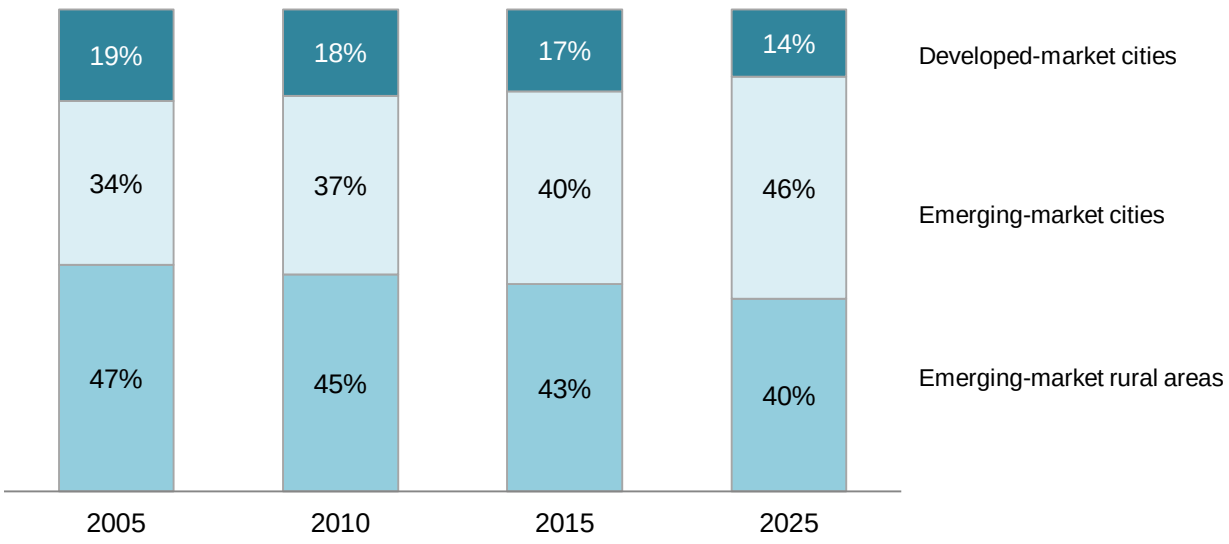
Cities as Economic Growth Engine

Urban areas are currently host more than half of global population and that proportion projected keep increasing until 2025, according to the 2014 United Nations World Urbanization Prospects report:

Percentage of World Population

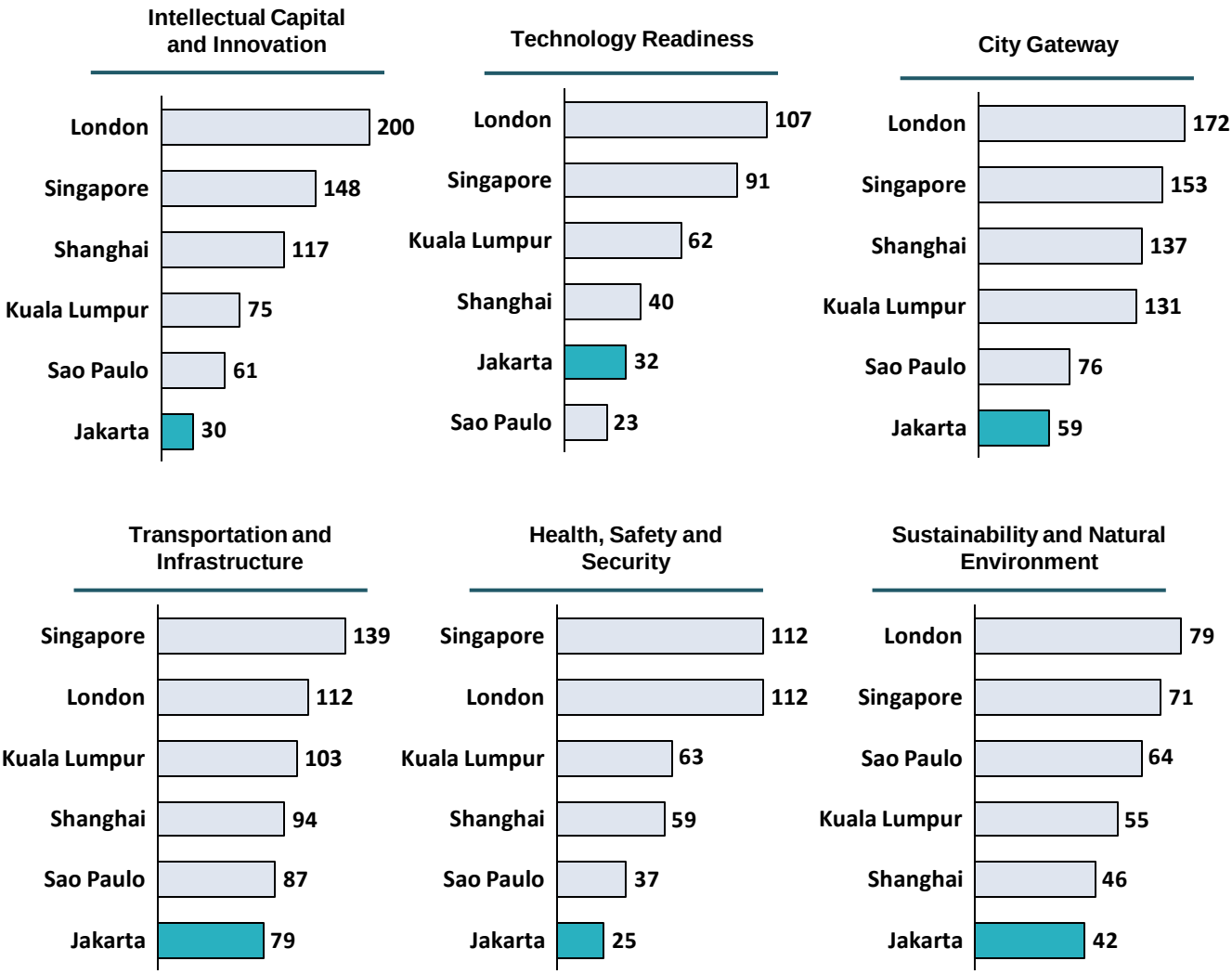


Source: BCG-Winning in Emerging Markets, World Population Forecast Reports – United Nations

Emerging markets lead the urbanization with more people will live in the cities increasing 12% in the span of 20 years from 34% in 2005 to 46% in 2025.

McKinsey Research in 2013 stated 80% of global GDP is generated in cities with half of it in the major cities of developed markets and 10 percent in the largest cities of the emerging market. In 2025, these cities will still be generating 60% of the growth in GDP but their membership will have shifted East with an estimated 100 new cities entering the rankings from China alone, where the urban population is expected to rise by 200 million, to over 800 million.

As engine for growth, major cities are facing challenges to enhance its capabilities in serving its citizens and meeting global demands. More global cities are transforming towards smart cities according to their own vision for their cities. A survey from PwC in 2014 ranked 30 major cities based on several categories that define the livability of the cities. Below is the result if the survey for selected cities, with the higher score the more livability of the cities:



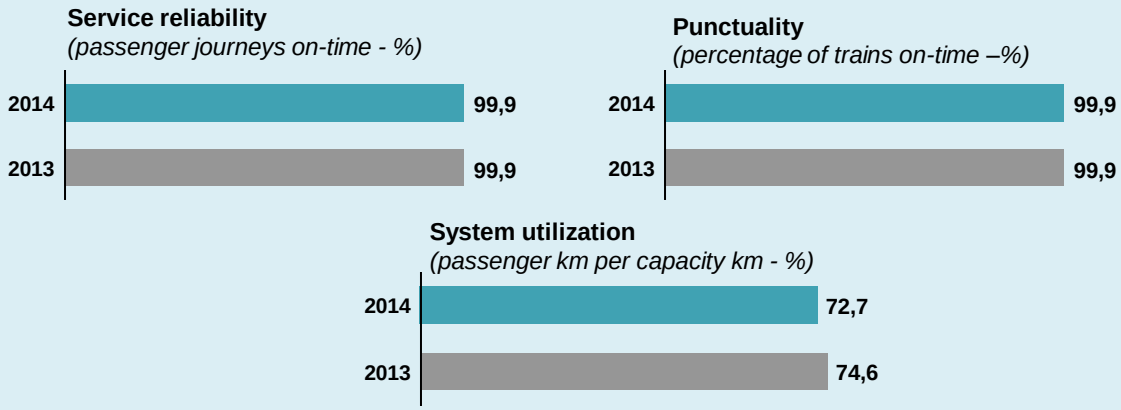
Source: Cities of Opportunity 2014, PwC

London topped the chart for the most livable city in the world. The British capital has the overall highest scores in Intellectual Capital and Innovation, Technology Readiness, City Gateway, and Sustainability and Natural Environment. Singapore is the only Asian country to made it into top 5 with obtaining highest scores for Transportation and Infrastructure and Health, Safety, and Security categories. The chart also shows that some mega cities are still lack behind the more sustainable cities in the western hemisphere. Cities like Shanghai, Sao Paulo, and Jakarta are still falling behind in all categories above, and given its large population, problems that may arise due to urbanization such as flood, traffic, and climate change are rising every year.

The increasing urbanization to the cities that holds large portion of the GDP of the respective countries creates the needs for developing solutions that will improve the livelihood of its citizens. Most cities in developed markets have begun introducing the smart city concept, where a system is built to enhance the daily activities of the citizens.

Case Study: Transit and Land Use Interconnection: The Hong Kong Transport

As one of the most populated areas with 7.2 million inhabitants and population density of 6,544 /km2, Hong Kong has managed to link real estate and transit, connecting business, commercial, and residential area. The Hong Kong transit system, managed by Mass Transit Railway Corporation (MTR), has the exceptional transit service, compact land use patterns around the city, and profitability. The Corporation managed 99.9% of service reliability and punctuality. The transit system carries more than 5.5 million passengers daily and has trains arriving every two minutes or less during peak hours. The network covers 220.9 km with 4 new railway projects are in progress that will add another 53 km to the existing Hong Kong network. Below is several key performance metrics for the MTR:



Source: MTR Annual Report 2015.

The MTR is not entirely a transit provider. The corporation also takes advantage of the values surrounding the transit stations by developing land above and around the stations. In 2015, MTR boasts US$ 5.3 billion of total revenue with 18.5% came from the commercial business. The profit from property business in 2015 was US$ 372 million. These revenues allowed MTR to fund transit expansions and continuously improving its system to ensure that it runs smoothly and efficiently, further increasing ridership.

Over the last decade, over half of MTR's operating revenue has come from property development rather than transportation service provision. The model that MTR uses is a rail property (R+P) model. MTR purchases development rights from the government— its primary shareholder—at "before rail" prices. It then uses the value captured through developing that land or selling or leasing the land to another developer to pay for transit investments. Many stations in the city are tied to Hong Kong shopping centers and mixed-use developments owned by MTR.*

This model rests on the understanding that a transit system is more than just a means of transportation. At its best, transit provides the land use structure for an efficient city, and underpins its overall wellbeing. By linking high-quality transit and land development, Hong Kong has been able to achieve remarkable densities, a superior quality of life, and protection of environmentally sensitive land areas.*

* Quoted from Infrastructure 2014, EY and Urban Land Institute

Smart City Definition

Gartner in 2015 defined a smart city as an urbanized area where multiple sectors cooperate to achieve sustainable outcomes through the analysis of contextual, real-time information shared among sector-specific information and operational technology systems. City Systems are essentials: Inter-departmental collaboration is a base requirement to ensure a consistent and aligned vision of the various city departments, but also to maximize the data (intelligence) being derived from their respective data resources.

- The Strategic representation of multi-faceted and multi-disciplinary relationships within the ecosystem need to be recognized and respected. City governments are no longer the key drivers but merely a stakeholder in the larger ecosystem that is the city.
- The key stakeholders in the city are its citizens. Equal opportunity needs to be afforded to all thus allowing innovation to transpire in a healthy and motivated environment. The risk marginalizing those less fortunate and thus increasing the already prevalent divide needs to be monitored carefully and safeguarded against.
- The goals, aspirations and quality of life are the key drivers of all Smart Cities. Whether the point of departure is safety and security, sustainability, wealth creation or freedom of choice. These visions need to be translated into clear and tangible strategies*

According to United Nations Commission on Science and Technology for Development, there are six key themes related to Smart City where cities can develop its infrastructure and systems based on the direction to further enhance the cities' capabilities.

