

the 1st white paper

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**SEJONG
NATIONAL PILOT
SMARTCITY**

2018.01 - 2019.10

Masterplanner & Masterplan team



Healthcare AI Center

Living space

Co-Working

Innovation Center

Community Space

Cafe/Culture Space

Data AI Center

SCHOOL



Healthcare



Healthcare AI Center

Life & Safety



Governance



Mobility



Energy & Environment



Education & Jobs



Data AI Center

Culture & Shopping



SCHOOL

Living space

Co-Working

Community Space

Cafe/Culture Space

Innovation Center



The new paradigm proposed by the Sejong National Pilot Smart City -
How will it change your life?

Dear all,

I am so proud to publish and provide with this white paper as the master planner of Sejong National Pilot Smart City.

Sejong National Pilot Smart City is the 'Korean Future City Project' aiming at a human-centered, decentralized city to enhance the quality of life in citizens and sustainability of the city.



The existence value of a country lies in 'Happiness of the people.' Sadly speaking, the Republic of Korea is one of the unhappiest countries among the countries with similar economic scale in term of gross domestic product (GDP) in the world, because we have targeted economic growth rather than people's happiness for last five decades. The Republic of Korea did become the country that overcame poverty more quickly than any other countries in the world. However, we have witnessed that material affluence could not guarantee people's happiness. Health, the quality of life, human relationships including family, friendships, colleagues and neighbors were snowed under with work.

Cities has been also built based on the rationale of economic growth rather than people's happiness. Tall buildings were built to sell land at high prices, and land was zoned into residential, commercial, and business districts for efficient management, and an automobile-centered road traffic networks were developed to establish a difficult system to maintain without public transportation. It quite naturally led to serious urban problems, such as traffic congestion, parking difficulties, energy overuse, and air pollution.

The Sejong National Pilot Smart City that we dream of is the 'city that converts all phenomena taking place within the city to the data and analyzes them with artificial intelligence to provide with urban services that improve the quality of residents' lives and the sustainability of the city for the future generations. In most of the modern cities including ubiquitous cities, urban developers, suppliers and managers are already using smart technologies to diminish the cost and increase the efficiency in urban systems. For our smart city, however, we plan to use it for the happiness of residents, the actual users, and owners of the city.

The Master Plan Team has established the master plan for the Sejong National Pilot Smart City and has done its best to reflect the spirit, philosophy, concrete plans, and contents of this master plan substantially in various consignment projects, which have been underway from this year. We prepared the white paper after following that process thoroughly, so that it can be used as a reference or guideline when developing a smart city elsewhere. While there is much to be desired, I hope it provides meaningful material and data.

The Sejong National Pilot Smart City aims at a city that concentrates on people's urban services to preserve its value. The Sejong National Pilot Smart City will resolve the problems of modern cities by connecting and integrating the best smart technologies and suggest a new paradigm of a future city that leads the whole world.

I would cordially like to ask you for your continuous interest and strong support with warm hearts. Thank you.

Best wishes,
Jaeseung Jeong, Ph.D

Master Planner of the Sejong National Pilot Smart City

History of Sejong National Pilot Smart City

Sejong and Busan, Selected as a National Pilot Smart City

January 2018



April 2018-July 2018 Design of Service for Value Implementation

- Derivation of 7 Innovative Factors to provide creative opportunities, make residents happy, and build a sustainable city

July 2018-December 18 Embodiment through Consultation with Related Organizations

- Reestablish scenario-based services that can be experienced at the user's convenience
- Refer to suggestions from various organizations and entities to embody values for each of the 7 Innovative Factors
- Reflect the voices of local governments, developers, and related organizations

December 2018-April 2019 Classification of Technologies Leading Innovation and Bottom-Up Technologies

- Improve the quality of residents' lives with smart technologies and designate 25 essential services to enhance the city's sustainability for the next generation
- Name the additional services to be incorporated into the Sejong National Pilot Smart City, 'Smart Service (Cloud Sourcing),' which will be carried out from the bottom up through a Hackathon and R&D task verification

April 2019-August 2019 Embodiment Through Consultation with Professional Institutions

- Standardization of embodying elements for all services using task management cards
- Contents of Service: Definition, Key Contents, Scenario
- Service Implementation Plan: Technology embodiment period, project promotion model, project promotion system, issues and measures, detailed promotion schedule, and required budget
- Annual Project Management (KPI)

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Chapter

Dreaming of a Better World

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- 1 What is a Smart City?
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 - 6 Difference with Smart Cities
Overseas

What is a Smart City?

Smart City?

Cities have evolved continuously to embody the 'value and philosophy demanded at various periods' while leading quantitative expansion through the industrial revolution in the 18th century.

The rise of smart cities across the world today also indicates the growing demand for new paradigms of cities. Developing cities through industrialization and urbanization caused severe urban problems. As a result, cities could not persist as 'vessels to sustain civilization' any longer. The smart technology, newly developed with the Fourth Industrial Revolution, has emerged as a solution for such urban problems.

Smart cities have been given various definitions depending on smart technology development and each city's embodiment characteristics.

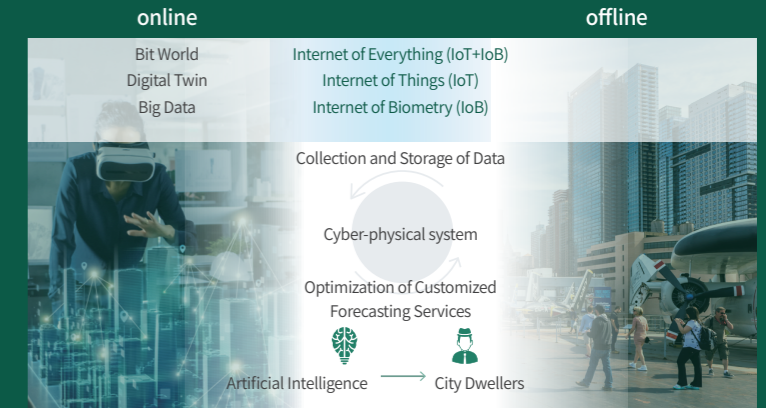
Various Definitions of a Smart City

2009	2012	2013	2013	2014
Smart City in Europe	Smart Cities Council	bsi.	FAST @MPANY	SMART CITIES
A city that brings about sustainable economic growth and enhances the quality of residents' lives through the effective use of natural resources and active government and investments in infrastructure based on human social capital, traditional traffic, and modern ICT	A city that increases the efficiency of the urban area, improves urban management and the quality of life through integrated approaches, and promotes the growth of the local economy rather than a shrewd city that makes better use of the information and communication technology	A city that provides the conditions and resources for changes in the city and is capable of playing various roles, including as an urban laboratory, innovative urban ecosystem, living laboratory, and agent of change	A clever city that uses information and communication technology to enhance livability, workability, and sustainability	A city that ensures a sustainable, flourishing, and comprehensively growing future for citizens by effectively incorporating physical, digital, and human systems into the built environment

Definition of a Smart City by the Sejong National Pilot Smart City

As for the Sejong National Pilot Smart City, a smart city can be defined as follows:

'A future city as a platform that provides personalized forecasting services that elevate the quality of life and happiness of city dwellers and the city's sustainability by converting all phenomena and movements taking place inside the city and residents' behaviors and analyzing them with artificial intelligence.'



The City to Feel the Fourth Industrial Revolution

Previous cities including the U-City have used smart technologies to decrease costs and increase efficiency, mainly by suppliers and administrators. Unlike them, a smart city is a 'futuristic city' that uses fourth industrial revolution technology to design, operate, and manage the city for the happiness of its users, the residents. A variety of urban issues caused by urbanization worldwide, such as resource depletion, environmental contamination, traffic congestion, energy shortages, increasing crime rates, and disaster, are increasingly serious. A smart city introduces the smart technologies of the fourth industrial revolution to preemptively respond to various urban issues.

Main Agent of a Smart City

Civil Creativity	Resident Participation	Government Support
<ul style="list-style-type: none"> · Promotion of Corporate Innovation Activities through Bold Regulatory Reform · Development of an Innovative Start-up Ecosystem · Discovery of a Civil Business Model and Personalized Support · Provision of a corporate investment environment with pacesetter investment in public infrastructure 	<ul style="list-style-type: none"> · Open Innovation System for Civil Participation · Embodiment of a Living Lab using a Sharing Platform 	<ul style="list-style-type: none"> · Organization of the Legal and Institutional Framework · Establishment of a Smart City Management and Promotion System · Expansion of Overseas Entries and International Cooperation

Expected Effects of a Smart City

A Walkable City



▲ 60%

Walking increases creativity by 60%.
Dr. M. Opezzo, Prof. D. L. Schwartz of Stanford University (2014)



▲ 80%

A walkable city has 80% higher trust and participation than an automobile-dependent city.
Prof. K. M. Leyden of the National University of Ireland (2003)



▲ 40%

A walkable city has 40% more active exchanges than other cities.
Manhattan Union Square North Research (2012)



▼ 49%

A walkable city has a 49% lower commercial vacancy rate than other cities.
Manhattan Union Square North Research (2012)

An Environment Reviving City



▼ 72%

Reduction of GHG by 72% by increasing energy efficiency
UN Sustainable Energy for All(2015)



▼ 14%

Reduction of power consumption by buildings and industry by 14% with increased energy efficiency
UN Sustainable Energy for All(2015)



24%

24% of CO2 emissions are generated from owned cars
The Guardian, edited (2017)



▲ 10 Times

As of 2030, the energy directly produced by private companies will be ten times that in 2016
Annual Meeting of the Global Future Councils(2016)

A City that Creates Ideas and Jobs



▲ 230 million

2.3 million new jobs due to automation using smart technology
Gartner Report (2017)



▲ 57%

Artificial intelligence increases idea diversity by 57%
Cannes Lions Deloitte Digital Case (2018)



▲ 25%

25% improvement in personalized demand through blockchain based information sharing
KPMG Study (2018)



▲ 300%

300% higher employment rate due to walking city development
Example: Dublin Temple Bar District

City for a Healthy and Happy Life



▼ 45%

45% reduction in emergency visits to hospital due to remote medical services
Capital Blue Cross Study (2016)



▼ 40%

40% reduction in infectious disease due to the integrated network of hospitals
The Kansas Healthcare Collaborative(2016)



▼ 15%

15% reduction in disease risk due to real-time air monitoring
McKinsey Report(2018)



▲ 11%

11% more social participation for every 10-minute reduction in commuting time
Prof. R. D. Putnam of Harvard University, edited (2000)



Meaning of a National Pilot City

National Pilot City Background

Various urban issues, such as resource depletion, environmental contamination, traffic congestion, and energy deficiency due to urbanization, have grown serious worldwide. In 2015, the UN forecasted the urbanization rate of all cities around the world and estimated that the rate would be 82.5% in Korea, 93.5% in Japan, 81.6% in the USA, and 82.6% in the UK. To resolve urban issues, existing cities promoted the quantitative expansion of the city's components, such as roads, police force, and power plants, physically responding to such issues. However, their methods faced limits in resolving issues that large cities currently suffer from. Now, the world is paying attention to the smart city as a new alternative solution for urban issues, because the smart city, which introduces fourth industrial revolution technologies, can respond actively and preemptively to various urban issues.

National Pilot City Purpose

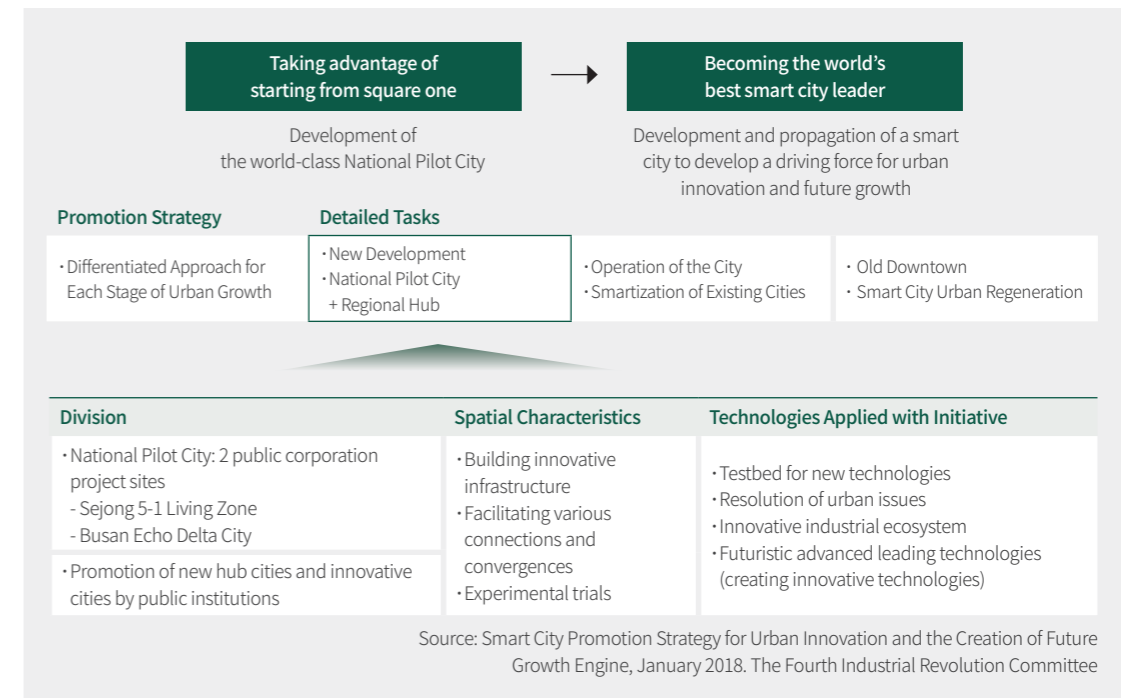
Smart city puts an emphasis on resident happiness in designing all infrastructure of the city from scratch. Also, it aims at being a world-class smart city based on South Korea's smart technologies. By using fourth industrial revolution technologies, it will resolve existing urban issues and execute innovative experiments to lay the foundations for sustainable urban civilization. The National Pilot City will supplement and improve problems through various and provocative trials and play the role of an 'urban experiment laboratory' for Korea and the rest of the world in the future.

Three Visions Proposed by the Sejong National Pilot Smart City

First, as the testbed for new technologies, it will test the new convergence technologies of the fourth industrial revolution and fully reflect intelligent infrastructure and new convergence industry services so that the National Pilot City can act as the platform for the integration of a variety of future technologies. The National Pilot City will introduce a regulatory sandbox and a variety of special regulations to support experiments in new technology innovation.

Second, it will embody services that resolve various urban issues, such as traffic and energy. It will develop an open operating system that embodies a data hub model for integrated big data management that connects the urban data with each other. It will induce new solution developments tailored to creative demanders.

Third, it will develop new services using an urban data platform with an innovative industrial ecosystem. It will expand the participation of the private sector and promote public-private joint projects so that companies can participate with a creative business model from the initial stage of urban planning. By taking advantage of starting from square one, it will discover and reflect various contents that residents need across all move-in stages, from planning to design and construction.



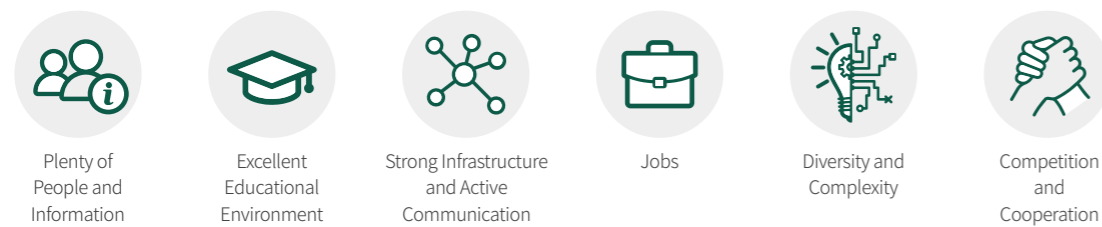
Meaning of a National Pilot City

- Testbed for new technologies
- Resolution of urban issues
- Innovative industrial ecosystem

Philosophy of the Sejong National Pilot Smart City

The Sejong National Pilot Smart City aims at the philosophy and values of the city: a sustainable platform that enhances residents' happiness and provides creative opportunities.

People that live in cities represent 50% of the world's population today and that figure is expected to exceed 70% by 2050. The reason people crowd into cities is that there is more to enjoy in bigger cities. Urban expansion is not just a quantitative matter. When a city becomes ten times larger, it becomes 17 times more creative. The city works as a creative engine inasmuch as the city accounts for 80% of the total GDP currently produced. How do cities generate 'creative opportunities?' Cities are places where smart people learn from each other. Factors such as plenty of people and information, an excellent educational environment, jobs, diversity and complexity, solid infrastructure and active communication, competition, and cooperation make cities creative.



However, the expansion of cities is also accompanied by various problems. The most serious problem among them is that large cities are no longer sustainable and the residents living in them are not happy. Today, cities only take up 2% of the world in terms of land area, but most of the world's energy and environmental issues are related with cities. Large cities become unsustainable due to environmental contamination, traffic congestion, excessive energy consumption, and the destruction of natural ecosystems. Also, the level of happiness of people living in farm villages and small country towns has been higher than that of people living in large cities over the past few decades. The reasons for that include high crime rates and safety accidents, inequality and polarization, work-life imbalance, and overly competitive education due to the increased population in larger urban areas.

When the City Changes, Human Civilization will be Sustainable

The Sustainable Development Goals are an agenda adopted by the UN in 2015, which will be implemented until 2030, and include 17 goals, 169 targets, and 230 indicators. It targets all countries, considers the integration of economics, society, and the environment, and was created through the participation of all stakeholders, including civil societies and private enterprises. We derived key elements to make the Sejong National Pilot Smart City sustainable based on the 17 goals, including health, well-being, and the elimination of excess inequality.

Seoul ranks 7th out of 100 cities in the Arcadis Sustainable Cities Index 2016. In detail, however, Seoul ranked relatively low in the fields of the environment (26th) and the economy (18th).

Therefore, we derived key elements to make Korean cities sustainable, such as securing clean energy, creating decent jobs and sustaining economic growth, sustainable consumption and production, responses to climate change, the protection of marine resources, and the protection of land resources.



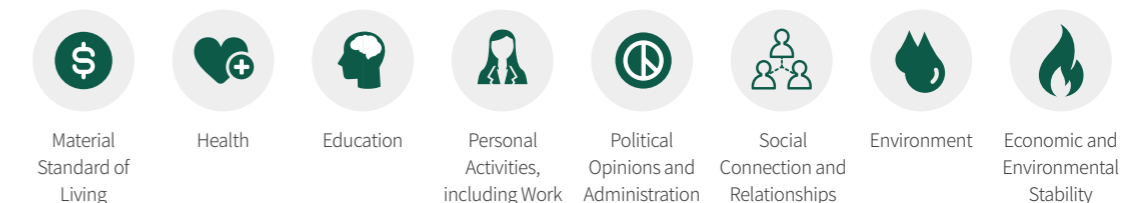
When the City Changes, Residents Becomes Happy

The Nicola Sarkozy Commission (Joseph Stiglitz, Amartya Sen, Jean-Paul Fitoussi) recommended that not only GDP but also an inclusive and diverse area of life should be examined to measure happiness.

