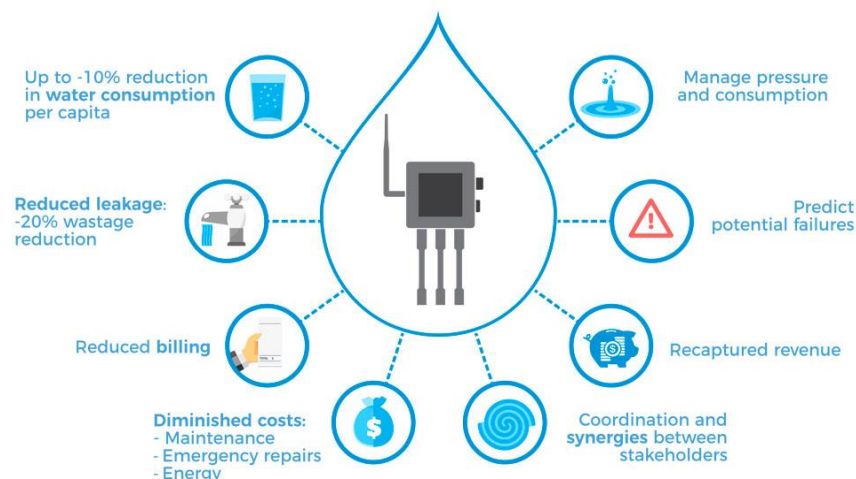


Figure Source: Libelium World

Flex Net is a smart utility network that support us to collect, manage and analyse the right data at the right time through a reliable, dedicated two-way network. With a smart utility network, we can actively monitor and dynamically optimize our smart water system to better serve our community. Smart water is the solution smart cities have been working on to control and prevent the waste of water. Water conservation is necessary for smart cities to exist and function efficiently. Smart water solutions are growing as they give consumers the ability to easily monitor their water consumption and provide useful information to the public<sup>11</sup>.



Smart Water Management solutions seek to alleviate challenges in the water sector by promoting the development and management of Information and Communication Technology products, solutions and systems to maximize economic and social welfare without compromising the sustainability of water as a resource of the environment<sup>12</sup>.

The goal of a smart water solution is to increase the efficiency and reliability of the physical component by measuring, collecting and analyzing the data and supporting appropriate actions for different events captured by the sensor.

#### 4. Smarter Energy

Increasing attention to climate change, rising energy prices and the availability of new technologies are leading many consumers to take a more active role in how they consume energy. New smart grid technologies are changing the relationship between utilities and end users, giving both parties new tools they can use to help reduce consumption, costs and greenhouse gas emissions. By building smart grids, utilities can help:

<sup>11</sup> <http://www.infiniteinformationtechnology.com/iot-smart-city-what-is-smart-water>

<sup>12</sup> <http://www.infiniteinformationtechnology.com/iot-smart-city-what-is-smart-water>



- Empower consumers by helping them better manage their energy usage with timely data about their consumption
- Deliver cleaner energy and reduce greenhouse gas emissions by incorporating more renewable energy and electric vehicles into the power grid, and by improving the efficiency of both current and future power generation
- Improve the reliability of the grid by managing the generation assets and the distribution grid through a more dynamic, automated, reliable and secure network



*Figure Source: E-3 Magazine*

### Rapid need for change

The energy and utilities industry is grappling with an aging infrastructure, growing client demand for affordable, reliable and environmentally sustainable electricity, as well as stringent government mandates on energy efficiency and water conservation. These challenges, coupled with the growing expectations of today's tech-savvy consumers, have driven a rapid need for change. Furthermore, they are forcing many utilities to tap new technologies to solidify a competitive advantage.



*Figure Source: E-3 Magazine*

Siemens and IBM team on next generation of cloud-based building energy management solutions. Cloud-based building management platform leverages enterprise asset management and data analytics technologies to help meet sustainability goals. Solutions for building management are evolving through emerging technologies in cloud computing, data analytics, and intelligent field devices



Solar energy forecasting by a very thoughtful machine, IBM Research revealed that solar and wind forecasts it is producing using machine learning and other cognitive computing technologies are proving to be as much as 30 percent more accurate than ones created using conventional approaches. IBM's approach provides a general platform for renewable energy forecasting, including wind and hydro<sup>13</sup>.



It's an intelligent overlay to the existing electrical grid infrastructure. It's highly interconnected and uses sensors, meters, digital controls and analytic tools to automate, monitor, and control the two-way flow of energy<sup>14</sup>.



