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Fundamental of Smart City

Concept of Smart City

Smart City Fundamentals

The concept of Smart City

'**Smart city**' has become more tha n just a buzzword in recent years. There is no universally accepted definition of a smart city. It means different things to different people. The conceptualisation of Smart City, therefore, varies from city to city and country to country, depending on the level of development, willingness to change and reform, resources and aspirations of the city residents.

Essentially, a smart city is the re-development of an area or city using information and communication technologies (ICT) to enhance the performance and quality of urban services such as energy, connectivity, transportation, utilities and others.

A smart city is developed when 'smart' technologies are deployed to change the nature and economics of the surrounding infrastructure.

In fact, according to a report from McKinsey Global Institute (MGI), smart city applications can improve some key quality-of-life indicators like health and safety, by 10 to 30 percent.

When did the concept of smart city first appear?

The term SmartCity is came into existence when the whole world was facing economic crisis in 2008.Besides this,urbanisation was also going on a very rapid speed. It is estimated that around 70% population will be living in cities by 2050. (Fig.01)
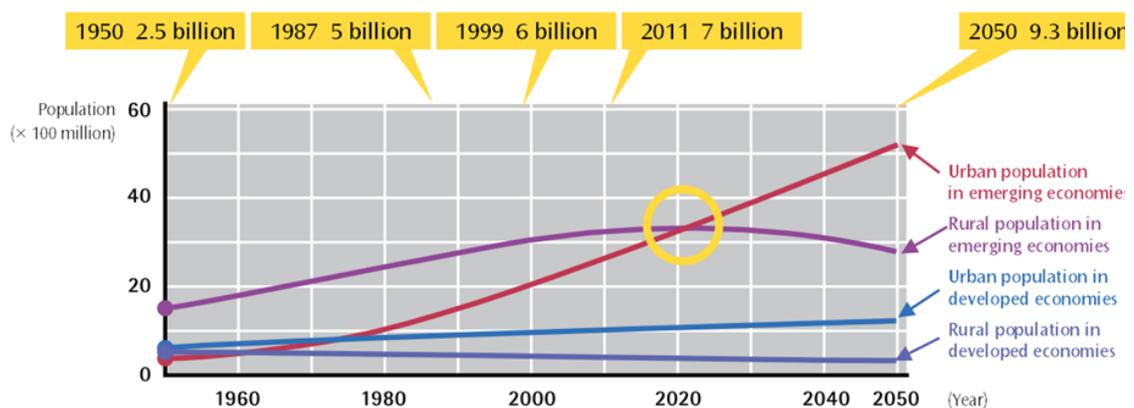

Fig 1. Growth in global urbanization

Commonly used Smart City definitions

Who	Definition
Department for Business, Innovation and Skills, UK 2013	"The concept is not static, there is no absolute definition of a smart city, no end point, but rather a process, or series of steps, by which cities become more 'liveable' and resilient and, hence, able to respond more quickly to new challenges.
Indian Government 2014	"Smart city offers sustainability in terms of economic activities and employment opportunities to a wide section of its residents, regardless of their level of education, skills or income levels
National Resource Defence Council	Бүтээмжтэй, тогтвортой, шударга, хүн амьдармаар орчинг бүрдүүлэгч хот
Thales Group	A smart city is a framework, predominantly composed of Information and Communication Technologies (ICT), to develop, deploy, and promote sustainable development practices to address growing urbanization challenges.
Boyd Cohen 2015	The smart city concept integrates information and communication technology (ICT), and various physical devices connected to the IoT network to optimize the efficiency of city operations and services and connect to citizens
Frost & Sullivan 2014	"We identified eight key aspects that define a smart city: smart governance, smart energy, smart building, smart mobility, smart infrastructure, smart technology, smart healthcare and smart citizen
2nd Smart Cities India 2016 Expo	A developed urban area that creates sustainable economic development and high quality life by excelling in multiple key areas: economy, mobility,environment, people, living and Government.
Toppeta, D. 2010	Ард иргэдийн тогтвортой амьдралд тус болхын тулд мэдээллийн технологи болон интернетийн боломжуудыг ашиглан хүнд суртлаас ангижирч, хотын удидлагын шинэлэг системд шижсэн хот.

Generations of Smart City

Smart City 1.0 was led by technology providers. This generation focused on implementing technology in cities despite the municipality's inability to fully understand

the possible implications of the technology or the effects it may have on daily life. This technology-centric vision of smart cities certainly creates an environment that is appealing to urban technology innovators, who in turn have the potential to grow jobs and the economy. So of course some cities jumped in early.

In contrast, Smart City 2.0 was led by the cities. In this second generation, forward-thinking leaders within the municipality helped determine the future of the city and how smart technologies and other innovations could be deployed to create this future. This phase has been led by cities, as opposed to technology providers. In this generation, the municipality—led by forward-thinking mayors and city administrators—takes the lead in helping determine what the future of their city is and what the role is for the deployment of smart technologies and other innovations. In this phase, city administrators increasingly focus on technology solutions as enablers to improve quality of life.

In the third generation, Smart City 3.0, neither the technology providers nor the city leaders take control; instead, a citizen co-creation model is being embraced. This most recent adaptation seems to be inspired by issues of equity and a desire to create a smart community with social inclusion. Instead of a tech-driven provider approach (Smart Cities 1.0), or a city driven, technology enabled model (Smart Cities 2.0), leading smart cities are beginning to embrace citizen co-creation models for helping to drive the next generation of smarter cities.

Some cities start and possibly stay in one of the three generations. Singapore, for example seems to be largely focused on Smart Cities 2.0 and it is hard to imagine city administration fully embracing the more chaotic, democratic approaches to citizen co-creation found in Smart Cities 3.0.

Using the word "smart" in a city definition

The definition of a smart city is an urban area that is smart of all spheres. Whether it concerns the use of technology at its best form being sustainable, environment-friendly, good water supply, being smart with energy management, surrounded by nature at its best form and living comfortably without any hassle.

Smart is used for more purposes than intelligentt. The meaning of the word Smart can be understood by combining the general characteristics of Smart Phone, Smart Building, and Smart Marketing.

The concept of smart include:

- ✓ User freindly;
- ✓ Fast;
- ✓ Can replace everything needed;
- ✓ Helping people;
- ✓ Easily adjustable;
- ✓ Optimized;
- ✓ Interrelated

and so on. Smart City also needs to have a new structure of policies, programs and activities to reflect all of these characteristics.
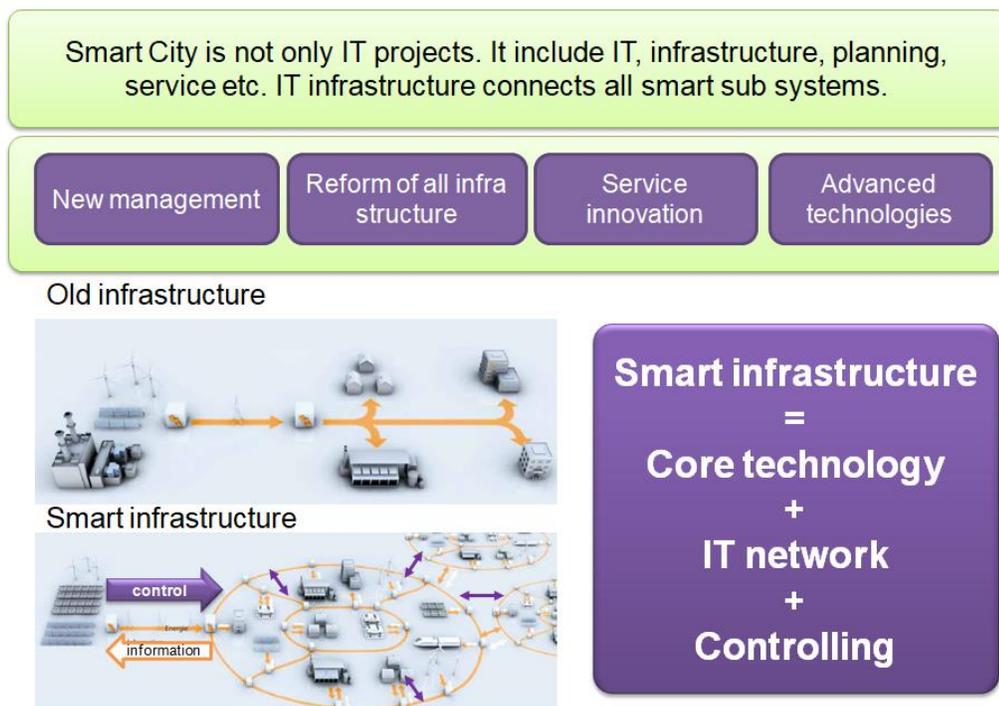

Fig 2. Smart Infrastructure

Other similar names for SmartCity

It's important to note that the Smart City project is called differently depending on the angle you look at it, but in the end, everyone is talking about the same thing.

Point of view	Term
Technology	Digital City
	Intelligent City
	Ubiquitous City
	Wired City
	Hybrid City
	E-City
	Information City
Human	Creative City
	Learnig City
	Humane City
	Knowledge City
Society	Smart Community

A change in the perception of the Smart City definition

Smart cities are getting more and more attention in the media, from technology companies and entrepreneurs, and increasingly from both local governments and civil society. On one hand, smart cities hold the promise to potentially make the growing number of cities around the globe more efficient, more tech-savvy, more wired–and with all that, they can hopefully improve the quality of life for citizens.

Around year 2000	Around year 2010	Around year 2020
Smart City is E-City	Smart City is City of Smart Technology	Smart City is City for Human
The main focus: Information technology	The main focus: Smart Infrastructure	The main focus: Higher quality of life
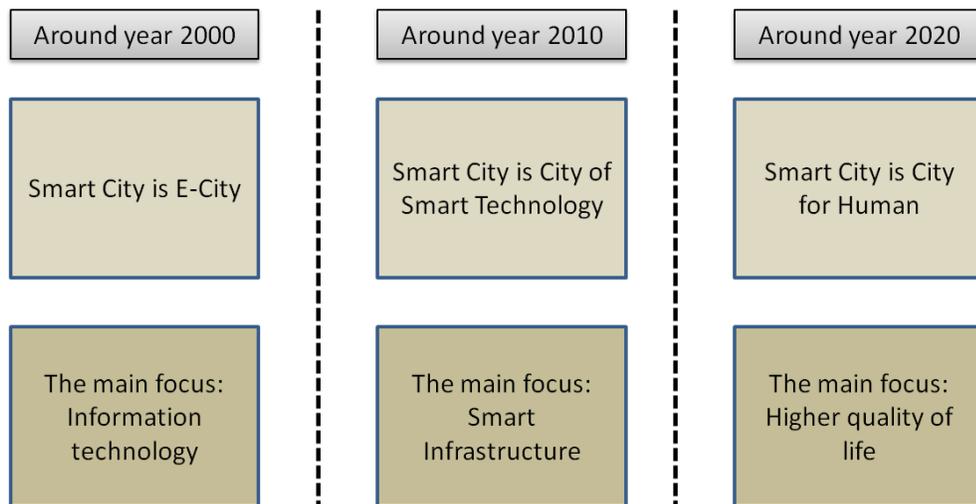
Fig.3 A change in the perception of the Smart City definition

Applications of Smart City

Ultimate goal of Smart City concept is to deliver highly advanced services to citizens and businesses using breakthrough technology platforms so that they can achieve sustainable growth.

Smart Transportation

It helps in reducing the traffic, easy movement of goods, and travel management for people. For example; smart traffic systems help citizens by reducing the chances of road accidents. Additionally, it also helps in avoiding traffic jams, reducing pollution, and promoting a healthier life.

Smart Data

Smart city collects the massive data related to various amenities used by the population. It allows to analyze the data quickly and has useful customer insights. Install the data on a portal and publish it at an online platform, these data can be utilized for predictive analysis to define future patterns.

Device Connectivity

The concept of smart city is based on the IoT devices. Sensors embedded into IoT devices collect the useful data that can be analyzed to gain relevant insights. With the support of IoT, complex city systems can exchange and manage the information quickly in real-time. Integration of data analytics with the system enables to minimize unintended consequences and accidents.

Smart Mobility

In order to build a smart city, seamless movement of data amongst several administrative and municipal systems is highly essential. As data is moving freely amongst the systems, it raises security, intellectual property, and privacy issues. Governments and enterprises should adopt revolutionary trends to plan out their legal technology needs and public policy.

Smart Infrastructure

Smart infrastructure offers big data analytics that helps in better planning and proactive maintenance for future. For example; you can prevent health issues growing due to water through real-time testing of lead content in the water supply. To collect the data, a smart infrastructure needs integration of big data, IoT, and various other technologies. Using the data, you can make future administrative changes.

Smart Parking

Smart parking enables the city to earn a higher profit by utilizing the same parking space frequently. The spaces can be utilized up to their fullest capacity. It also boosts the number of bucks.

Smart Waste Management

Implementation of smart waste management solution enables cities to reduce costing by installing sensors inside the bins. It helps in monitoring the level of trash in each bin. Bins can be emptied only when they are full. So, there is no need to follow any standardize process to collect the waste from bins frequently.

When the bins are full, the respective department will get notifications through the sensors. Waste collecting truck can empty the bin. This project reduces the number of waste collecting vehicles on the street on average. It obviously reduces the traffic and fuel cost.

Smart Lighting

Decrease electricity consumption using the smart lighting. Intelligent lighting control can contain dimming lights on streets without traffic and pedestrians. Many times, smart lighting systems are equipped with central management software that tracks usage and leads to maintenance efficiency.

Smart Energy

Smart energy provides deep insights about overall power consumption by buildings, commercials and residential. It helps in designing and executing various strategies to cut down power consumption. These days, few of the cities are using smart grids and smart streets. Even, smarts meters are also installed in the homes.

Integration of IoT helps cities in optimizing power production, improving grid management, and providing effective distribution of energy production. On the other hand, the smart grid allows businesses to improve data capture, grid modernization, outage detection, field operations and disaster recovery techniques.
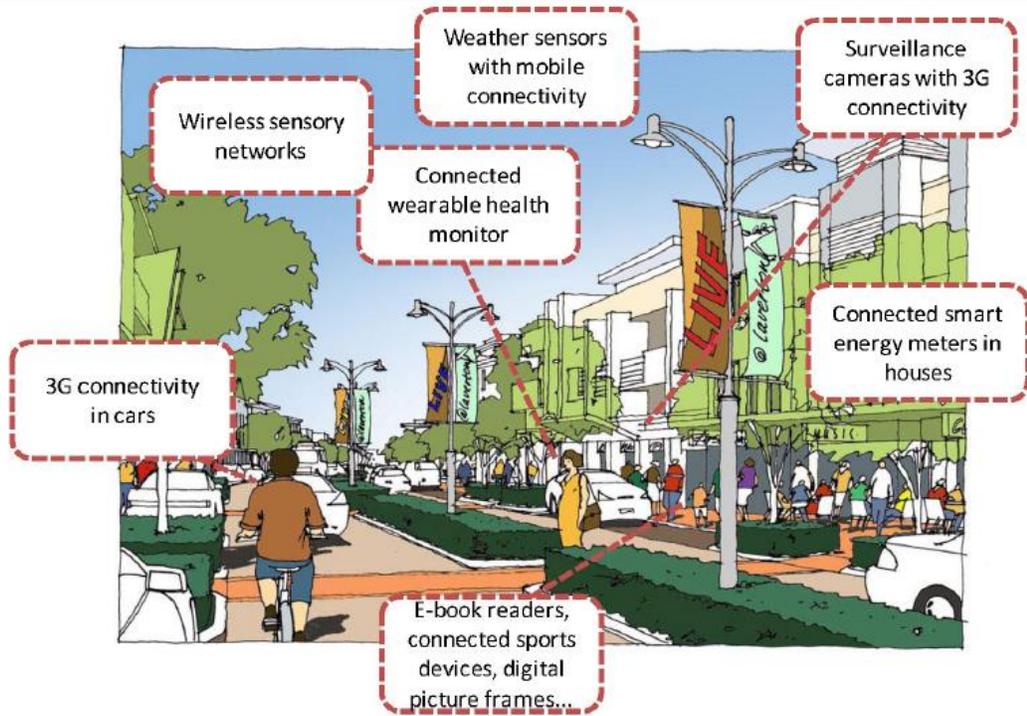
Fig 4. Applications of Smart City

The main objectives of Smart City projects

The following table shows that government, research, and implementing companies implementing the SmartCity project focus on different objectives.

	Mobility	ICT	Environmental sustainability (energy, construction, land, water)	Quality of life	Smart society (education, health care, participatory governance)
Government					
EU SET plan			■		
EU Smart Cities and Communities Initiatives	■	■	■		
Digital agenda for Italy	■	■	■	■	■
MIUR calls for bids	■	■	■		■
Academia					
Vienna polytechnic	■	■	■	■	■
MIT SENSEable Lab		■	■	■	■
Caragliu et al. (2009)	■	■	■	■	■
Harvard	■	■	■	■	■
Business					
ABB	■	■	■	■	
Alcatel	■	■	■	■	
IBM	■	■	■		■
Siemens	■	■	■		
Cisco	■	■	■	■	■
Accenture		■	■		■

Fig 5. Goal of Smart City

SmartCity projects around the world

According to a new report from NavigantRSRCH, in 2015 year, there are more than 250 smart city projects from 178 cities around the world, and the majority focus on government and energy initiatives, followed by transportation, buildings, and water goals.
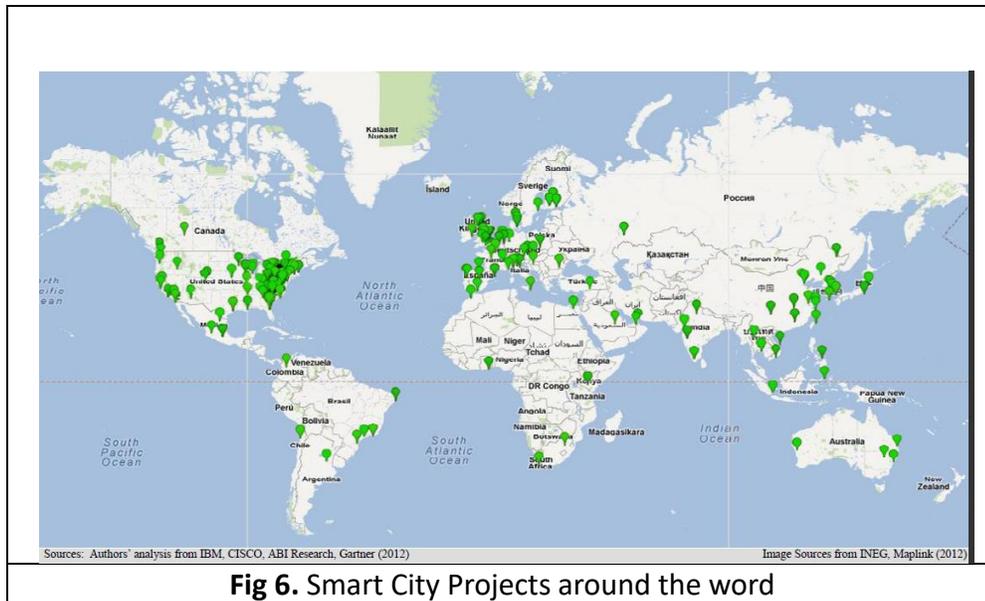
Fig 6. Smart City Projects around the word

The global market for Smart City projects

The smart cities market is expected to grow from USD 308 billion in 2018 to USD 717.22 billion in 2023, at a CAGR of 18.4% during the forecast period.

The smart city is a conceptual model, designed to deliver a set of cutting-edge services and infrastructure. Smart cities are differentiated in terms of their governance, technological advances, economic benefits, and social and environmental standards. Globally, there are over 1,000 cities with a population exceeding 500,000. The APAC region accounts for over half of these cities/urban agglomerations, followed by North America and Europe. This opens up the market for industry players to grow their business in new and emerging smart cities.

Smart city projects have evolved through various phases over the past 5 years, from being a vendor-driven technology-centric vision of smart cities to citizen-centric models. Smart cities are segregated based on their development stage into anchor, platform, and beta smart cities.
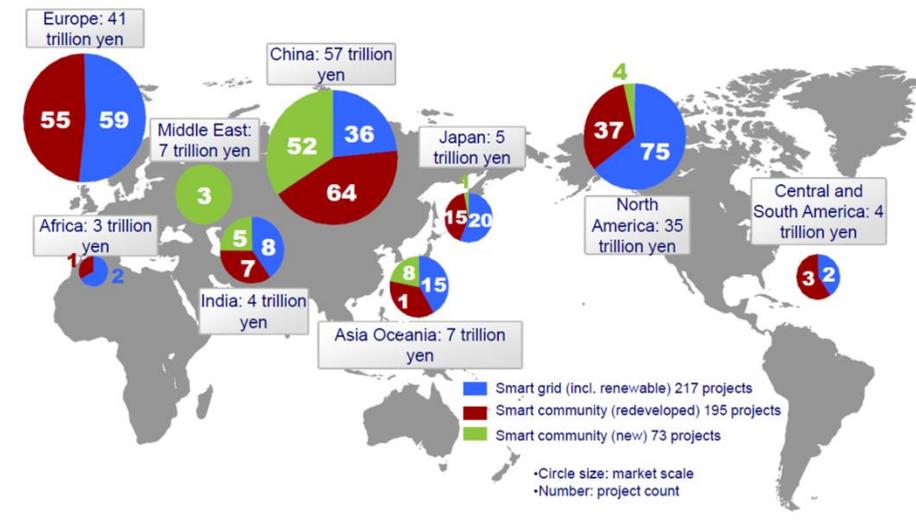
Fig 7. Global Market of Smart City Projects

The smartest cities in the world

A variety of surveys select smart cities around the world. Each competition has its own basic criteria, so the scores are different. As an example, the results of two types of selection are shown.

1- Vienna - Ranked the top 10 in each category, making it the smartest city in the world. For example: Innovation (5), Green City (4), Quality of Life (1) e-Government (8). Policy Project (Smart Energy Vision 2050, Roadmap 2020, and Action Plan 2012-2015)

2- Toronto - the smartest city in America. Introduced the most polluting, Smart Commute Toronto program, best public service solutions, waste management, and gas-powered vehicles.

3- Paris - Sustainable development with the right policy. The following categories rank high in innovation (3), green city (10), and e-government (11). There are 250 bicycle rental points.

4-New York - Ranked 47th in terms of quality of life, but ranked in the top 10 in terms of criteria.