Based on this indicator, we approached the matter of improving the quality of life and happiness of the Sejong National Pilot Smart City residents.

According to the OECD's Better Life Index 2017, Korea ranked 29th out of all 38 countries, indicating that the level of happiness is relatively low, particularly in the areas of community, environment, health, work-life balance, and life satisfaction.

Therefore, we derived key elements to make Korean residents happy, such as health, education, personal activities including work, political opinions and administration, social connection and relationships.



Values of the Sejong National Pilot Smart City

Post-materialism

The Sejong National Pilot Smart City, a city that places the highest priority on people, and a lifestyle with work-life balance and an eco-friendly future, aims for post-materialist values.

Decentralization

The Sejong National Pilot Smart City, a city where residents are the principal agent, aims for a decentralized value that respects the fairness and diversity of the city based on sharing, openness, and dispersion.

Smart Technology

The Sejong National Pilot Smart City, a city that realizes the convergence of services, aims for smart technology that provides creative innovation and opportunities through data-driven artificial intelligence and blockchain.

By taking advantage of starting from square one, the Sejong National Pilot Smart City places an emphasis on residents' happiness, from urban planning and infrastructure development, and creates a Korean smart city that draws the world's attention by using smart technology. We will become the world leader for smart city development to achieve innovation of future cities and create future growth engines for the next generation.

Human-centered and People-oriented City	A Decentralized City that Respects Sharing, Fairness, and Diversity	A City that Realizes the Convergence of Services based on Smart Technologies
A City where All of These Improve Resident Happiness		
Post-materialism Lifestyle, Work-life Balance, Human-centered + Eco-friendly	Decentralization Sharing, Openness, Dispersion, Respect for Diversity, Resident Participation	Smart Technology Data-driven Artificial Intelligence Blockchain, Creative Innovation
Mobility	Gradually reducing the number of cars down to the 1/3 the normal level while maintaining economic sustainability and convenience.	
Healthcare	Response (treatment) preemptively (prevention) and quickly (emergency) to emergency situations through a medical network environment.	
Education and Jobs	Promote critical and creative thinking and provide education for start-ups and employment.	
Energy and the Environment	Demonstrate a participatory climate change neutral city through urban new renewable energy and e-mobility.	
Governance	Encourage residents to solve urban issues directly and experiment with basic income using a local currency.	
Culture and Shopping	Provide various cultural experiences and a convenient shopping environment through personalized forecasting services.	
Living and Safety	Monitor abnormal signs through an artificial intelligence-based living safety system and respond promptly.	

Values of the Sejong National Pilot Smart City

Overview of the Sejong National Pilot Smart City Project

- Location:** Whole area of Hapgang-ri, Sejong-si (Sejong 5-1 Living Zone)
- Project Area:** 2,741,000m² (830,000 pyeong)
- Project Period:** 2018-2023 (Moving in from the first half of 2023)
- Design Population:** Approximately 20,000 (approximately 9,000 households)



City of Big Data

The Sejong National Pilot Smart City seeks to become a platform that provides personalized forecasting services that increase the quality of life and happiness of residents. The city will solve existing urban problems by digitizing and analyzing all phenomena and activities and residents' behaviors that take place in the city. At the same time, it will become the foundation for smart city innovation.

The Sejong National Pilot Smart City thoroughly protects residents' personal information and privacy by ensuring data anonymity and transparency. Residents actively produce and provide data and build the city of big data of their own accord. By digitizing a variety of information produced in the city into data and using it, we are building an unprecedented innovative urban data ecosystem.



The kernel of a smart city is to store the city's data, obtained through IoT, mobile, and various service platforms, in a cloud system and manage them as a data hub, while solving urban issues through artificial intelligence and developing and providing personalized services to improve the quality of life for the residents and guarantee the city's sustainability.

In particular, the smart city will provide various services by analyzing the city's data accumulated in the data hub using AI techniques, such as deep learning and machine learning.

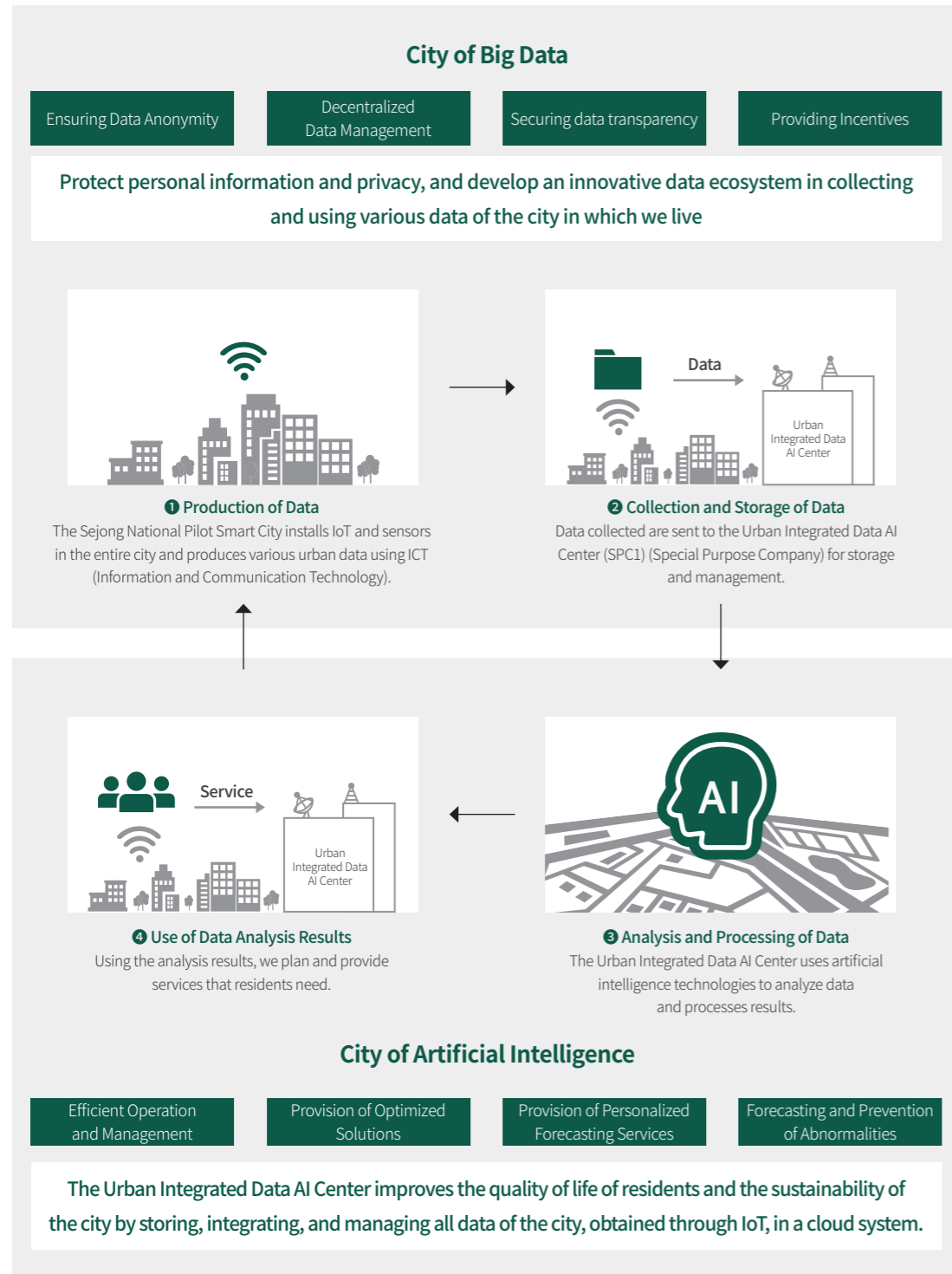
- ① Efficient management of energy and costs
- ② Provision of optimal solutions for maximizing urban functions
- ③ Preemptive responses through the discovery of outliers
- ④ Provision of personalized services that residents demand (personalized service)
- ⑤ Forecasting various changes in the urban environment and responding to demands appropriately

At the Urban Integrated Data AI center, IoT experts, big data managers, artificial intelligence experts, and smart city urban service planners plan and provide services by analyzing the collected city data. They also measure and feedback indicators for the results, to improve the system continuously.

The Sejong National Pilot Smart City provides convergence services based on residents' needs by integrating and connecting data in various fields, including mobility, healthcare, education and jobs, energy and the environment, governance, culture and shopping, and living and safety.



Sejong National Pilot Smart City Data Use Flow



1) SPC: Special Purpose Company

Requisites of the City of Data

- 1 Ensure Data Anonymity
- 2 Decentralized Data Management
- 3 Secure Data Transparency
- 4 Provide Incentives for Data Provision

The Sejong National Pilot Smart City – A City that Restores Residents’ Data Sovereignty

The Sejong National Pilot Smart City is a platform that embraces the lives of residents by utilizing the data provided by residents and links and shares the data between fields within the city. Residents are not simply the consumers of the city’s services, but prosumers who produce and consume data and services, taking the lead in the data-driven ecosystem. The program proposes a personal data exchange activation plan to secure personal data sovereignty and create new business models. For example, it promotes resident participation with a blockchain-based local currency for various services within the city and the Urban Integrated Data AI Center processes the data produced by residents and private companies to implement a data marketplace where it can be sold.

The Sejong National Pilot Smart City residents, who produce and provide data, take an active position in solving urban problems through subjective and active resident participation. Data anonymity and transparency form a bottom-up open governance. Resident participation and sympathy are the most important keys that determine the success or failure of the Sejong National Pilot Smart City as a city of big data. The city, starting from square one, reflects the various needs and opinions of residents in the planning, design, construction, and pre-move-in stages of the city. The combination of various community programs such as the data-driven resident living lab, public open governance, and smart technologies secure competitiveness and a sustainable city.

Communication and harmony between various residents are the future of the data city that residents build. The public sector supports various social innovations and their bold applications with a regulatory sandbox and establishes an architecture that integrates and operates administrative services for convenient access by residents. It also develops governance that improves the city, by reflecting ideas and data suggested by residents, realizes participatory democracy and consensus democracy, and promotes regional development to fully realize the social value of the city.

Seven Innovative Factors

Healthcare

1. Integrated Network of Clinics
2. Quick Arrival to the Scene for Emergency and Emergency Treatment Services
3. Smart Home Doctor Service

Education and Jobs

1. Introduction of an International Standard Curriculum
2. Design of School Spaces and Development and Operation of a Platform
3. Personally-customized and Self-Learning Edutech Service
4. Life-cycle Academy
5. Operation of an Innovation Center, Playing a Pivotal Role in the Innovation Ecosystem

Mobility

1. Closed Small PM Sharing Service
2. Demand-responsive Self-driving Shuttle within the Circulation Ring
3. Integrated Mobility Service
4. Private Parking Lot (P2P) Sharing Service
5. Smart Signal Control Service

Energy and the Environment

1. Smart Grid based Energy Management
2. Development of an Energy Self-sufficient City
3. Development of Charging Infrastructure
4. Futuristic Architecture
5. Environmentally Friendly Food Resource Recycling

Governance

1. Reflection in the Municipal Administration (Vote, Opinion Petition) and Development of a Citizen Participation System (Living Lab)

Culture and Shopping

1. Customized Performer and Potential Audience Connection Service
2. Development of Variable Performing Culture Spaces for Various Performances and Cultural Events
3. Integrated Shipping Service for Items Purchased at Individual Shops

Living and Safety

1. Crime Prevention and Emergency Response Services
2. Development of a Nature Conservation Area Observation Station
3. Particulate Matter Reduction and Fog Forecasting Service
4. Smart Farm Service
5. Convergence Playground Service



Background for the Promotion of Seven Innovative Factors

The Sejong National Pilot Smart City analyzed the factors required for resolving problems of Korean cities including Sejong City. Innovative factors as well as the goals and core services by innovative factors were derived based on the analysis.

Problems of Korean Cities	Requisites	Innovative Factors	Goals
<p>Problems Unique to Sejong City</p> <ul style="list-style-type: none"> · Lack of Medical Services · Lack of space for sports · Lack of various theater facilities · Lack of various cultural and shopping facilities · Significantly low occupancy rates for shopping malls and offices · Excessive commute times · Inconvenient and insufficient public transportation and parking environments 	<p>Creative Opportunity</p> <ul style="list-style-type: none"> · Plenty of People and Information · Decent education · Jobs · Diversity and complexity · Connectivity · Competition and cooperation <p>Sustainable City</p> <ul style="list-style-type: none"> · Secure clean energy · Sustainable consumption and production · Response to climate change · Resource protection <p>Happy Residents</p> <ul style="list-style-type: none"> · Health · Political opinions and administration · Social connection and relationships · Education · Personal activities, including work 	<p>Mobility</p>	<p>Facilitate transportation and reduced travel time noticeably.</p>
<p>Problems of Korean Cities including Sejong City</p> <ul style="list-style-type: none"> · Lack of capacity to cope with emergency situations promptly · Difficulty in securing fresh ingredients due to the long distance from farmlands · Uncomfortable and uneasy living environment for the challenged, senior citizens, pregnant women, and children · Increased stress due to work-life imbalance · Difficulty in collecting public opinions immediately · Inconvenient access to public data · Anxiety about personal information management · Difficulty in promoting conative and critical thinking due to cramming education · Difficulty in promoting creativity due to uniform educational contents and environment · Lack of jobs for the young and the old · Worse traffic congestion during commuting hours · Worse traffic congestion due to the increased use of private vehicles · Lack of environmental requirements for start-ups 		<p>Healthcare</p>	<p>Manage health in daily life and respond to emergencies quickly.</p>
		<p>Education and Jobs</p>	<p>Cultivate critical thinking and creativity with various personalized education options. Build an innovative economic ecosystem for the coexistence of start-ups and large corporations.</p>
		<p>Energy and the Environment</p>	<p>Provide clean energy and fresh air and protect the ecosystem.</p>
		<p>Governance</p>	<p>Collect residents' opinions immediately and resolve urban problems with the virtual city.</p>
		<p>Culture and Shopping</p>	<p>Provide a variety of performances and a convenient shopping environment as demanded by residents.</p>
		<p>Living and Safety</p>	<p>Provide a safe environment by monitoring the city thoroughly.</p>

Expected Effects of the Seven Innovative Factors

Mobility



- Reducing traffic congestion and time spent commuting during rush hour and creating work-life balance
- Reducing commute times by 40 minutes or more: 100 minutes → 60 minutes or less
- Clean urban air due to reduced exhaust and particulate matter emissions
- Decreasing the use of fossil fuels such as gasoline and diesel
- Reducing parking lot areas and multiple utilization of the areas
- Reducing traffic accident rates through self-driving
- Intensifying the city's ability to respond flexibly to fluctuating traffic volumes through services

Education and Jobs



- Sejong City serves as the center for fostering and training creative and competitive talent.
- Alert the standardized school environment and making a world-class contribution to the spread of various types of schools
- Qualitative evaluation, respect for diversity, critical and creative thinking, maker activities, etc.
- Applying products and services of globally competitive Edutech start-ups to schools and students (100 or more over ten years)
- Increasing the educational use of infrastructure throughout the city
- Overwhelming increase in the number of created jobs, start-ups, and re-employment

Governance



- Promoting regional development and realizing social values by resolving urban problems through online and offline platforms and creating an 'open' smart city in which private sector and residents participate
- Improving resident experience and smart city satisfaction by applying smart city solutions and resolving urban problems through active resident participation
- Possible to deriving improvement measures through continuous project evaluation and feedback and spread them to other cities
- Building a new innovation model that promotes the active participation of residents from the initial stage and creates results through the cooperation between public and private sectors and civil society
- Discussing new labor and welfare paradigms through a basic income test

Living and Safety



Healthcare



- In case of emergency, the time required to receive emergency medical treatment is reduced
- Increasing survival rate of emergency patients
- Reducing the time required until receiving treatment after sensing pain
- Increasing early detection of severe diseases with Smart Healthcare
- Increasing diagnosis and treatment accuracy through medical data accumulation and analysis
- Reducing social costs for medical insurance, etc.

Energy and the Environment



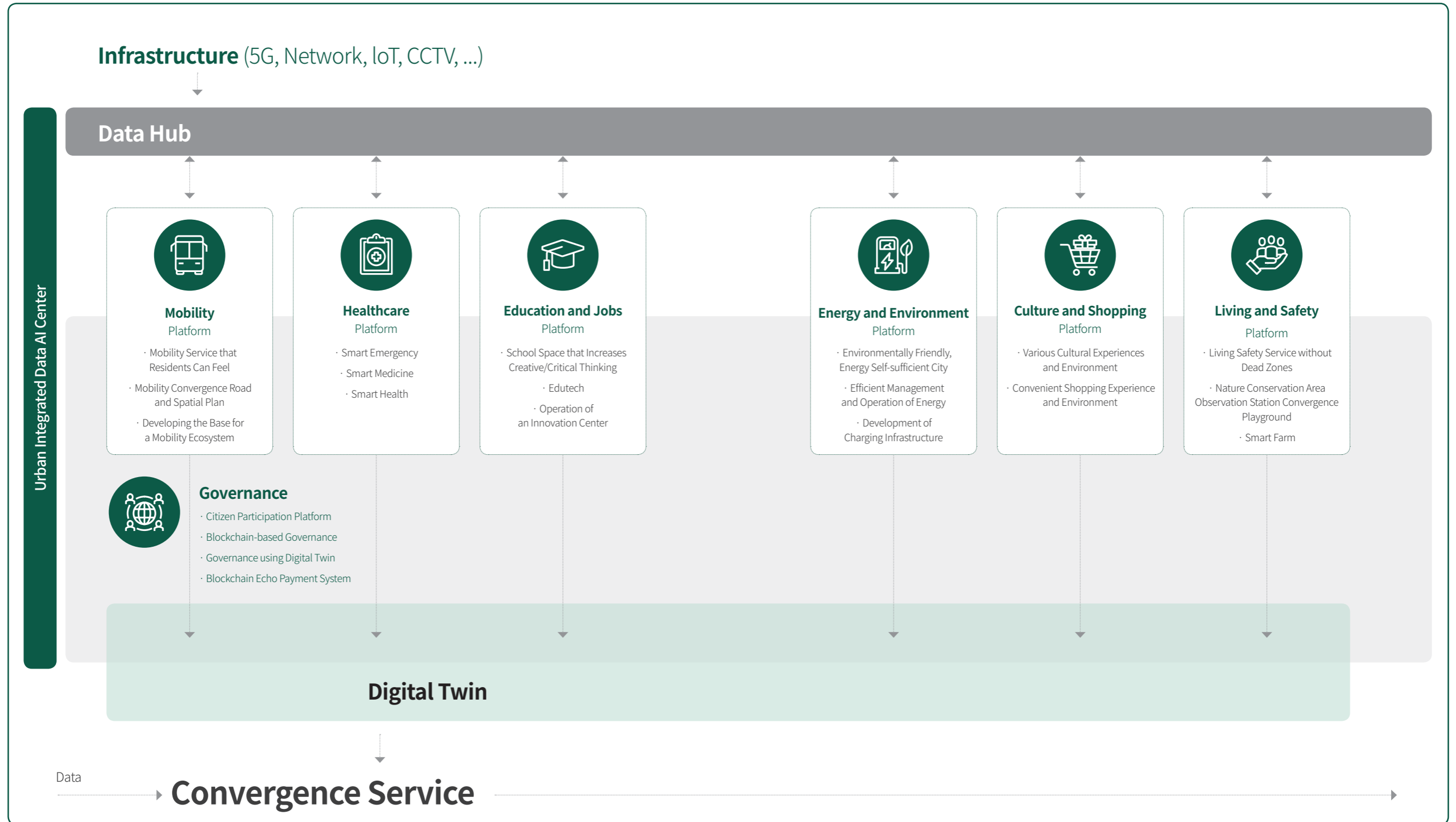
- Creating a future electric business model based on big data by demonstrating the futuristic system for embodying RE3020
- Presenting a climate change neutral city model by improving energy self-sufficiency (30% or higher) and activating the E-prosumer
- Demonstrating an efficient urban e-mobility system from the perspective of economic feasibility and resource utilization
- Proposing the portfolio of a zero-energy building that can secure economic feasibility
- IoT and digital based transformation using electricity and suggestions of the future city operation model
- Realization of a clean, quiet, hygienic, and safe city by using e-mobility and the automatic disposal of household waste, improving the quality of life
- Reducing environmental load due to development, securing urban sustainability, and creating pleasant urban and architectural spaces

Culture and Shopping



- Increasing residents' urban satisfaction by providing various cultural experiences
- Expansion of the local cultural market
- Increasing residents' satisfaction with leisure life
- Increasing economic vitality in the city and creating an economic ecosystem of a certain scale or higher
- Reducing the burden on fees through a local currency (convenient payment) and coexisting with small businesses
- Respecting the value of leisure life by pursuing quality of life
- Decreasing food mileage due to increased food self-sufficiency within the city
- Increasing resident's exercise twofold compared to other cities
- Reducing police dispatch time in case of emergency
- Reducing the number of safety accidents

Convergence Process



Difference with Smart Cities Overseas

Difference with Smart Cities Overseas

The Sejong National Pilot Smart City, developed into the National Pilot City in Sejong City, is the only smart city in the world developed from scratch by placing the emphasis on resident's happiness in the entire infrastructure of the city. It is the future city of South Korea built based on smart technologies to become 'South Korea's representative smart city' that will lead the global smart city market.