<sup>13</sup> Business Wire February 22, 2016 02:00 PM Eastern Standard Time

<sup>14</sup> IBM



ABB is working with IBM to use the Watson supercomputer to predict supply patterns in electricity generation and demand from historical and weather data.

## 5. Smarter Building

As digital technologies enable the creation of smart, digitally connected spaces, businesses should consider four aspects that would place people at the center of their smart buildings.

### What is a Smarter Building?

Smarter Buildings are well managed, integrated physical and digital infrastructures that provide optimal occupancy services in a **reliable**, **cost effective**, and **sustainable** manner.



#### Smarter Buildings...

- Are more cost effective by reducing energy and operating costs.
- Use active and designed-in techniques to achieve reliability, efficiency and environmental responsibility.
- Provide Visibility, Control and Automation to building systems.
- Maintain a safer and more secure workplace.
- Communicate in real-time to supporting infrastructure (i.e. smart grid, broadband, etc.).

© 2012 IBM Corporation

Smart buildings are digitally connected structures that combine optimized building and operational automation with intelligent space management to enhance the user experience, increase productivity, reduce costs, and mitigate physical and cyber security risks<sup>15</sup>

Buildings with the power of IoT are restructuring every aspect of a building, from construction to habitation to management. Use IoT data to make informed decisions to optimize the experience of occupants, staff and management. With asset optimization, better facilities management and occupant safety, smarter buildings can streamline business processes and expand profits. Smart buildings are a new and powerful source of competitive advantage. They interact with its people, systems and external elements around them. They learn from past experiences and real-time inputs. They adapt to the needs of the people and the businesses within them. Through intelligent control, security and energy management systems we help factories and offices better support the industries within them, and we help schools and hospitals have more impact – all while increasing comfort, efficiency, resilience and safety<sup>16</sup>

---

<sup>15</sup> Deloitte LLP

<sup>16</sup> Siemens

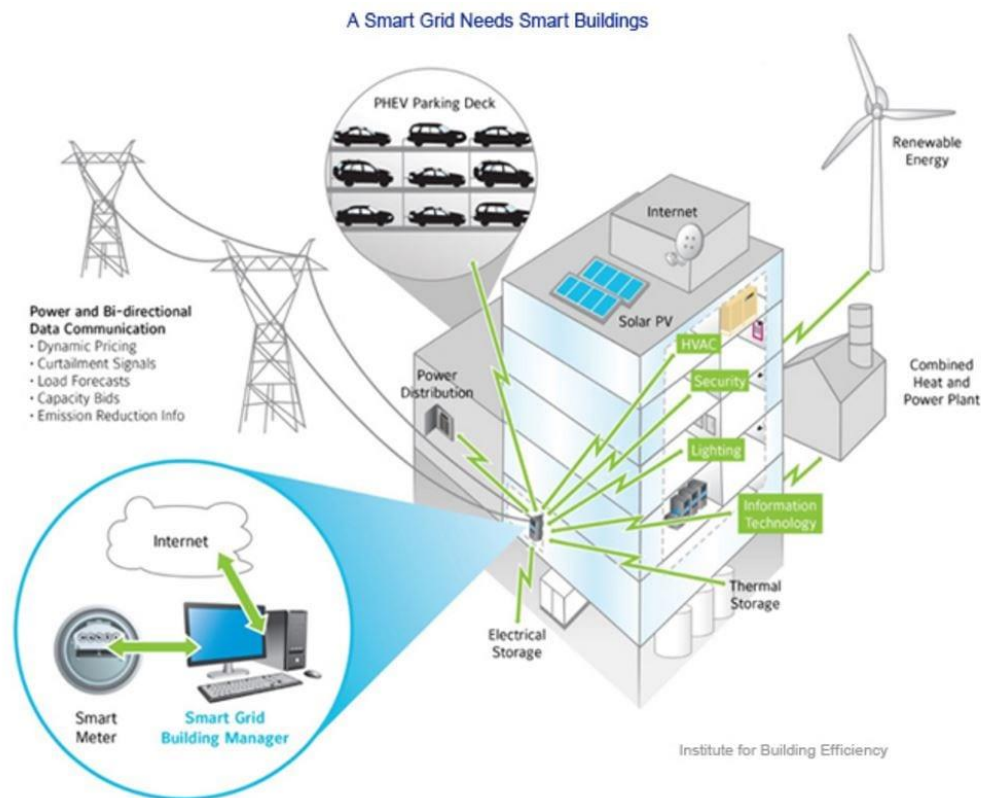


Therefore A smart building is any structure that uses automated processes to automatically control the building's operations including heating, ventilation, air conditioning, lighting, security and other systems. A smart building uses sensors, actuators and microchips, in order to collect data and manage it according to a business' functions and services. This infrastructure helps owners, operators and facility managers improve asset reliability and performance, which reduces energy use, optimizes how space is used and minimizes the environmental impact of buildings.