5-London- Best for migration and tax refunds. Smart Cities Research Center. It has the largest WiFi network in Europe.

6- Tokyo - Asia's smartest city with innovation (22) and digitalization (15). Smart Daurian cities are being built. Actively implement solar energy projects.

7- Berlin - Introduced electric cars (V2G technology).

8 - Copenhagen. The greenest city in Europe. By 2025, 40% of the population will be able to use bicycles regularly

9-Hong Kong - Excellent e-government. RFID technology is used for a variety of services.

10 - Barcelona - Pioneer of the SmartCity project. The best solution to reduce air pollution. Electric car charging service was launched for the first time.

Criteria:
Innovation Cities top 100, Quality of Life rankings, Siemens regional ranking of green cities, Digital community, IDC rankings of smart cities, Digital governance in municipalities worldwide study to compare cities on their innovative use of ICT.

Globally SmartCity selection

Criteria:
IT nevtrelt- (1) and (2) (3) availability of IT infrastructure, IT's use of IT.
Benefits of IT– (1) Social (2) Economic (3) Environmental.

Fig 8. Ericsson Networked Index selection

SmartCity comprehensive solution

According to Hall R.E. and Harrison C, a smart city must have a unified picture of city life, structure, people, and services, and be able to control and coordinate at every level of activity for the benefit of the community. This requires mapping, measurement, and management of each layer of the city's soil, engineering structures, streets, lighting, buildings, green spaces, and atmosphere.

Integrated management is also needed to comprehensively map, feel, and repair service infrastructure.

The interconnection of the city map and services can be done as shown in the following figures.
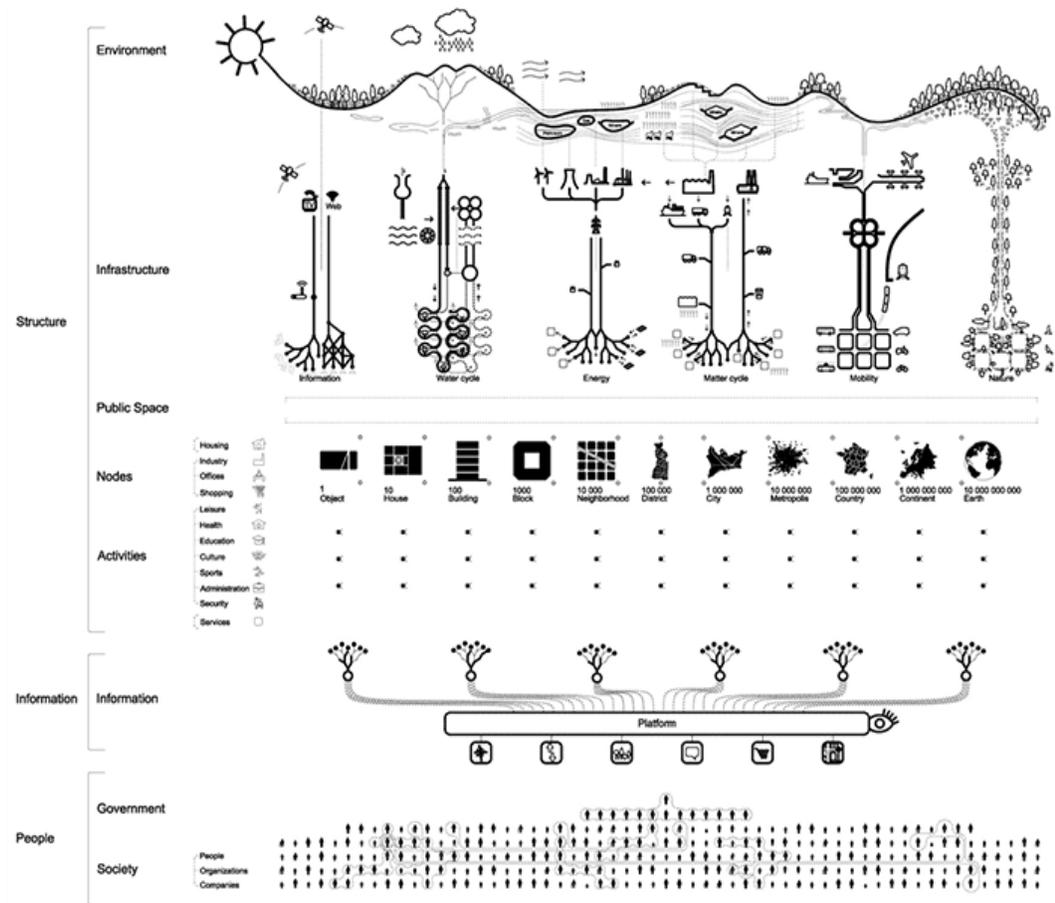
Fig 9. Unified Map of City
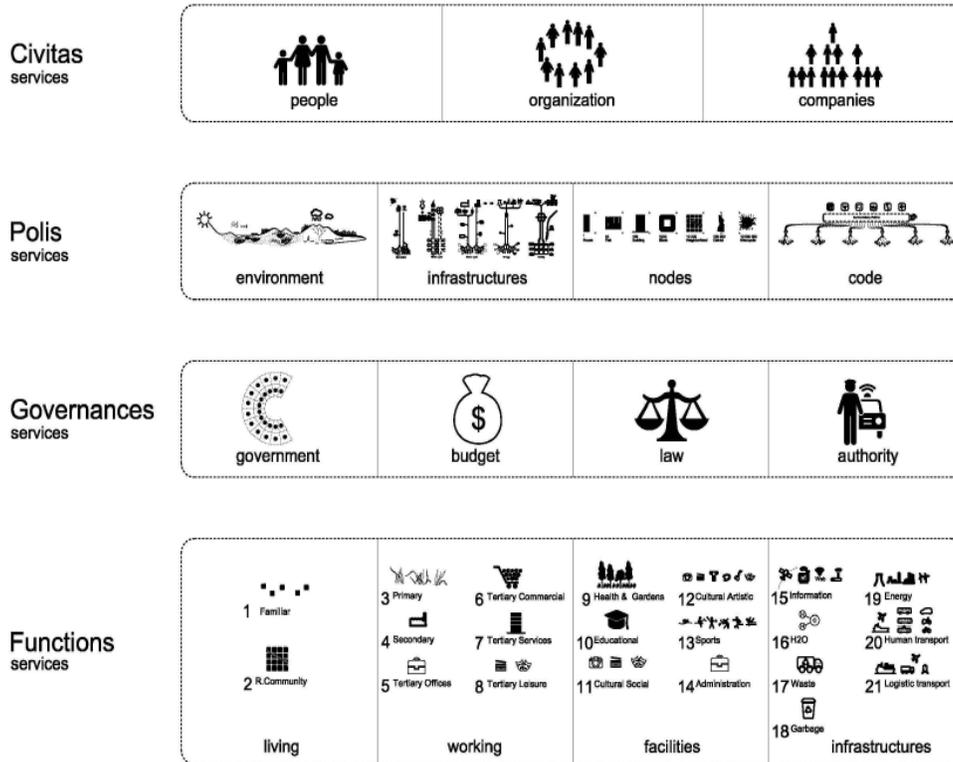
Fig 10. Integrated map of city services

Smart City determinants

Researchers have identified the factors that determine a smart city in different ways. For example, Giffenger and other scientists have identified a smart city with the following six characteristics, 31 factors and 74 indicators.
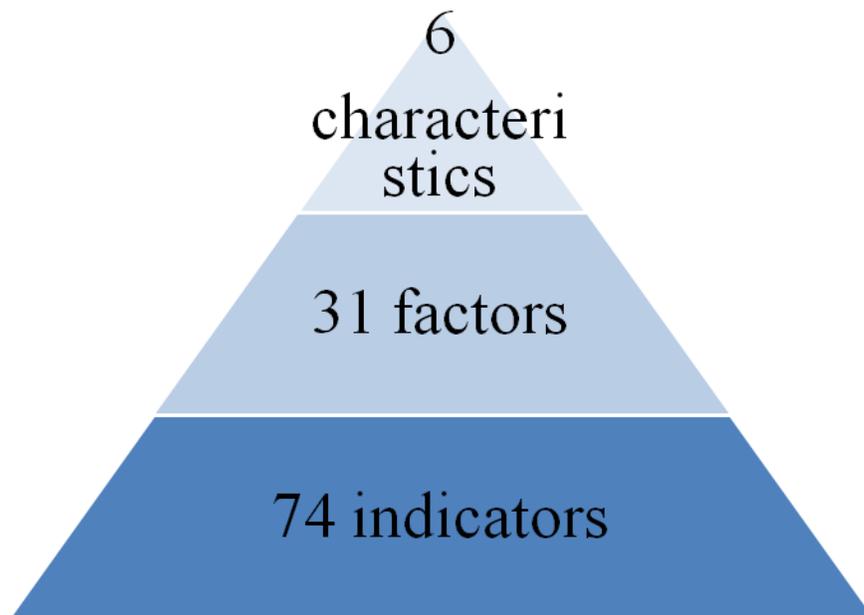
Fig 11. Characteristics, factors and indicators that define SmartCity
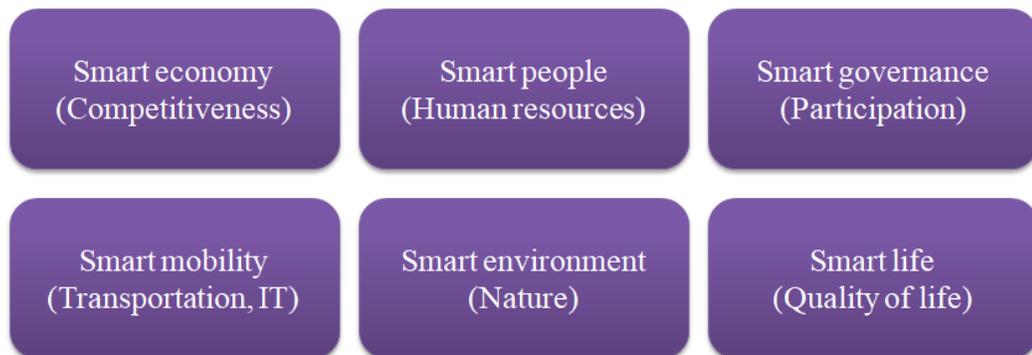
Fig 12. 6 characteristics of Smart City

- o Smart economy: A knowledge-based economy that ensures the sustainable development of the city.
- o Intelligent communication and infrastructure: The city has developed and developed a flexible, accessible, reliable, information and communication technology-based infrastructure, and widely used digital technology in its services.
- o Smart environment: Created an environment that is comfortable, healthy, safe and comfortable to live and work.
- o Intelligent population: Developed science, technology and innovation system

based on intelligent people.

o   Smart life: Housing, buildings, living environment and service infrastructure have been created to ensure high living standards of citizens.

o   Smart governance: Established an open, transparent and participatory governance system, and introduced e-government.

Char.	Factors	Indicators
Smart Ecomoiny	Innovation environment	Support research
		Knowledge-based economy
		Patent copyright
	Doing business	Self-employment
		Newly registered business entity
	Brand and reputation	Decision making center
	Work productivity	Average income of employee
	Labour market	Unemployment rate
		Level of part-time employees
	Competing internationally	Companies in the international stock market
		Air travellers
		Air freight
Smart people	Skill level	University and research center
		Specialization of citizens
		Foreign language
	Lifelong learning	Library
		Distance learning
		Foreign language courses
	Multicultural	Number of foreigners
		Citizens born abroad
	Flexibility	Opportunity to get a job
	Creativity	Employees in the production of new technologies
	Community	Percentage of participation in elections
		Overseas passenger
		Social knowledge
	Public Works	Political activism
		Volunteering
Smart Governance	Participate in decision making	Number of cititizens thar represent citizens' representative
		Citizens' political activity
		Political role and influence
		Percentage of female representatives
	Public and social services	Cost per capita
		Kindergartens

	Open governance	Schools
		Bureaucracy
		Corruption
Smart Mobility	Transportation system	Number of public transport
		Public transport quality
		Public transportation satisfaction
	International Logictiss	International shipping
	IT infrastructure	Household with computer
		Mobile phone service
	Traffic management	Environmentally friendly vehicle rental
		Environmentally friendly vehicles
		Road safety
Smart Environmnet	Natural conditions	Sunny days
		Green plant
	Pollution	Smoke
		Waste
		Infectious diseases
	Environmental protection	Citizen participation in environmental protection
		Environmental awareness
	Consumer infrastructure management	Water supply
		Power supply
Smart Living	Culture	Cinemas
		Museums
		Theatres
	Health	Life expectancy
		Hospital
		Doctors
		Health system
	Safe environment	Number of crimes
		Death due to crime
		Crime protection system
	Home and apartments	Housing level
		Area per capita
		Satisfaction
	Education	Students
		Schools
		Quality of education
	Tourism	Attractions
		Number of tourists
	Poverty	Number of poor people

	Poverty risk	

Fig 13. SmartCity indicators

The ranking of European cities according to the above indicators, is as follows.

cc	city	Smart Economy	Smart People	Smart Governance	Smart Mobility	Smart Environment	Smart Living	total
LU	LUXEMBOURG	1	2	13	6	25	6	1
DK	AARHUS	4	1	6	9	20	12	2
FI	TURKU	16	8	2	21	11	9	3
DK	AALBORG	17	4	4	11	26	11	4
DK	ODENSE	15	3	5	5	50	17	5
FI	TAMPERE	29	7	1	27	12	8	6
FI	OULU	25	6	3	28	14	19	7
NL	EINDHOVEN	6	13	18	2	39	18	8
AT	LINZ	5	25	11	14	28	7	9
AT	SALZBURG	27	30	8	15	29	1	10
FR	MONTPELLIER	30	23	33	24	1	16	11
AT	INNSBRUCK	28	35	9	8	40	3	12
AT	GRAZ	18	32	12	17	31	5	13
NL	NIJMEGEN	24	14	14	3	51	24	14
NL	GRONINGEN	14	9	15	20	37	13	15
BE	GENT	19	16	31	7	48	4	16
SI	LJUBLJANA	8	11	43	31	3	29	17
NL	MAASTRICHT	26	18	17	1	43	14	18
SE	JOENKOEPING	36	10	7	34	22	26	19
BE	BRUGGE	23	20	29	18	44	2	20
NL	ENSCHEDE	31	17	16	4	35	23	21
DE	GOETTINGEN	11	34	20	12	15	31	22
SE	UMEAA	39	5	10	36	46	10	23
DE	REGENSBURG	9	40	27	19	38	22	24
FR	DIJON	38	29	22	26	9	25	25
FR	NANCY	41	31	23	25	10	20	26
DE	TRIER	21	44	19	10	18	33	27
FR	CLERMONT-FERRAND	33	33	26	29	7	27	28
FR	POITIERS	48	37	28	33	8	15	29
SI	MARIBOR	49	21	37	40	2	32	30

Fig 14. Ranking European Smart Cities

SmartCity's issues needed urgent solutions

According to Forrester, the SmartCity project identifies the following key areas of priority. These include:

✓ Traffic and public transportation
✓ Electric water supply
✓ Health

- ✓ Education
- ✓ Land and construction management
- ✓ Waste management
- ✓ Citizen services
- ✓ City management


Fig 15. Most demanded Smart City solutions
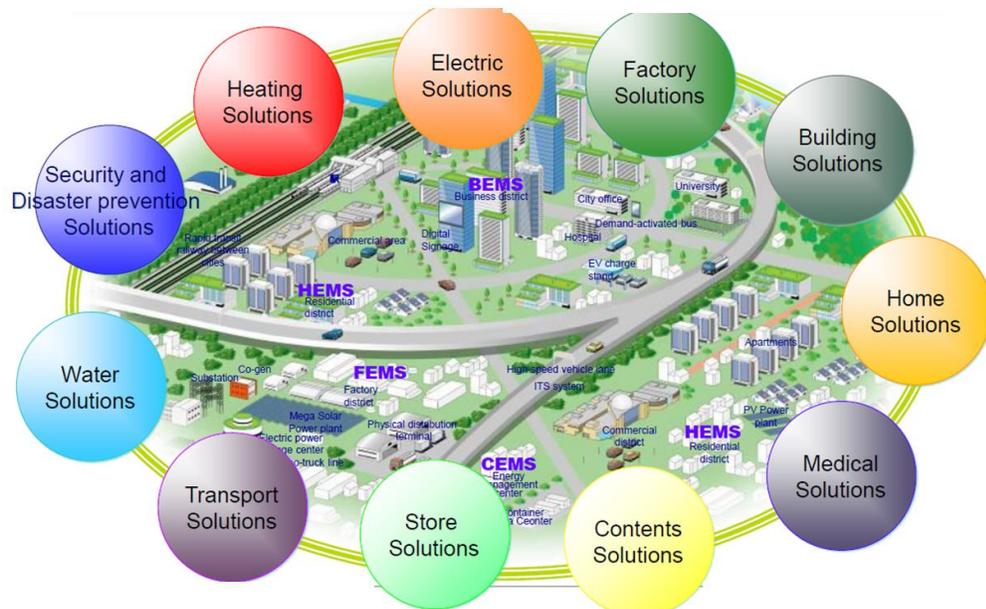
Fig 16. Comprehensive solutions offered by Toshiba

Examples of solutions

Smart road and transportation solutions

The SmartCity project has a number of initiatives to address transportation issues. Today, each city has its own traffic regulations. In most cases, solutions have been chosen using the latest technological advances. For example:

- ✓ London and Stockholm used IBM Smart Transportation solution.
- ✓ Mobile phone parking solutions have been introduced in the following cities.
- ✓ Most Spanish cities use the Presto Parking system.
- ✓ Dublin city uses Marking tag system.
- ✓ The streetline system is used in Washington, New York, Sausalito, Los Angeles and Culver city.
- ✓ Bicycle rental services have been widely introduced in several cities, including Barcelona
- ✓ Some cities have a regular car-free day.

Electrical and water solutions

Most of the world's major cities have switched to the SmartGrid system and are implementing various projects and programs to regulate the use of electricity, heat and water
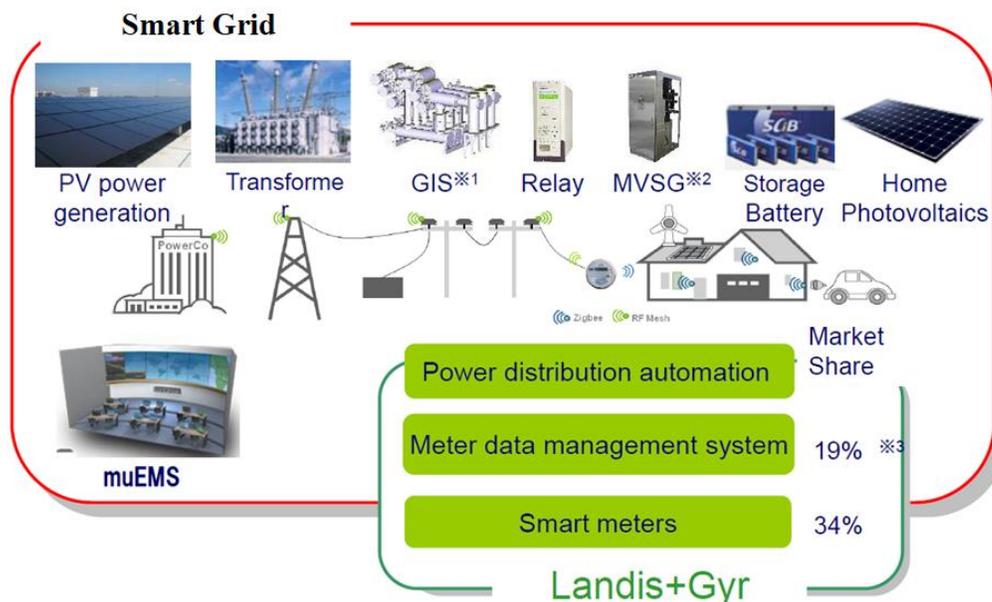

Fig 17. Components of the SmartGrid solution

Smart Building

Residential and office buildings use one-fifth of the world's energy. America uses 70 percent of the energy it produces. Therefore, a well-designed building with electricity, heating, cooling, etc., has a decisive impact on the city's energy efficiency. Many companies, such as Honeywell, Johnson Controls, and Etisalat, offer smart building management solutions.

Smart Building is a new type of building that creates an environment that improves the quality of life and increases productivity. The most important feature of this type of construction is a sharp reduction in electricity consumption. This requires a variety of sensors, connections, software, and easy controls. Figure 17 shows a schematic of the technology used in Smart Building.


EWT: Elevated water tank   HSE: Heat source equipment
PSS: power supply system   HST: Heat storage tank
SCiB: Storage battery   PGS: Power generation system
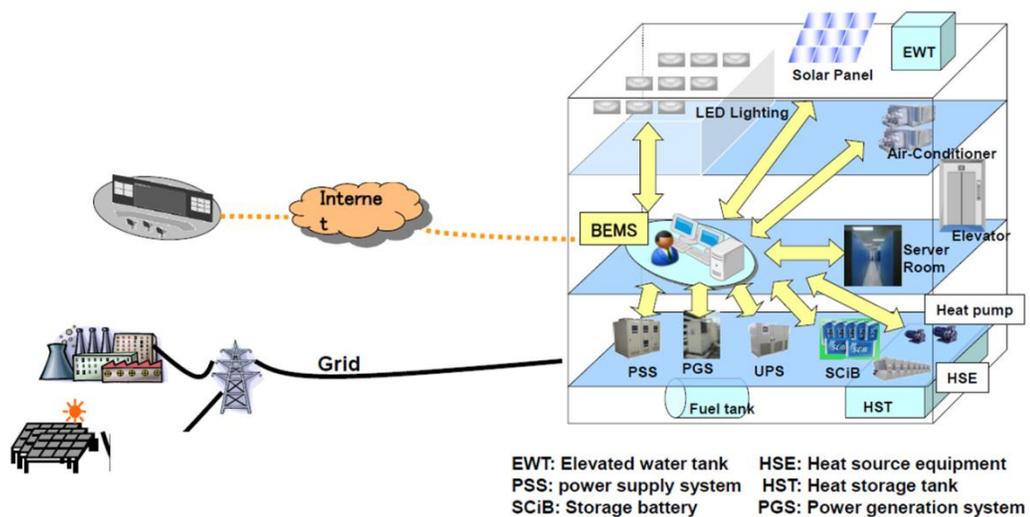
Fig 18. Smart Buildings

Smart infrastructure solutions

The smart city solves and creates the comfort, safety, healthy and clean environment of its residents using the latest advanced technologies.
The main principle of building a "smart city" infrastructure is to create comfortable and peaceful living conditions for every city resident and citizen, regardless of time and place, to receive services from all sectors of society to citizens and businesses. that is.