Smart cities in other places around the world went only so far as testing and applying smart elements and providing a single service in the existing old town center by the local government.

On the contrary, the Sejong National Pilot Smart City could apply smart technologies from the infrastructure and from the design and planning stages, because it started from square one. It could also test and apply the services of the seven innovative factors at once and becomes a place of opportunity to prepare a future city where services create new services in connection with each other.

Smart City by Innovative Factors

<Data: 1 >

Mobility	Copenhagen, Tokyo, London, Sydney, Hong Kong, Singapore, San Francisco
Healthcare	Barcelona, Sydney, Singapore, Toronto, Seoul, London, New York, Chicago
Education	Boston, Melbourne, Geneva, Zurich, Singapore, Toronto, Moscow
Energy and the Environment	Zurich, Geneva
Governance	Melbourne, Copenhagen, Stockholm, London, Singapore, Shanghai
Culture and Shopping	Barcelona, Shanghai, Singapore
Jobs	Boston, San Francisco, Zurich, Stockholm, Copenhagen, Singapore, London, Chicago



- Glasgow** Integrated urban infrastructure and improved the quality of life by establishing a communication network
- Milton Keynes** Urban platform using data, resident-centered living lab
- Cambridge** City platform using data, sustainable city structure, transportation and environment oriented
- Barcelona** State-centered leading city, private participation and fostering, sustainable city structure
- Santander** Smart City Expo, energy and transportation centered
- Oslo** Resident-centered living lab, a large testbed type experimental city
- Kalasatama** Activation of the connection between companies and local governments, smart grid, new renewable energy stations, electric vehicle charging stations
- Copenhagen** Resident-centered living lab, sustainable city structure, eco-friendly city, widespread use of bicycles, resident health

- Amsterdam** State-centered leading city, services that residents can feel, resident-centered living lab, smart meter installation and smart grid optimization
- Friedrichshafen** Smart life experience service
- Nice** Eco-friendly city planning, data platform, smart roads
- Masdar** State-led pilot city, the world's first/largest eco-friendly planned city
- Aurangabad** Public city operation, including green field development, public transportation, inexpensive housing
- Singapore** State-centered leading city, private partnership, virtual reality, testbed
- Toronto** Various future technologies, such as the pilot city project led by the private sector, base for Fourth Industrial Innovation and growth, operation of the city based on PPP (Public-Private Partnerships), and reduction of housing costs

2

Chapter

Preparing for Unchartered Territory

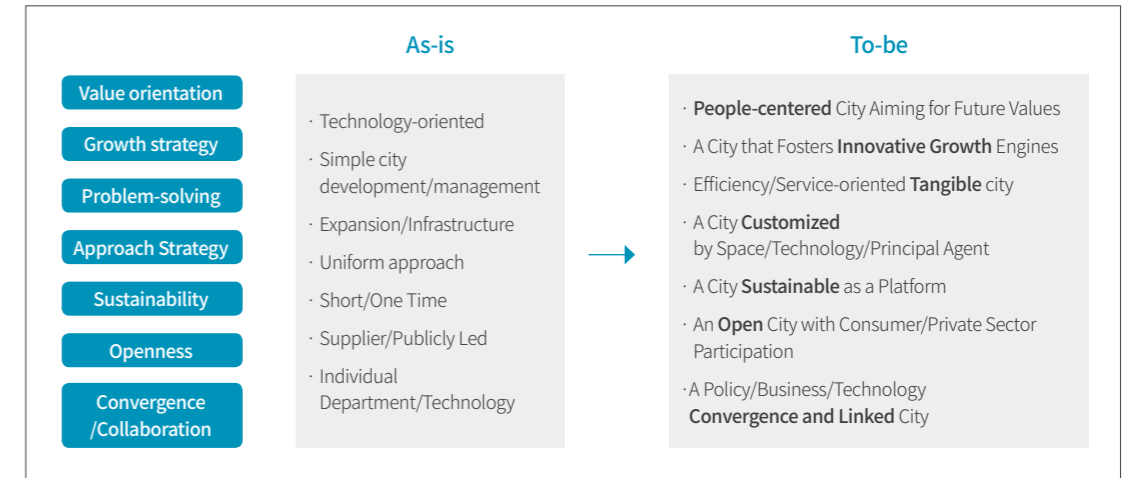
-
- 1 Sejong 5-1 Living Zone,
Designated as National Pilot City
 - 2 Professor Jeong Jae-seung,
Appointed as the Sejong
National Pilot Smart City Master
Planner
 - 3 Announcing the Basic
Conception Plan

Sejong 5-1 Living Zone, Designated as a National Pilot City

The Presidential Committee on the Fourth Industrial Revolution held the fourth meeting of the Fourth Industrial Revolution Committee presided by the chairman at the conference room in the Gwanghwamun office on January 29, 2018 and discussed the agenda on the ‘Smart City Promotion Strategy.’

The chairman of the Fourth Industrial Revolution Committee said, “The smart city holds significance as the platform that can embody all technologies and services of the Fourth Industrial Revolution. Mr. President has also emphasized the smart city as a concrete policy program that people can feel and recognize during the first meeting following the establishment of the committee,” and added, “Securing open scalability such as resolving urban and social issues through the participation of residents and the private sector is most important in making a smart city established as a sustainable platform.”

The main contents of the 『Smart City Promotion Strategy』 resolved are as follows;



Smart City's Seven Innovative Changes

We will promote “Smart City's Seven Major Innovative Changes” to transform the city into a sustainable city that drives innovative growth and a people-centered open city where various consumers, including private companies and residents, participate. For this, we will implement three strategies: ❶ differentiated approach for each stage of urban growth, ❷ incorporation of personalized technologies to increase the city's value, and ❸ re-establishment of the roles of private enterprises, residents, and governments.

Firstly, we will have the National Pilot City, which will be newly developed from scratch, reflect three directions: a testbed for new technologies, resolution of urban problems and improvement of the quality of life, and the development of an innovative business ecosystem. The Smart City Special Committee has discussed the most appropriate site to implement the concept of the pilot city since November 2017 and selected two locations as the sites for the pilot project: Sejong 5-1 Living Zone (830,000 pyeong), Busan Eco Delta City (center of Semulmeori area, 660,000 pyeong). In Sejong City, we plan to implement various technologies that people can feel in life in the energy and transportation areas.

Secondly, for the Sejong National Pilot Smart City, we will

focus on implementing technologies such as future common leading technologies, next-generation networks, big data, and AI, to sensory technologies such as autonomous driving, a smart grid, and virtual reality, and also promote the validation and commercialization of them. For existing cities and old town centers, we will propagate commercialized technologies in related fields such as transportation, energy, the environment, administration, and housing that people can easily recognize.

Lastly, we will implement an innovative industry ecosystem by improving regulations to promote private investment, creating a start-up incubation zone, and fostering human resources and prepare various support measures such as discovering business models so that private companies can participate with business models from the urban planning stage.

The Deputy Minister of Land, Infrastructure, and Transport emphasized at a briefing, “The development of a pan-governmental cooperation system and the participation of the private sector is essential for the success of the National Pilot City,” and added, “We will promote the project so that people may actually feel the changes in life sooner or later.”

Professor Jeong Jae-seung, Appointed as the Sejong National Pilot Smart City Master Planner

The Presidential Committee on the Fourth Industrial Revolution recommended Professor Jeong Jae-seung (Professor of the Department of Bio and Brain Engineering and the Dean of the Moon Soul Graduate Program for Future Strategy, KAIST) as the Master Planner (hereinafter, 'MP') who will lead the Sejong National Pilot Smart City.

The MP appointed will lead the entire project, starting with the establishment of the National Pilot City's vision and goals, and will take on the role of overseeing the smart city development project up to the point of move-in.

Unlike in the past, when an urban planning expert played the role of MP and also the role of advisor for the project operator in new town development, the professor is expected to increase the innovativeness of the National Pilot City by promoting the project with initiative, as an expert in science and technology.

Professor Jeong Jae-seung, appointed as the Sejong National Pilot Smart City MP, is a brain engineer based on humanistic understanding and is recognized for his competence and influence inasmuch as he was selected as the 'Next Generation Leader' at the Davos Forum.

As an expert on the fourth industrial revolution, which forms the basis of the smart city, he has been leading the convergence and integration of brain science, architecture, and artificial intelligence.

Considering that future smart cities are aiming for a 'smart city' that utilizes various city data and enables the incorporation and convergence of new technologies in various fields, including artificial intelligence, he is considered to have sufficient competence as an expert on the subject.

Professor Jeong, appointed as the Sejong National Pilot Smart City MP, expressed his ambition, "I will make Sejong City grow into a city that can act as a testbed where start-ups can come and actually apply smart technologies in improving the happiness and the quality of life of the residents. Sejong City will become a city where innovation for happiness is embodied."

The officials of the Ministry of Land, Infrastructure, and Transport and the Ministry of Science and ICT said, "The Sejong National Pilot Smart City intends to embody new challenges and innovations on a clean slate, unlike existing urban developments. The MP nominated is considered the best person to fulfill this intent of the National Pilot City."

The officials added, "We will make sure the MP and project operators will reflect diverse opinions from related ministries, academia, and private companies, so that they can fully exercise their imagination and provide full support so that the Sejong National Pilot Smart City grows into a world-class future city that evolves by itself centering on residents and companies."

Announcing the Basic Conception Plan

The Presidential Committee on the Fourth Industrial Revolution and the Ministry of Land, Infrastructure, and Transport announced the basic conception plan for the National Pilot City with the National Pilot City Master Planner (MP), representatives of relevant government agencies and local governments (Sejong City and Busan City), and the project operator (LH·K-Water) at the Sangam DMC High-tech Industry Center on July 16, 2018.

Through the basic conception plan, we could see the big picture for the full-scale implementation of the pilot city, such as the vision and goal, implementation strategy, and main contents of the National Pilot Smart Cities (Sejong 5-1 Living Zone and Busan Eco Delta City).

Since January 2018, the government has been focusing on the smart city as one of the innovative growth projects to present a leading model for smart cities for the future. After the announcement of the site, we have discovered major contents that can be incorporated into the pilot city for each project site, discussed how private companies can participate, and identified parts of regulations requiring improvements. We have also expanded resident participation by holding naming contests and competitions. Also, in May 2018, the National Assembly's standing committee passed the revised bill of the Smart City Act, which includes various special cases for fostering new industries in the National Pilot City and the introduction of innovative growth promotion areas.

Since the appointment of the Master Planner (MP) in April 2018, we have focused on preparing the basic conception plan that corresponds to the big picture of the National Pilot City promotion, centering on the MP. For the basic conception plan for the pilot city, we formed a task force (TF) in which local governments and project operators participate based on the MP's proposal, and have held in-depth discussions for the past three months on the vision, goals, and suitability of the major contents. We also discussed these topics with the Smart City Special Committee (June 22) and the Presidential Committee on the Fourth Industrial Revolution (June 26). Also, we collected a wide range of opinions through various channels, such as meetings with experts in urban planning (July 3) and meetings with relevant associations (July 5).

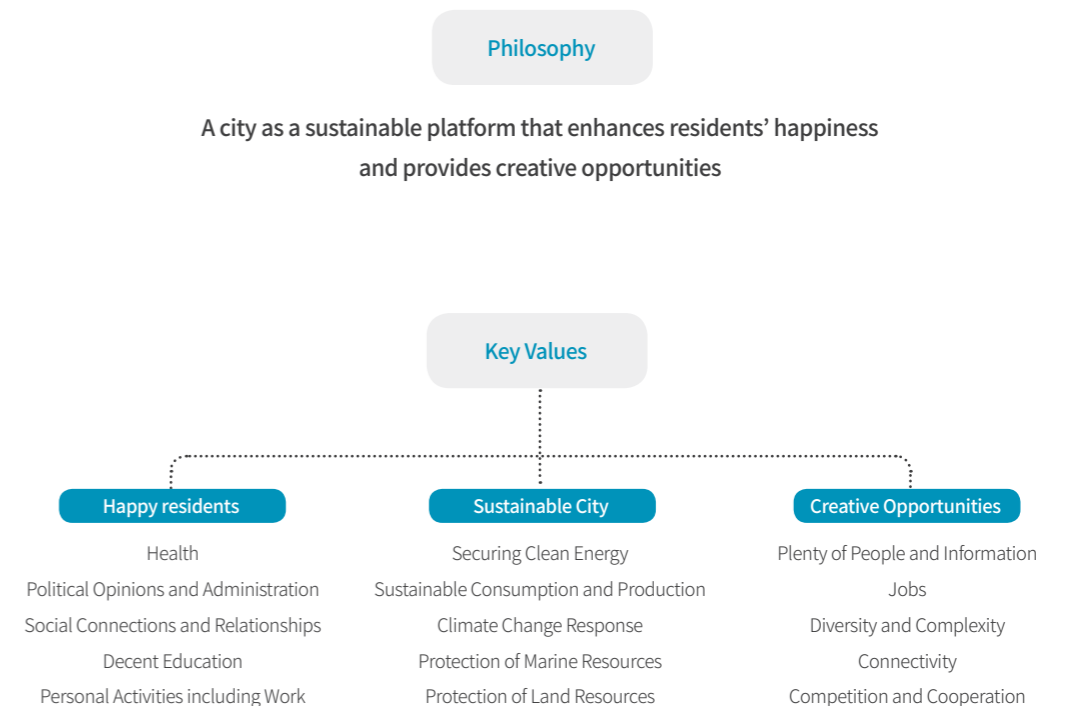
Jang Byeong-gyu, Head of the Presidential Committee on the Fourth Industrial Revolution emphasized in his opening address that a smart city is a platform that realizes various Fourth Industrial Revolution technologies and can be a new growth engine for the Korean economy. He also stated, "We will concentrate all policy capacity into the project so that the 'Human-centered Smart City' can be implemented through the participation of the nation and companies, based on the basic conception plan announced today."

Meanwhile, the Smart City Association and the Venture Business Association participated in the presentation and explained their position on the promotion of the National Pilot City on behalf of each industry.

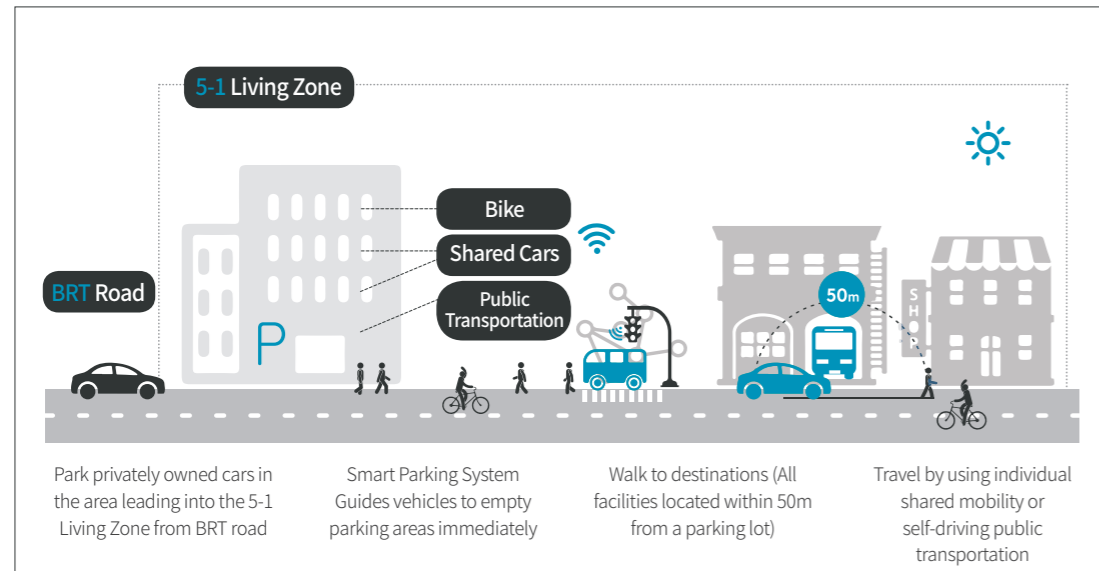
The Smart City Association welcomed the announcement of the basic conception plan of the pilot city on behalf of the Smart City industry, emphasized the need for regulatory improvement, and announced that they will actively participate in the preparation of the detailed implementation plans of the basic conception plan with the members of the association (private companies) and the development of a business ecosystem.

The Venture Business Association also welcomed the announcement of the basic conception plan and expressed its expectations for the National Pilot City as a testbed for new technologies for venture companies. By stating that the provision of a new innovative industrial ecosystem will be an excellent opportunity for smart technologies in relevant fields, the association announced that it will contribute to the development of a "venture ecosystem."