#### The creation of a smart building

Making a smart building, or making a building smart, begins by linking core systems such as lighting, power meters, water meters, pumps, heating, fire alarms and chiller plants with sensors and control systems. At a more advanced stage, even elevators, access systems and shading can become part of the system.

There is no single set of standards that makes up what a smart building is, but what they all have in common is integration. Many new building have "smart" technology, and are connected and responsive to a smart power grid.



*Source: Institute for Business Efficiency*

The main features of smart buildings

### **Systems are connected**

The most fundamental feature of a smart building is that the core systems within it are linked. So, water meters, pumps, fire alarms, power, lighting etc are all connected. This is what makes a building “smart” – the ability of the systems within it to talk to one another.

### **The use of sensors**

Sensors are an integral part of smart buildings and play an important role in collecting data to inform decisions about where to allocate resources. So, for example, footfall counters may be integrated into the building to provide information on where people are at certain times of the day and which areas are high traffic.

### **Automation**

Information is gathered and analysed by the systems that have been put in place in a smart building – importantly, this is done constantly and in real time. This on-going monitoring allows for automated adjustments that can control conditions across an entire building.

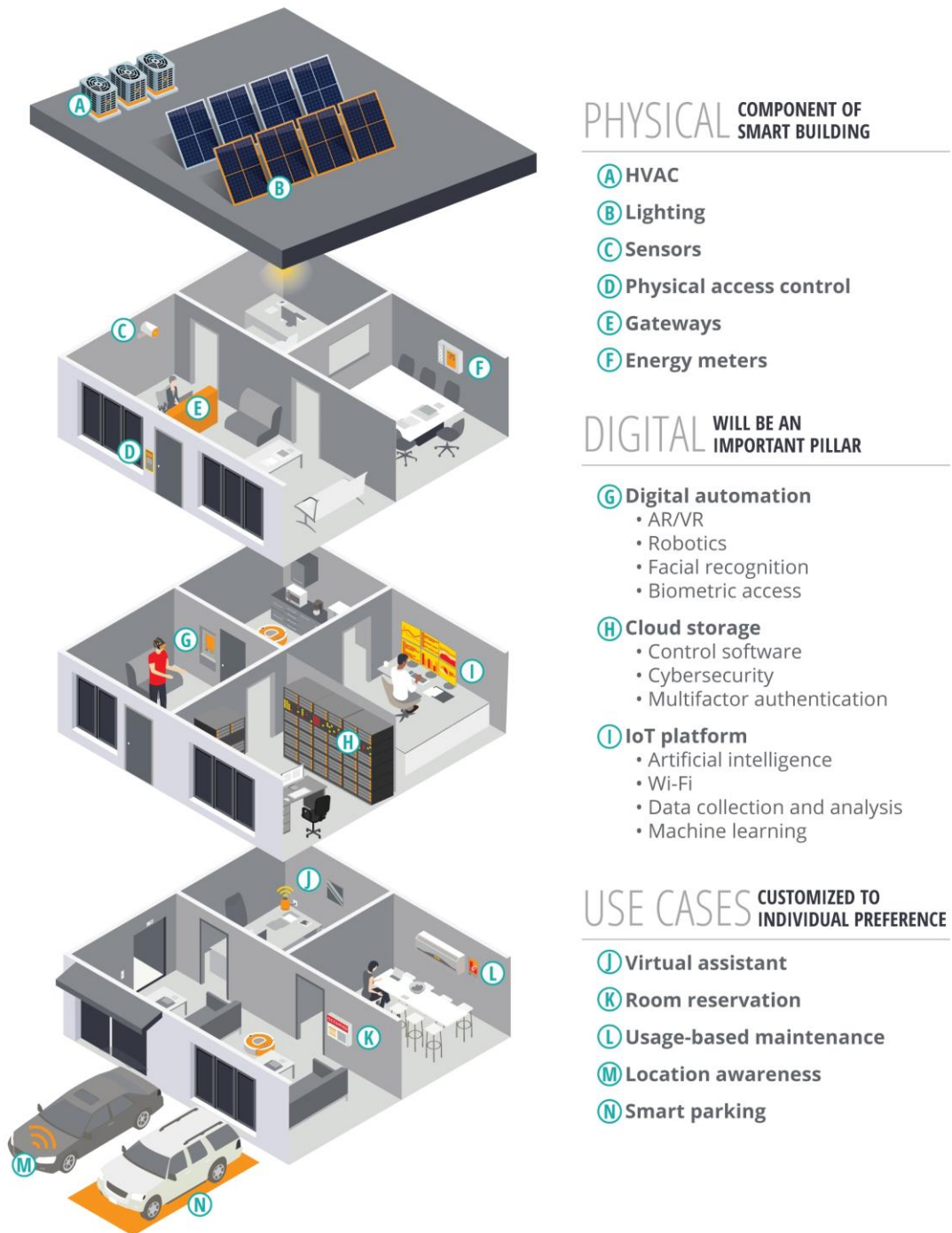