Fiber-optic networking of all urban infrastructure such as information technology, road transport, telecommunications, public transportation, electricity, water supply and sewerage systems, etc. High-tech, integrated management and integrated database to create and manage a smart city is the basis for organizing, monitoring and developing. The Ubiquituos system is a network based on the advanced technologies used to build a smart city, which can exchange information with each other regardless of location or time.

U-IT Infra (WiBro, HSDPA, DMB, GPRS), modern computer technologies (Super Computer, Grid Computing, Hardware, Software), satellite communication technologies (GPS) are used to create a smart city. , Satellite TV & Radio), cellular communication technologies (GSM, CDMA), wireless data transmission technologies (RF, ZigBee, Bluetooth), high-precision sensors.

In the development of smart city infrastructure, information technology infrastructure is built in the following four main areas. These include:

1. Convenient City
2. Healthy City
3. Safe City
4. Clean City
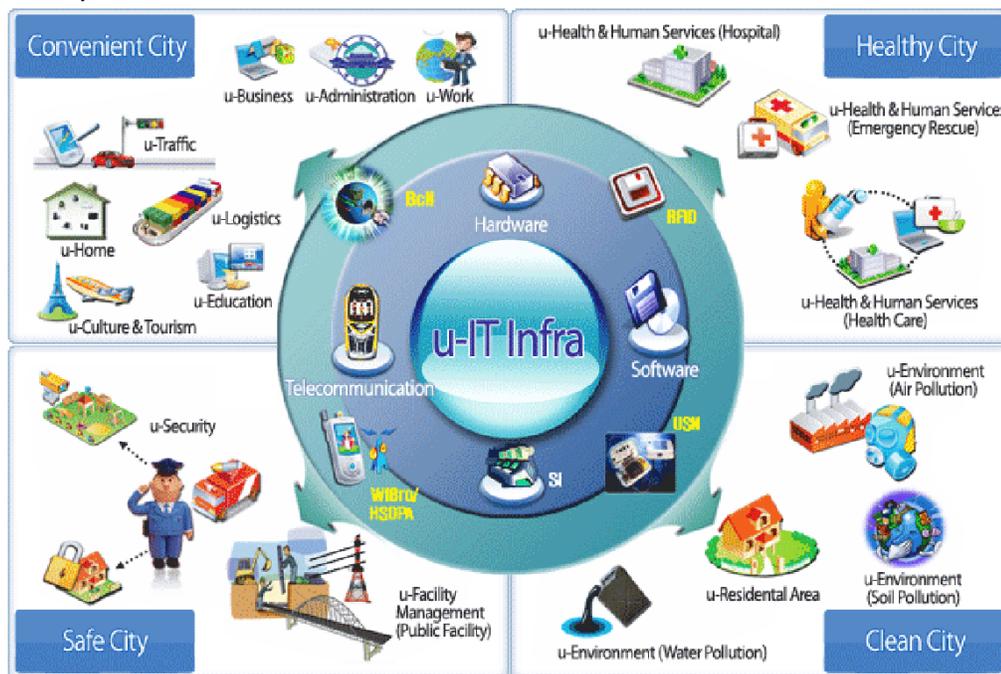
Fig 19. Smart Infrastucture

Convenient City

✓ S-Traffic System: Taking into account many factors such as traffic intensity, weather, etc., it is wise to regulate traffic signals and automatically take a picture of the license plate of a driver who has committed various violations using high-speed and high-resolution cameras. is a system for typing pages and sending them to the address of the place of residence.

✓ S-Bus System: A system that locates all vehicles (buses, trolleybuses) on public transportation, calculates distances and times, manages fuel consumption, and monitors the safety and comfort of drivers and passengers with a camera. .

- ✓ S-Home Networking: A system that can process residential electricity, hot and cold water meter information and automatically send it to the relevant authorities, make payments online, and control and monitor household appliances and car garages from a mobile phone. For example, on the way home from work, use your cell phone to reduce the temperature in your refrigerator, thaw meat, turn on your rice cooker, and so on.

- ✓ S-Building: Reducing the electricity consumption of a building using advanced technology, such as gasifying windows and roofs with solar panels, providing a certain percentage of electricity for storage, using rainwater for heating and sewage, and saving money, a system that calculates room temperature, humidity, and solar energy, and includes solutions to control the heating system, turn it on and off, and save electricity.

- ✓ RFID & QR Code Shopping System (RFID & QR Code Shopping System): The product is equipped with a two-dimensional code or small smart RF (Radio Frequency) chips that contain all the information about the product. When a user reads the product code on their smartphone, all the information such as the date of manufacture of the product, the shelf life of the food product, the amount of ingredients, the price sold in other stores, etc. will appear and help the user make a choice. It is a system that automatically calculates the price of goods and deducts money from a bank card online.

- ✓ Product Registration System (RFID Product Registration System): A system that installs and registers smart RF (Radio Frequency) chips in valuables (cars, computers, etc.) and in containers at customs. For example, if you decide to buy an old car, there is no doubt that the car's RF chip will have the car's year of manufacture, mileage, arrival in Mongolia, date, accident, maintenance, and number of owners. Such information can be obtained in a matter of seconds.

- ✓ Smart sectors of social services (E-Banking, S-Business, S-Administration, S-Education, U-School): Internet banking, online civil registration information center, online payment system, online education, online school, etc.

- ✓ S-Tourism & Culture: An integrated information system for foreign tourists that provides information on Mongolian history, culture, traditions, historical sites, and itineraries that can be found at any city service center.

Healthy City

- ✓ S-Hospital: Provides online surgery, treatment instructions, and patient records and medical histories to critically ill patients in other baghs, soums, aimags, cities, and countries using high-speed networks and high-resolution screens. An integrated automated system that allows citizens to receive medical services without delay, such as booking an appointment with a doctor in all possible ways (texting, telephone, Internet).

✓ S-Health Care: Elderly and disabled people have a 24-hour heart rate, fever and blood pressure measurement on their wrists that alert the hospital and provide emergency care. system.

Safe City

✓ S-Baby Care System: A device worn around a child's arm, leg, or neck that informs a parent's cell phone of the child's current location and whereabouts for a period of time.

✓ S-Building Access Control Integrated System: A centralized alarm system that protects the building from fire, theft, and other external intrusions.

✓ S-Special Object Security System: An integrated fence and object protection system for state-protected special facilities such as power plants, fresh water tanks, and chemical and oil plants.

Clean City

✓ S-Air Pollution System: A system that measures the amount of air pollutants in a city and sends a message to the relevant authorities and residents of the area if the air pollution reaches excessive levels.

✓ S-Water Pollution System: A system that measures the composition and volume of water in rivers, surface wells, deep wells, and freshwater reservoirs 24 hours a day, and alerts the relevant authorities and local residents when dangerous levels are reached. is a system that provides all forms.

✓ S-Soil Pollution System: A system that monitors soil pollution in a city or area.

Considerations for successful implementation of Smart City project

There are many factors that need to be considered for a successful project, as the concept and work of the SmartCity project is very wide. These factors can be combined into eight sections. These include:

1. Management and organization

2. Technologists

3. Governance

4. Policy

5. Human resources

6. Economy

7. Infrastructure
8. The environment
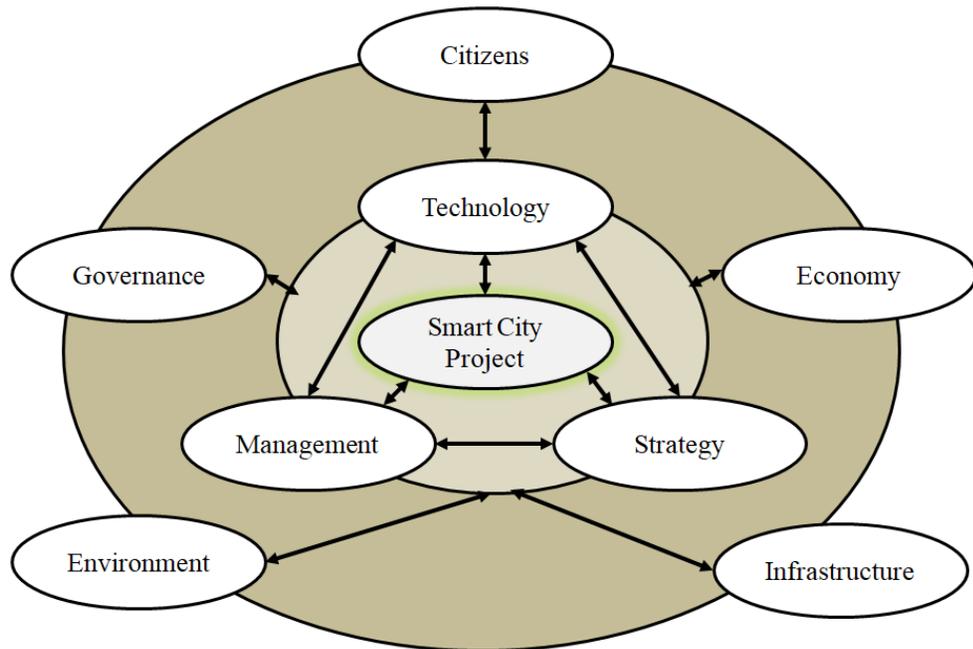
Fig 20. Classification of SmartCity project factors

Project management

The key to the success of most SmartCity projects is project management. Depending on the nature of the project, let's classify the issues and the strategy of the team that manages it.

Challenges and issues	Strategies
- The SmartCity project is a very large and diverse project - Leader's organizational skills - Versatile activities of the city - Coherence between each sector - Overlapping and conflicting activities - Internal resistance that does not want changeМаргаан, тэмцэлүүд	- Project team skills and experience - Project Leader Skills - Clear and understandable purpose - Partner activity - Involve end users - A good, timely plan - Good model of operation - Good training - Research skills - Good experience of others

Technology

The word smart is often used to mean good technology. Therefore, SmartCity projects are often based on information and other high technologies. Problems with technology adoption are common.

Group of Problems	Challenges
● Information technology skills	● Training system ● Skilled workforce ● Information culture
● Organization and structure	● Inter-sectoral coordination ● IT policy ● Internal culture of the organization

Governance

Many cities have launched the SmartCity project to improve citizen services. These projects need to coordinate and manage the interests of many stakeholders. As governance is a way to integrate rules and planning and achieve it effectively, let's look at the factors that influence the governance of a SmartCity project.

Factors
● Leader influence, experience and skills   ● Cooperation models and procedures   ● Public participation   ● Means of communication   ● Information exchange   ● Integration of services and systems   ● Transparency   ● Accounting, registration and control system

Policy

The SmartCity project is primarily about urban policy. When policymakers understand the importance of the SmartCity project, they are a key driver of project start-up, implementation, and implementation, influencing project success. No project can be implemented without the support of policy makers. Many policy changes will be required during the implementation of the SmartCity project.

Factors
● Change of laws, rules and regulation   ● Restructuring   ● Change the old mode of operation   ● Find funding   ● Support the right solution   ● Identify the right partner

Citizens

Citizens and their feedback is one of the most important parts of the SmartCity project. Any city initiative must be for the good of all the city's citizens. Many researchers have suggested that the following key factors should be considered when defining the goals of the SmartCity project for the benefit of citizens

Factors
● Equal access to information. Digital Divide
● Information technology infrastructure
● Citizen participation
● Communication opportunities
● Education
● Quality of life

Economy

Economic freedom and employment opportunities are major factors influencing the peaceful life and quality of life of urban residents. Therefore, one of the important goals of SmartCity projects is to create a favorable economic environment. There are certain factors that contribute to a smart economy.

Factors
● Fair competition
● Favorable innovation environment
● Opportunity to start a new business
● Patents and trademarks
● Good labor market
● Opportunity to operate nationally and internationally

Infrastructure

The foundation of SmartCity's infrastructure is the information technology infrastructure and its quality. The following issues should be considered when building an IT infrastructure.

Group of Problems	Challenges
● Information technology infrastructure	● Integration of separate systems ● Resistance of existing systems ● Employee knowledge, experience and education ● System solution

• Information Security	• Hacker attacks
	• Network virus
	• Privacy
	• High cost of security system
• Operation cost	• High salaries for IT professionals
	• The cost of purchasing and installing the system
	• The cost of maintaining the system
	• Training costs

The environment

Any SmartCity project aims to create and maintain an environmentally friendly green city. There are the following solutions that will have a positive impact on the environment.

Group of Problems	Challenges
• Smart Energy – Smart Grid	• Economical use
	• Integrated management
	• Renewable energy
	• Electric cars
• Smart Building	• Low heat loss
	• Low carbon emissions
	• SmartBuilding integrated management
• Smart Water Management	• Усыг дахин ашиглах
	• Ус цэвэршүүлэх төхөрөөрөмж
	• Борооны ус ашиглах
	• Усны нөөцийн менежмент
• Smart Waste Management	• Soil pollution management
	• Waste sorting and recycling
	• Waste management
• SmartTransport	• Electric car with low emissions
	• Traffic congestion
	• Bicycle use
	• Car rental
	• Public transportation

Solutions of world's top companies

IBM's smart city and smart city solutions

The concept of a "smart city" has emerged as globalization continues to grow and new needs emerge. It covers a wide range of solutions, including urban transport, public safety, energy, water supply, utilities, education and health. The purpose of this concept is to help cities better understand and meet their needs.

The smart city assessment method is based on a methodology developed by IBM's Global Location Strategy. This helps companies determine the most suitable countries and cities to host their businesses. Cities use this tool, based on a study by the IBM Institute for Business Value, to provide IBM with information on key areas of activity (population, business, transportation, telecommunications, water, and energy). Will provide.

Based on this information, initial recommendations are made to compare the city's capacity with its location, assess its relative strengths and weaknesses, and improve.

Smart city -Transport

For the city, transportation is one of IBM's most important solutions. In the transport sector, urban traffic is a real issue. Not only should cars be smart, but roads should also be smart. In this case, IBM will introduce advanced technology in the construction of new roads, equip vehicles with GPS, which is a roadside sensor and positioning system to control the movement of urban vehicles.

An example of IBM's work is the introduction of a new smart payment system that significantly reduces traffic congestion and emissions in Stockholm.

Fig 21. Smart City – Public Transportation

Smart City - Public Security

By 2050, three-quarters of the world's population is expected to live in cities. For this reason, public safety must be considered an important factor. Here it is important to choose the most appropriate method.

Public officials are focusing on making the security system smarter. Businesses are using advanced technology such as automatic sensing, response, analysis, monitoring, and computational modeling. This technology allows you to anticipate, react and prevent events.

Fig 22. Smart City Ухаалаг хот - Safety

Smart city - Energy and water supply

Thanks to this smart technology, consumers can reduce their consumption and costs. Supply companies now provide consumers with the information they need to monitor their habitual consumption.

Power supply companies can reduce inefficient costs, prevent power outages, and streamline network regimes..

Fig 23. Smart City - Energy

Smart City - Health

In 2010, 30% of the data stored on computers worldwide was health-related images, and the issue of creating smart systems using health solutions will be of interest.

Technology alone will not create this for us. Thus, a healthy individual can use this information to make wise choices to protect their health, treat their illnesses, and find ways to fight infectious diseases.

Fig 24. Smart City - Health

Smart city- Education

Education is an important area for smart city development. For example, a smart city can play an important role in enhancing the effectiveness and efficiency of education for the future of a country.

Management, metrology, and development can improve the efficiency of the school system by 22% at current cost levels.

Here is an example from the United States. The country has 15,000 high school districts and 4,000 universities, while China has 500,000 primary and secondary schools, so many people are responsible for building their infrastructure. This leads to significant inefficiencies, high costs, and misuse of resources.
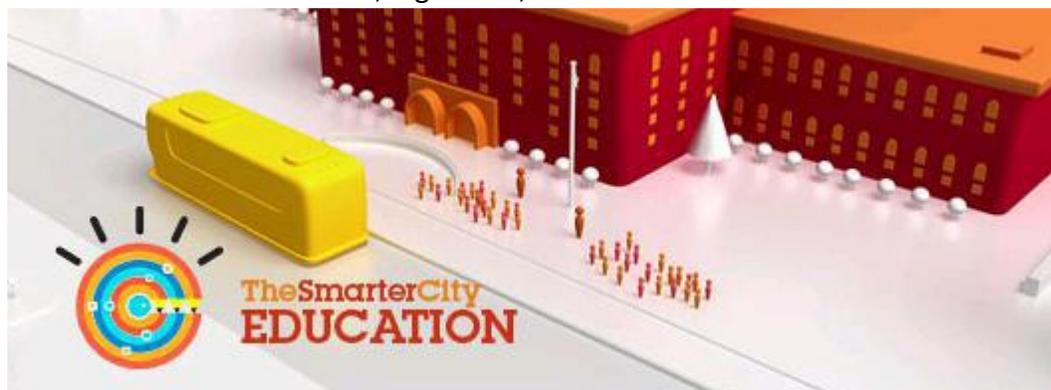
Fig 25. Smart City - Education

IBM Smart City Challenge Help

On March 9, 2011, 24 cities around the world were selected to receive IBM's Smart City Test Grant after identifying the location for the introduction of this method and the

appropriate technological solution. These cities include Guadardara (Mexico), Rio de Janeiro (Brazil), Delhi (India), Antophagasto (Chile) and Glasgow (Scotland). As part of this grant, these cities will be in direct contact with IBM's leading experts to analyze and develop recommendations on opportunities and ways to create a conducive environment for work, life and play.

A total of 100 cities around the world will benefit from this IBM smart city test. The competitive program has a budget of $ 50 million over the next three years for technology development and service delivery.

IBM's selected experts will work together to improve the city's service and performance. IBM technicians, researchers and consultants participated in the selection process. They addressed issues such as health, education and security.

In the end, it was decided to select those cities and participate in IBM's test assistance

SIEMENS MOBILITY solutions

Siemens' Mobility division is an international leader in transportation and logistics, offering a complete Mobility solution.
This solution aims to integrate the operation of the railway system and the traffic control system into the sustainable development and integration of air transport, postal logistics services, railway electrification, urban public transportation, and regional and main highway rolling stock.
Siemens offers a comprehensive solution that is safe, cost-effective, and environmentally friendly for passengers and freight, as it can withstand many challenges by closely coordinating and flexibly handling all modes of transportation.
Siemens' Mobility branch is looking for efficient ways to transport passengers and focuses on creating a variety of transportation networks using the Complete Mobility method.
Siemens Mobility offers four solutions that cover the following industries: These include:

1. Airport logistics
2. Postal automation
3. Railway solutions
4. Road solution

Fig 26. SIEMENS MOBILITY - Solutions

CISCO Smart + Connected Residents

CISCO helps residents connect with each other. Interacting the population in this way has the following benefits. These include:

- Make sustainable economic growth a reality;

- Ensure environmental sustainability through improved resource management and operational efficiency;

- Improve quality of life.

The concept of "smart + interconnected residents" is derived from the combination of "residents + interconnectedness", i.e. the relationship between residents and businesses and "residents + exchanges".

Residents will be able to access information and services related to their lives and improve their lives with appropriate solutions such as homes, schools and transportation.

For CISCO, "Residents + Exchange" is about creating a solution that supports the day-to-day operations, planning, and management of any group of residents.

An example of a "Residents + Exchange" solution can be found in the following areas.

• Water supply and utilities;

• Transportation;

• Safety and security;

• Real estate;

• Government.

STREETLINE smart parking

STREETLINE is a private company based in San Francisco, California. In collaboration with STREETLINE, most cities around the world are renovating their parking lots using the smart parking method.

This method provides information on parking usage and real-time payments. Other benefits include improved smart parking policy planning, increased profitability, reduced emissions, and improved compliance with regulations. The following figure shows the actual parking situation in real time.
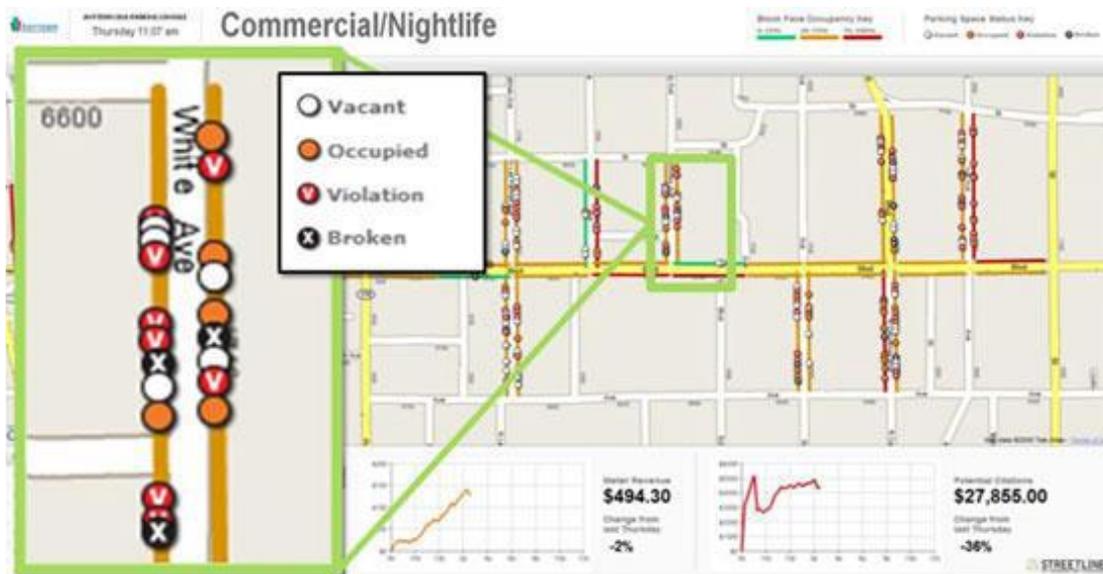
Fig 27. STREETLINE Smart Parking

The smart parking allows the driver to reach the vacant parking lot with the help of the parking guidance system. It also helps to quickly find vacant parking spaces, which is important to reduce emissions.

E-Government

Definition, purpose and indicators

Information technology was used in government work in the 1970s, and the Internet was introduced in the 1990s, marking the beginning of e-government. There are many definitions of e-Government. Here are some commonly accepted definitions.

e-Government is	✓ A comprehensive approach to improving public services through the use of information technology, especially the Internet
	✓ Democracy in the use of information technology in public services, creation of new capabilities and new structures to improve public services / EU definition /
	✓ Government services provided via the Internet
	✓ Technological solutions for good governance
	✓ It's not just a matter of setting up a computer and having a website on the Internet, it's a matter of improving the quality of citizen-government relations..