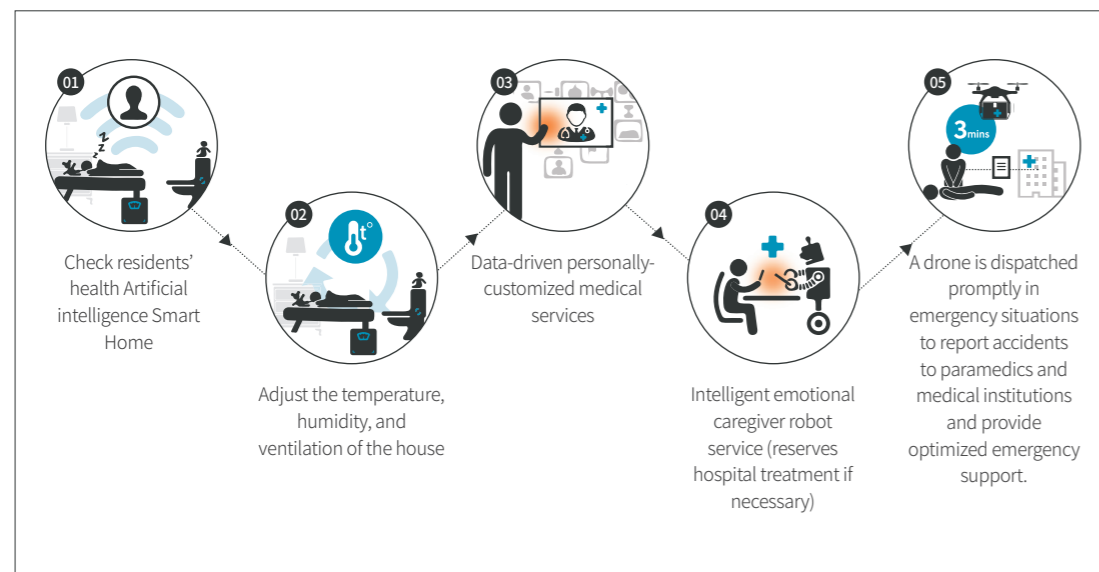
The following explains the main contents of the National Pilot City's basic conception plan; The Sejong National Pilot Smart City presented the vision of the 'city as a sustainable platform that increases residents' happiness and provides creative opportunities' by reflecting the philosophy of MP Jeong Jae-seung.



Also, we closely analyzed the problems unique to Korean cities and Sejong City and derived seven innovative factors for residents' happiness. Among them, we emphasized four innovative factors: ① Mobility ② Healthcare ③ Education ④ Energy and Environment, as the key elements.

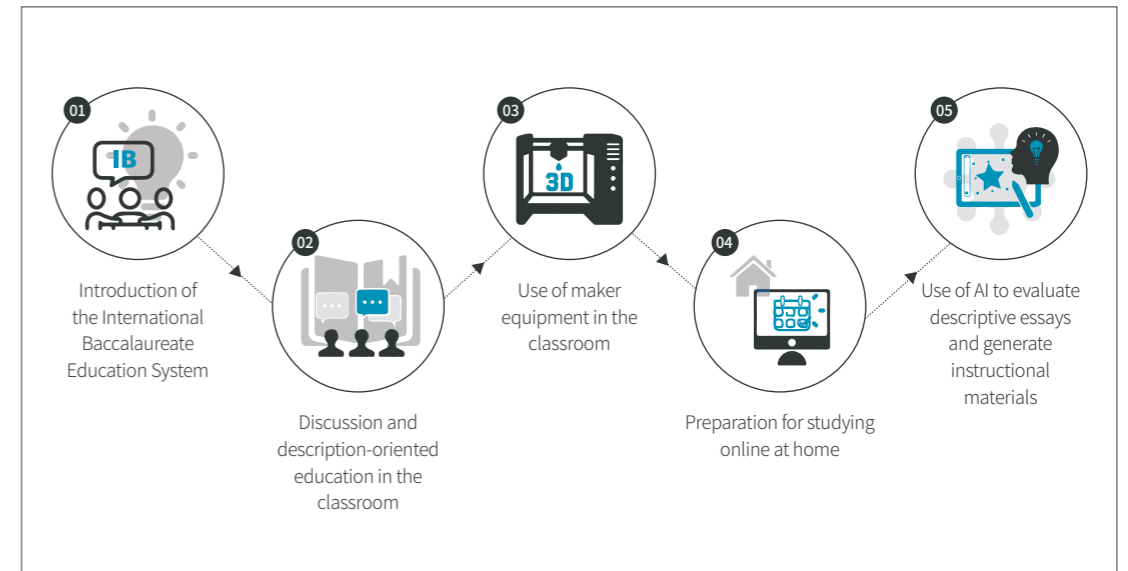


Convenient Mobility (Representative Service for Mobility)

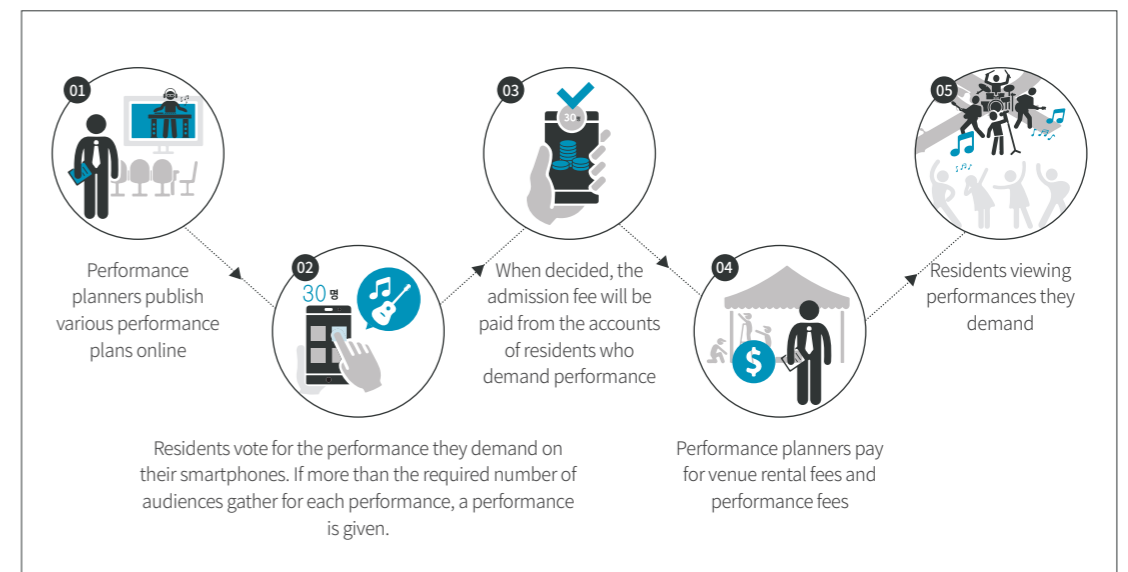


Personalized Medical Service and Emergency Response (Representative Service for Healthcare)

This reflects MP Jeong Jae-seung's philosophy of taking one step closer to the happiness of residents by combining new technologies and services related to healthcare and education services that Sejong City needs to improve on, in addition to transportation and energy that have been pointed out in Sejong 5-1 Living Zone.



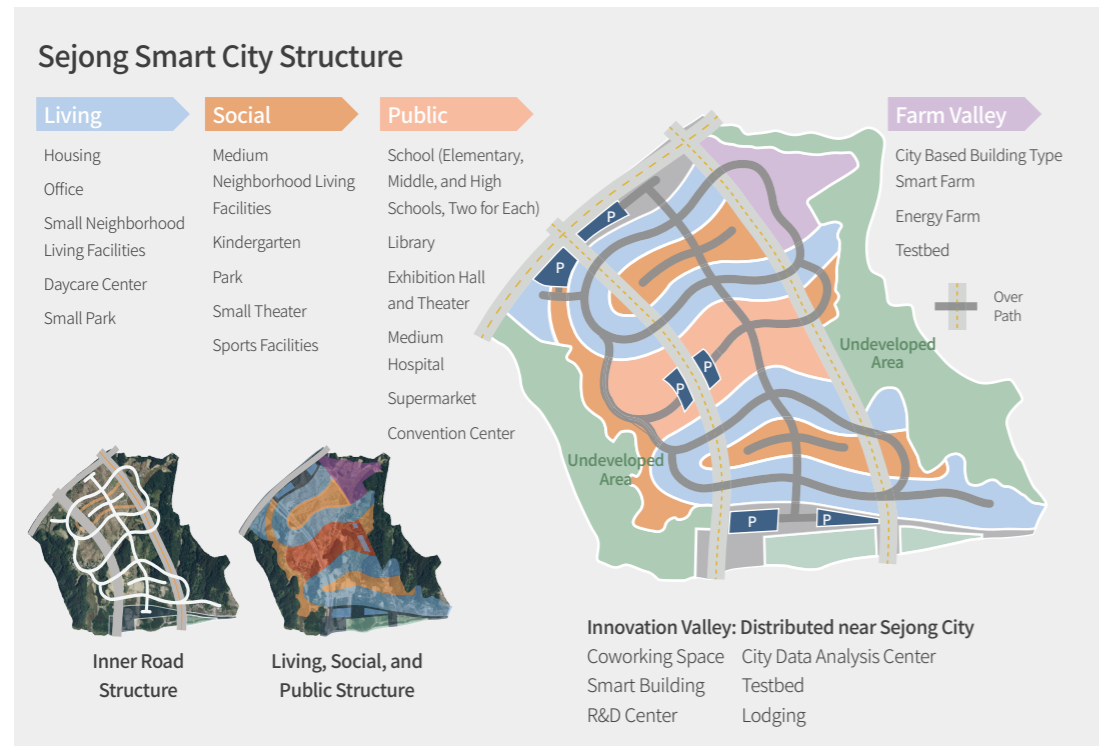
Personalized Educational Environment Centering on Discussion and Description (Representative Service for Education)



Provision of Cultural Performances Demanded by Residents (Representative Service for Culture and Shopping)

Meanwhile, we included innovative proposals related to the urban spatial structure of the Sejong National Pilot Smart City in the basic conception plan. First, we moved away from existing urban planning, which is based on the use area system, to embody a new urban space system that responds to the era of the Fourth Industrial Revolution. We proposed a “city without a use area (mixed use and variable) designation system, which divides the entire city into living, social, and public areas only,” as the main urban composition system.

This reflects the difficulty in developing an innovative city according to the preliminary designation of use areas and the intention of MP Jeong Jae-seung to break away from stereotypes, such as placing an emphasis on the land utilization plan, which has been used for new town developments in the past. By taking into account the traffic congestion issues and economic loss from the perspective of the entire city due to door-to-door movement using privately owned vehicles within the city, the Sejong National Pilot Smart City’s basic conception plan introduced the concept of the ‘shared car-based city.’ It proposes a transportation operating system where privately owned cars should be parked in the area leading into the living zone, and people can use self-driving vehicles, shared vehicles, and bicycles inside the living zone. It also emphasized humanistic approaches to urban design.



Sejong 5-1 Living Zone Spatial Structure (Draft)

Public Sector’s Support Plan for Implementing the Basic Plan

Promoting Regulatory Improvement for an Innovative Pilot City

To successfully promote the basic conception plan established by the Master Planner, the government actively discovered contents (technological services) that can be incorporated into the National Pilot City, while improving regulations, supporting the budget associated with R&D, and supporting ventures’ and start-ups’ participation. The government also said that it will promote international cooperation for the overseas expansion of the National Pilot City in the future.

First, we actively promoted regulatory improvements to encourage private companies to participate and provide free testing spaces for innovative growth. We are making efforts for the revised Act on the Promotion of Smart City Development and Industry to pass the National Assembly (the “Smart City Act”) within this year, and promote additional institutional improvements by collecting opinions from companies and local governments. In addition, we plan to consider introducing a regulatory sandbox to enable freer validations and various business models for the pilot city.

Also, we plan to flexibly operate urban planning and the supply of land so that innovative technologies can be easily incorporated into the National Pilot City, and demonstrated and new attempts can be made at all times. For the land utilization plan, we will make efforts to implement the “urban planning without use area” structure as proposed by the MP, by utilizing the current systems such as the minimum site regulation area and special construction area. We also plan to provide an innovative space where companies can use land freely without any cost, and prepare flexible land supply plans (long-term leases, etc.) to cope with potential demand from future technological changes.

Preemptive Investment by the Private Sector to Expand Private Sector Participation

The government said that it is considering a plan to support only areas where national support is deemed legitimate regarding the project cost added, due to the designation of the National Pilot City, with the budget.

Also, the government planned to concentrate R&D, which are distributed among various agencies, into the National Pilot City to develop the National Pilot City into a testbed for cutting-edge technologies related to the Fourth Industrial Revolution and a future model for smart cities. If additional validation is required at the city level considering the development details and technological levels of the departments’ R&D associated with the contents, it will be associated with the National Pilot City (support for validation costs). We plan to actively review new R&D for validation and continue consultations with related ministries, centering on the Ministry of Land, Infrastructure, and Transport and the Ministry of Science and ICT.

Meanwhile, the project operator will also shoulder the project costs required for upgrading basic infrastructure (roads, waterworks and sewage, etc.) and land development. Additional project costs related to the smart city will be estimated based on the confirmed contents and will be additionally reflected in the site development costs.

Realizing Private Company Participation and Expanding Participation Opportunities for New Ventures and Start-ups

With the announcement of the basic conception plan, the government announced a plan to expand the opportunities for private companies and residents to participate further as the participation of various actors is essential for the successful promotion of the National Pilot City.

First, we provide various opportunities to participate, such as the formation of a consortium and the establishment of an SPC, instead of the existing method of ordering public project operators, to promote private companies to invest in the pilot city. Also, instead of the lowest bidding system, we plan to use various purchasing methods, such as the best product bidding for the appropriate price or competitive dialogue to promote the development of innovative products and services.

The client will communicate from the initial stage and purchase the finished product to develop innovative and unprecedented products and services. Also, we plan to expand the participation of start-ups within the National Pilot City and provide testbeds for initial investment through collaboration with accelerators. We will promote the Fourth Industrial Revolution technology development and validation support project for small and medium-sized ventures and start-ups (LH, June 2018) and expand the area of residents' participation by making full use of ICT, as well as promote new resident participation based on sharing and openness, such as digital twin.

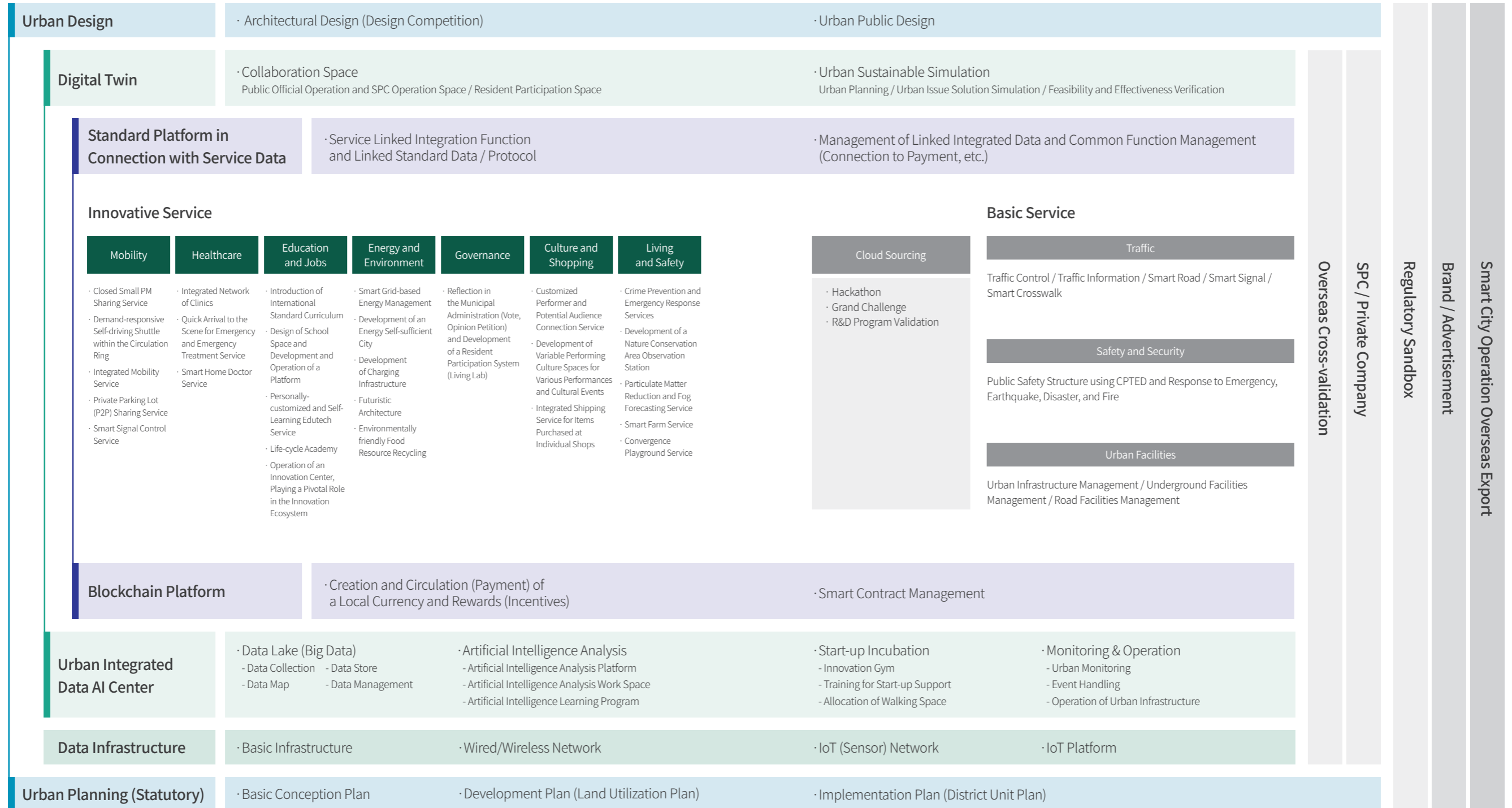
International Cooperation for Overseas Expansion and Cross-Validation

The National Pilot City plans to export the Korean Smart City overseas as one of its main goals. For this, the government plans to support the exportation of the city model and companies to expand their businesses overseas by continuously expanding government-international organization cooperation, which has been promoted for some time, and by performing smart city cross-validations. We plan to export a pilot city model and a proven Smart Solution through the ASEAN-Korea Smart City Network, which has been promoted as part of the New Southern Policy. We support and cooperate with the National Pilot City by matching 26 ASEAN cities, led by Singapore, with cities outside the smart city leaders (including Korea) one-on-one.

We are also planning to actively utilize public relations through international events such as the Korea-World Bank cooperation project and "World Smart City Week (September 18-20, 2018)." We plan to improve city services through cross-validation between the pilot cities and overseas cities as proposed by the MP and support domestic companies' overseas expansion while registering and promoting (tours, seminars) companies participating in the pilot city development to the World Bank 'Solution Portal.'