Six Key Themes Related to Smart City

Smart Mobility

- Improved Accessibility
- Efficient, intelligent and safe transportation systems
- Efficient movement of vehicles, people, and goods
- Mobility sharing

Smart Economy

- Entrepreneurship and innovation support
- High level of productivity
- Electronic business processes
- Broadband access for businesses and customers

Smart Environment

- Use of sustainable technologies
- Sustainable energy consumption
- Energy efficiency and reduce energy consumption with the use of Technology

Smart Living

- Better quality of life
- Social aspects – Education, healthcare, housing
- Access to high quality healthcare services
- Smart building

Smart Governance

- Participatory decision making
- Transparency
- Interconnecting Government Administrations
- Improving community access to public services

Smart People

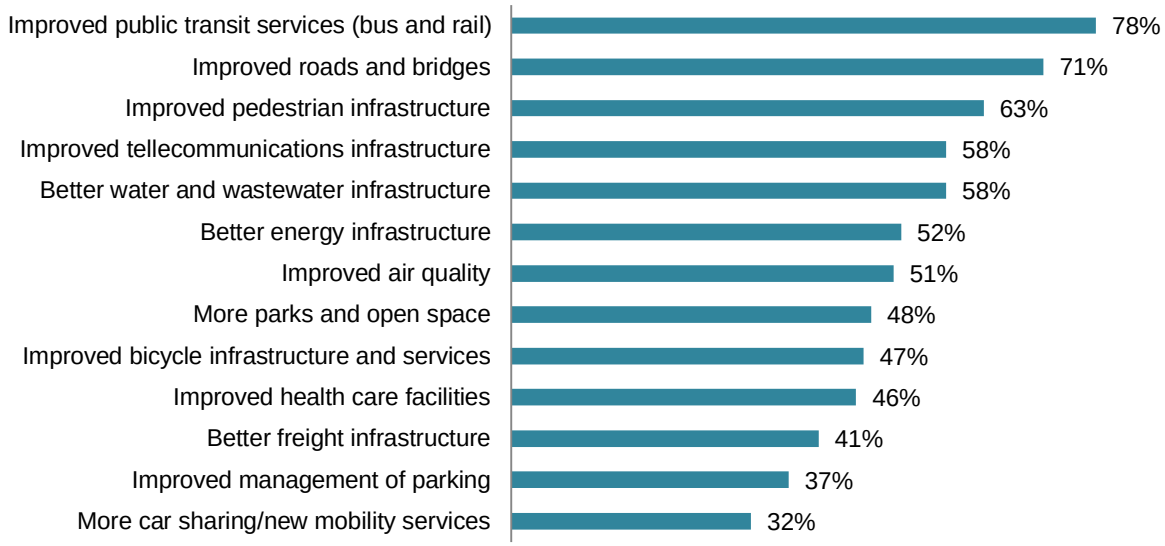
- Qualified, Creative, and Educated Citizenry
- Interconnecting with high quality IT services
- E-education solutions (distance learning and collaboration

* Smart Cities Technology, Deloitte

Smart City Infrastructure

Infrastructure development plays a key role in establishing smart city. The system of systems connects these infrastructure for more efficient and effective delivery for the citizens. A recent survey conducted by EY and Urban Land Institute targeted citizens from several developed-market cities about prioritization of infrastructure investments, with the higher percentage means higher priority:

Infrastructure Improvement Priorities
Percentage saying "One of the very top priorities" or "High priority"



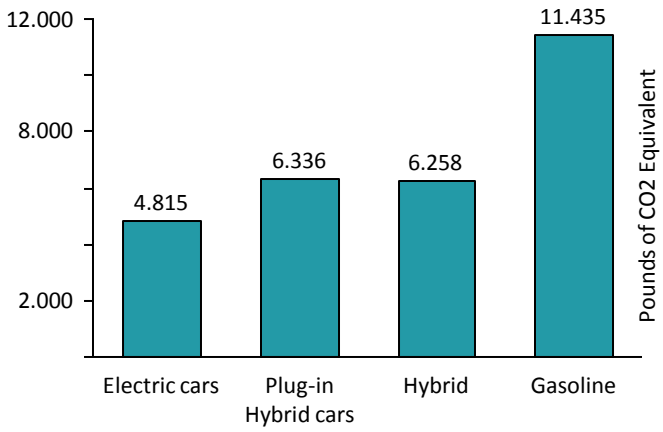
Source: Infrastructure 2014, EY and Urban Land Institute

The survey result shows improvement in transportation sector related infrastructure is a major expectation from the citizens. Improvements in public transit system, roads and bridges have the highest percentage with 78% and 71% respectively. Besides telecommunications, the citizens are prioritizing environment-related infrastructure such as water and waste management, energy, air quality improvement, and more open areas.