The purpose of e-Government is:

- Governance that works faster
- Improving public services and getting rid of bureaucracy
- Provide public services for justice and transparency
- Get rid of corruption
- Ensuring democracy, etc.

The indicators to be evaluated by e-government users are:

- Accessibility
- Demand
- Satisfaction
- One-stop service
- Easy to use

E-government services can include all types of government services. For example, the

European Union has selected the following 20 e-services as its core services.

1. Corporate tax reporting and registration

2. Labor market and exchange

3. Social insurance services

4. Civil registration

5. Car registration

6. Building permit

7. Police information

8. Public library

9. Document reference

10. University registration and enrollment

11. Migration records

12. Health care

13. Public activities

14. Environmental permits

15. Procurement activities and tenders

16. Register a company

17. Customs clearance

18. Value Added Tax Report

19. Obtain statistical data

20. Personal income tax return

Information technology policies of different countries

Recognizing the vital need for information technology in the development of the country and the lives of its people, every country in the world is developing a national

program on information technology. For example:

	Name of the country	Name of the ICT strategy and Program
1	India	IT Action Plan – IT for All by 2008
2	Indonesia	ICT Policy Framework, 5 year Action Plans
3	Japan	e-Japan Strategy I and II
4	Korea	e-Korea Vision 2006, Ubiquities Korea
5	Malaysia	National IT Agenda, Super multimedia Passage
6	Mongolia	ICT strategy; e-Mongolia program*
7	Singapore	Infocomm 21 Master Plan, Smart Island
8	Thailand	IT2010

Fig 28. IT Policies of Different countries

Ranking of e-government in the world

Many research organizations are doing research on e-government in many countries. For example, in a 2012 study by Waseda University in Japan, the following countries ranked first.

No	Final Rankings	Score	No	Final Rankings	Score	No	Final Rankings	Score
1	Singapore	93.8	20	Netherlands	69.0	38	Brunei	52.1
1	USA	93.8	21	Portugal	68.8	40	UAE	48.3
3	Korea	91.5	22	Spain	67.5	41	Chile	48.1
4	Finland	88.7	23	Thailand	67.1	42	Pakistan	47.5
5	Denmark	86.5	23	Malaysia	67.1	43	Venezuela	47.0
6	Sweden	84.1	25	Mexico	66.3	44	Peru	46.9
7	Australia	82.8	26	Israel	65.3	45	Romania	46.2
8	Japan	81.5	27	Hong Kong	63.2	46	Argentina	45.5
9	UK	81.0	28	Czech Republic	62.1	47	Kazakhstan	44.5
10	Taiwan	80.1	29	China	61.5	48	Tunisia	44.1
10	Canada	80.1	30	Turkey	61.0	49	Fiji	43.6
12	Germany	79.2	31	Philippines	58.2	50	Egypt	42.1
13	New Zealand	76.7	32	South Africa	57.5	51	Cambodia	40.4
14	Belgium	75.2	33	Indonesia	56.2	52	Iran	39.0
15	Switzerland	73.5	34	Brazil	55.6	53	Nigeria	38.4
15	Norway	73.5	35	India	54.7	54	Uzbekistan	37.1
17	France	71.9	36	Macau	54.4	55	Georgia	36.8
18	Italy	71.3	37	Russia	53.4			
19	Estonia	70.8	38	Vietnam	52.1			

Fig 29. Ranking of E-Governments

Experience of e-Government projects in countries

New Zealand E-Government Structure
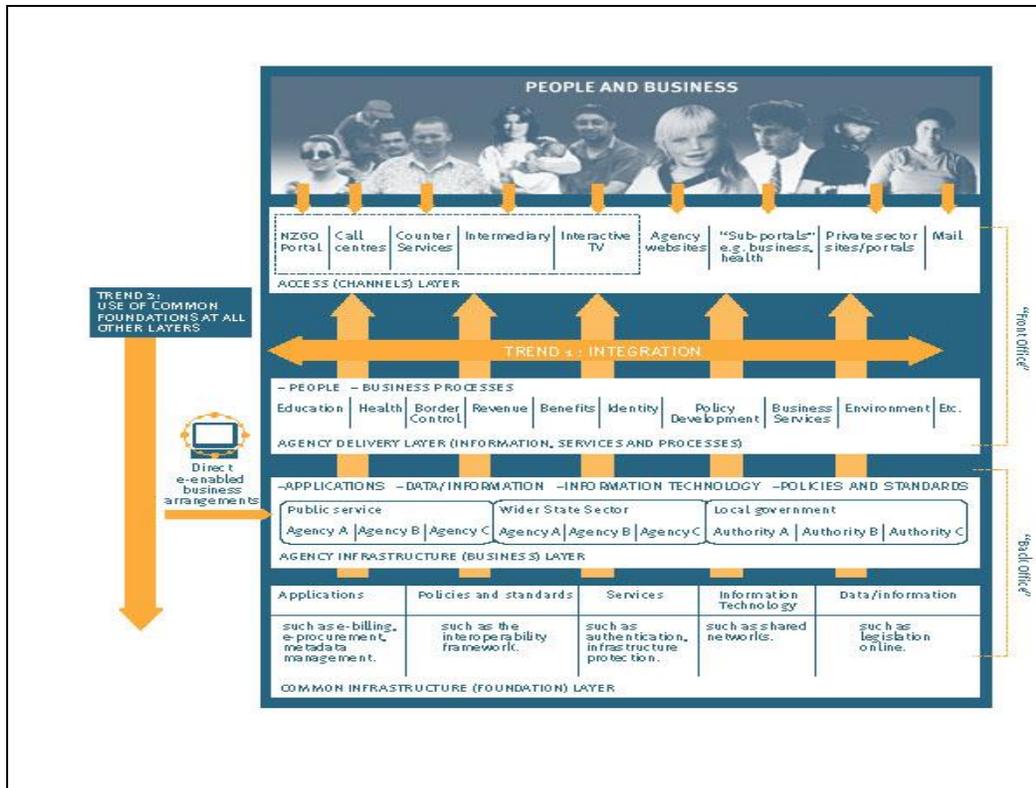
**Fig 30.** New Zealand E-Government Structure

Australian E-Government Structure
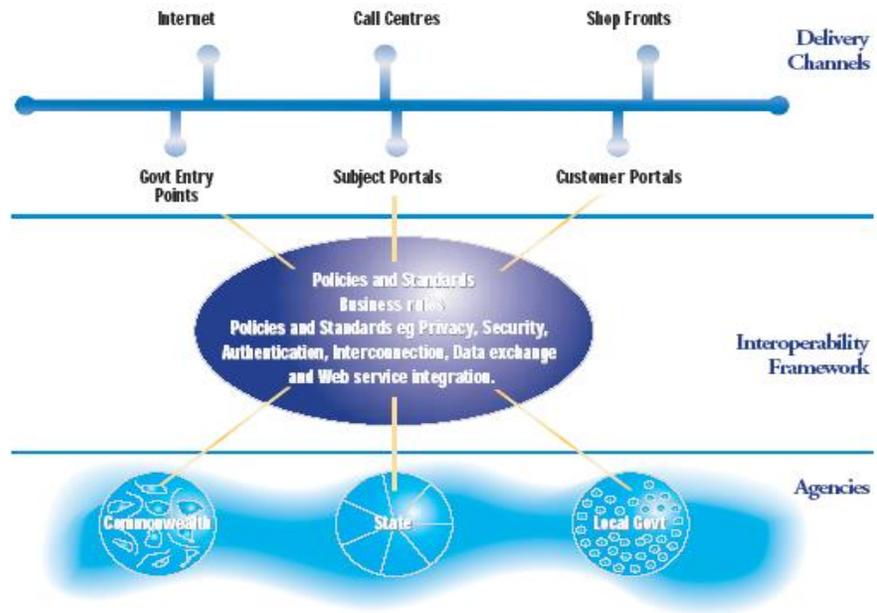
**Fig 31.** Australian E-Government

The structure of e-government in India
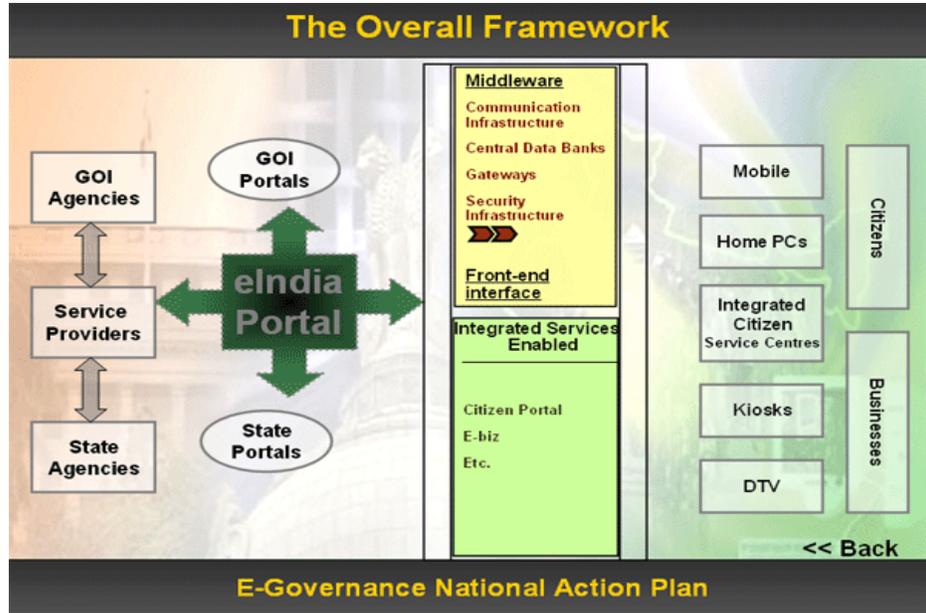
Fig 32. Indian E-Government

Shirilanka E-Government Structure
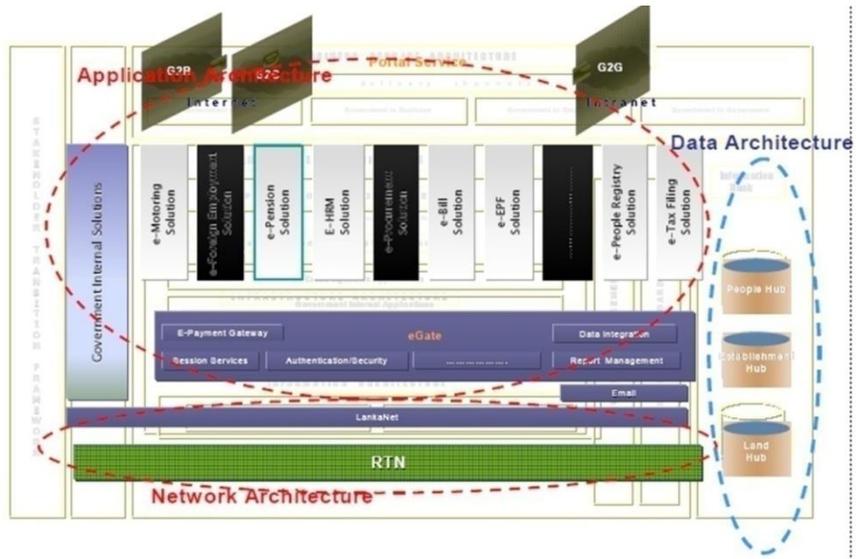
Fig 33. Sri Lanka E-Government

Practical Plan and Solutions of Smart City

Motivation

The common goal of smart cities in the world is to quickly sense the interests of the city's residents and create the environment they expect. Citizens must live in peace in a fair, safe and healthy environment. The smart city will introduce a whole new set of people, services and technologies aimed at ensuring economic growth, reducing costs and introducing fast-paced services. The city will be under full citizen control.

The Smart City Program is a major development that covers all areas of urban activity. The program will take all business sectors to a new level of technology and introduce many services and technologies into every aspect of urban life to create a fair competition and a corruption-free environment.

The main goal of smart cities is to create a green city, control environmental pollution and create a healthy environment by introducing environmentally friendly technologies, green facilities, new recycling solutions and technologies.

Smart cities are leading the way in adapting to the needs of population growth and business competition, and in building the foundations and good governance that will sustain urban development for centuries to come.

Technological advances over the past five years, changes in people's knowledge and skills, and new service models have created ample opportunities to start building smart cities.

A city is a large, complex system that combines many different infrastructures, activities, and lifestyles. Smart city solutions allow such a large system to be integrated and managed according to integrated system theory. Integrating control and management from separate management is a key function of smart city operational management information systems.

Smart cities will be easier, clearer, more transparent and faster to integrate and coordinate mutually beneficial cooperation between city government, business organizations, branches and citizens.

Smart cities are projects that focus on long-term economic benefits, environmental protection, and citizen-business satisfaction.

Fig 34. Why we must build Smart City
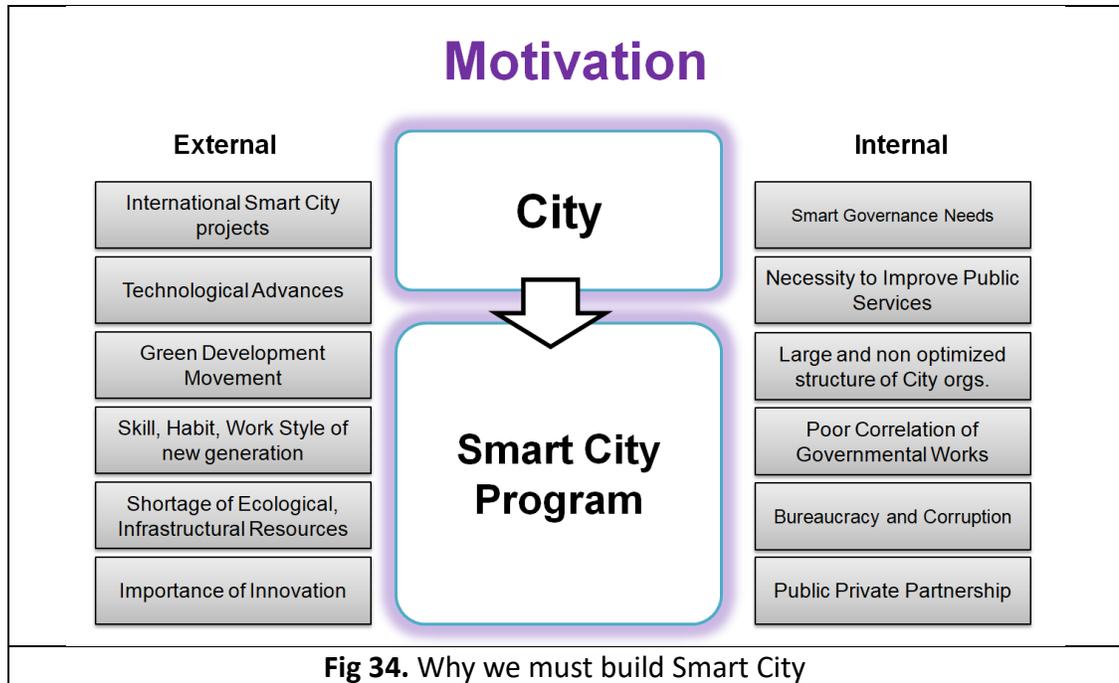
Key components of Smart City Program

Smart governance: Establish an open, transparent and participatory governance system, carry out legal reforms and introduce e-government.

Smart economy: To help businesses improve government-business relations and move to a knowledge-based economy that promotes sustainable urban development.

Smart People: Create an environment for the development of science, technology and innovation systems based on intelligent people.

Smart services: Implement a comprehensive solution to simplify public services by creating a flexible, accessible, reliable information environment and infrastructure in the city.

Smart environment: Create an environment that is comfortable, healthy, safe and comfortable to live and work.

Smart life: To create housing, buildings, living environment and service infrastructure to ensure high living standards of citizens.

Key Components of Smart City program
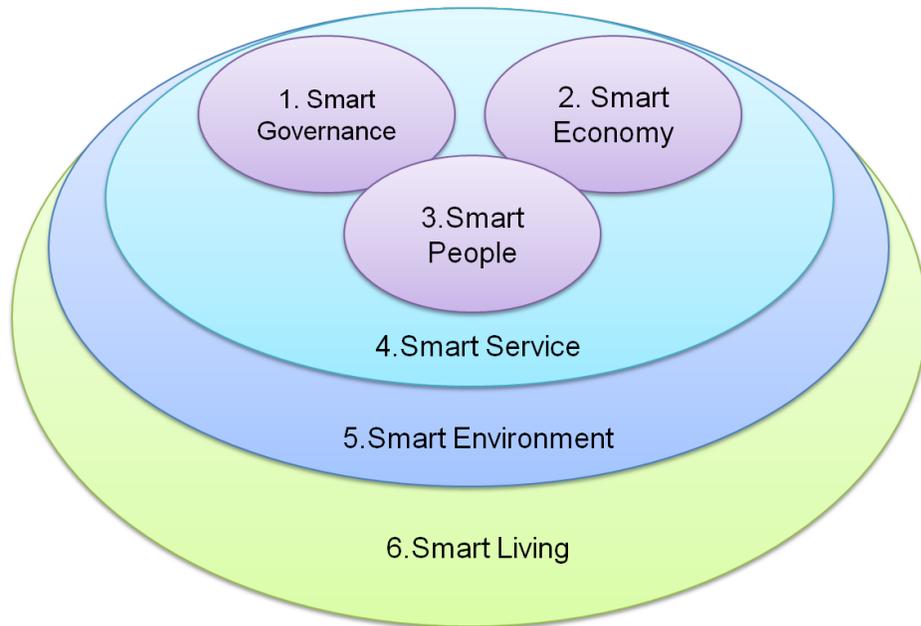
Fig 35. Key Components of Smart City Program

Smart Governance

Smart Governance. Establish smart governance at the city level that works in the right structure, makes smart decisions with the participation of all, operates in a transparent and understandable manner, and creates a culture of public action. Activities to be carried out within this guideline:

Redevelopment of urban development policy and planning activities

1. Establish an integrated development policy management structure for Smart City. Things to do:

*Conduct basic research on urban development and develop a formula for implementing optimal solutions.

New Governance
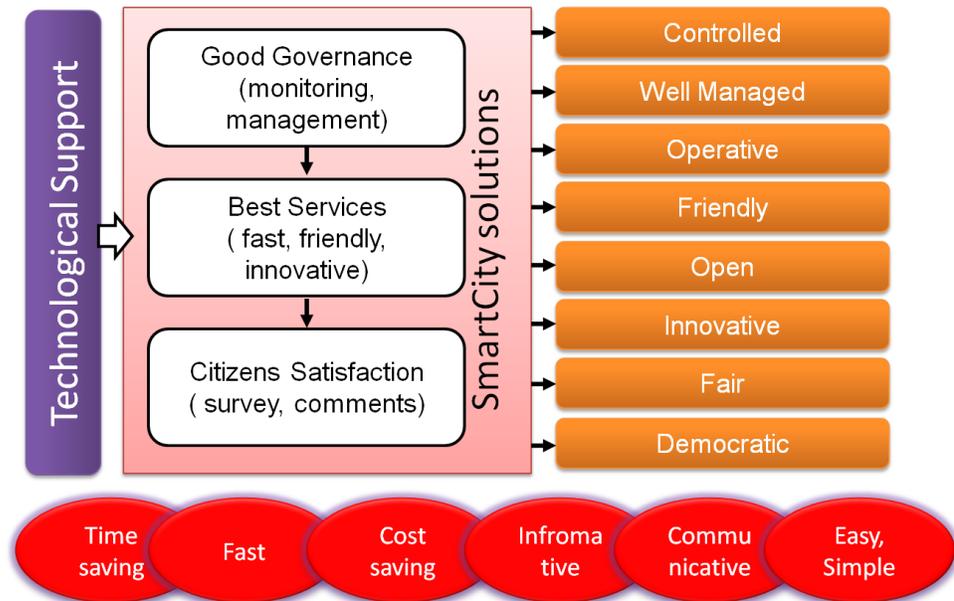
Fig 36. Smart Governance

* Analyze the progress of the program and identify key indicators of smart city change on a regular basis.

* Create innovative urban design models and standards, and restructure to adapt to new responsibilities.

Smart city solutions:

* Develop an integrated program management information system

* Launch a web portal for urban development discussions.

* Establish an automated dashboard system to calculate the citizen satisfaction index.

Expected results:

* Reduce the number of civil servants per 10,000 citizens to ..... s ....

* Increase the speed of each service by ..... percent and become a city with innovative and cultured services.

* Create a new city with information, decision-making capacity and structure to adapt quickly to development changes.

2. Implement "Smart City" infrastructure technology development program

Things to do:

* Build hard and soft technological infrastructure.

* Establish technological infrastructure to support the long-term sustainable development of the city, capable of supporting the growth of the city's population, the speed of business activities, and the growth of production and development

* It will be an environmentally friendly green city by effectively introducing technological advances.

Smart city solutions:

The Smart City program technology solution will be implemented in three stages.

* In the first phase, E-City's information infrastructure will be established and public services will be fully electronic

* In the D-City phase, we will create a city that is equipped with technology and is sensitive to the processes and delays in every cell of the city.

* In the final stage, S-City will replace all the basic infrastructure with smart solutions and become a Smart City with a fully managed infrastructure from one point.

Expected results:

* A powerful data center will be established to monitor and manage city life as a whole

* The city will have a fully wireless internet environment

* Applicable to world-class cybersecurity and information security solutions in urban network and information centers.

* Infrastructure will be 50-80 percent more efficient and several times more reliable than it is now.

3. Develop an optimal urban planning model

Things to do:

* Establish city sub-centers.

* Ger area redevelopment will continue

* New districts will be built with Smart City policy.

Smart city solutions:

* Develop an electronic map of each layer of the city's solid infrastructure, including soil resources, underground engineering structures, soil quality structures, streets, buildings, communications, and airspace.

* Technologies such as Google Street View can be used to create a "3D realistic map" of the city.

* Develop an electronic system for informing urban development maps in a clear and simplified form.

Expected results:

* Urban development is under the universal control of new methods and technologies

* There will be full city spending

4. Create a big data forecasting system (Big data)

Things to do:

* Experience the city's daily activities every hour and minute.