"The announcement of the basic conception plan for the National Pilot City holds significance as a starting point for broadly collecting and developing the opinions of private companies, residents, and experts in the future," said the Deputy Minister of Land, Infrastructure, and Transport, "We will work to prepare an implementation plan that specifically describes the roles of each of the principal agents, from the public and private sector, by supplementing the basic conception plan."

Sejong National Pilot Smart City Scheme



3

Chapter

Taking a Step for the Next Generation

1 Spatial Plan Development Process

- Land Utilization Plan
- Spatial and Environmental Design
- Street Planning

2 7 Innovative Factors Development Process

- Mobility
- Healthcare
- Education and Jobs
- Energy and the Environment
- Governance
- Culture and Shopping
- Living and Safety

3 Data Operation Development Process

- Digital Twin
- Data and Artificial Intelligence
- Blockchain

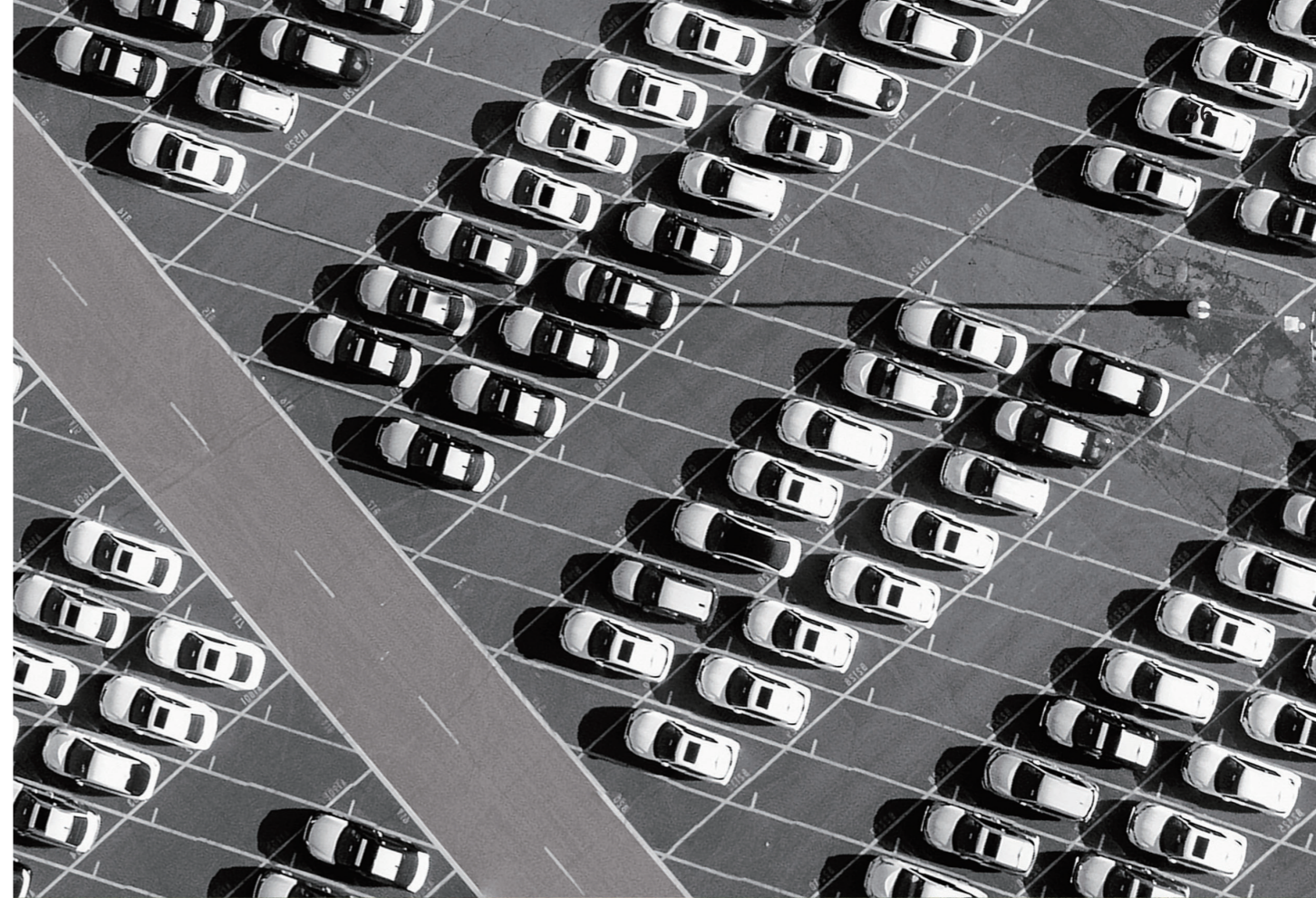
4 Important Promotion Strategy Development Process

- Private Company Participation
- Regulations
- Overseas Cross-validation and Exportation of a Smart City Model

Spatial Plan Development Process

In January 2019, we restarted the land utilization plan in line with the philosophy of the Master Plan led by the MP. The new Land Utilization Plan contains five planning principles: Developing a walkable environment, diversifying means of transportation, creating new values such as mixed uses, respecting the value of preserving the original state, and establishing a smart technology infrastructure.

We devised differentiated spatial and environmental designs to give residents a new experience that suits the philosophy of the National Pilot City and planned streets to ensure traveling using various PMs so that walking is safe.



A city where people, nature,
and technology coexist in
harmony and various innovations
take place for the next generation

A city that embodies the human
rhythm and scale through smart
technologies

Land Utilization Plan

The land utilization plan places the highest priority on the embodiment of an urban space based on the creative community that realizes job-housing proximity. We will lead the innovative project of the Fourth Industrial Revolution by building the physical platform that embodies seven innovative factors.



The 50th Revision of the Development Plan (Draft) Land Utilization Plan (July 4, 2019)

Final Land Utilization Plan Approved as of Now

The land utilization plan shown on the left is a draft approved and announced on July 4, 2019 with the 50th revision of the development plan. We planned an urban space that forms a physical platform so that the services in the master plan for the Sejong National Pilot Smart City can be developed well within the city. After that, the development plan was approved with the spatial plan, developed through six meetings with the spatial design expert committee and consultations with each of the related organizations (July 4, 2019). It moved away from vehicle-oriented urban planning toward a pedestrian-oriented city. Personal mobility (hereinafter referred to as “PM”) has been activated and seven innovative factors were incorporated throughout the city. The infrastructure that facilitates the implementation of innovation and technology is well established at the base of the city.

The reason the 50th revision of the development plan was carried out was that the Master Planner (MP) was appointed after the National Pilot City was selected (January 2018) and the result of continuous consultation on urban planning and services for a Smart City as a pilot city were reflected in the development plan (draft). The major changes in urban space planning were the introduction of mixed use sites* that combine residential and commercial purposes, which were classified in the existing land utilization plan, and the self-driving road inside the living zone.

For the park and green plan, we will create a network connecting natural environments around the foot of Chuldongsan Mountain inside the site, Hapho Seowon Confucian Academy, which is a historical park, Mihocheon Stream, and Geumgang River. We will make it easy for local residents within the target site to access and use the areas and improve community functions. The Sejong National Pilot Smart City is designed to reach all parks in strategic points to act as the link for the natural environment and pedestrians between different living zones. The plan for educational facilities applied the potential student population per household* by housing density and type was applied.

The number of students who would need school facilities is expected to be approximately 976, which means that a total of 1.08 schools (25 students, 36 classes) or 0.81 schools (25 students, 48 classes) are needed in the region.

* Mixed use sites combine various functions, such as residential, commercial, business, industrial, and research functions. It is categorized as a facility site and will be put under review procedures for changes of development plans and reviews by the promotion committee if more than 10% of the major use area changes when confirming more detailed plans in the future.

* Medium Density: 0.334 persons/household, residential and Commercial: 0.16 persons/household (For 1-person or 2-person households, the potential student population was not considered due to the direction of the plan centering on growth function.)

Urban Planning Concept for the Sejong National Pilot Smart City

Current Status

Site Condition

An area close to the area that leads from Osong to Sejong City, located in the joining of Mihocheon Stream and Geumgang River, with a beautiful natural environment

Transportation

Railroad Connected to Seoul-Busan and Honam high-speed rail from KTX Osong Station (14km)

Road Close to Seoul-Busan Expressway, Jungbu Expressway, and Cheonan-Nonsan Expressway

Airport Close to Cheongju Airport (37km), accessible from major cities nationwide within 2 hours

Environment

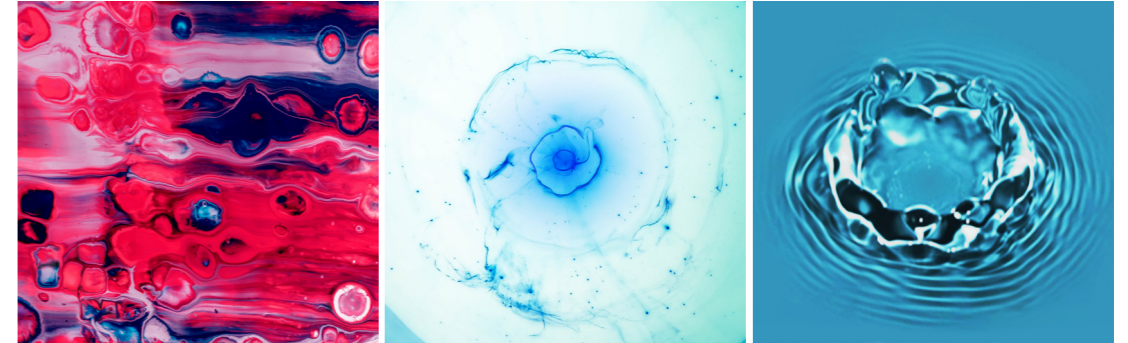
The project site is mostly hill currently, and Hwangwoosan Mountain (194m) is located in the east. Some areas form steep slopes, with south-facing slopes concentrated on the southeastern side.

As for cultural properties, there is Hapho Seowon Confucian Academy under preservation. Organisms with protection value are mainly found in the joining of Mihocheon Stream and Geumgang River in the south. There are various fixed elements, such as the existing BRT and National Local Highway No. 96, the outer ring road route, undeveloped area, drainage, and a reservoir. Preserved mountain areas are designated on the eastern side of the site, the central scenic districts around BRT, and the waterfront landscape district around the waterfront area.



Location Whole area of Hapgang-ri
Project Area 2,741,000 m² (830,000 pyeong)
Design Population Approximately 20,000 (approximately 9,000 households)

Concept Inspired by Nature

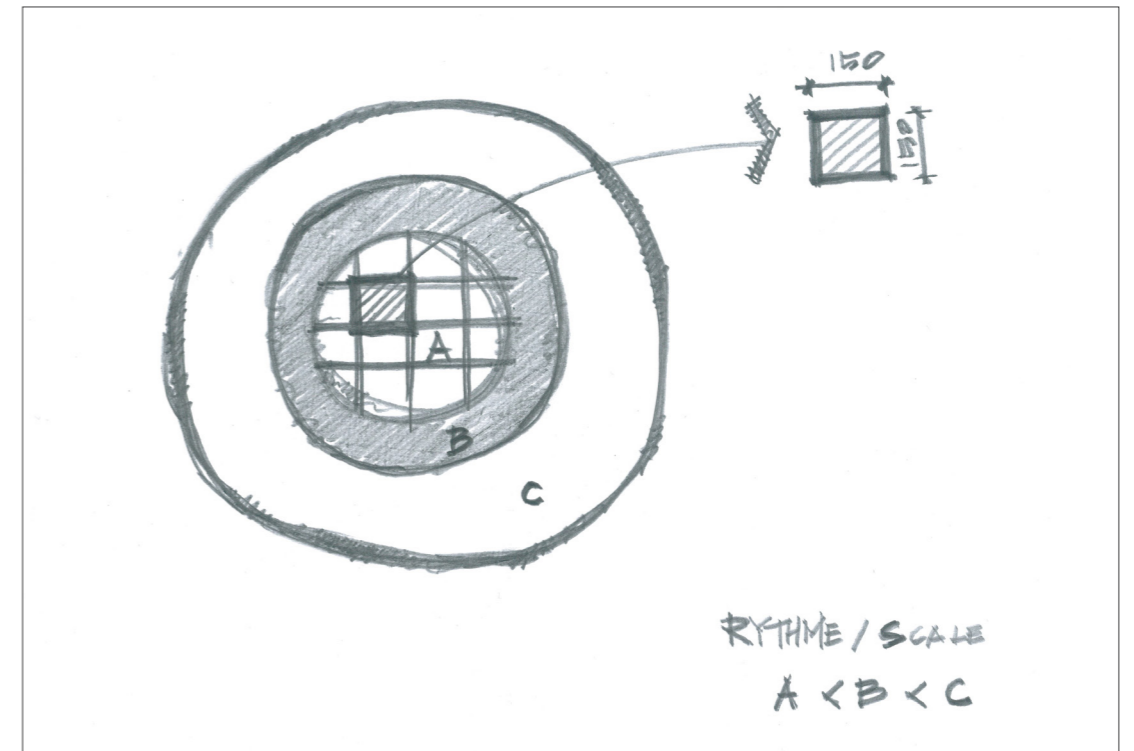


(A) Cell of Organism

(B) Cell of Organism

(C) Impact of Water Drop

Urban Design Concept and Sketches



A The area that facilitates slow-pace walking and various PMs by setting the length of a side of a block to 150m, a suitable distance for people to walk

B A space that connects and supports A and C. The area that operates a self-driving shuttle, which is connected to public transportation, and buffers the difference in speed and scale between the two areas

C The area with large blocks, accessible by fast vehicles coming in from other areas

Principles in Urban Design Planning



Creating a Walkable Environment

1. Implementation of a pedestrian-centered street system by expanding the width of the sidewalk
2. Connection between sidewalks and pocket parks developed across the road
3. Activation of events within the road by combining with various cultures and shopping
4. Introducing specialized streets for each season and theme and creating a dynamic street



Diversification of Means of Transportation

1. Development of a street system to activate various means of transportation on the road
2. Introduction of new regulations for the introduction and activation of smart mobility
3. Providing new services such as mobile retail, mobile delivery, and mobile food



Creating a New Value, Mixed Uses

1. Realization of job-housing proximity
2. Development of new business models
3. Searching for business development plans for each area
4. Flexible space to realize innovation
5. Changing the ratio of commerce, business, and housing flexibly to meet demand



Respect the Value of Preserving the Original State

1. Prepare a development site that adapts to the original state
2. Protected areas for wildlife protection within the living zone
3. Seeking architectural solutions for preserving the original state of mountains during development
4. Preserving trees in place much as possible and transplant only if necessary



Development of an Infrastructure to Provide Innovative Services through Smart Technologies

1. Convert and analyze all phenomena and movements within the city into data
2. Develop a platform that provides personalized forecasting services
3. Develop a data, artificial intelligence, and blockchain-based infrastructure
4. Develop a digital twin convergence platform to create a chance for convergence between data

Urban Design Process

Sejong 5-1 Living Zone Topography



Most living zones are located on hill areas centering on the foot of Chuldongsan Mountain (height: approximately 110m) in the 5-2 Living Zone and Hwangwoosan Mountain (194m) in the east. A topographical wind path is formed from the mountain in the north down to Hapgang River in the south.

Preservation of Existing Geographical Features of the Mountain and Natural Context



Connect the natural axis connecting the foot of Chuldongsan Mountain and Haphoseowon Confucian Academy and the green axis connecting west, south, and east to preserve the existing natural context.

Urban Division at Various Speeds and Rhythms



By using the Circulation Ring as the boundary (acting as a buffer) to divide the city into areas with a speed and rhythm appropriate for people and PM, and areas with a speed and rhythm appropriate for cars.

Connection to the Urban Context of Sejong



Set BRT trunk road, which encompasses the entire Sejong City, as the central axis for the development of the Sejong National Pilot Smart City to connect with other living zones in the urban context.

Circulation Ring, Encompassing Living Zones in Harmony with the Topography



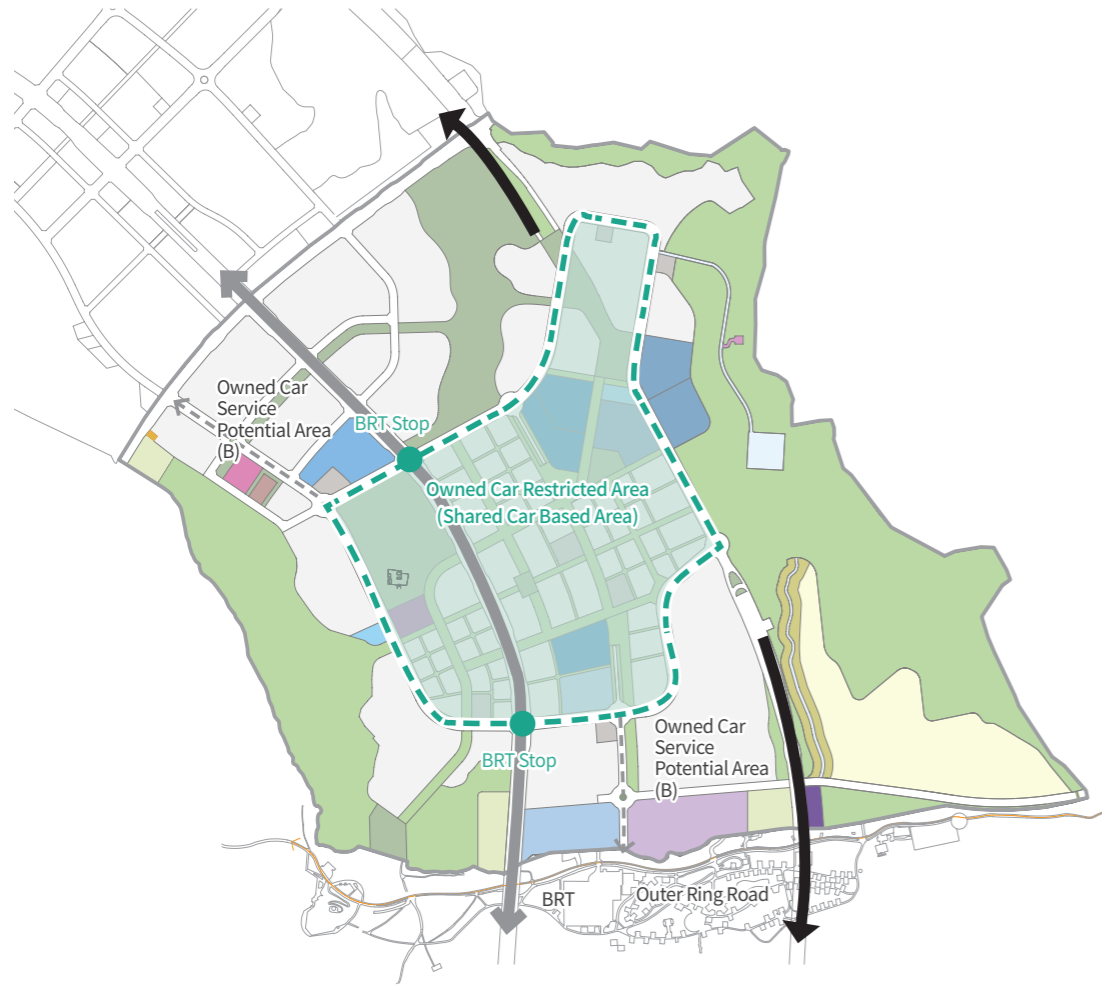
Establish the Circulation Ring encompassing the entire region while preserving the natural axis and the topography to develop an infrastructure that applies smart technologies to the whole region of the Sejong National Pilot Smart City.