Public transit system improvement is essential in developing markets such as Asian cities, since urbanization is a major issue especially the cities are already overcrowded and choked with traffic. Urbanization also pose another serious pollution threat to the environment. Mega cities that are heavily dependent on road transport are facing challenge to lower CO2 emission (see chart).

In order to avoid gridlock and minimize environmental impact, a structured public transit infrastructure system that has interconnection between transport modes is necessary, as well as shifting dependencies on fossil fuel cars to environmental friendly vehicles. Several developed market cities have established electric charging station throughout the city to encourage more usage of electric cars.

Annual CO2 emissions by different vehicles



Source: US Department of Energy

Besides urban transport infrastructure, other infrastructure sectors are vital to establish a smart city. The benefits of infrastructure to smart city objective are:

- Enhance the flow of goods and services
- Promote more environmental friendly energy and water management
- Integrate technology as enabler to the people's daily activities
- Increase quality of public service delivery, especially in Government administration services and healthcare

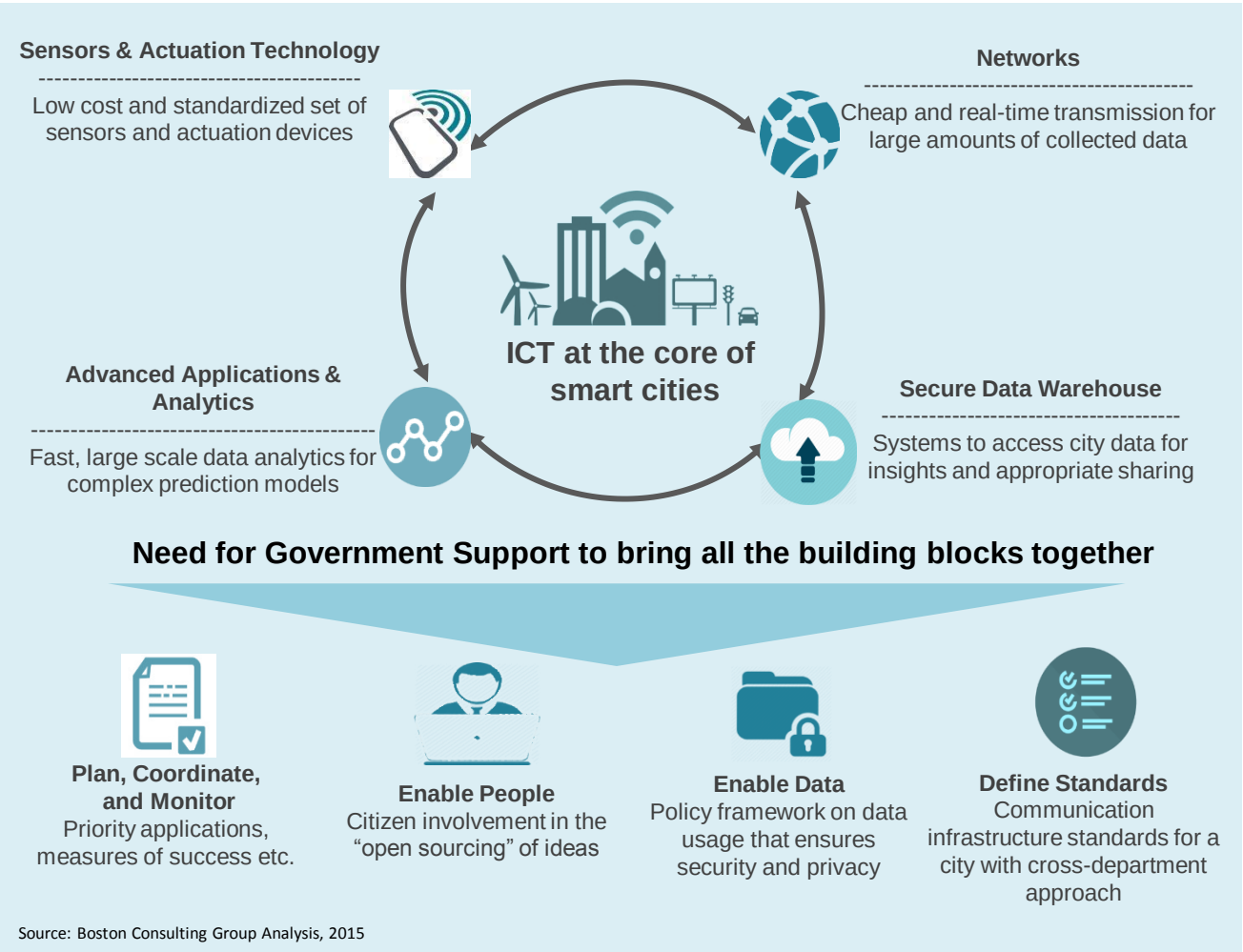
The figure below provides examples of infrastructure solutions for smart cities that will answer the Sustainable Development Challenges:*