* Create a unified database

* Predict the process

Smart city solutions:

* Establish a unified database management system

* Introduce information engineering solutions

* Establish an instant information network

Expected results:

* Crime and the spread of infectious diseases are predicted in certain areas.

* Provide public administration with forecast information.

Optimization and reform of the legal framework

1. Improve the existing legal environment in the city

Things to do:

* Criteria and types of legal documents to be issued at the national, city and municipal levels will be defined.

* Eliminate overlaps and inconsistencies between regulations and decisions in the city. Most regulations are the same in the capital city, and all districts follow the same rules, limiting districts to issuing separate regulations.

Smart city solutions:

* Establish an integrated system for registration, monitoring and open information of decisions set by common norms issued by municipalities.

Expected results:

* Create an environment for proper and fair governance

2. There will be a "City Charter"

Things to do:

* Establish common rules for city government organizations, residents, business entities, governmental and non-governmental organizations to work and live in the capital city.

Smart city solutions:

* Develop information systems and smart device applications that constantly remind you of each provision of the city rules

* Launch a web portal for grammar introduction, discussion, and online training.

* Make animations and games explaining the rules

Expected results:

* Everyone living in the city will have a set of rules to follow.

* The culture of the city and the system of responsibilities for living in the city will be clear

3. A set of simplified and mandatory procedures that are understandable to the public shall be universally enforced.

Things to do:

* Everyone living in the city will develop a set of simple, essential and easy-to-understand rules to follow in their daily activities.

* Coordinates the implementation of regulations

Smart city solutions:

* Develop software to interpret, practice, and test simplified grammar sets.

* Monitor the implementation of regulations and create a social media environment for consultants.

Expected results:

* Urban residents will be cultured, organized and coordinated.

Restructuring of municipal organizations and reform of their functional functions

1. Establish "Public Service Centers"

Things to do:

* Establish specialized service centers where you can get all kinds of government services. Transfer from public service district committee to public service centers.

* The centers will have service tellers and professional experts.

* The centers will be evenly distributed according to population density and type of services.

* Eliminate paper references, verify references through the center's electronic network, and save paper, time, and costs.

* All branches of vertical government will provide public services through a unified public service center.

Smart city solutions:

* Connect to the public service information system of public service centers.

* Digitalize the operation of the Public Service Centers.

* Each center will have an electronic system to evaluate the service load, skills and communication culture of service staff.

Expected results:

* Every citizen and organization will be able to receive prompt and professional service through the electronic and the nearest and least busy public service points.

2. Change the functions of the district

Things to do:

* The workload of public services will be shifted from districts to public service centers, and the district will become a citizen's representative body to protect the interests of citizens living in the area and to coordinate collective decisions.

*

Smart city solutions:

* Integrated information systems for citizens' information exchange, information inquiry and activities will operate in the district.

Expected results:

* Districts will become non-governmental organizations.

Communities shall become citizens' organizations

Things to do:

* Communities will be transformed into community centers.

* Communities provide residents with special rights for research and co-employment.

Smart city solutions:

* Citizens and Communities electronic communication system will be created.

* There will be an electronic information channel to be delivered to the Communities Information Agency.

Expected results:

* Communities are the primary unit for solving problems together.

Switch to contract services

Things to do:

* Most of the UB's services will be outsourced to contractors.

Smart city solutions:

* Contract announcements and contracts will be submitted electronically.

.

Expected results:

* Switch to contract service mode.

City good governance and operational productivity management

1. Establish a "good city management" system.

Things to do:

* Management tasks, speed of decision implementation and reporting standards

* Accountability system for decision-making and oversight officials

Smart city solutions:

* Management information system.

* Task solution information, performance and accountability monitoring system

Expected results:

* Management decisions are executed quickly and reported back.

2. Switch to productivity-based operation mode. Employee e-jobs will be created.

Things to do:

* City employees will report on their work every day and every hour in the future.

* Establish a unit for measuring productivity.

* Develop productivity incentives and responsibilities.

Smart city solutions:

* Provide all opportunities for employees to conduct their work electronically through the electronic workplace system.

* Each employee reports electronically on a daily basis.

Expected results:

* Employee and collective productivity will increase by 40-70 percent.

3. Enter a new mode of performance monitoring and accountability.

Things to do:

* Integrate oversight of city-wide activities.

* The results of the monitoring will provide integrated reports on the quality, speed and progress of the work.

Smart city solutions:

* Develop integrated monitoring and sectoral monitoring information systems.

*.

Expected results:

* Interaction of control, responsibility, service and results.

4.Improve service speed and culture, eliminate bureaucracy and sources of corruption

Things to do:

* Eliminate the opportunities and causes of rudeness, bureaucracy and corruption that arise in the course of personal contact.

* Capacity building of UB local government staff

Smart city solutions:

* Develop e-services and open information systems.

*.

Expected results:

* It will be a fair, equitable, open and efficient city

5. Ensuring transparency and creating an open and fair environment

1 Citizens shall have full control over the day-to-day operations of government and public service organizations and their employees.

Things to do:

* Publicize the day-to-day work of city government officials.

* Every citizen will have the opportunity to evaluate employee behavior and performance.

Smart city solutions:

* Develop a program to evaluate civil servants of the capital city and write comments on their work in one electronic citizen window.

* Develop a public information system based on the daily working group of the employee's electronic workplace.

Expected results:

* The work of city government officials will be appreciated by the people who interact with them and the quality of service will be improved

5.Introduce the "Open Account" system in the financial activities of each city, agency and organization and report to the public in an understandable way.

Things to do:

* All city offices report their daily cash flow, withdrawals, and property expenditures to the public on an hourly basis.

* Each report will be compiled by the capital city, land agencies and individuals and presented to the public.

Smart city solutions:

* Develop an integrated city open account system and put it into daily use.

Expected results:

* Three-pronged use of capital and money in the city, public control over the use of assets and a significant reduction in wasteful spending

6. Establish an open information system.

Things to do:

* Establish procedures for open information that can be used by anyone without any restrictions.

* Digitize open information

Smart city solutions:

* Develop an information system to help use open information at the city level for everyone's daily needs.

Expected results:

* Provide equal opportunities for all citizens to receive and use information.

7. Introduce an "Open Tender" system for procurement.

Things to do:

* Transparency of city-wide procurement activities.

* Measures will be taken to fully involve stakeholders in the dissemination of information on procurement activities.

* Procurement information will be distributed free of charge.

* In particular, make the selection process fair

* Contract performance black book will be kept open to the public electronically

Smart city solutions:

* Develop a "glass tender" system for informing the public about the procurement process, easy to monitor, and auditing complaints.

Expected results:

* Eliminate all suspicions and collusion related to the procurement process.

8. Establish a "transparent license" system to make all types of licenses and licensing processes available to the public.

Things to do:

* Reduce the number of licenses and licenses.

* Make the documents required for obtaining licenses clear.

* Anyone who meets the requirements will be able to obtain a license without hindrance.

* Improve the liability control of the licensee. It will be under the control of citizens

Smart city solutions:

* Develop an "Transparent License" electronic information system for issuing, reviewing, and simplifying all types of licenses.

Expected results:

* Every eligible citizen and organization will be able to obtain a license without any obstacles

9. Establish a "Citizen Participation" system that enables citizens and all members of society to participate in the formulation, decision-making and implementation of government policies.

> Things to do:
>
> * Establish procedures for introducing specific ideas and activities initiated by citizens and organizations to the capital city administration and services.
>
> * Some public service providers will be transferred to citizens and organizations.
>
> Smart city solutions:
>
> * Develop an information system that regularly informs citizens about their participation and results and encourages their participation.
>
> Expected results:
>
> * Citizens will have the opportunity, confidence and encouragement to participate fully in the development and improvement of the city

Smart Economy

Create a favorable business environment, encourage innovation and stimulate entrepreneurship. Activities to be carried out within the framework of this guideline :

1. Become a city that supports innovation

> Establish urban innovation centers
>
> Things to do:
>
> * Create innovation centers.
>
> * Incentive movement to support new ideas among citizens
>
> Smart city solutions:
>
> * Implement technological innovation initiatives.
>
> *.
>
> Expected results:
>
> * Build a city that supports innovation
>
>
> Establish a palace for children and youth and technical thinking in each district
>
>
> Every citizen of Smart city shall initiate an innovative movement
>
> Establish an urban competitiveness research association

Smart Economy
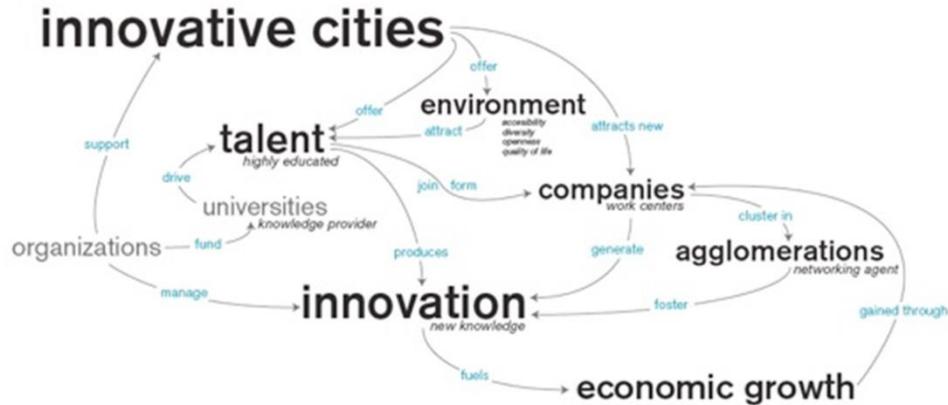
Fig 37. Smart Economy

2. Creating a favorable environment for doing business

Preferential participation of national producers in public procurement

Things to do:

* Create a list of activities of national producers and a database of work done.

* Strive to notify all contractors of proposals for participation in public works

* Procedures will be established for assigning support jobs to start-ups, regardless of experience.

* Try to involve as many companies as possible

* Regular consultations with professional manufacturers will be organized to find the right solutions for large projects and programs.

Smart city solutions:

* Establish a unified database of ash producers

* Establish an electronic discussion system to discuss the right project technology solutions.

Expected results:

* Support knowledge and production and create a foundation for national producers to grow.

Establish a land exchange

Things to do:

* Urban land will be taken to a new level of management.

* New economic zones will be created around the capital city

* Illegal land trade will be stopped and put under public control

* Provide everyone with the right understanding of land use

* Land reuse system will be established

* Land registration will be of good quality.

Smart city solutions:

* Establish land exchange information infrastructure. Develop trading, settlement, dealership and information subsystems.

* Urban land database and manual efficiency index information system will be created.

Expected results:

* Efficient use of land and registered trading.

Restrict public investment in activities that can be performed by the private sector. Increase the number of works and services to be performed under the concession agreement

Things to do:

* Increase the percentage of works and services that can be performed with private investment every year.

* Concession agreements will be used more to complete works and services in the capital city.

* Establish investment accountability and incentives.

Smart city solutions:

* Develop an information system for private investment and concession work.

* Pursue a privately invested project performance monitoring information system.

Expected results:

* Urban development will be accelerated by public and private investment.

Issue a "Green Light" procedure for concluding a direct contract with a business entity that completed its previous contract work on time and with quality

Things to do:

* Criteria and list of reliable contractors will be developed.

* Accelerate project selection and increase the number of direct contract works.

* Increase corporate responsibility.

Smart city solutions:

* Develop an information system to manage the "green light" contracting process.

Expected results:

* Construction work will be done quickly and efficiently.

* Reduce the bureaucracy of procurement

Rationalize public-private relations and transfer some public functions to the private sector

The capital city's property policy will be formulated rationally and most of the property will be transferred to contracts, leases and leases.

Things to do:

* Improve property registration.

* Make a list of property to be leased or leased

* Property use audit will be established.

* The contract will be made through an open tender

Smart city solutions:

* An open bidding information system will be set up to lease property required by the capital city

* Develop a program to monitor the use and efficiency of all property in the capital city.

Expected results:

* The use of property will be drastically improved and there will be a responsible owner

Restrict the economic activities of local organizations. Some public services will be transferred to the private sector.

Things to do:

* Analyze each work and service of each local state-owned organization and make a list of tasks to be performed by the government, individuals, community and residents.

* Establish a risk management system for the transfer of public works to the private sector.

* Reduce the number of city-owned organizations and refuse to establish new ones

Smart city solutions:

* Develop an integrated control and management information system for public and private activities.

Expected results:

* Improve the quality of local government operations and services.

Investment Promotion

Establish procedures to support foreign and domestic investment in urban areas.

Things to do:

* Establish procedures to encourage investment in urban development.

* Establish a system for investment transparency and performance analysis.

* Establish a working group to attract large foreign investment.

* Create city bonds and sell them in foreign markets.

Smart city solutions:

* Develop special regulations to support investment in new technologies

Expected results:

* Create a source of urgent funds for urban development

Establish procedures to support and encourage citizens' initiatives to make private investments in their environment.

Things to do:

* Establish procedures that specify the direction, restrictions, and specifics of private investment.

* Incentives and investments will be provided to those who have improved their living environment.

Smart city solutions:

* The capital city will help build the technological infrastructure to invest in the environment.

Expected results:

* A system will be established to support the participation and activity of every citizen in urban development.

Creating a City Brand

Develop a "Brand Book" for the city and change the general color and shape of the city, street and square equipment, buildings, public services and clothing color design.

Things to do:

* Unify city brands.

* Anyone can see city activities from anywhere.

* Uniforms for civil servants.

Smart city solutions:

* Widely used in national design, technological advancement and lighting mapping solutions.

Expected results:

* The appearance of the city will improve. It will be different from other cities in the world.

The city will create unique branded products, cultures, skills, food, green spaces and ornaments among the cities of the world.

Things to do:

* Clarify the standards and uses of products that take into account the specifics of the city.

* Launch City brand products in the international market.

Smart city solutions:

* Combine technological progress with national characteristics to create a unique product in Smart City

Expected results:

* Introduce the city to the world and its citizens.

Introduce a tree planting movement for the city to create a green environment in the form of regular, competitive, voluntary and recreational activities.

Things to do:

* Green city will create a movement.

* Grow trees and plants suitable for city's weather and brand colors

* Establish a resident council to protect green areas

Smart city solutions:

* Develop biological and genetic solutions to create new weather-resistant green environments.

Expected results:

* Create a city with a clean and beautiful environment.

Activation of the labor market

It is customary for group leaders to conduct regular employment and daily knowledge and skills surveys of each citizen. Labor tourism activities will be carried out at the committee level by volunteers.

Things to do:

* Surveillance of employment surveys of people living in each household.

* The survey will be conducted by the committee, unit, CHP staff and on a voluntary basis.

Smart city solutions:

* Establish a household information system on employment and job placement.

Expected results:

* Create a city where everyone has a job and every household has an income

Maintains an online employment index.

Things to do:

* An online index of employment and job placement will be released to inform citizens.

* A survey will be conducted on each type and form of employment in City.

Smart city solutions:

* Establish an online labor exchange system with volunteer intermediaries for household employment

Expected results:

* Unemployment will be registered and controlled to help the unemployed at the household level.

Establish a microfinance system. Establish and equip special zones to support small and medium enterprises and create an environment that encourages employment.

Things to do:

* Small and medium enterprise support centers will be established in the city.

* Establish a state microfinance fund at the city level.

Smart city solutions:

* Develop a loan fund information system

Expected results:

* Citizens' income and employment will increase. Citizens will be provided with practical assistance and advice

Smart People

Improve the education and skills of the city's citizens and inculcate the city's culture. Work to be done within this guideline

Fig 37. Smart people

Educated and knowledgeable citizen

Establish a universal non-formal education network

Things to do:

* Create a universal, open and online learning system.

* Assist citizens in retraining.

* Provide educational opportunities for working people and the elderly.

* Spend your free time productively and increase the number of knowledgeable people.

Smart city solutions:

* Create a public online learning environment system and issue licenses and certificates

Expected results:

* The number of educated and capable people will increase.

Cooperate with individual development, book and knowledge communities.

Things to do:

* Create facilities to support human development and self-development.

* Increase public libraries and online books.

* Support the activities of Dharma-loving communities

Smart city solutions:

* Create an online reading room in the city

Expected results:

* Everyone develops a mindset to develop independently.

An informed citizen shall create an environment

Things to do:

* Increase the participation of experts to help citizens get the information they need quickly and accurately.

* Create a database on Smart City.

* Provides access to important information from a single point.

Smart city solutions:

* Establish a unified general information portal and call center

Expected results:

* Make information flow clear.

Urban Culture - Civic Pride - Clean City

Things to do:

* Take comprehensive measures for education, training and organization to create a waste-free and clean city.

* Increase citizen participation in enhancing the city's appearance.

Smart city solutions:

* 10 beautiful locations of the city will be advertised on the media and create a competitive pride among the residents.

Expected results:

* Develop a desire to live in a clean and beautiful city.

Procedures for joint ownership.

Things to do:

* Joint ownership will be registered and controlled by a responsible owner.

* Create economic incentives to involve residents in the efficient use, conservation and protection of common property.

Smart city solutions:

* Develop an integrated information system for registration, management and control of joint ownership.

Expected results:

* Each property will be controlled and profitable

Norms and customs of good behavior in public places

Things to do:

* Establish proper behavior in public places and conduct regular advertisements and trainings.

* Citizens will learn resistance skills.

Smart city solutions:

* Operate a social information system that informs each other about right and wrong actions

Expected results:

* It will be a city with good relations and no frustration.

Service culture standards

Things to do:

* Establish mandatory service culture standards for public services.

* The license will be extended based on citizens' comments on the service culture.

Smart city solutions:

* Operate a service information and evaluation system

Expected results:

* Improve the overall service ground service.

A healthy and active person

A person without bad habits will support the initiative.

Things to do:

* Increase alcohol-free environment and promote proper consumption.

* Support all aspects of community initiatives to get rid of bad habits.

Smart city solutions:

* Training and educational materials will be promoted

Expected results:

* More and more people will break free from bad habits, have incomes and goals for the future.

Implement a healthy person and universal physical education project

Things to do:

* Increase the area for public sports.

* Facilitate the issuance of permits for healthy eating places.

* Improve food safety control.

* Promote active and interesting public life

* Create a large number of voluntary partnerships

Smart city solutions:

* Launch a healthy life information portal

Expected results:

* The number of healthy and active people will increase and unemployment will decrease. Crime will decrease.

Moral and family relations

Encourage correct action

Things to do:

* Promote the right actions and the right life

* Develop a unified procedure for keeping time

* Establish procedures to help the elderly, infants and people with disabilities

Smart city solutions:

* Promote lessons and good deeds

Expected results:

* Learn to support good deeds and to condemn wrongdoing.

Family Respect Movement

Things to do:

* Strengthen the family

* Create a new family day

Smart city solutions:

* Promote family values

Expected results:

* It will be a city with many good families.

Smart Service

Make public services easier, more civilized and more controlled. Activities to be carried out within the framework of this guideline :

Fig 39. Smart Service

Government - civil service

Public service centers shall be established regionally taking into account population density and space.

Things to do:

* Provides access to public service points within 10 minutes anywhere

* Qualify civil servants

* Improve service culture

Smart city solutions:

* Establish an information system and connect to all public service centers to provide the same services

Expected results:

* There will be no congestion in public services. Anyone who can use a computer can get most of the services from their home through a single citizen electronic window.

Communicate with the majority through a single electronic window

Things to do:

* Provide access to all types of e-services to citizens through one website.

* Citizens' web windows are the main tools for obtaining all relevant information, tracking their accounts and payments, accessing government services electronically, and evaluating government and public services.

* Simplify services by creating standard service packages that are essential and regularly available to every citizen.

* You can communicate using computers, mobile phones, tablets and televisions with one window.

* Special information security solutions are provided. The electronic keyboard uses font technology.

* It is possible to integrate all types of electronic government services.

* It will be easy to use for ordinary citizens.

Smart city solutions:

* Develop a citizen's electronic one-stop-shop software based on cloud computing technology, government information interconnection, and integrated system solutions

Expected results:

* Anyone who can use a computer will be able to access government services anywhere, anytime.

Regularly study the lives of citizens.

Things to do:

* Not only listening to citizens' comments and suggestions, but also studying them

* Research by researchers who work closely with citizens will be used in public policy development

* A committee and household survey team will be established

* The research methodology will be professionally prepared and the results will be used effectively.

Smart city solutions:

* Launch an online information system to receive and consolidate all survey results

Expected results:

* Advanced research methods and technologies will be used to realistically determine the aspirations of the people.

Government - Business services

Simplify and digitalize government-business services

Things to do:

* Make business services as electronic as possible.

* For face-to-face services, face-to-face meetings with public service officials will be abolished and services will be provided through specialized service staff.

* Increase the number of business support services.

* Reduce and simplify the number of public services

Smart city solutions:

* Create a comprehensive system to digitalize government services to businesses.

Expected results:

* Businesses will be more interested in receiving government services and support.

To listen to the voice of business organizations against government bureaucracy and increase their rights and responsibilities

Things to do:

* Establish business consulting centers

* There will be a special team to eliminate government bureaucracy

* Increase the productivity of civil servants

Smart city solutions:

* Bureaucratic index is issued for each job and service.

Expected results:

* Transform public services into fast and fair

Establish consulting services to promote competition in foreign markets

Things to do:

* Establish an information center and portal to meet business representatives and foreign partners.

* Establish consulting services for foreign markets.

* Special orders will be provided for the growth and experience of foreign export organizations.

Smart city solutions:

* Launch an information portal for finding foreign orders and obtaining technological information

Expected results:

* Support the creation of a competitive manufacturer in the global market.

Speed and accessibility of public services

Improving the exchange of information between organizations will reduce the number of documents required from citizens. Switch to less paper technology

Things to do:

* Integrate information from the vertical system of public services into the horizontal structure of services.

* Public service inquiries will be received electronically and paper inquiries will be eliminated.

* Reduce inquiries from citizens about public services.

* Consolidate black book references of citizens and organizations. All rights to services not provided to blacklisted citizens are open.

* Eliminate duplication and gaps in public services

Smart city solutions:

* Establish a unified list of citizens and organizations in the black book.

Expected results:

* Most government services will be available only with ID cards.

Improve video and electronic surveillance of public services.

Things to do:

* Improve the speed and culture of public services.

* Integrated control over service speed and technology sequence.

* Introduce an electronic ticketing system to the service and monitor each stage of performance.

Smart city solutions:

* Introduce an electronic ticketing system for services.

* Develop an integrated electronic control solution

Expected results:

* All public services will be transferred to a unified system of control and accountability.

Introduce cloud technology to government services.