Establishment of a Hierarchy of Roads and Lots



Main trunk roads (outer ring road, inner ring road (BRT), and local road: 96 lines) feeder line (Circulation Ring) within the living zone divide the city to form large-grade lots while roads, such as main pedestrian passages, subsidiary pedestrian passages, and pedestrian passages divide the large-grade lots into subdivided small-grade lots.

Set Owned Car Restricted Areas



Need for a Pedestrian-Oriented City

Better Creativity
60%
Walking increases creativity by 60%
Dr. and Prof. of Stanford (2014)

Higher Trust and Participation
80%
A walkable city has 80% higher trust and participation than an automobile-dependent city
Prof. K. M. Leyden of the National University of Ireland (2003)

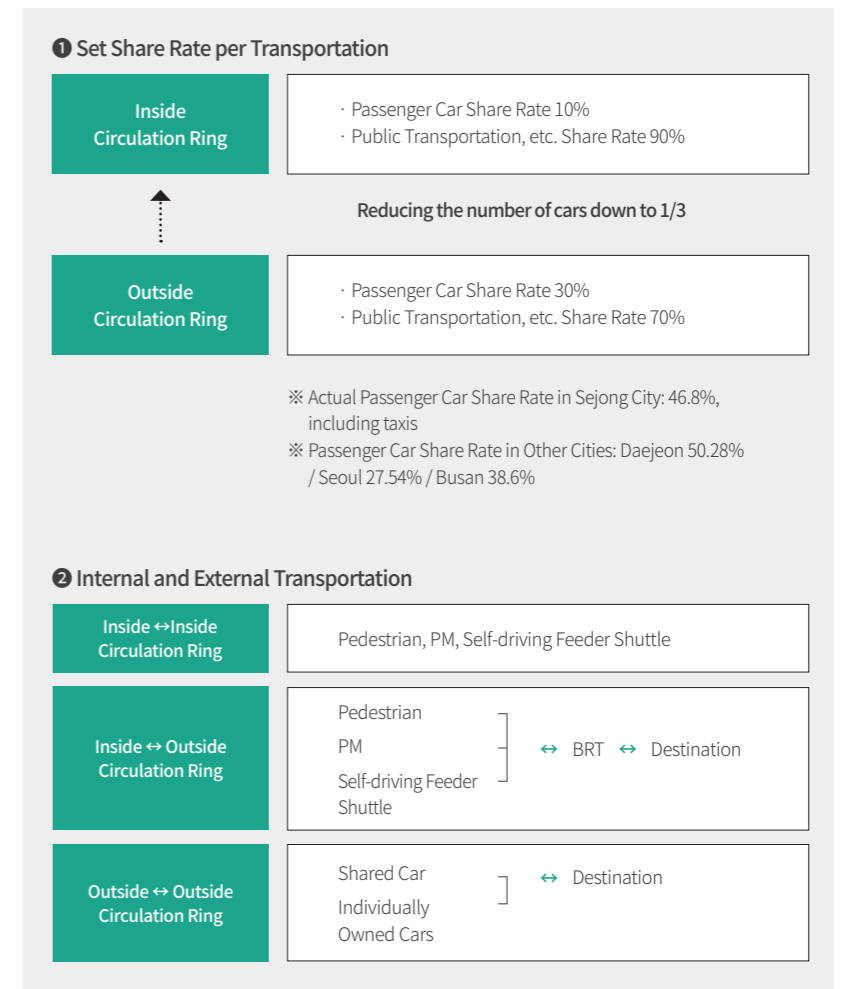
More Exchanges
40%
A walkable city increases exchanges by 40% over an existing city
Manhattan Union Square North Study (2012)

Lower Vacancy Rate
49%
A walkable city has 49% less commercial vacancy rates than other cities
Manhattan Union Square North Study (2012)

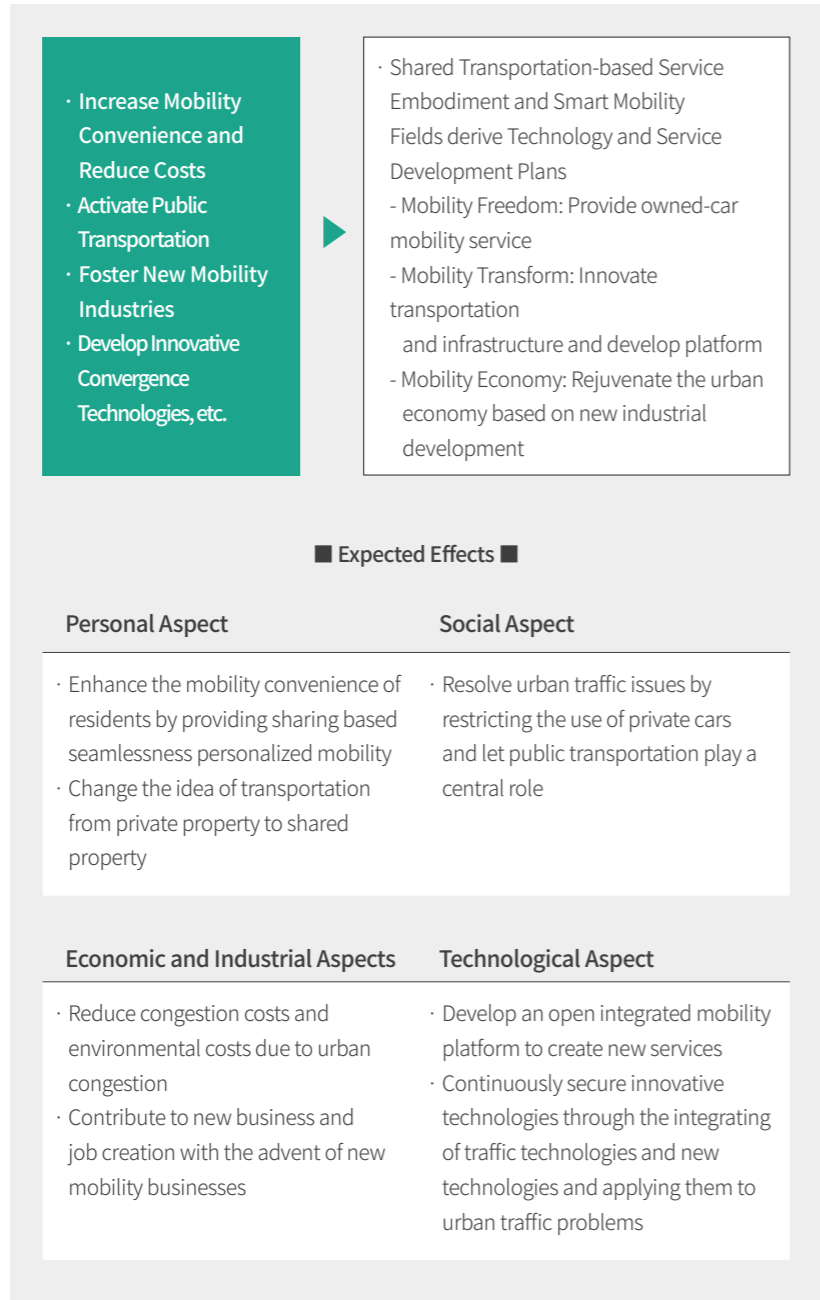
Restriction on Owned Car Access

- Access by owned cars and carbon emitting vehicles is restricted as a rule
- Formation of a pedestrian-oriented city structure through the formation of small-scale blocks
- Development of a PM-oriented street environment

Analysis of Road Service and Transportation



Application of Various Mobilities



Mobility, Operable in Owned Car Restricted Areas

Exceptional Permits

- No limit on emergency vehicles directly concerned with residents' life and safety, such as ambulances, police cars, and fire engines
- Limited access is allowed for service vehicles such as working vehicles and for disability vehicles (20km/h)
- Limited access vehicles will be tagged, must use designated entry and exit sections, and use one-way roads

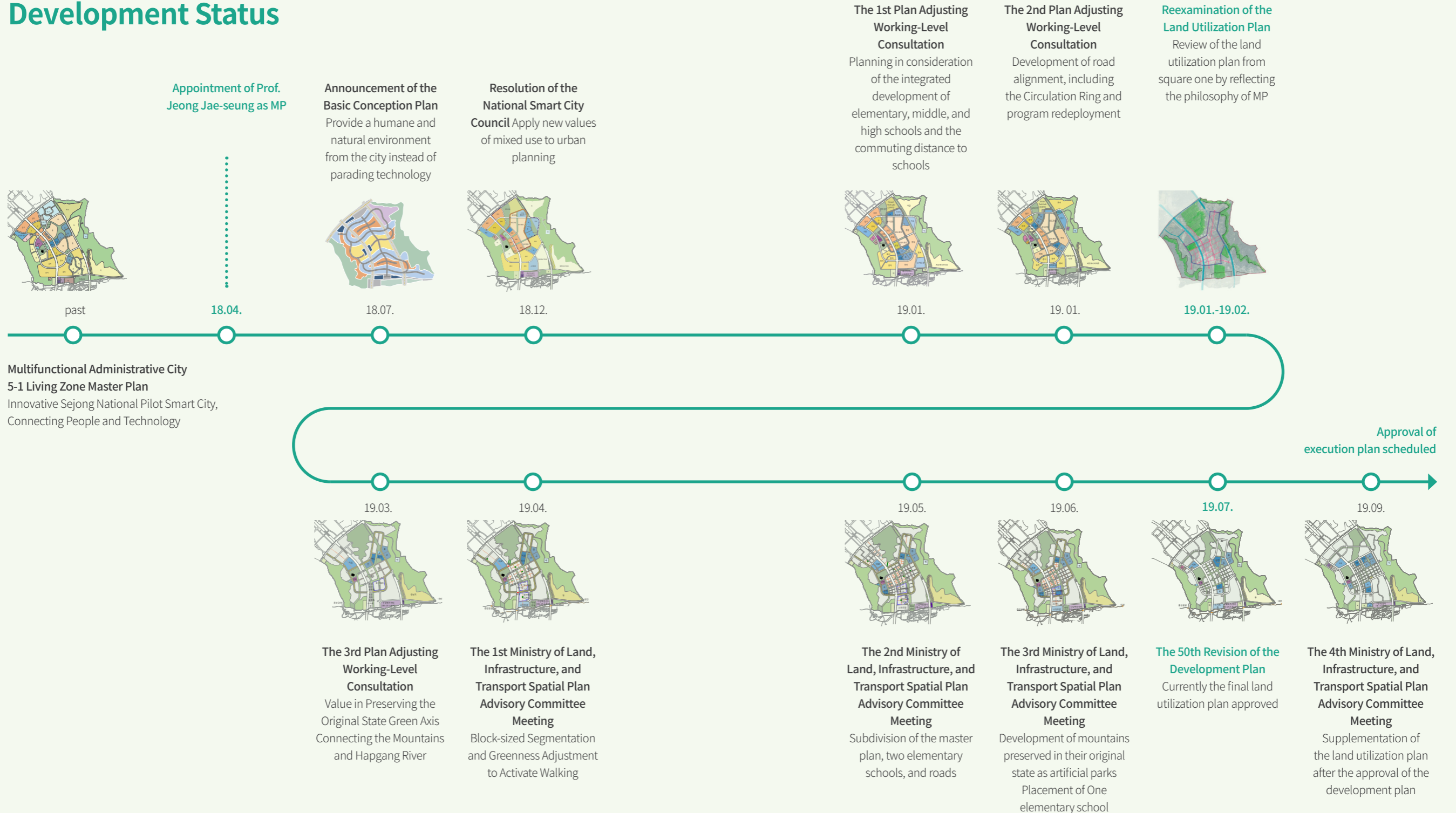
Self-driving Shuttle

- Pilot introduction of self-driving shuttle (low-speed, short routes) to enhance mobility within the Circulation Ring
- Operation of demand-responsive self-driving routes in connection with self-driving feeder shuttle stops

PM

- Introduce various PMs to deal with owned cars, supplement public transportation, and short-distance travel
- Restrict access by owned cars as a rule
- Restrict shared cars, emergency vehicles, and working vehicles from accessing PM routes

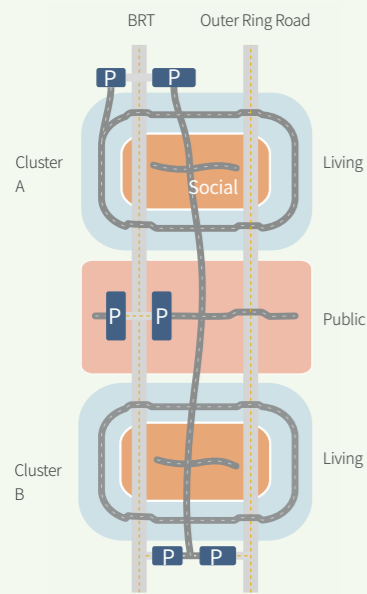
Sejong National Pilot Smart City Land Utilization Plan Development Status



Land Utilization Plan in the Basic Conception Plan

The city that provides a humane and natural environment instead of parading technology

Composition of the City



City of Sharing Based Cars

All owned cars will park in the area leading into the Sejong National Pilot Smart City and use self-driving vehicles, shared vehicles, and bicycles inside the city.

MP Jeong Jae-seung thought the original plan did not fully reflect post-materialism, decentralization, and smart technologies, the value and philosophy pursued by the Sejong National Pilot Smart City. He proposed Seven Innovative Factors based on the philosophy of embodying a city as a sustainable platform that improves residents' happiness and provides creative opportunities. To reflect these factors into the urban space, the city was planned to provide a humane and natural environment through the basic ideals of a shared car-based city and a city without use areas, while using technology as the element for convenience and innovation as the base.

In general, the city aims at being a city of sharing-based cars and a city without use areas (allowing mixed use and variable use). The City of Sharing-based Cars was designed by having all owned cars park in the area leading into the Sejong National Pilot Smart City and use personal mobility (PM) to move inside the city. Also, instead of designating the use of each area and constructing buildings of varying density within the area, living/social/public programs are applied with one another to compose the city, providing creative synergy through the exchanges among them.

We introduced various elements such as neuroarchitecture, universal and active designs, and nudges into the city's design. First, neuroarchitecture is about evidence-based design and building human-oriented spaces. We applied neuroarchitecture, which measures the influence of a space on human thoughts and behaviors and explores better architectural solutions based on the measurements, to urban space planning to build a resident-centered city based on scientific evidence-based design. Second, we aimed at a city where everyone from workers to homemakers, students, children, senior citizens, and the challenge to be safe and comfortable anywhere and anytime by applying universal and active design so that people would naturally exercise and take a walk in everyday life. Through Persona Simulation, we wanted to predict how a virtual person created based on actual data would behave under specific situations and environments. It was intended to analyze how residents of various traits would act under specific conditions and what restricted them to apply the results to embody them in the design of the city. Third, we used various design techniques such as nudges for public facilities found across the city to prepare a planning guide that reflects the design philosophy and use the guide to provide a new

experience through the new urban contents. We wanted to use the entire city as a living lab and designate and operate certain areas as testbeds for social innovation. Through this, we wanted to prepare the groundwork for social innovation based on various forms of citizen participation. Also, in specific spaces designated in the heart of the city, we conducted a variety of tests to resolve urban issues that the companies moving into the Sejong National Pilot Smart City may experience and provide a space to create social innovations.





Sejong National Pilot Smart City Land Utilization Plan in the Basic Conception Plan (July 16, 2018)





Resolution of the National Smart City Council and Land Utilization Plan at the time the National Smart City was announced (December 26, 2018)


Initial City Design Principle


- 


Low Impact Development: Preserve the original topography as much as possible to deploy programs organically, intensively, and densely within the development area that minimizes the impact on the ecosystem.
- 


BRT Road Center: Use BRT as the central road of the Living Zone, install two bus stops to connect roads for public transportation and self-driving vehicles, and intensify pedestrian-centered plans.
- 

Reflect Innovative Factors in the Space: Promote specific urban space design and development so that the seven innovative factors for the Sejong National Pilot Smart City plan would be embodied across the city.
- 

Accessibility: Deploy public transportation, owned cars, and shared cars in a manner that all of them can easily access the Complex Community Center, Metropolitan Welfare Center, City Integrated Data Artificial Intelligence, and schools.
- 

Two Axes of the City: Develop a public transportation road centering on BRT and a walkable pedestrian road. Realize job-housing proximity in the neighborhood through mixed use and high-density development.
- 

Owned Car Restricted Area: To embody a pedestrian-centered city, designate owned car restricted areas to promote public transportation, shared vehicles, PM, and walking, developing walkable streets.
- 

Self-driving Exclusive Road: Develop roads exclusively for self-driving vehicles, accessible from the sidewalk to develop an environment to use self-driving shuttles and feeder buses safely.
- 

Gradual Flexibility: Develop a road system and respond flexibly to upcoming changes in the mobility environment (fossil fuels → electricity, owned → shared, self-driving, etc.).

Applying the New Value of Mixed Use to Urban Planning

We introduced eight design principles in planning the city and made the Land Utilization Plan more organized in terms of programs. We adjusted the linear form of the roads to evenly provide services across the areas developed within the city, and subdivided the programs required in the urban planning. Also, we further developed the idea of developing walkable roads in two large trunks, showed the atmosphere of the city through examples, and made it possible to check how seven innovative factors are applied within the city more specifically.

The increasing distance between the place of work and the place of living causes adverse impacts, such as the increased number of vehicles, increased time consumption, and environmental degradation. It would be possible to eliminate socially adverse impacts greatly if we realize job-housing proximity by placing commercial, business, and residential functions in the same building. We planned a pilot complex, a mixed use district, as a test bed reflecting this idea and conducted a test. We placed two roads as the trunk roads within the city, a Circulation Ring with self-driving lanes and a -Circulation Ring mainly for owned cars. Two important axes, the green axes preserving original topography, and two walkable streets (shopping street and living culture pedestrian street) form the framework within the city. To realize the value of job-housing proximity, we designated the Innovative Growth Promotion Area (Smart

Integration Center, Smart Tech Lab) and planned to develop them by mixing uses. In addition, considering the connection with school facilities, we installed an integrative program for the Smart Farm Research Complex and Complex Community Center to resolve food problems of the future city. In general, we followed the principle of Low Impact Development within the city.