Sustainable Development Need/ Challenge	Example Smart Infrastructure Solutions	Description
Improve Energy/ Utility Infrastructure	**Smart Grids**	Re-engineering electrical systems through application of smart meters, smart appliances, and renewable energy resources in order to attain better energy efficiency.
Provide Affordable and High Quality Connectivity	**Broadband Network**	Fiber to Home and other emerging connectivity solutions, including public internet and mobile broadband
Develop Urban Transport Infrastructure	**Electric Vehicles**	Cars which operate on electricity/ batteries with appropriate charging stations infrastructure throughout the city
	Smart Parking	Car parks and street parking locations that transmits real-time information to the users.
Improve Public Housing and Commercial Buildings	**Smart Buildings**	Array of sensors and technologies that improve safety, security, energy efficiency and usability
Improve Environmental Performance	**Environmental Sensor Network**	Continuous data collection about air, water, soil conditions
Ensure Public Security and Safety	**Video Security**	Public safety, crowd management and people counting using sensor networks and cameras
Increase Efficiency of City Management	**City Command Centre**	Monitoring and management of a range of Government, transport, environmental and emergency services
Improve Health and Education Services	**Remote Healthcare and Online Education**	Products and services for remote access to health services and education

Source: United Nations Issues Paper on Smart Cities and Infrastructure

ICT as The Backbone of Smart Cities

Connecting the infrastructure altogether is a reliable ICT platform, where flow of information and knowledge network can be created. The ICT system is not only to gather and analyze data for city information, but it also can be utilized to gather knowledge how the city is functioning. Municipal Government can use these information to formulate public policies and regulations that aimed to increase the quality of life for the citizens. The figure below illustrates the multiple roles of ICT for smart cities development:



Source: Boston Consulting Group Analysis, 2015

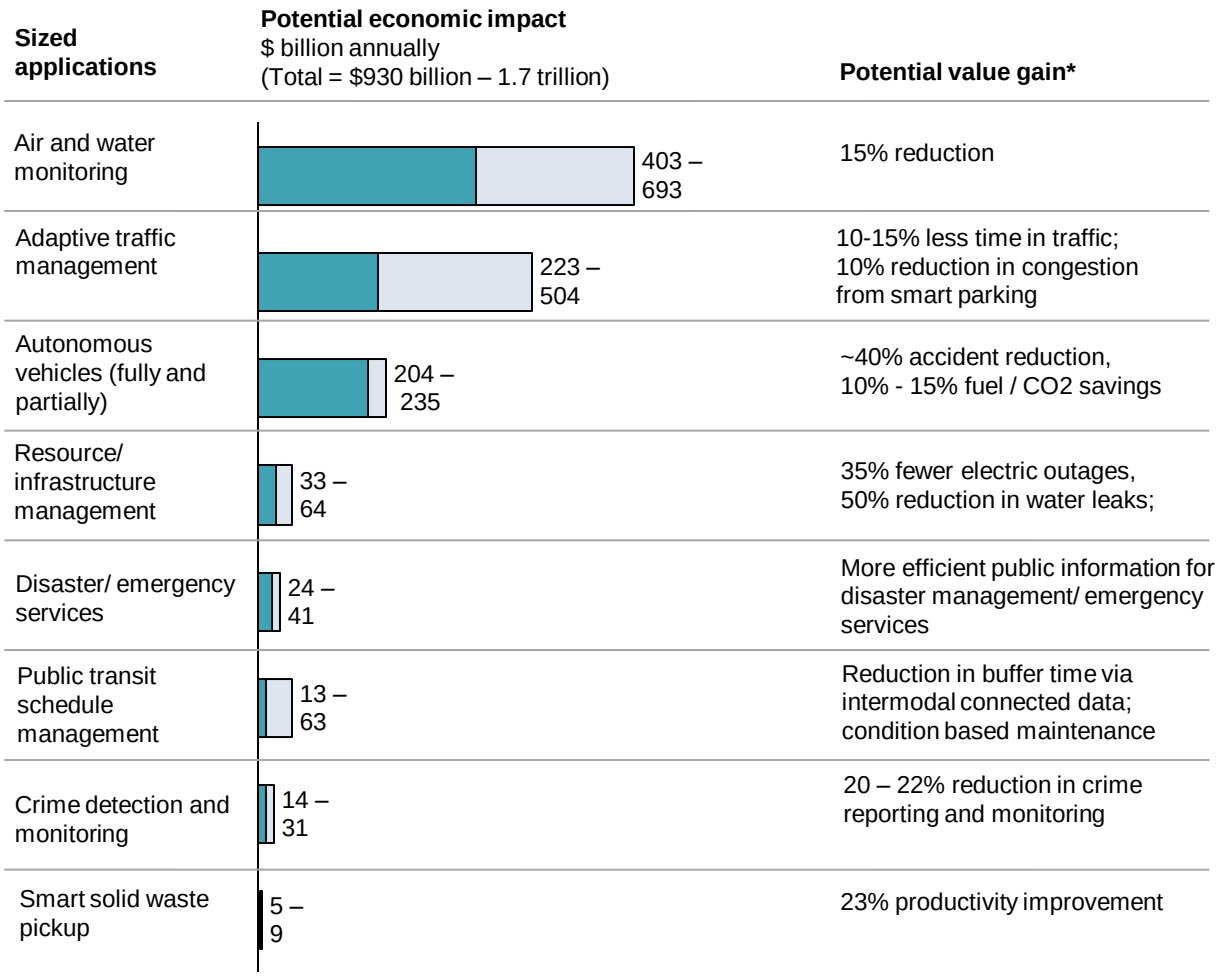
Based on the figure above, there are four key layers in the form of different digital supports for a smart city ICT system:*

- **Sensor and Urban Layer.** Smart devices are measuring and monitoring different parameters from connected physical and digital infrastructure. The example is when a smart mobility in a traffic monitoring system is able to sense road occupancy and public transport ridership.
- **Data Storage Layer.** A smart city system shall be able to store and process large amount of data from various sensors, automation process, and data analytics parameters.
- **Data Analytics Layer.** Data Analytics solutions are of three principal types: (1) Descriptive, which uses business intelligence and data mining (2) Predictive, which uses statistical models and forecasts and (3) Prescriptive (includes Cognitive), which uses optimization and simulation
- **Connectivity Layer.** Implementing smart city technologies often requires a robust, reliable, affordable broadband network. This underlines the need to continue to focus on bridging the digital divides, in order to harness the benefits of smart applications

Source: United Nations Issues Paper on Smart Cities and Infrastructure, 2015

Cities around the world have been using Internet of Things (IoT) to accelerate innovation. Through smart city vision along with its strategic initiatives, cities are exercising with IoT applications to improve public services, water and energy conservation, ease traffic congestion, and improve quality of life. Since the urbanization is going to grow rapidly over the next decade, mega-cities with large populations and complex infrastructure are key targets for IoT applications. As the economic growth engine, city authorities can make most of the gain with IoT to easily provide access to its citizens. To maximize the economic impact of the applications, there are several key areas that cities may focus on such as public health and safety, transportation, and resources management. There are great potential direct economic impact of IoT for city management, reaching US$ 1.7 trillion per year by 2025 as stated by Mckinsey in 2015. The figure below illustrates what are the potential benefits of IoT applications for cities:

Cities: Potential direct economic impact of $930 billion to $1.7 trillion per year by 2025



Source: McKinsey Global Institute analysis, 2015

The biggest potential impact is on air and water monitoring since it the impact reaches most of the citizens. IoT applications will help to put greater awareness and accountability that could improve air and water quality. This monitoring process leads to effective pollution-reduction strategies , cities could cut pollution and consequently reduce deaths linked to pollution.