Things to do:

* Provide access to public services from anywhere, anytime, anywhere.

* Everyone will have equal access to information and services.

Smart city solutions:

* Create infrastructure and software to access services from anywhere, anytime with internet and mobile phone using cloud computing solutions.

Expected results:

* Effectively use new information infrastructure and solutions in public services

Operational management of public services

Establish a unified operational management center.

Things to do:

* Establish an integrated control center for electricity, heating, water, police, lighting, roads and public transportation.

* Install a large number of special intelligent monitoring devices.

* Establish a network of monitoring devices and an integrated control center.

* Develop integrated monitoring software.

Smart city solutions:

* Establish an integrated public service emergency control center

Expected results:

* It will be a city with integrated technology solutions and prompt control

Integrated control information shall be made public.

Things to do:

* Every citizen can get it from the relevant information control center.

* Allow the private sector to develop software for smart devices using information from the Unified Control Center.

Smart city solutions:

* Develop a wide range of applications using controlled smart city solutions

Expected results:

* You can control and manage each piece of equipment using smart tools.

Smart Environment

Create a comfortable, peaceful and creative living environment and infrastructure for citizens. Activities to be carried out within the framework of this guideline :

Smart Environment – IoT and Big data

Fig 39. Smart Environment

Create a healthy and safe living environment

Occupational health and safety will be maintained on a regular basis.

Things to do:

* Provide information systems and organizational measures for regular updating of health and safety index information.

* Information from automatic measuring devices is used to calculate the EHI.

* HSE information will be shared with every citizen and made available on a daily basis.

Smart city solutions:

* Maintain information system for recording, aggregating and calculating OHS information.

Expected results:

* Every citizen will feel and work in the environment in which they live.

Introduce green economy solutions and award environmentally friendly grades to all vehicles and facilities.

Things to do:

* Special notes will be issued for vehicles and equipment that emit carbon dioxide, use raw materials that are harmful to the environment, and require a lot of energy. Create a tax on environmentally harmful devices.

* Make more use of green development solutions for further urban development. A green solution certificate will be issued.

* Record the equipment used by each household and provide advice on opportunities and ways to use environmentally friendly technologies.

Smart city solutions:

* Develop software for carbon dioxide emission calculation and reduction methods.

Expected results:

Create a healthy and harmless environment.

Transition to a comprehensive disaster management system.

Things to do:

* Develop a unified procedure for measures to be taken in the event of a public disaster.

* Disaster response training will be provided on a regular basis.

* Create conditions that do not cause public disorder.

* Establish roads, information, electricity and dual channels.

* Every citizen will be provided with basic emergency clothing and equipment.

* Prepare disaster information channels.

Smart city solutions:

* Establish information systems and technology backup infrastructure for public disasters.

Expected results:

In the event of a mass disaster, be prepared to cope with minimal damage.

Establish Smart City information infrastructure

Establish a unified city cloud data center.

Tasks and technological solutions:

* Improving the internal network of the data center. Align network devices, update all settings, purchase additional hardware, and install integrated network monitoring system software.

* Server device upgrade. Acquisition of additional server equipment, integration of servers used in land departments into data centers, acquisition of backup data storage devices (SAN, NAS), installation of special server system equipment and software for 3-level information systems.

* Improving the technical environment of the data center. Installation of additional power generators and backup power generators for reliable power sources, installation of integrated heating and cooling systems.

* Establish a data center security system. Protect the data center from external attacks, protect it from viruses and other malicious activities, protect information confidentially, include special security procedures in the internal procedures of the data center, and establish a backup data center.

* Operate an integrated data center management center. Record all accesses connected to the network and data center, visually monitor in real time, consolidate and monitor all city network traffic, issue job descriptions, and select permanent staff.

* Build basic cloud computing infrastructure (IaaS). Install software to create a virtual environment for the required hardware and make quality adjustments.

* Create a cloud-based service system environment (PaaS). Develop and configure web-based service systems, software, and environment

Expected results:

* It will have a data center that will be the core of the city's information subsystem.

Improve the quality of network access and become a city with wireless internet.

Tasks and technological solutions:

* Significantly improve the city network. The department audits the network of each agency, harmonizes the devices used in the network, studies the ability of the network to transmit audio and video in addition to data, checks and improves the speed of each network connection, conducts QoS (Quality of Service) testing, checks the security of connected points. install and test, etc.

* All city districts will be connected by fiber optic cable.

* New network distribution points will be organized. Capacity testing and improvement of devices on the Mongolian Internet MiX network, creation of backup lines, dual

connection to each department, and audit of network supplier network quality management.

* Wireless internet for the whole city. Internet will be provided to residents of remote districts and to every point in the city. It will also be possible to install smart sensors and controllers on equipment distributed throughout the city.

Expected results:

* Internet and network issues will be fully resolved in the city. Complete the construction of the basic information network infrastructure.

Cyber security and information confidentiality

Tasks and technological solutions:

* Develop an integrated security solution for the city network and data center

* Install and implement a data center security system

* Establish an emergency response team to protect against computer attacks

* Establish a special structure to separate and protect information and data

* Establish a privacy protection system

* Establish a system to ensure continuous operation

* Install all types of unauthorized access, attack and virus protection systems

* Electronic signatures are widely used.

Expected results:

* Bring e-services, information networks, data centers to electronic security and information confidentiality to the international level.

Soft Information Infrastructure

Connect soft infrastructure, horizontal and vertical infrastructure

Tasks and technological solutions:

* Soft infrastructure includes software that resurrects hard infrastructure, databases, and business modeling.

* Every citizen will have their own code and their own window. Every citizen registered in the registration system of the Commission can access all types of public services in cioty with his / her own code. By creating such an opportunity, it will be possible to identify the citizens of the khoroo from which they are communicating and the issue of addressing government services electronically will be resolved.

* Every city government employee will have an e-job. Each employee will perform their duties and services through their electronic window, and each job will be owned, timed and monitored.

* Work control system will be introduced. A unified information environment will enable reports and integrated monitoring of all employee and citizen activities on an hourly and minutely basis.

* Channels to access e-services will be created. There will be service channels to regulate the flow of information, such as citizen and employee, management - work, service - control.

* Create unified coding and classification

Expected results:

* The main goal of soft infrastructure is to find low-cost, comprehensive solutions for e-government. The transition to a unified information system will make it possible to do all this

Improve the quality and use of databases

Tasks and technological solutions:

* Use a unified database to communicate with employees, citizens and management in the unified information system.

* Citizen and household, employee and service databases are used in all systems and other databases are used as ancillary.

* Citizens and household databases will be maintained by khoroo inspectors, and a database of staff and services will be maintained in the capital city.

* These databases are used to give citizens and employees access to the system.

* Services will be allocated to each employee and the employee will not be allowed to access other services only by providing the services he / she is responsible for.

* Citizens will have the right to receive all government services only for themselves.

Expected results:

* Integrated database creates a comprehensive solution that connects everyone. With the use of integrated databases and cloud computing technology, it will be introduced

at an additional cost and move to a service mode that can provide services anytime, anywhere.

Provide private enterprises with access to databases and special opportunities.

Things to do:

* The database collected in city will be put into permanent use.

* Create information services based on factual information that is updated on an hourly basis.

* Involve private companies in city's information services.

Smart city solutions:

* Develop a system of various electronic services.

* Develop applications for smartphones and devices.

Expected results:

* City will be a more informed city. Information technology will be introduced into all aspects of city life.

* Capacity of information technology companies

Equal access to traffic and information

Increase the use of smart devices

Things to do:

* Every household and office will build infrastructure to support the use of smart devices.

* The latest new communication technology will be widely used in Smart City.

* Use smart devices for every city equipment.

Smart city solutions:

* Develop a large number of applications for smartphones and devices.

Expected results:

* It will become a city equipped with smart devices

Introduce smart public transportation solutions.

> Things to do:
>
> * Introduce public transport traffic notification and settlement facilitation solutions.
>
> * Establish an integrated public transport logistics system
>
> * Develop and put into operation a city car navigation system.
>
> Smart city solutions:
>
> * Develop and put into operation a public transport management system.
>
> Expected results:
>
> The quality, timeliness and demand for public transport services will dramatically improve.

Create an environment for shared vehicles. Build bicycle paths,

> Things to do:
>
> * Supports car sharing business.
>
> * Introduce smart parking solutions
>
> * Build more bicycle lanes and parking lots and encourage bicycle traffic.
>
> Smart city solutions:
>
> * Introduce a joint vehicle ownership information system and an integrated parking information system.
>
> Expected results:
>
> * Significantly reduce urban traffic congestion and increase the percentage of environmentally friendly and healthy traffic.

City-wide Internet of Things (IoT)

Service kois, ATMs, e-Maps, e-Guides will be available everywhere

> Things to do:
>
> * Every point in city will be mapped and made available to the public.
>
> * Service points will be equipped with modern technology.
>
> * Government and business services are provided from one point.
>
> * Integrated payment environment.
>
> Smart city solutions:

* Introduce easy and accessible technology solutions in all parts of the city

Expected results:

* It will be a fully technological city

Smart Meter, Smart Sensor, QR code, NFC are widely used in city services.

Things to do:

* Smart Meter, Smart Sensors will be used to equip the city's main facilities, public property and equipment.

* Increased use of QR Code and NFC technology to simplify customer service.

* Strive to create easy access to public services using smart devices.

* Residents will be able to control their homes, cars and property from anywhere.

* Citizens will have all smart IDs.

Smart city solutions:

* Introduce technological solutions to simplify public services.

Expected results:

* Customer service will be easier.

Infrastructure Reform

Energy system reform. Smart Grid

Things to do:

* Complete energy restructuring.

* Bilateral energy management will be established in the city.

* Provide smart energy solutions for factories and apartments.

* Significantly increase the use of renewable energy.

* Every household and organization will switch to energy efficient mode.

Smart city solutions:

* Complete upgrade of Smart Grid technology.

Expected results:

* Transformed into a smart power system

Introduce effective solutions for waste pollution control, maintenance and recycling.

Things to do:

* Strict adherence to waste sorting procedures.

* Establish waste recycling centers.

* Establish waste-to-energy plants

* Provide training and publicity on waste management to residents.

* Take comprehensive measures against soil contamination

* Establish integrated air and soil pollution management

Technology support and solutions:

* Introduce new waste separation and recycling technologies.

Expected results:

* Complete reuse of waste.

Radically change the city's water supply, distribution network and reuse technology.

Things to do:

* Use water meter sensor to drastically reduce fresh water loss.

* Upgrade the engineering network and equip it with smart devices.

* Introduce new water reuse solutions to all households and buildings. Reuse of water is mandatory, especially for new construction.

* Widely used in natural water collection devices.

* Renovate the sewage treatment plant and generate electricity

Smart city solutions:

* Commissioning of a comprehensive water management information system.

Expected results:

* It will be a water-efficient city with clean water resources management

Smart Living

Create comfortable, peaceful and creative living conditions for citizens. Work to be done within this guideline

Smart Living
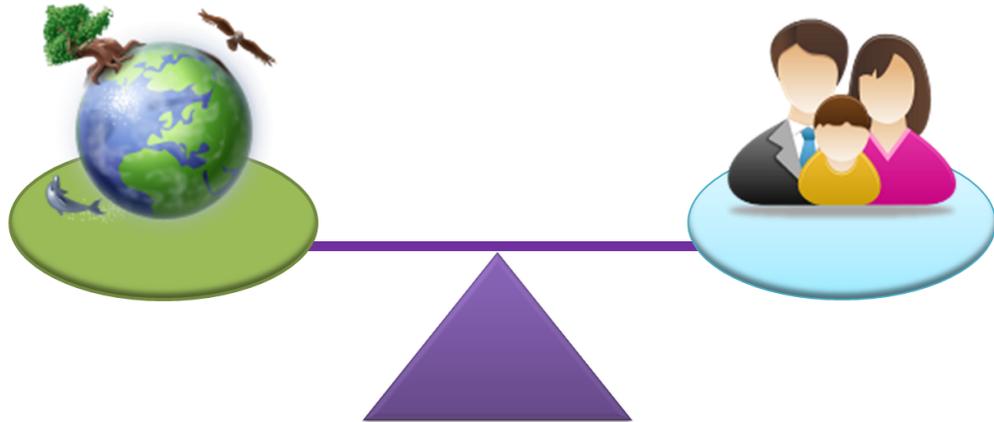
Fig 40. Smart Living

Safe and peaceful life

Establish a crime-free, bright and controlled city

Things to do:

* Take comprehensive measures to reduce the circumstances and causes of crime.

* Camera surveillance system will be installed on all streets

* Increase city lighting.

* Use voluntary patrols and on-duty patrols

* Make a rule on a quiet night

* Information processing and analysis will be widely used to prevent crime.

Smart city solutions:

* Establish a unified crime control and information center.

Expected results:

* Crime rate will decrease.

Special facilities for construction and traffic accident reduction

Things to do:

* Construction of traffic accident protection facilities.

* Regular traffic safety measures will be taken on a regular basis.

* Establish school children's traffic control and regulations. Parents are involved in traffic during school hours.

* Develop and enforce special road and building safety regulations.

* Special safety regulators will be in place during construction and renovation work

Smart city solutions:

* Renovate and improve the integrated traffic control system.

* Develop a building safety monitoring information system.

Expected results:

* Reduce the cause of accidents.

Smart education system

Establish a school system close to the home

Things to do:

* Primary and secondary schools will be established taking into account the population density. Make sure the child attends school close to home.

* Support the development of universities on a campus basis.

* Extra-curricular and extracurricular reading rooms will be established

Smart city solutions:

* Develop school management information system.

Expected results:

* Bring the education system closer to home.

Create smart school classrooms.

Things to do:

* Create mass e-learning.

* Equip schools with smart classroom equipment

* Establish a technological infrastructure for parental control over school activities.

Smart city solutions:

* Develop a large number of smart, school and classroom software.

Expected results:

* Schools will be more technologically advanced, and training will be more interesting and rewarding.

Smart Health

Renew health services.

Things to do:

* Increase the number of hospitals

* Establish an integrated information system for medical institutions. Digitize medical services

* Improve emergency services quickly and efficiently. It serves all state and local hospitals.

* Diagnostic results are communicated

* Develop new regulations to prevent and reduce the spread of communicable diseases

* Establish a number of sanatoriums and nursing homes for the elderly.

* Increase citizen participation and feedback in health services

Smart city solutions:

* An integrated information system for hospitals and pharmacies will be established.

Expected results:

* Basic infrastructure to improve health care will be established.

Introduce smart health systems

Things to do:

* Widely used in smart devices in hospitals

* Connect people and homes to the hospital system.

* Promote remote diagnosis and treatment.

Smart city solutions:

* Complete technologicalization of the hospital environment.

Expected results:

* Modern medical services are available from anywhere in the city.

Develop comfortable housing, leisure and recreation, and tourism

Create comfortable, economical and remote-controlled smart buildings and apartment areas.

Things to do:

* Increase smart buildings

* Build a new smart town

* Update building safety standards

* Equipped with smart sensors

* The information network will be designed in the same way. Arrange multiple cables

* Establish procedures to ensure the mutual comfort of apartments and neighbors. Establish public meeting rooms and points of contact

Smart city solutions:

* Introduce a building management system with energy and water efficient information network.

Expected results:

* Buildings will be economical and comfortable

Increase the number of recreational and tourism sites

Things to do:

* Create themed parks.

* Establish procedures for government and public service organizations to create space for citizens to rest and play.

* Increase playgrounds and public parks.

* Renovation of city tourism centers. Develop domestic tourism.

* Establish foreign advertising sectors to develop urban tourism and attract investment

Smart city solutions:

* Create a virtual city where you can see and walk

Expected results:

* Create an interesting leisure environment for city residents and foreign visitors

Hard Infrastructure of Smart City

Smart City - the goals and objectives of the modern city.

All activities under the Smart City Program will use a combination of innovative and technological solutions for operational change. In each area of city activity find a smart solution.

Activities for each activity to be performed under the program operational innovation and technological innovation will be done.

City-wide technology

The sum of smart solutions is the Smart City project.

Smart City = Technological advances

Smart City = City of the Future

Fig 41. Smart Hard and Soft Infrastructure

Scope of the Smart City project

Smart City - works online

> Infrastructure. Structures will be established to provide electricity, transportation, water supply, waste management, construction and site management, and other public services such as health, education, security.

> Integrated management. Control and management will be simplified and decision -making steps will be reduced.

> Service. The service will be fast and efficient.

> Access. Every citizen will be able to receive public services in a timely and accessible manner.

> Opportunity. Public service becomes easier, citizens spend more time in their business will be able to work.

Fig 42. Smart Hard Infrastructure

Information infrastructure

Establish optimal hard infrastructure

Infrastructure. Information infrastructure consists hard and soft infrastructure.

Hard infrastructure. Networking, computing and information storage centers and security devices

Soft infrastructure. All kinds of software, information systems

Consumer. Citizens, organizations and the state

Operation. Consumers infrastructure in its environment
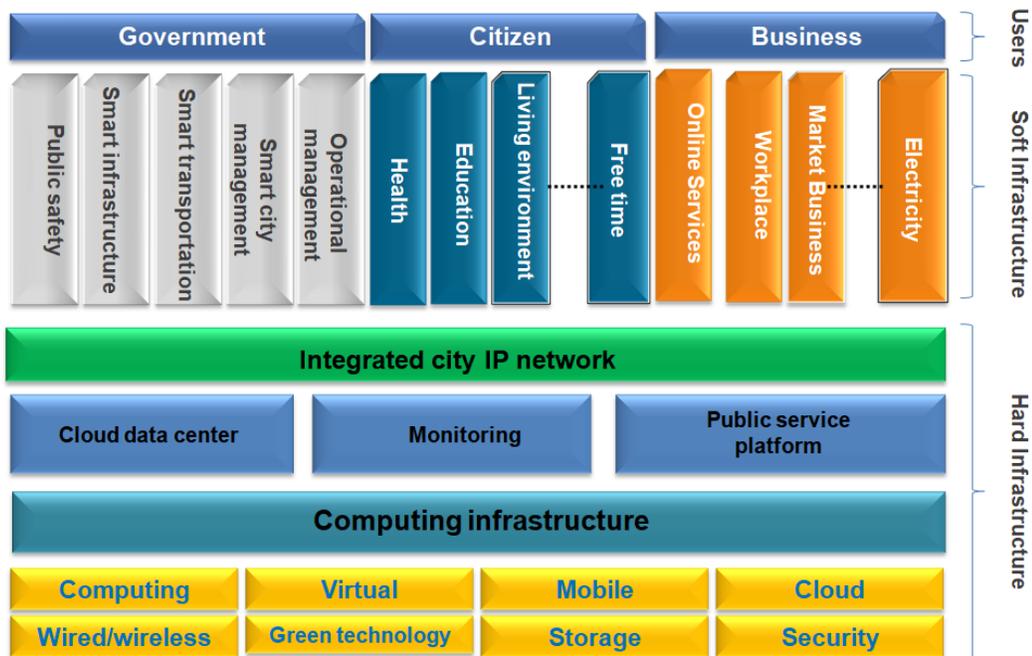
Fig 43. Structure of Hard and Soft Infrastructure

The world's best technologies that build hard information infrastructure

Without the right solution, wasteful costs will continue to rise

Optimal construction of hard infrastructure

    high level of technology and professionalism

    requires skills and experience.

Long time and high financial capacity

    required.

Choose from a variety of solutions

    The coherence between them must be ensured.

The world's best intermediate company

    need to run without intermediaries.

Further regular service

    It is important to pay attention to
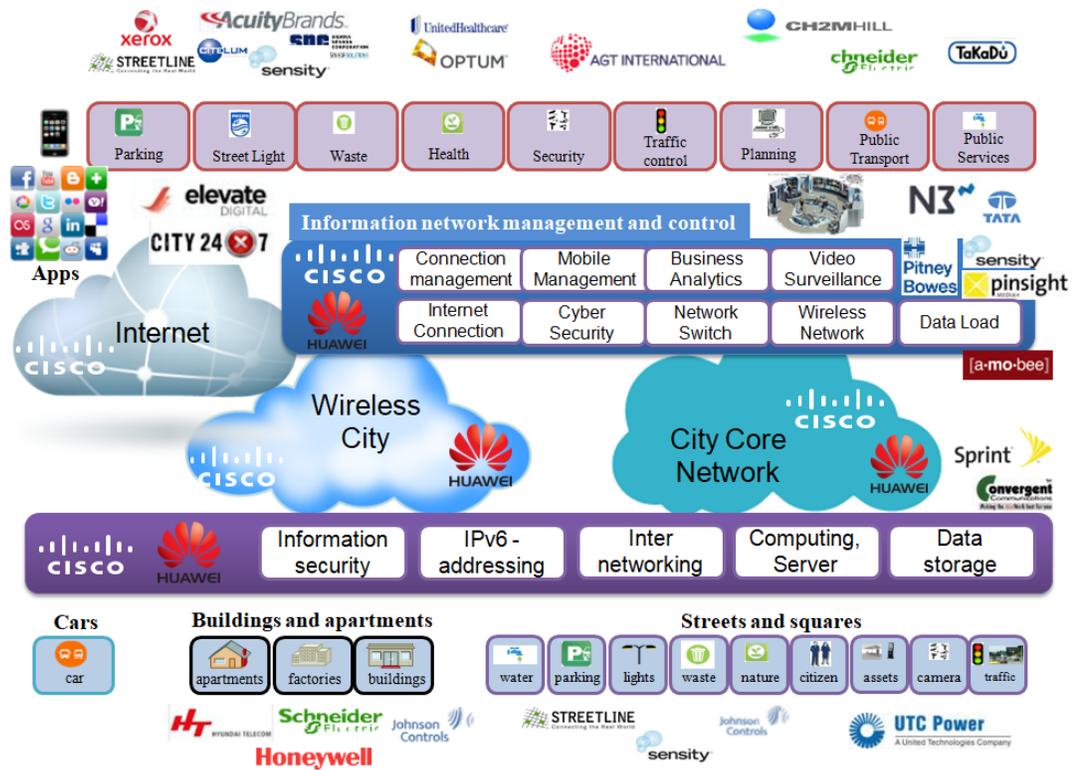
Fig 44. Hard Infrastructure Technology

Components of hard information infrastructure

It consists of a large number of subsections.

  Find the optimal technical solution for each subsection.

  Improper technical selection risks rendering all infrastructure inoperable.

  The right solution and the right technology can reduce costs and operating costs by hundreds of times.

  Today, technology is improving every month, but it needs to work with the old system.