Seven Innovative Factors Reflected in the Land Utilization Plan

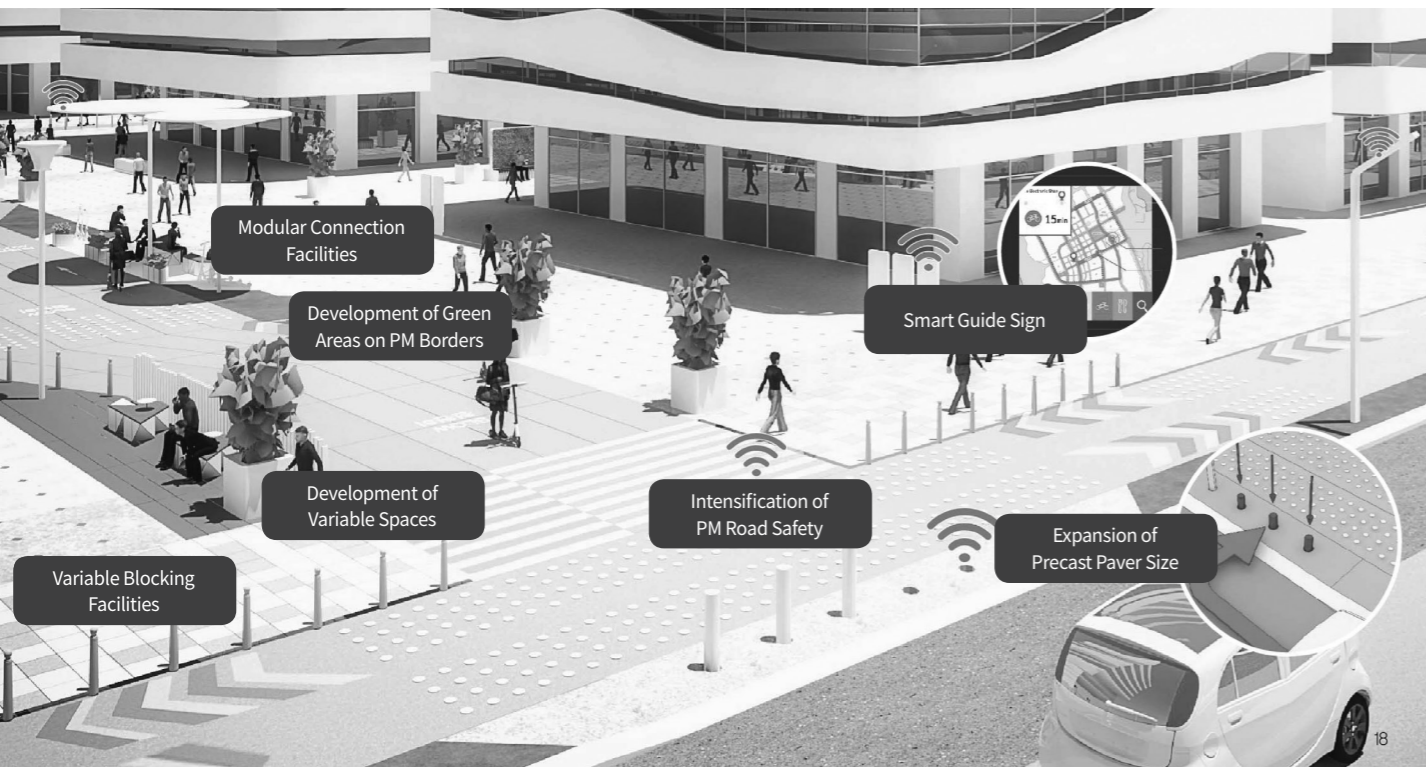
1. Mobility: Restricted zones for owned cars and carbon-emitting vehicles, routes for self-driving vehicles, pedestrian-oriented areas, road plans that can be reached from the hub within 5 minutes, etc.
2. Healthcare: A road that utilizes the surrounding nature and can be used as a trail, a network of hospitals across the city, etc.
3. Education: The locations of schools within the city and the connection with major public facilities, etc.
4. Energy: Preparation of individual buildings for E-prosumers, preparation for commercialization in each city, distributed power supply, energy storage
5. Governance: Spatial location and connection of administration and citizen participation, etc.
6. Culture and Shopping: Development of a culture and shopping activation zone on the Smart Floor, etc.
7. Jobs: Fostering industries that create jobs in areas concentrated with commercial/business facilities, etc.

Spatial and Environmental Design

The urban design that the residents would actually experience was a very important element in establishing the master plan, as important as the distinctiveness of the new smart contents and urban planning introduced to the Sejong National Pilot Smart City.

Urban design becomes the window or the beginning and the end for residents to experience the new services of the smart city.

MP Jeong Jae-seung thought out a differentiated and exclusive special and environmental design specialization study unique to the Sejong National Pilot Smart City in this context.



Sejong National Pilot Smart City Spatial and Environmental Design Specialization Strategy Research Plan

1. Why is a Spatial and Environmental Design Specialization Strategy Needed?

- It is necessary to give the Sejong National Pilot Smart City significance as a testbed for innovative growth, a validation complex for the resolution of urban issues, and an innovative ecosystem
- It is a way of embodying the idea of a city pursued by the Master Planner through the smart city
- There is a need for a new approach for the spatial and environmental design of the future smart city which introduces the spatial plan based on innovative services and new paradigms
- It will provide the experience of the new city to domestic and foreign visitors to the Sejong National Pilot Smart City

2. Purpose of the Spatial and Environmental Design Specialization Strategy

- To establish a special and environmental design plan (for spaces and facilities installed by public and private sectors) that may provide a convenient and pleasant urban environment to residents and suit the urban image of the Sejong National Pilot Smart City
- To propose a Spatial and Environmental Design Specialization Strategy that forms a harmony with existing public design planning, such as the integrated image of the Multifunctional Administrative City and the seven strategic tasks for the cityscape, and reflects the innovative factors and spatial plans unique to the Sejong National Pilot Smart City

3. Contents of Spatial and Environmental Design Specialization Strategy Research

- Derive implications based on the spatial and environmental design of domestic and foreign smart cities and the latest status of spatial and environmental design and case studies
- Establish the Sejong National Pilot Smart City spatial and environmental design specialization strategy considering the current status of the National Pilot City, seven innovative factors, and characteristics, and develop spatial and environmental design

1) Establish the Sejong National Pilot Smart City Spatial and Environmental Design Specialization Strategy

- Suggest the Basic Direction and Principles of Spatial and Environmental Design
- Suggest a Spatial and Environmental Design Specialization Strategy and Detailed Execution Plans
- Suggest a Spatial and Environmental Design Specializing Space and Pilot Project

2) Develop the Sejong National Pilot Smart City Spatial and Environmental Design

- Derive elements that specialize the spatial and environmental design
- Establish design guidelines and application plans for each specializing element
- Establish design application plans for each specializing element
- Suggest a roadmap for each stage of spatial and environmental design
- Review international public subscription projects on the elements that specialize spatial and environmental design



Preparation of a Proposal for Companies to Establish the Spatial and Environmental Design Specialization Strategy and MP Jeong Jae-seung's Intentions

MP Jeong Jae-seung thought that it was necessary to change the landscape plan given in accordance with the characteristics and roles (medical welfare zone) of the 5 Living Zones in the early stages of Sejong City's construction, as the 5-1 Living Zone was designated as the Sejong National Pilot Smart City. As it is the project that was given a new vision and role for the nation's future industry, MP thought that it should be different from what residents experience in existing cities, because it is planned with different contents and approaches (Smart City) from existing cities and living zones. MP argued that it is necessary to study the urban design that residents would experience superficially to let them experience the distinctive smart services provided by the city in a new and substantial way.

Long before the 5-1 Living Zone was designated as the Sejong National Pilot Smart City, the Multifunctional Administrative City has been equipped with a unique urban landscape management system. The National Agency for Administrative City Construction has presented and continuously developed the City's Integrated Image Formation Plan, Seven Strategic Tasks for Urban Landscapes (building aesthetics, outdoor advertisements, colors of the urban environment, public facilities, nightscape, urban structures, parks, greens and waterfronts), public design integrated design (public spaces, public art, public facility directive), etc., which they developed through the advice of a large group of professional researchers, as a super concept like the statutory plan for the urban planning procedures.

The Happiness Administration is a plan to form an integrated urban image created through the consultation of a large-scale professional research team, 7 strategic tasks for urban landscapes (building aesthetics, outdoor advertisements, urban environment colors, public facilities, night view, urban structures, parks and green areas), as a higher concept like the statutory plan of the urban planning procedure.

*The image above is the simulated example suggested by a company consigned for Sejong National Pilot Smart City Spatial and Environmental Design Specialization Strategy Research.

Consistency of Sejong City and Distinctiveness of the National Pilot City

The Master Plan Team thought that it is necessary to consider the currently planned landscape system first and to find the special elements unique to the Sejong National Pilot Smart City, while maintaining harmony with the overall landscape plan of Sejong City. Essentially, we avoided implanting only the smart contents onto the existing urban design methods, because we were concerned about the situation where residents moving in with high expectations for a smart city do not feel any difference from existing cities. The Master Plan Team explained the National Pilot City's unique mission and characteristics, and the appropriateness of its distinctiveness in design to organizations and officials related with Sejong City's landscape planning (Ministry of Land, Infrastructure, and Transport, National Agency for Administrative City Construction, Sejong City, LH, etc.) and made it its first task to form a consensus on the need for smart city public design specialization research services. Through several discussions, the Master Plan Team and relevant organizations deliberated on how to deal with the two contrasting issues of the Sejong National Pilot Smart City public design: unity and differentiation, while maintaining the balance in the entire Sejong City plan.

Reestablishment of the Term from 'Public Design' to 'Spatial and Environmental Design'

First, we discussed with the officials actually living in Sejong City to identify the current situation and problems related with the landscape. The designs (e.g. signage design) in the public domain (eg signage design) cost substantial amounts of money, yet had little impact on the actual urban experience. We realized that one of the reasons the city does not look organized is that the design of the private sector has a far greater impact on the city's image than residents feel. Also, we realized the need to update the existing landscape guidelines, which is necessary for building the entire Sejong City into a Smart City. Based on such findings, the Master Plan Team acknowledged that they need a detailed analysis of the existing Sejong City landscape standards and that the elements of the Sejong National Pilot Smart City public design specialization research must include public domain designs that Sejong City has dealt with to a limited extent, as well as the private domain designs. Therefore, we reestablished the familiar term, 'Public Design,' into 'Spatial and Environmental Design' to include all experiential elements of the city and include the designs of the private domain.



Establishing the Direction for the Spatial and Environmental Design Specialization Strategy based on Relevant Experts' Advice

Another concern we had within the Master Plan Team was whether the design companies that had mainly engaged in existing public design (e.g. public design promotion plan established by the local government every five years) would carry out the study properly, as the scope of the study conducted expanded from public to private design.

The companies consigned to establish spatial and environmental design specialization strategies needed comprehensive strategy consulting capabilities (feasibility review, proposition of public subscription projects, preparation of an execution roadmap by development stage and procedure) based on the understanding of the smart technologies, services, and special urban spaces to be introduced to the Sejong National Pilot Smart City to achieve the goals the Master Plan Team expected from them.

We sought advice from experts in various public and private sectors in the course of deliberation. We visited the Public Design Team of Seoul, the leading figure in the public design field of Korea, and examined how Seoul carries out public design projects and a few relevant cases. We also sought advice on the direction for the Sejong National Pilot Smart City Spatial and Environmental Design Specialization Strategy. We understood the need for consistent design based on philosophy through interviews with expert planners who planned advertisement design and public design specialized streets and the public design context that Seoul faces through meetings with the head of the DDP Division of the Seoul Design Foundation. In addition, we sought advice from various private sector experts. It was a great resource to help in understanding the current trend of spatial and environmental design (public design) in South Korea.

The Master Plan Team prepared the Project Contents Description for the Academic Research Service for Establishing the Sejong National Pilot Smart City Spatial and Environmental Design Specialization Strategy by reflecting the concerns we have deliberated on.

First, we established the direction for the specialization strategy specifically for the Sejong National Pilot Smart City and made sure the existing Sejong City Guides were fully observed. Also, we made the 'Proposal of new design elements, derived from smart innovation services that are different than other cities considering the characteristics of the Sejong National Pilot Smart City and approaches that are different from existing urban planning (owned car restricted areas, self-driving test bed, PM activation, shared vehicle activation, etc.)' the key objective. We also needed an execution roadmap showing how each element could actually be applied to the city in each phase of the project and in each procedure. We collaborated with the Sejong City Landscape Project Review Service Team, which is currently working with us in a greater framework, to produce consistent outcomes and also had to consider the contents of the research services for establishing the Sejong National Pilot Smart City Brand Strategy that the Master Plan Team has carried out internally, because we had to make sure all outcomes trade off with each other and have close relevance and consistency in a greater context.

We considered the issues posed by realities while carrying out the research services. We wanted to push the extent to include and deal with all design elements that could be experienced in the urban space, but we had to adjust the extent of the project and the depth of the outcomes, considering that the actual period we had for the research services was three months, given our administrative procedures.

*The image above is the simulated example suggested by a company consigned for the Sejong National Pilot Smart City Spatial and Environmental Design Specialization Strategy Research.

Street Planning

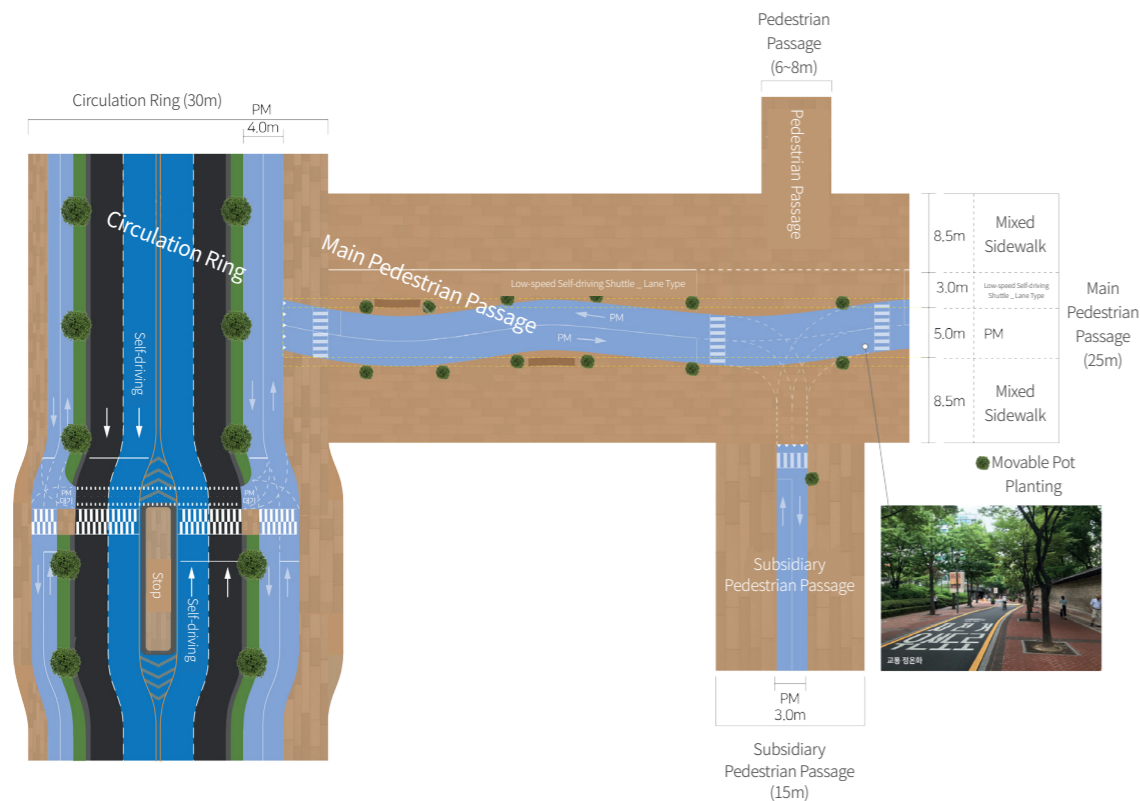
Sejong National Pilot Smart City intends to provide the owned car restricted areas and an environment to test various mobilities to build a pedestrian-friendly city.

Instead of applying the cross-sectional width of the ordinary streets of the existing Sejong City as it is to the Land Utilization Plan, a new street system suitable for a future mobility environment is required.

**Basic
Conception
Plan
(2018.07.)**

We introduced the basic philosophy of urban planning which restricts owned cars and aimed at a shared care based city in the basic conception plan announced in July 2018.

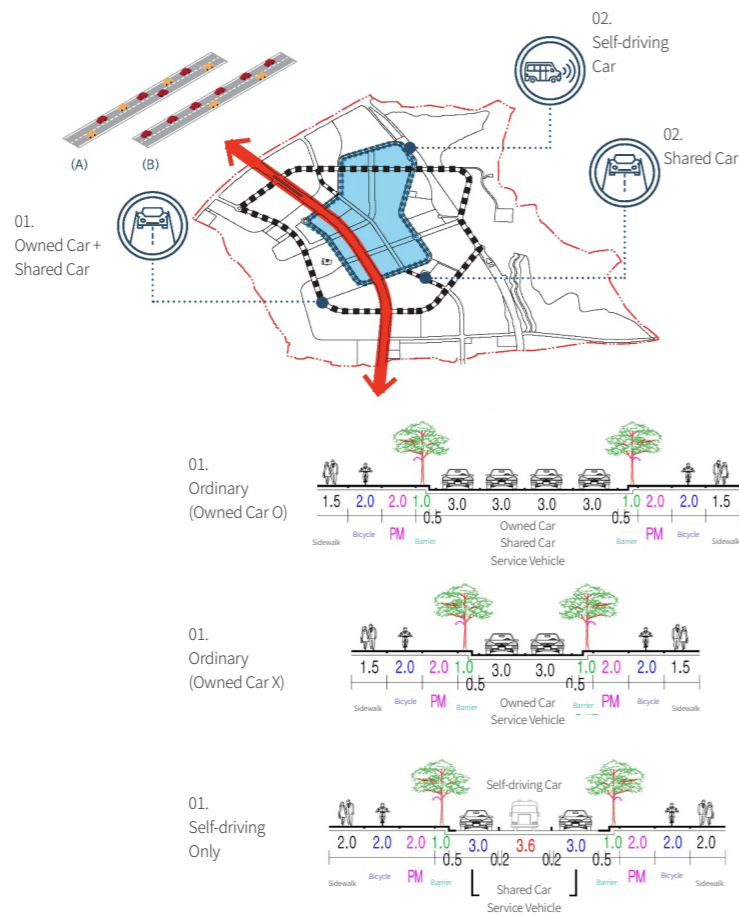
The road-oriented planning proposed by modernist architects a century ago has been continuously applied until today, 2019. Many residents are still driving over one ton four-passenger cars alone, causing traffic congestion (rush hour) in downtown, parking problems, air pollution, and overuse of energy. To resolve the non-sustainability issues of the city, the Sejong National Pilot Smart City, the testbed for future city design, gradually promoted the use of shared mobility instead of the use of personally owned cars and designated the owned car restricted areas (inside the Circulation Ring) to allow the proper experiment of future mobility in an uneven playing field (the behavior pattern which demonstrates a preference for the existing urban environment where owned cars are more convenient than shared cars and there is a preference for owned cars over shared cars). (This excludes some service vehicles running on electricity and new renewable energy.) We will move from an existing single transportation (owned car), automobile, based road system and provide an environment where all individuals will not experience inconvenience, through innovative smart mobility technologies such as the pedestrian-oriented street plan, diversity of transportation (various PMs), shared mobility service, self-driving shuttles, and the control of traffic flow through artificial intelligence. Ultimately, we will reduce the number of owned cars within the city down to 1/3 of current levels to enhance the sustainability of the city.