### **Data**

Smart buildings generate a large volume of valuable data about their own use, which is something that regular buildings simply don’t do.

FIGURE 1

## Deloitte's smart building framework

Deloitte's smart building framework consists of the physical assets within the building, the digital assets that create a fabric throughout the connected space, and finally the use cases that are enabled by the marriage of physical and digital assets.



Source: Deloitte analysis.

Deloitte Insights | [deloitte.com/insights](https://deloitte.com/insights)



## 6. Smarter Governance

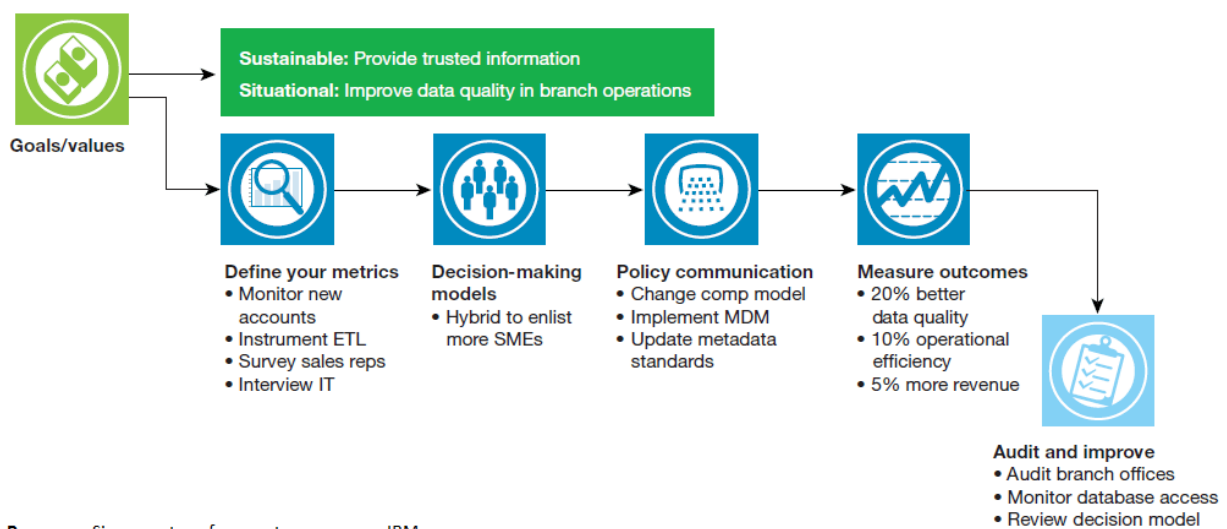
Smart Governance is related to the future of public services by using technology to facilitate and support better planning and decision making systems. Therefore, access to meaningful data is a core demand and indispensable part of a smart governance to improve service delivery and citizens' quality of life.

Four elements might be more critical than the others as an indicator of a smart government; **i)** participation in decision making mechanisms, **ii)** public & social services, **iii)** transparency in governance iv) political strategies & perspectives. All of those indicators can provide more considerable outputs if there is available of a superior data governance system.

**Smart governance** improves democratic processes and transforms the ways that public services are delivered, but increasing complexity and volume of data in cities as they are getting smarter create a necessity of comprehensive governance plans to understand the usefulness of data in a better way.