  It is important to calculate the future of technology correctly.
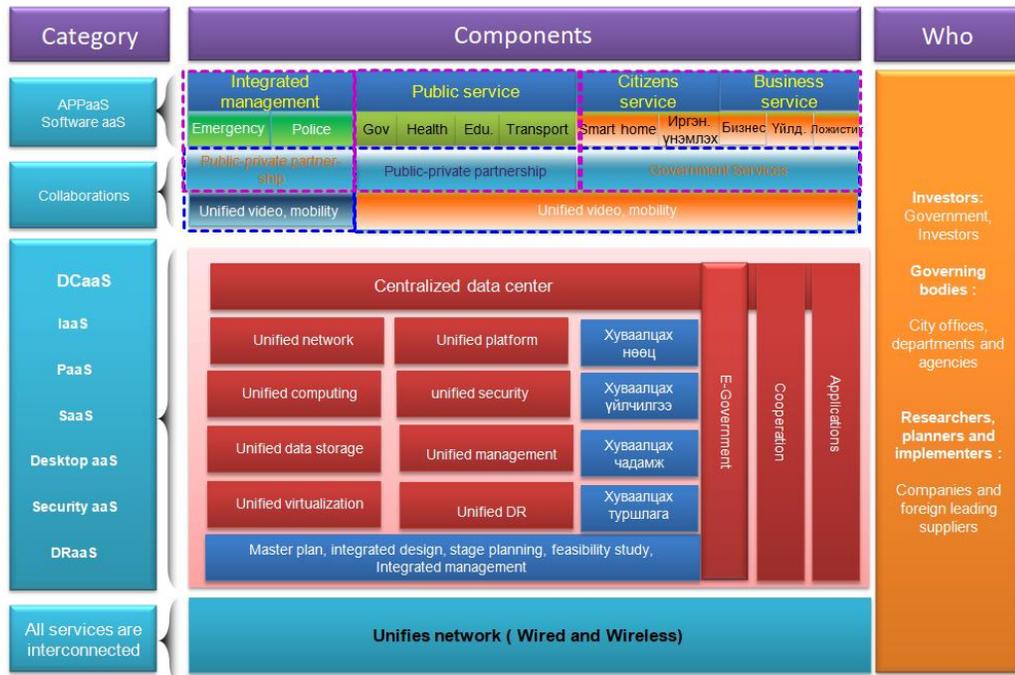
Fig 45. Cloud Data Center

Cloud data center

There is a special data center to adapt to daily changes

City's information flow - the largest set of information at many levels and will continue to grow.

As new and new service flows arise, we will have a data center with a network and equipment to meet their needs.

It can handle millions of customers.

It works on the principle of cloud computing.

Meets the highest requirements for information confidentiality and protection.

Updated regularly.

Cloud data center establishment and technological solutions

Cloud Computing - Cloud Computing technology.

Uses blade server infrastructure for computing and storage servers.

Optimal organization of data center and external network connection structure.

There is an integrated management and control system.

The security and protection of the data center will be decided at a high level.

Configure system applications well.
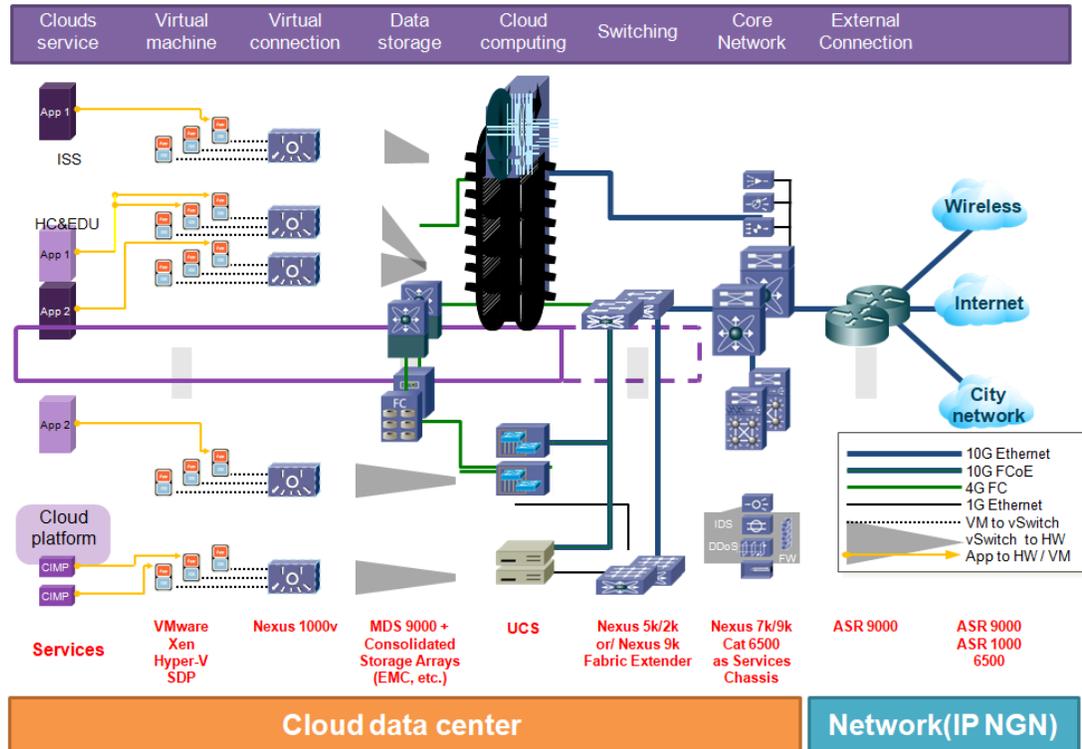
Fig 46. City wide network backbone

City network

City network architecture design will be guided by the following design principles:

- Technologically advanced model: taking into account the advanced experience of industries, having foresight, to meet the development of the next 5-10 years.
- Cost-effective balance: take into full account the input-output ratio for optimal efficiency.
- Availability and reliability: network architecture is basis for good operation and the management of UB-Cisco Smart Town ICT businesses. Maintaining the availability and reliability of the network architecture is of vital importance, which entails the design of network architecture, structure, nodes, features and many other aspects to avoid single-point failures and improve the overall availability of network.

- Scalability: give support to the business expansion and improve the horizontal scaling capabilities of network by applying the hierarchical and modular network architecture so that the upgrading and scaling will not undermine the network infrastructure.
- Standardization: build a unified network services platform to provide unified network services for everyday businesses, management, and working, and achieve a uniform network architecture and access standards with a unified planning; design must be based on an open platform and compatible with many vendors.

General network structure

Smart City network design will abide by the network architecture design principle of the service provider. The network will assume the high speed data forwarding of the park data; Ethernet (convergence layer + access layer) of UB-Cisco Smart Town network will provide business isolation, user isolation, etc; the access layer of UB-Cisco Smart Town network will apply the appropriate FTTx method to provide the last mile optical fiber connection between its network and the user's premise. In addition, Smart City will build appropriate service channel, so as to ensure that residents and enterprises can enjoy service provided by authorized service providers.

City government agencies, their employees, businesses and citizens will be connected in a unified manner.

Provide network service quality assurance (QoS).

Integrates cable and wireless networks.

It works on the principle of cloud computing.

Integrated control and easy to manage.

It can be further expanded and improved.
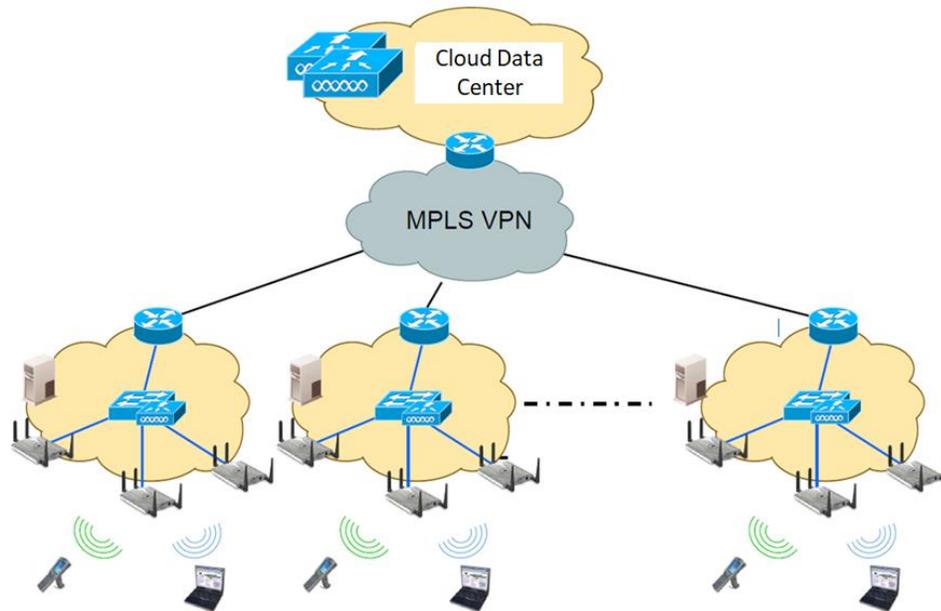
Fig 47. General Structure of City network

The standard architecture of the core layer is as shown in the above figure. From the perspective of data interaction, the core layer will be mainly connected with the data center, Internet area, WAN access area, smart edge layer, convergence layer, extranet area, etc. Ensure multi-business sustainability. Its basic functions, design key points and design standards to be observed are as follows:

The basic function of the MAN core layer is as follows:

- Be responsible for the high speed data exchange between regions
- Realize regional level expansion capability
- Guarantee the forwarding quality of different types of key business
- Higher stability of the equipment and characteristics

The design key points of the core layer are as follows:

1) Deploy MPLS forwarding functions on MAN core router of UB-Cisco Smart Town, so as to ensure high speed forwarding. The core equipment shall be able to fully support MPLS forwarding functions (LDP, TDP).
2) Apply MPLS-based Qos to customize forwarding control strategy of VPN of different customers and give different levels of service quality priority to different types of customer business in the core network. It shall support MPLS-based Qos function.
3) One core requirement of the multi-business core is its high availability. The availability depends on the physical link and equipment reliability and safety. The reliability and safety of the multi-business core is realized by ensuring the equipment and transmission optical

fiber link redundancy. Hence, the core module of the initial phase of UB-Cisco Smart Town will include 2 high performance routers for mutual backup.

The core layer network design shall abide by the following standard requirements:

1) Considering the area and development progress of UB-Cisco Smart Town, UB-Cisco Smart Town shall deploy 1 core node to form the network core layer, so as to cover the convergence layer equipment access and data center access of UB-Cisco Smart Town;
2) The core node shall deploy the expansible modular high performance routing equipment of the hot standby to achieve high availability, and eliminate the impact of the single point failure on the network system;
3) Considering large amounts of data and media video business of different module areas, the group of core layer equipment shall support single-slot and multi-port 10 Gigabit Ethernet interface module, so as to realize high speed and stable data transmission;
4) Viewing from the business in the future, different property management businesses shall be isolated from the city management businesses, and the core layer equipment shall have MPLS VPN capability of IP NGN technology architecture;
5) Considering that the network scale is the small and medium-sized MAN and there will be a large amount of users in the future, for the expansibility in network architecture, the core layer will be operated in L3core layer equipment and apply the standard and open IGP dynamic routing protocol, such as: OSPF or ISIS;
6) Considering the network management, the core layer equipment shall support out-of-band management, so as to support high maintainability requirements of the core equipment.

General structure of the city network

Establish a multi-level, integrated management network

Establish a multi-level network. These include:

-Basic and backup data center

-City organization

-Housing and services

-Subsets such as businesses

Each level has a special access, control and privacy regime.

All networks will be coordinated and integrated.
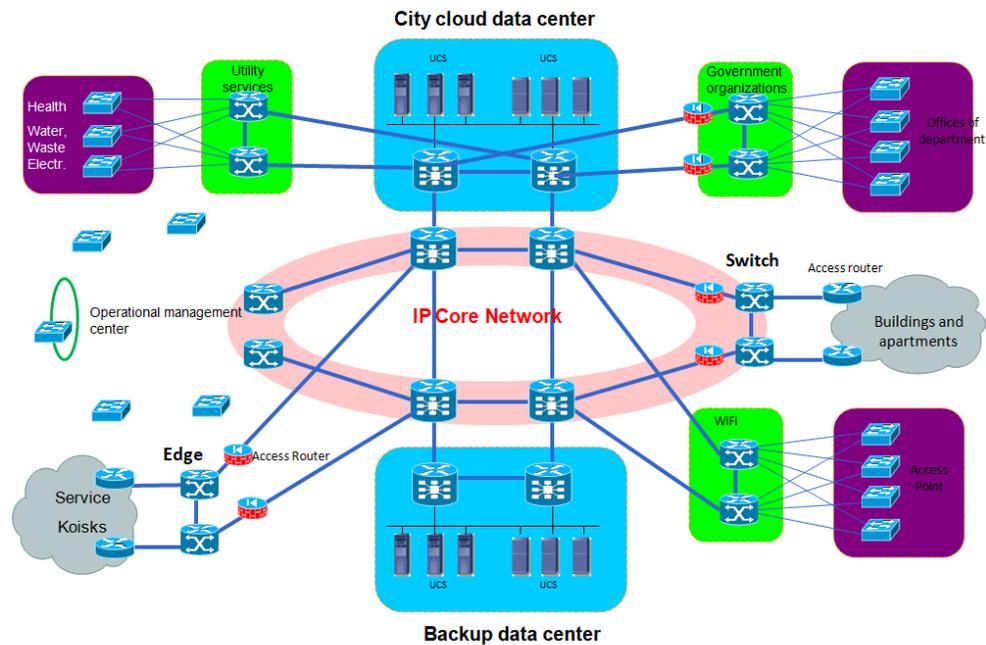
Fig 48. *Cloud data center*

City wireless network

Wireless connectivity is the main gateway to end users

The broadband network allows the operational control center to manage the city and communicate with citizens.

Citizens will be able to access city services using mobile phones, tablets and smart devices.

Network speed and connection quality are up to modern standards.

Wireless technology will be available.
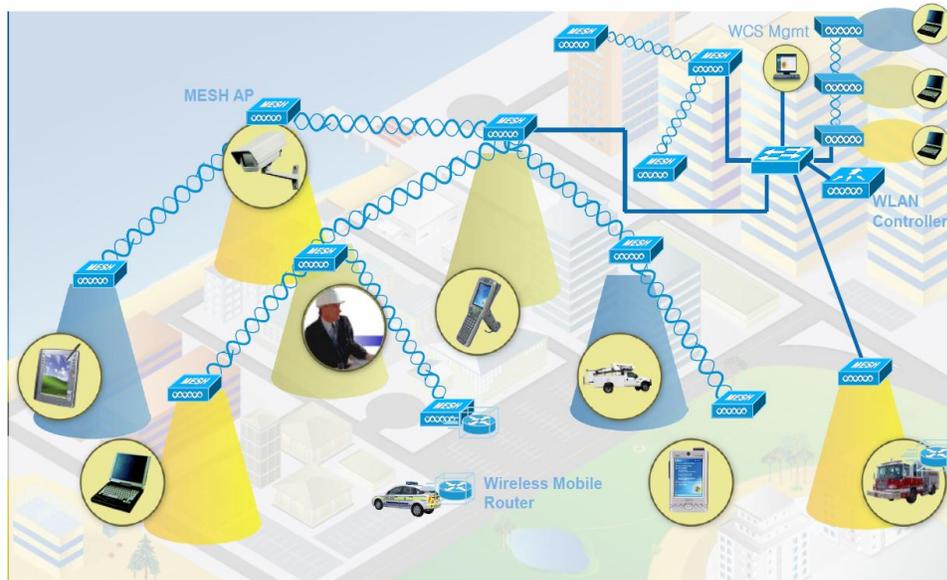
Fig 49. *City wide wireless network*

WLAN Architecture and Components

WLAN Architecture mainly includes below parts: wireless controller, wireless access point, wireless control system (WCS), wireless positioning service system (MSE), user authentication system Radius server as well as the access switch supporting power over Ethernet and the aggregation & core switch responsible for data exchange (provided by City MAN).

WLAN Network Architectures

Three types of WLAN network architectures are commonly deployed:

1. Autonomous Architecture
2. Centralized Architecture
3. Distributed Architecture

Autonomous Architecture

In the autonomous architecture, the WTPs completely implement and terminate the 802.11 function so that frames on the wired LAN are 802.3 frames. Each WTP can be independently managed as a separate network entity on the network. The access point in such a network is often called a "Fat AP".

During the initial stages of WLAN deployment, most APs were autonomous APs, and manageable as independent entities in the network. During the past few years, centralized architectures (discussed next) with ACs and WTPs have gained popularity. The primary advantage of the centralized architecture is that it provides network administrators with a structured and hierarchical mode of control for multiple WTPs in the enterprise.

Centralized Architecture

The centralized architecture is a hierarchical architecture that involves a WLAN controller that is responsible for configuration, control, and management of several WTPs. The WLAN controller is also known as the *Access Controller* (AC). The 802.11 function is split between the WTP and the AC. Because the WTPs in this model have a reduced function as compared to the autonomous architecture, they are also known as "Thin APs." Some of the functions on the APs are variable, as discussed in the following section.

Distributed Architecture

In the distributed architecture, the various WTPs can form distributed networks with other WTPs through wired or wireless connections. A mesh network of WTPs is one example of such an architecture. The WTPs in the mesh can be linked with 802.11 links or wired 802.3 links. This architecture is often used in municipal networks and other deployments where an "outdoor" component is involved. This article does not address the distributed architecture.

Technological solutions for urban wireless internet

Provide optimal solutions for basic network and wireless network connection

Optimal organization of wireless network coverage, device location and distance

Ensure a smooth flow of information to the endpoints

Easy integrated management, control and scalability of the wireless network

Make a clear mark on the city map
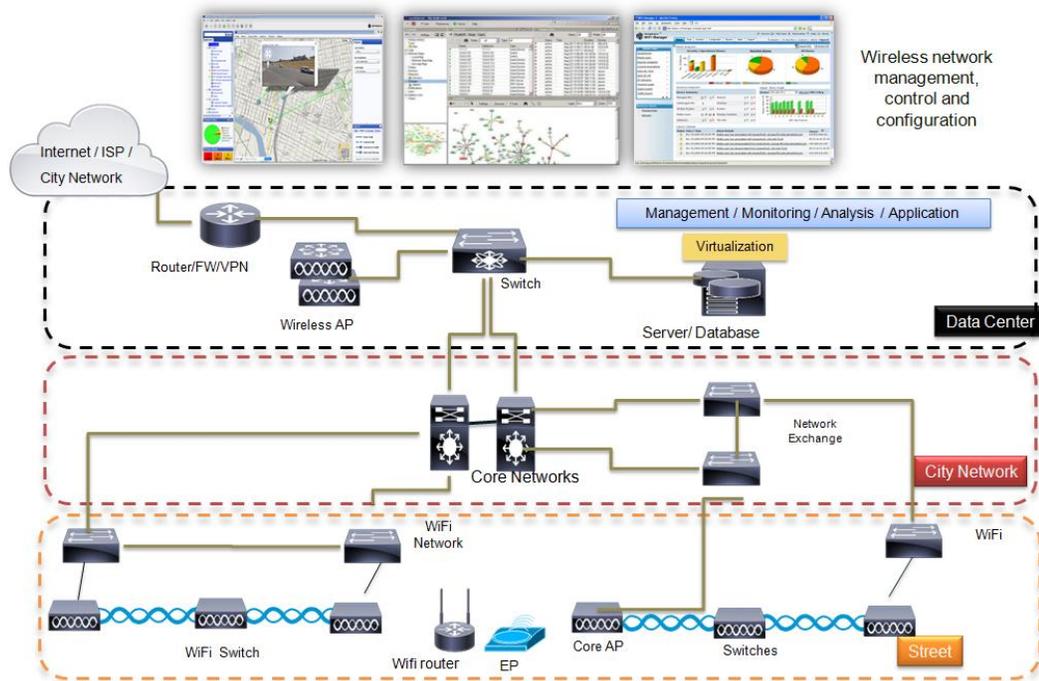
Fig 50. Network management

Urban wireless internet usage

Wireless internet is the foundation for starting new businesses

With the advent of broadband Internet, any citizen will be able to access government and other services from anywhere.

You will be able to use the wireless network and introduce new services.

Citizens' incomes will increase as new services are created and jobs are created.
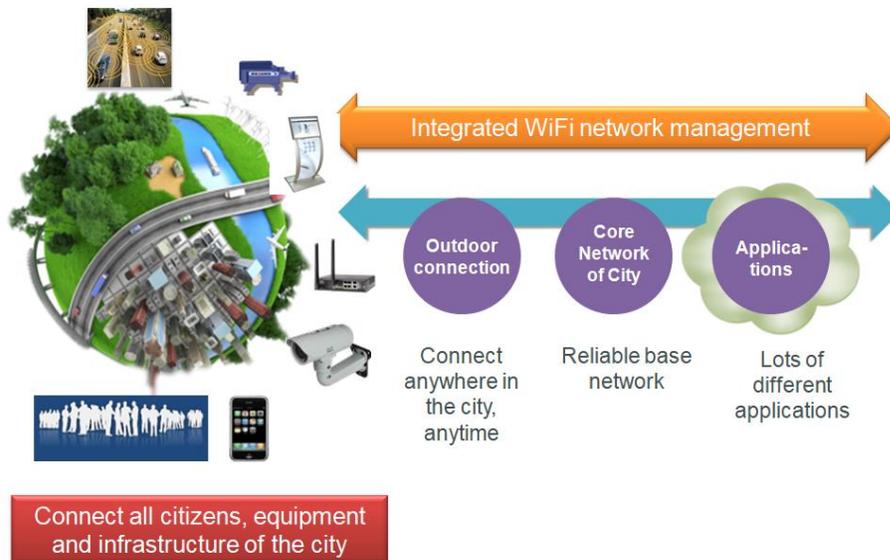
Fig 51. Usage of Wireless Network

Overview of Usage Wireless Network

Smart and Connected City Wi-Fi supports multiple use cases in the area of city infrastructure management, as described below:

Use Case: Public Wi-Fi

Citizens can access the Internet over their smartphone, tablet, and other computing devices when they are in public spaces and on the move: for example, to view maps, local business information, or educational content.

Use Case: City Location Services

City planners and officials can gather new data and insights of the city by deploying location-based services together with geo-spatial capabilities. Such analysis can lead to

improved long-term planning decisions. City officials can use the information for city planning and get a comprehensive view of the city.