Adaptive traffic management uses real-time data to adjust the timing of traffic lights to improve traffic flow. Abu Dhabi recently implemented such a system, which covers 125 main intersections in the city. The system also can give priority to buses, ambulances, or emergency vehicles. Use of adaptive traffic control has been shown to speed traffic flow by between 5 and 25 percent.

Case Study: Bandung Smart City

Key Statistics*	
Population	2.5 million
GDP (2014)	IDR 172 trillion
Number of Universities/ Colleges	80
Number of Higher Education Students	227,000

Bandung is one of the largest cities in Indonesia as well as one of the major center of economics in the country. The population reach 2.5 million with 60% of the population are below the age of 40. There are 80 universities/ colleges/ higher education with a total number of higher education students reaching 227,000. There are over 84 business units focusing on strategic industries in the city, with more than 500 business units for medium industries. The strategic industries range from airplane and firearms manufacturing, pharmacy, telecommunications and technology, and railway. Bandung is also known as the hub for creative industry in the country. The City is one of the smart city pioneers in Indonesia, looking to become a center of creative industry and technology, with several initiatives are already in place and more development will be made in the near future.

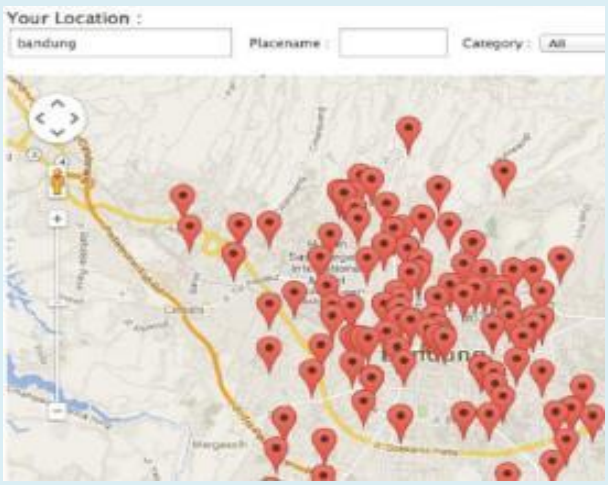
The City has introduced several key initiatives to become a smart city such as:

- **Establish a Command Center.** The command center was established in 2015 with objective to provide better service to the citizens by using video surveillance across the city. City authorities are expect that the establishment of command center accelerates decision making process.

- **Establish Free Access Public Wi-Fi.** There has been over 10,000 public Wi-Fi spots accessible for the citizens throughout the city. The city is keen to increase the accessibility of internet to further enhance the smart city concept based on ICT.

Bandung Command Centre

10,000 Free Public Wi-Fi Access



Source: BPS Statistics 2015 and Smart bdg city by Ridwan Kamil, 2015

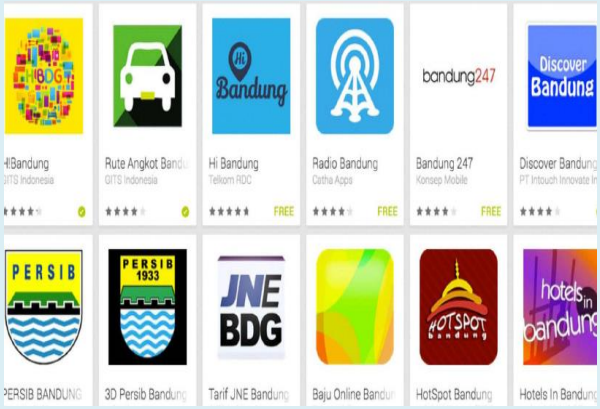
- **Smart Healthcare and Education.** The education solution enable students to be able to enroll their admission online and monitor the selection process of new students. The smart healthcare system provides interconnection of data management of patients between Public Health Clinic (Puskesmas) and Public Hospitals.

- **City Apps.** In order engage its citizens in the city lifestyle, there are numerous mobile apps that provide any information related to the city, such as transport, tourism guide, and public events. The Government is looking to reach 300 apps in 2016.

- **Creative and Smart Hub.** To further establish Bandung as a creative hub, the City provides facilities that accommodate startup businesses and creative industry players to further develop their businesses.

- **Smart Green Space.** The City Government is keep on developing public space to hold various public activities, as well as promoting digital and green lifestyle to its citizens.

Bandung City Apps



Movie Park

Disclaimer

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