### Data Governance

Data & data analytics are the most critical elements to be able to understand what is going on in your city or anywhere in the world, and they are the base of all smart governance activities. According to IBM, there are six main elements to build up a strong data governance system;





## CONCLUSION

Smart city initiatives present unique opportunities and challenges to cities, but their implementation faces obstacles for both subnational and national levels of government. The concept of Smart Cities gained importance, as a means of making ICT enabled services and applications available to the citizens, companies and authorities that are part of a city's system. It aims at increasing citizens' quality of life, and improving the efficiency and quality of the services provided by governing entities and businesses. This perspective requires an integrated vision of a city and of its infrastructures, in all its components. To compete in this new economic environment, cities will need to better apply advanced information technology systems to develop a more citizen-centric approach to services. By doing so, cities can better attract, create, enable and retain their citizens' skills, knowledge and creativity. While the smart city is being increasingly welcomed in to the day - t o - d ay management of cities, it still faces many challenges. It remains a vast field of future innovation to be explored, both in emerging and developed countries. For the latter, being creative becomes crucial given that the space available for these initiatives generally only concerns 1% of the city with the remaining 99% being the built environment.

- Technology allows us to overcome these hurdles, especially thanks to the cloud, big data, analytics and cognitive computing. We have to hand three elements enabling us to build the smart city of the future:
- The massive collection of data from many sources and its aggregation and correlation to obtain information for making decisions closely tied to urban businesses (water, waste, energy, transport networks, security, etc.)
- Information shared in real time and predictively to facilitate the development of new uses
- Citizens contributing actively to data production.

Cities also witness instances of social instability due to rising inequalities and unemployment, air and water pollution, traffic congestion, and urban violence and crime.

However, cities also create tremendous opportunities for economic development – 80% of the world's Gross Domestic Product is created in cities; for career development – urban citizens earn on average three times the income of their rural counterparts; and for sustainability – people living in larger cities tend to have smaller energy footprints, require less infrastructure, consume less resources, and have higher productivity levels.

Smart City initiatives can help overcome the limitations of traditional urban development that tends to manage urban infrastructure systems in silos. By leveraging the pervasive character of data and services offered by digital technologies, such as Cloud Computing, the Internet of Things, or Open Data, they help connect different city stakeholders, improve citizen involvement, offer new and enhance existing services, and provide context-aware views on city operations. Smart City development is, however, highly complex, challenging and context-specific. The challenges include different discourses used by technologists and policymakers, lack of capacity to connect urban sustainability challenges to actionable

approaches, and pressures on social and territorial cohesion requiring unique governance solutions<sup>17</sup>

The role given to residents is crucial for these initiatives. In addition to technological tools and access to a wealth of information, the smart city is inscribed in an inclusive project focused on citizens and more sustainable development. For this reason, it needs to be the subject of a collective ambition transforming the relationship between the various players.

---

<sup>17</sup> *UNU*

## References

1. UNFPA, State of world population 2019, New York.
2. Siemens (2010). Pictures of the Future: The Magazine for Research and Innovation, Spring 2010.
3. Smart city framework, Siemens 2012.
4. Ulrich Eberl, “Life in 2050- How we invent the Future today” Beltz & Gelberg, Germany, 2011.
5. Smart Cities Applications and Requirements, White Paper, Networks ETP, 2011.
6. Official web page of IBM.
7. OECD web page.
8. Official web page of Siemens.
9. Official Web Page of Deloitte
10. Official Web Page of BOSCH
11. Official Web page of Schneider Electric
12. UN-HABITAT web page.
13. [www.smartcities.info](http://www.smartcities.info)

## About Author



### Dr. Mukesh Kumar Mishra

Secretary General  
**Krityanand UNESCO Club, Jamshedpur**  
(United Nations ECOSOC Accredited NGO)  
[knunesco@yahoo.com](mailto:knunesco@yahoo.com)

**Mukesh Kumar Mishra** is Secretary General of The Krityanand UNESCO Club, Jamshedpur, (NGO having Consultative Status with the United Nations ECOSOC). He did his doctoral studies from the Department of Political Science, Kolhan University, Chaibasa. He is interested in theories of International Relations, and Economic and Political Development. His primary research area is at the intersection between Policy and Development Economics. Some of the topics he has investigated or is currently investigating are Emerging Trends in Indian Economy and financial Reforms, Sustainable Development Linking economy and environment In the Era of Globalization, Role of Technology in Smart Governance: 'Smart City, Safe City'. Actively engaged as a Research Guide at Undergraduate and Post-Graduate level Research/Internship program in field of Social, Political and Economic Development. He also serves as Assistant Professor of Management and Social Sciences in Jamshedpur.