Cities can also leverage location analytics and key partner technologies to create virtual tourist applications where visitors access city information and historical facts, which dramatically improve their experiences. Tourists can also receive push information regarding their surroundings to help them better understand the city and its environment, further enlightening their experience.

With the aid of an advertising operator, cities can offer local merchants the ability to publish targeted offers and deals to citizens directly, or through social networks, which generates revenue. By creating a business model on top the technology layer, city officials can revitalize local commerce and obtain added revenue streams for their cities.

Use Case: Smart Traffic

City traffic departments can deploy wireless sensor networks to help enable traffic operators with a real-time view of live traffic conditions and incidents. This can dramatically reduce response time and time to recovery, and thereby reduce congestion.

Use Case: Smart Parking

Wireless sensors notify drivers of available parking and avoid the need for circling. Similarly, parking enforcement officers can work more productively by viewing live video feeds of parking violations and saving a recording as evidence.

Use Case: Smart Utilities

Introducing automated meter-reading infrastructure reduces the cost of meter data collection and billing errors. With these sensors, utilities can detect water leakage more easily and waste collection companies can monitor bin utilization and plan pickups more effectively.

Use Case: Smart Safety

Using the Smart and Connected City Wi-Fi, live video feeds from surveillance cameras can be integrated with other sensors and centrally monitored from security operations centers, providing law enforcement officers with greater situational awareness. A safer city makes it easier to attract talent and investors.

Use Case: Smart Environment Monitoring

A city's environmental conditions have a huge bearing on its livability index. Air, noise, and water quality sensors can help enable monitoring of key environmental metrics to better inform short-term and long-term response plans.

Integrated city network control center

A comprehensive sensor, information processing and response system is available 24 hours a day

The Integrated Network Monitoring Center monitors and manages networks and subnets located in all regions of the city. *Fig 46. City wide network backbone*

Information is received from time to time through video cameras, smart sensors and alarm systems.

Process information from monitoring sensors and report conclusions.
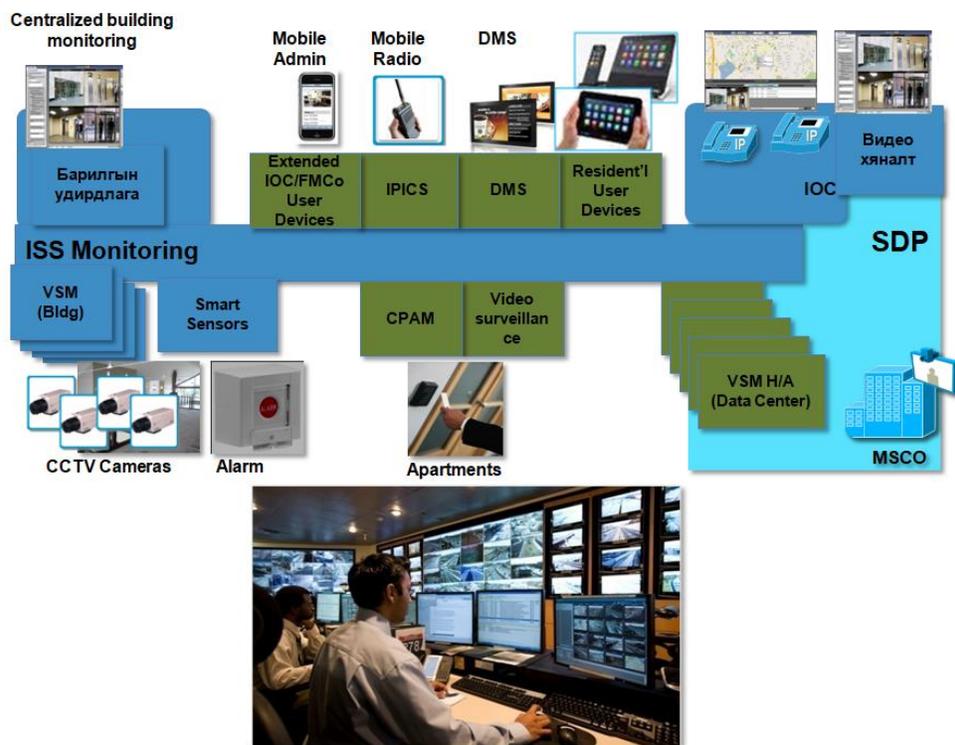
Fig 52. Control Center

City video surveillance system

Multi-level intelligent control keeps city residents safety

Worldwide, the use of video information is growing rapidly, accounting for about 90 percent of all information.

It is important to view and store video information, not to process it automatically.

The city's video information system is a comprehensive system for recording, image processing, data analysis, decision making and response.
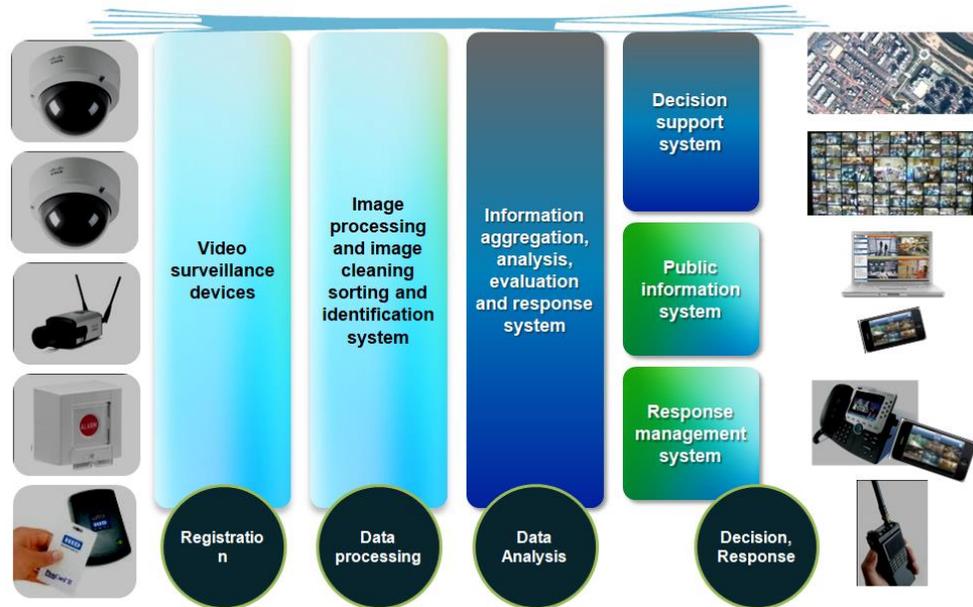

Fig 53. *Video Surveilance system*

. Infrastructure to serve citizens remotely

Reduces traffice congestion, bureaucracy. Communicates as if you were there

Establish smart service points in urban areas and densely populated areas.

Citizens do not have to go to the city center, but come from their homes or to a nearby smart spot.

Contact the caller via video and send the required documents directly.

Take public services to a new level

Fig 54. *Smart Kiosk system*

IoE – Internet of Everything

Citizens, businesses and government agencies will work together to exchange information via the Internet.

Relevant news and information will be provided to every citizen in a timely manner.

Any process will be notified in advance.

IoE - The most important part of a smart city.

Fig 55. *Internet of Everything*

IoE ecosystem

The Internet will change the whole lifestyle in the coming years

Millions of smart devices will be installed in the city.

Every household and organization uses a smart device.

The city's broadband network has a high capacity.

Fig 56. *IoE Ecosystem*

Smart street lighting

Street lighting is a versatile smart service point

Current street lighting requires high electrical and maintenance costs.

Each smart city lighting pole will be upgraded to be a source of revenue.

Each lighting pole will be equipped with smart devices such as cameras, wifi, smart sensors.

All devices are connected in one line.

Light poles are the point of delivering smart solutions to consumers.

Light pole = Smart point
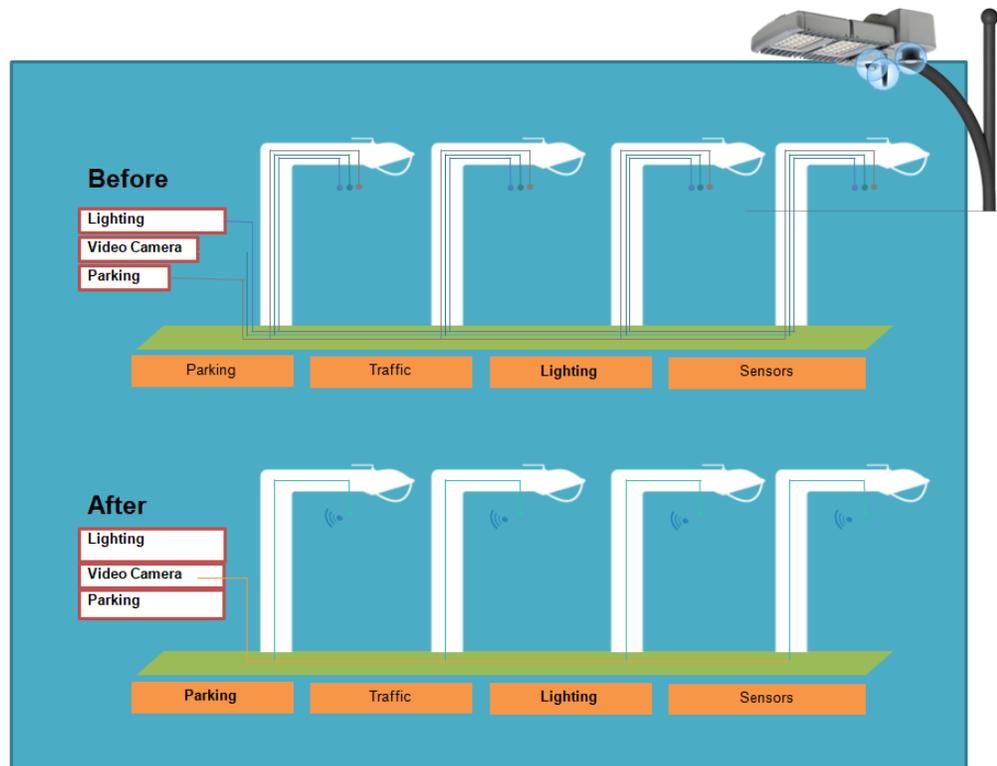
Fig 57. *Smart Street Light*

The introduction of smart street lighting can often act as the first step to realising a smart city's true potential.

Across the many countries, many local authorities are in the midst of a transition from standard street lighting to more cost-efficient LED technology.

Indeed, analysts Northeast Group predict that as much as 89% of the planet's 363 million streetlights will have adopted LED technology by 2027. It makes financial sense. The switch to LED represents an effective reduction in costs, maintenance, and environmental degradation. Updating to more robust and resilient technology seems innocuous enough, but LED installation represents a golden opportunity for smart city planners.

What many local authorities are missing, however, is that the switch to LED bulbs offers the opportunity to jointly transition to a smart street lighting system. The same Northeast Group reports posit that just 29% of the global total of LED bulbs will have installed smart lighting features within the next decade.

Installing at the same time in a no brainer, in terms of maintenance and building costs. Indeed, if the thought process behind the switch to LED is to ease the burden of energy expenditure, then smarter street lighting should be seen as an even greater boon in the budgeting sphere.

At a time when local authorities are staring down the barrel of decreased budgets and funding cuts, investing in the right areas is more crucial than ever before.

Why is smart street lighting the answer?

Alone, smart lighting systems turn a city's lighting grid into one centrally-controlled network; each individual light able to be modified as a single element, or part of the wider

system. Lighting, of course, is paramount to a city experience; improving safety both for pedestrians and vehicles, enhancing areas of beauty or high tourism footfall, and generally keeping the city running in hours of darkness.

A smarter street lighting system offers the opportunity to control the output of each and every light; brightening in areas of high crime, or being programmed to respond to pedestrian or vehicle activity. It also offers the chance for each light to be individually monitored and maintained, meaning technicians need not be needlessly called out to manually check the health of each bulb.

However, improvements to a city's lighting infrastructure aren't the only benefits a transition to smart street lighting offers. By hooking up each and every pole to a wider network connection, each lamp becomes an Internet of Things (IoT) ready installation platform, a plug-in-and-play IoT base acting as a catalyst for additional smart city investment.

With a safe and secure connection already present via the lighting system, bolt-on technologies from CCTV cameras to advertising boards can be added to the network, offering a range of benefits from public safety to revenue options.

A smart parking solution

Every part of the city land will become a valuable asset

Most of the traffic in the city center is now looking for parking.

All parking lots in the city will be equipped with smart sensors and payment systems.

Drivers will be notified of nearby vacancies and city traffic will be reduced.

Urban vacant land use will improve dramatically.

Improve land control.
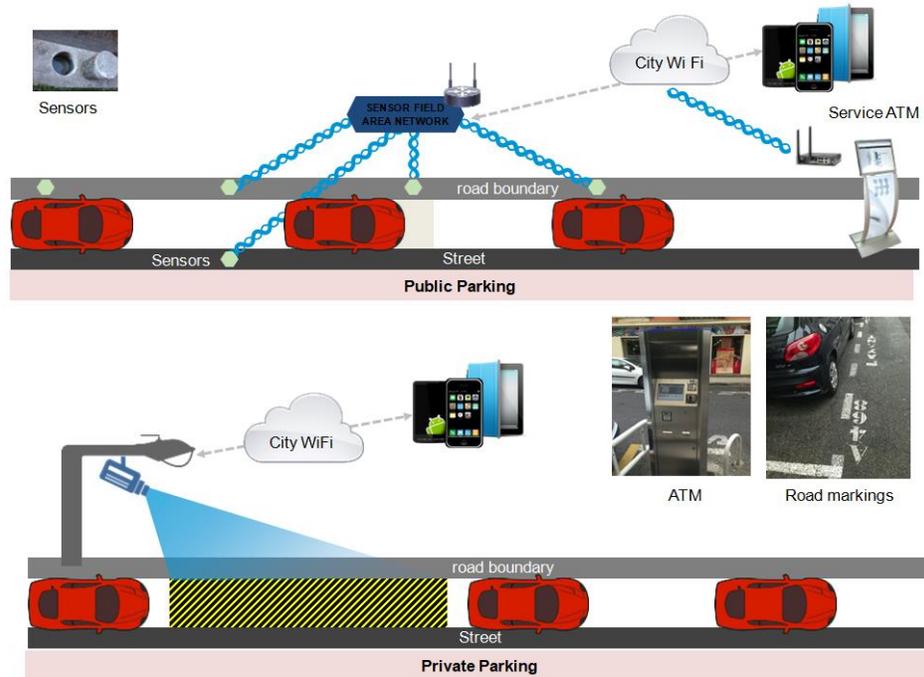
Fig 58. *City wide network backbone*

Function of Mobile Hand-held Collector for Parking Lot Fee (PDA)

1. Non-card consumption function and IC card consumption function.

   Both the card consumption pattern and the non-card consumption pattern are charged based on time. You may swipe the card on the PDA at the entrance and verify the payment on the PDA at the exit.

   Non-card Pattern: You may ask the staff to swipe the card for you to record the vehicle information. When the vehicle goes out, the information will be retrieved to charge corresponding amount. Card holding pattern: Swipe the card and relevant matters of recording and fee chargingwill be executed.

   It supports multiple patterns of consumption:

       1) General consumption;   2) Discounted consumption;

       3) Top-up preferential; 4) Fixed monthly payment;

       5) The patterns of consumption can be modified.

2. To provide GPRS/3G transmission

   1) GP RSGPRS/3G data transmission must meet the four conditions: a computer connected to the internet; mobile SIM card (GPRS service available); fixed domain name or IP address; a router.

   2) The data can be uploaded and downloaded automatically with GPRSGPRS/3G, flexible and convenient.

3. Receipt printing

   The width of printing paper is 58mm; in case of non-card consumption pattern, it can be set to print a receipt automatically or repeatedly; in case of card consumption pattern, no receipt will be printed.

4. Function of USB flash disk upgrade

After turning off the computer, connect the USB flash disk to the computer with a USB interface. Turn the computer on, pull out the USB flash disk after successful upgrade. Reboot the computer.

5. Multifunctional consumption data inquiry

The consumption breakdown can be inquired with the functions of total record inquiry, vehicle out-going record inquiry, and vehicle in-coming record inquiry. And the consumption data can be inquired according to the plate number, card number, operator number, the in-coming time and the out-going time.

6. Function of consumption data statistics

The consumption data can be collected according to the total record, out-going record statistics, the in-coming record statistics and the consumption record statistics. The consumption data can also be collected according to the plate number, card number, operator number, the in-coming time and the out-going time.

7. It supports other functions.

The functions include modifying terminal time, setting user sector, formatting internal storage record, formatting the blacklist (this function is not applicable forthe moment), setting terminal number, automatically printing receipts, authorizing terminal password, allocating GPRS parameters, modifying management password, reading operator card, checking/clearing times within a period, viewing device information, viewing/closing GPRS service, modifying operating password, GPRS automatic uploading of data, revising time, setting blacklist, formatting internal storage, reading time, and GPRS downloading of parameters etc.

Real-time Monitoring

- **Parking Space Monitoring:** To monitor the parking lotsaturation by taking advantage of GIS platform with the parking status.
- **Charging and Management Control:**To monitor the dynamic state of management staff at parking lot, the charging conditions of each terminal and the physical conditions of terminals by taking advantage of PDA inbuilt locating function and communication function.

Patrol Supervision

- **Supervision on TollCollectors and Administers:**Inspect the tollcollectors and administers regularly and irregularly.
- **Supervision on Parking Lot Conditions:** Patrolthe parking lot conditions regularly and irregularly.
- **Forewarning Management**: Form the forewarning information according to the patrol and supervisionconditions.

Intelligent Inquiry

- **Card Opening Detail Report:**Review card opening detail record.
- **Card Top-up Summary:** Inquire the top-up summary information in the system according totypeof card.
- **Vehicle In-coming Record:** Different from the vehicle consumption record, this record is only for inquiry of vehicle in-coming record.
- **Vehicle Consumption Summary:** Review the consumption summary by vehicle
- **Terminal Information Details:** Review vehicle consumption summary information

- **Terminal Consumption Breakdown:**Inquire terminal information
- **Terminal Consumption Summary:** Inquire consumption information summary according to the terminal number.

Traffic Police Affairs
- **Management of Street Codes and Building Codes:**According to municipal government and public safety specifications, collect and manage the street codes and building codes for the parking.
- **Vehicle Type Management:**Manage the vehicle types according to the vehicle registration data from the traffic police.
- **Management of Static Traffic Conditions:**Manage the conditions by collecting and recording the parking lot data and vehicle passing data.

Bill Management
- **Bill Information Data Collection:** For USB data connection and communication, including downloading setting parameters, downloading printing marks, collecting consumption record, etc. It can also be used for the data collection when the wireless transmission of GPRS/3G terminal cannot be used normally.
- **Device Connection Management:** Add USB accessing device. If USB downloading is required to set parameters, set printing marks and collectdata, it is required to add terminal information here.
- **Printing Mark Setting:** Set the headers and footers of the receipt to be printed by the terminal. It does not support image format, but only the text editing.
- **Bill Printing Management:** Print the relevant bills in accordance with the consumption data acquired.

Parking Lot Management
- **Top-up Device Information Management:** Add top-up device information. Every top-up device must have a piece of information on the server (Top-up device refers to the computer that has our IC card system installed and the IC card reader installed).
- **Reader Information Management:** Set all readers of this system. If the readers are not set, the settings of the card issuing and card top-up will not be able to be executed due to the absence of reader information, and the card issuing and top-up will not be realized.
- **Parking Lot Information Management:** Add the parking lot information to the system. There can be only one parking lot or multiple parking lots. When the consumption parameters are set, different consumption standards can be set for different parking lots.

Parking Card Management
- **User Management:** Add user materials, and the user cards can also be issued while the user materials are being added.
- **Card Management:**Add, reissue and edit user card. If the user information is onlyadded in the previous step of user management, a card can be added here. During the user management, ifthe card issued reports an error but the user information has been generated, the card can be reissued; for the loss report, cancellation of loss report and card replacement etc., all information can be edited here.
- **Card Top-up:** Read card information, top up the amount and times for the card, modify the month corresponding to the monthly payment card made.

- **Quick Card Issuing**: The card is issued quickly without any materials required. Only the information of card number and card type is needed. This is not advised in normal cases because it is usually used for the test of first debugging of the system.

Charging Management

- **Communication Port Setting:** The system authorization can be done when you've chosen this top-up device reader, otherwise it won't work. Set the use sector. It is recommended to maintain default sector if there's no special need.
- **Issuance of Tool Setting Card:** Issue domain name setting card. When the machine is using GPRS, a server address needs to be read in the terminal for "GPRS Parameter Setting" in the hand-held device administrator. After successful setting, the record on terminal will be uploaded to this server.
- **Cost of Production and Parameter Setting:** Set deposit for the card and corresponding amount for times of top-up.
- **Cards Discount Information:** Set different discount for various kinds of cards. If there's no discount, the setting shall be 100%.
- **Period Information Settings:** Set consumption period for this system. You may set different consumption standards for different periods in this system (i.e. set consumption price based on period. If there are more than one period, they should be sorted based on number of period by an increasing order- please note the explanations below).
- **Consumption Price Setting:** Consumption parameter setting. Set different consumption pattern and price based on category of card, period and parking lot. For example, if for one card, three periods and one parking lot are used in this system, three (1*3*1) pieces of consumption information must to be set; and if for two cards, three periods and two parking lots are used in this system, twelve (2*3*2) pieces of consumption information must to be set.

System Setting

- **Company Information:** Change company name. Head Office cannot be deleted, but change of name is available. If there's branch office, and related data about such branch exist, such branch office cannot be deleted.
- **Department Setting:** Add department information. Although issuance of card needs to choose specific department, but here you don't need to add all departments of the company, because cards are targeting at customers, not necessarily at internal departments. Department setting here is only used to differentiate our customers. If there's no need to differentiate customers, set one department is enough. When related data about department exist, the department cannot be deleted.
- **Operator Group:** Add operator group information.It is similar to user group ofWindows. When a new group is added to the operator group, you may distribute new authority, such as authority limited to refer to statements. Members under such group are entitled to such authority, which means they can only refer to nothing but statements. System default general operator group cannot be changed.
- **Operator Management:** Add information about the operator and divide him/her into an operator group. Default admin cannot be changed.
- **Change Password:** Change password of the current logged-in user.

- **System Authorization**：You must authorize the system when first using this card issuance and top-up system. You may not issue card without authorization or when authorization fails.