Sejong National Pilot Smart City Road Cross-Section (Draft)

The Implementation Plan
(2018.10.~12.)

After establishing the basic conception plan, we established the Master Plan Team to support MP Jeong Jae-seung and began the work of reflecting the MP's philosophy in urban spaces in full with a private urban architecture company. The MP's direction for mobility was that it should be connected to all traffic lines of the Sejong City but interference should be minimized to set the circular road of the 5-1 Living Zone. It meant the inner ring road on which the self-driving feeder bus operated played the role as the testbed for self-driving shuttles and had the symbolism of the smart city. Also, it was a strategy to secure the accessibility of shared vehicles (electric vehicles, self-driving vehicles, PM, etc.) that can cover the lot in their operations. Based on this, we suggested a few street cross-section prototypes centering on self-driving shuttles, PM, and walking, considering the existing road environment in the implementation plan



Lane Composition within Roads

Basic Direction for the Street Plan
(2019.01.~2019.04.)

MP Jeong Jae-seung and the Master Plan Team began to think concretely about the road system following the application of the new mobility system, starting from setting a few principles. They thought that the basic road hierarchy should be set based on the speed, not the vehicle, and the possibility of switching lanes by varying the speed even with the same vehicle, and how to operate new mobility should be also considered. The self-driving test was concretized into two versions, a road type self-driving shuttle and a sidewalk type self-driving shuttle. Basically, when the Circulation Ring became broad (four lanes), the severance between the inside and the outside of the Circulation Ring became a concern. Also, it is expected that the number of vehicles would be much less than the number of vehicles calculated with the unit loading factor of the existing city due to the increase in the public transportation share rate following the owned car restricted areas and shared car promotion policy, the promotion of PM, and the operation of self-driving shuttles. They considered changing the four lanes to two lanes and routes for self-driving shuttles.

MP thought that if the self-driving shuttle exclusive lanes are put together with the ordinary road (four lanes), it would place the broad road on one side of the cross section, and residents would feel the street space in the form of a car-oriented broad road that they had experienced in existing cities and it would worsen the severance between the inside and outside of the Circulation Ring as it is. They considered easing the severance between the inside and outside of the Circulation Ring by the broad road by placing the self-driving shuttle exclusive lanes to both sides of the road so that the shuttle can be operated and tested at a speed similar to walking and considering passengers getting on or off the shuttle.



We felt that it was necessary to establish a single organized mobility principle regarding the reason and other justification reasons, so we designed a different cross-section and road system than existing cities for smart mobility and road systems. We developed the Key Principle in Urban Planning for the Sejong National Pilot Smart City and decided to share it with relevant institutions.

‘Urban Planning Centered on Pedestrians and Various Vehicles’

Embodiment of a Pedestrian-Centered Street System (Circulation Ring and Inside Circulation Ring)

Place the pedestrian passage in the middle of the street and expand its width

Develop human scale lots and various alleys

Install an overcrossing across the BRT road to overcome the severance of the pedestrian passage by a BRT road

Develop a variety of small activities and social spaces (pocket parks, squares, stages, etc.) across the pedestrian passage

Limit the speed of all mobilities within the Circulation Ring down to 30km/h

Embodiment of a Street System Centered on Various Mobilities

Activate various PMs

- Separate roads (Circulation Ring) to prevent collisions between slow PMs (5-20km/h, including bicycles) and fast PMs (20-40km/h)
- Install a PM friendly street environment in all region (install parking spaces and charging stations across the region)

Diversification of Self-driving Vehicle Tests as Public Transportation

- Road Type Self-driving Shuttle (-40km/h): Operated on the Circulation Ring
- Sidewalk Type Self-driving Shuttle (-20km/h): Operated on pedestrian passages inside the Circulation Ring, route type and demand-responsive type

Promotion of Shared Cars and Shared PMs

- Owned cars may pass through but cannot enter (park inside) the Circulation Ring. Shared cars can enter the basement (parking) (Shared car parking tower).
- Place shared PM mainly for 1-person or 2-person vehicles on the ground inside the Circulation Ring to facilitate convenient stopping on the pedestrian passage inside

Street System

- As many buildings will be constructed on the lots facing the outside of the ring, the Circulation Ring requires a central street system
- Place vehicle lanes (owned cars, shared cars, service vehicles) on the outside to facilitate access to the outside of the Circulation Ring and place PM lanes on the inside to facilitate access to the insider of the Circulation Ring
- Install a road that penetrates the inside of the Circulation Ring underground to act as an alternative route and a shortcut
- Facilitate parking and transfer for shared cars and all PMs by providing shared cars with access to the Shared Car Parking Tower through the underground road and all PMs, from the ground, (Integrate various programs into the Shared Car Parking Tower and secure flexibility to enable change of use in the future.)

Main Pedestrian Passage inside the Circulation Ring

- If a service vehicle (emergency, logistics, waste, etc.) needs to enter, the entry into the sidewalk is allowed within the limited speed (bollard, tagging, etc.)

Ordinary Pedestrian Passage inside the Circulation Ring

Circulation Ring Road Section



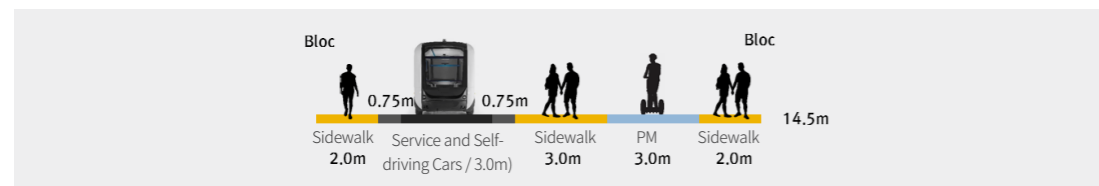
- Advantages**
- Expand pedestrian space, such as sidewalks and park-type sidewalks
 - Secure runways for various PMs
 - Self-driving vehicles would not need to pass through the roundabout
- Disadvantages**
- The road capacity would be insufficient if the population plan in the current (design) stage is applied
 - A traffic management measure is required for vehicles coming in and going out of the side of the outer ring
 - Limitations in expanding capacity when operating with one self-driving lane (The minimum headway is determined based on the distance between stops.)
 - Roadway and self-driving lane, placed on both sides of the park-type sidewalk, deteriorate pedestrian comfort and increase the risk of pedestrian crossing accidents
 - If the circular road network is operated with two lanes, the delay at the intersection will increase due to the turning traffic volume and insufficient road capacity (The number of lanes should be determined based on the result of forecasting demand later.)

Main Pedestrian Passage Section



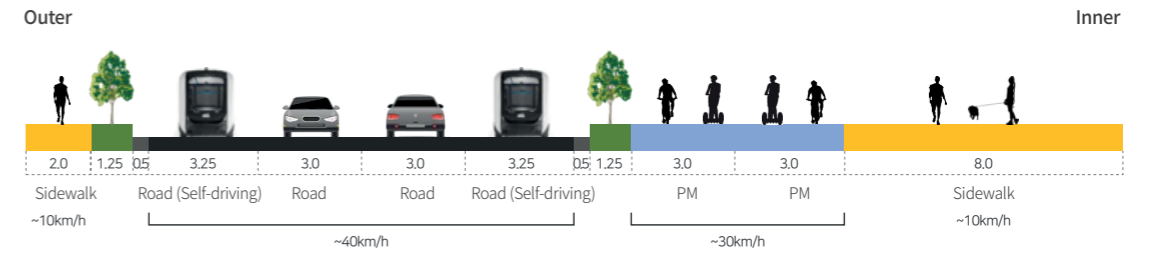
- Advantages**
- Expanding pedestrian spaces such as sidewalks and park-type sidewalks
 - Securing various runways for PMs
 - Increasing user convenience due to the operation of (low-speed) self-driving shuttle buses
- Disadvantages**
- Requiring a legal review on the operation of service vehicles on sidewalks
 - Increased risk of pedestrian accidents by fast PMs capable of running at high speeds

Subsidiary Pedestrian Passage Road Section



- Advantages**
- Increased user convenience due to the operation of a self-driving shuttle bus (low speed)
 - Securing a 7.0m sidewalk
 - Enhanced user accessibility and moving speed due to personal mobility
- Disadvantages**
- Need for securing pedestrian safety due to access by self-driving vehicles
 - Generating a number of pedestrian crossing points due to self-driving and PM

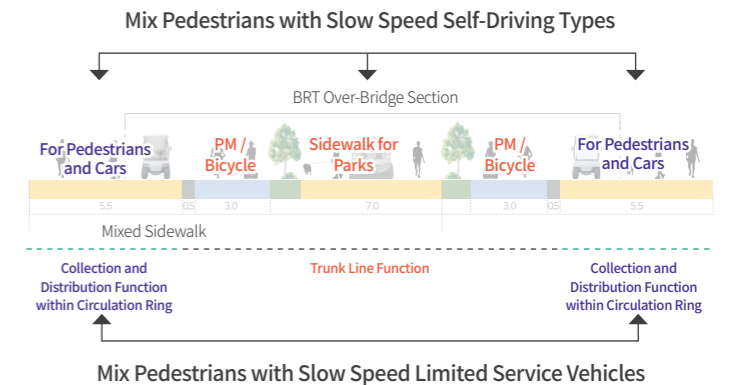
We agreed on the need for securing a certain level of alternative (extra) lanes when reviewing the advice of KOTI and the advisory committee, and changed the road plan from a two-lane road in both directions to a four-lane road (ordinary vehicles can use all four lanes) and placed the self-driving car on the outer lane, assuming sufficient safety of direction (left turn), emergency situations, and traffic volume. Also, adjustments were made to place the central sidewalk near the lot on the inner side of the Circulation Ring and specify the conversion of a PM road into a lane to secure PM safety per speed level and the autonomy and flexibility in lane selection.



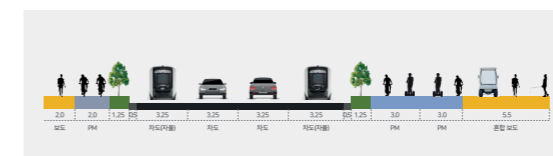
In the first spatial plan advisory committee meeting organized by the Ministry of Land, Infrastructure and Transport, traffic experts suggested the concept of a Shared Street in relation to the road system. MP told us that the mixture of road spaces is significant alongside the mixture of spatial use and that the accident risk could be reduced as more attention will be paid to safety cognitively when various mobilities are put together with a certain speed limit. Various foreign cases that used this were also considered.

Section B (25.0m)

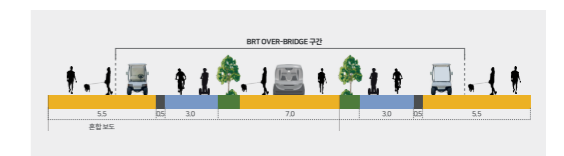
- Connect to Trunk Line Function Traffic Line within Circulation Ring
- Connect to Collection and Distribution Function Traffic Line within Circulation Ring
- Composition of Road Width and Section within Circulation Ring



Section B (25.0m)



Section A (32.0m) Circulation Ring



7 Innovative Factors Development Process

25 core services were developed from seven innovative factors to enhance the quality of life of residents by using smart technologies and enhance the city's sustainability for the next generation.

Master plans were developed for each service to derive goals and visions, scenarios, cases, and end images.

The relevant professional consignment organizations are developing plans and strategies to embody core services according to the direction of the master plan.

- Mobility
- Healthcare
- Education and Jobs
- Energy and Environment
- Governance
- Culture and Shopping
- Living and Safety

Mobility

Mobility for Smart Residency

Sejong National Pilot Smart City will reduce the number of owned cars and operated vehicles within the city gradually down to 1/3 of the level of other cities of a similar size while maintaining personal economics and the convenience of city life.

Also, it aims to enhance the diversity of transportation and the city's sustainability by introducing various tangible mobility services, including shared, self-driving, and integrated mobilities.

A. Closed Small PM Sharing Service

Small PM sharing service protected from the external environment for short-distance travel
· Free floating + Station combined method

B. Self-driving Shuttle for Demand within Circulation Ring

Demand-responsive self-driving shuttle operated on the pedestrian passage within the Circulation Ring based on real-time user demand

C. Integrated Mobility Service

Shared Mobility Integrated Support System

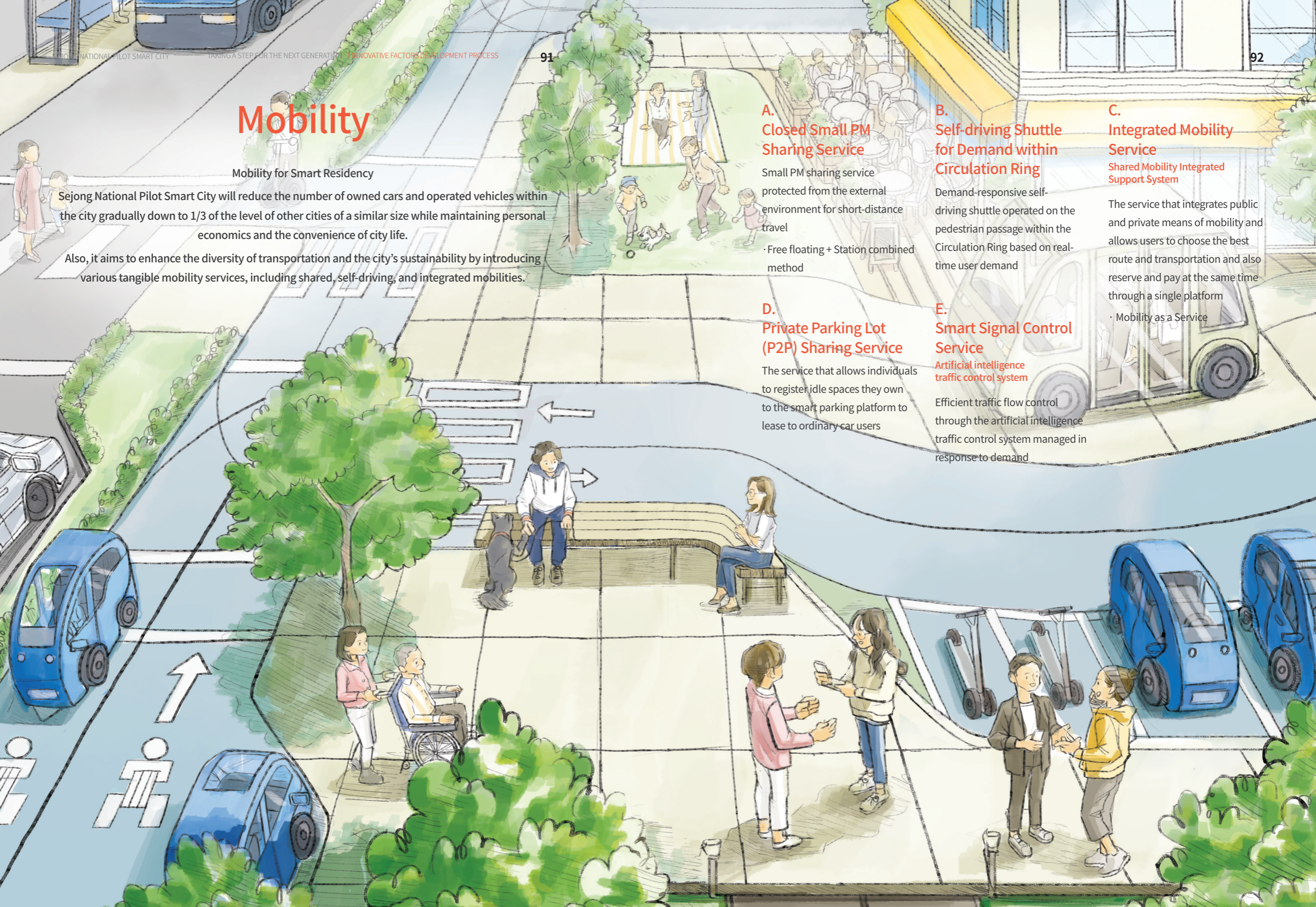
The service that integrates public and private means of mobility and allows users to choose the best route and transportation and also reserve and pay at the same time through a single platform
· Mobility as a Service

D. Private Parking Lot (P2P) Sharing Service

The service that allows individuals to register idle spaces they own to the smart parking platform to lease to ordinary car users

E. Smart Signal Control Service

Artificial intelligence traffic control system
Efficient traffic flow control through the artificial intelligence traffic control system managed in response to demand



Mobility for Smart Residency

Developing a Mobility Ecosystem that Provides the Mobility of Owned Cars without Owning a Car

The paradigm of the 20th century was ‘job-housing separation and public transportation and owned car oriented mobility.’

The urban system constructed high rises to sell land at high prices, divided the land into residential areas, commercial areas, and business areas to manage them efficiently, and provided car-oriented road networks to divide the transportation between them into public transportation and owned cars. This caused serious urban issues such as traffic congestion, parking difficulties, overuse of energy, and air pollution (including particulate matter).

The system was great for selling land at high prices and managing land efficiency by use area. However, we had to waste as much as two hours of our precious lives commuting. 700kg vehicles had to be mobilized for a 70kg person to commute, wasting energy and producing air pollution.

Also, there is a problem of large parking lot areas. On average, cars take up 96% of parking lot space in times other than commuting hours and a certain ratio of facilities shall be provided as parking lots based on their uses according to the current system.

What is the new paradigm for the city for the future generation of the 21st century?

It is the question that I asked myself when building the smart city. I think it is the ‘platform for job-housing proximity and various vehicles.’ To resolve serious urban issues and embody a human-oriented city, it is necessary to provide a street environment that allows for the convenient and safe implementation of various vehicles (bicycles, electric kickboards, motorcycles, and personal vehicles, etc.), self-driving public transportation, and sharing-based mobility services. I think we need to provide a land utilization plan that combines uses to realize job-housing proximity and provide an urban environment in which people wish to walk.

We intend to provide a pedestrian-centered, personal mobility-centered street environment to embody a city of various vehicles while limiting the use of owned cars like Oslo and Copenhagen, providing an environment for the safe use of personal mobility.

Excerpt from the interview with Master Planner Jeong Jae-seung, inserted in the March 2019 edition of 'Architecture & Urban Space,' the periodical publication of the Architecture & Urban Research Institute.

Key Goals



Development of an integrated mobility service that combines PM, vehicle sharing (car sharing and ride sharing), and self-driving public transportation



Development of a safe and efficient pedestrian environment based on Smart Crosswalks, Smart Road Surfaces, and Information Signs



Optimization of traffic flows using artificial intelligence based traffic signal control



Support for an environmentally friendly mobility environment to introduce electricity-based mobility tools

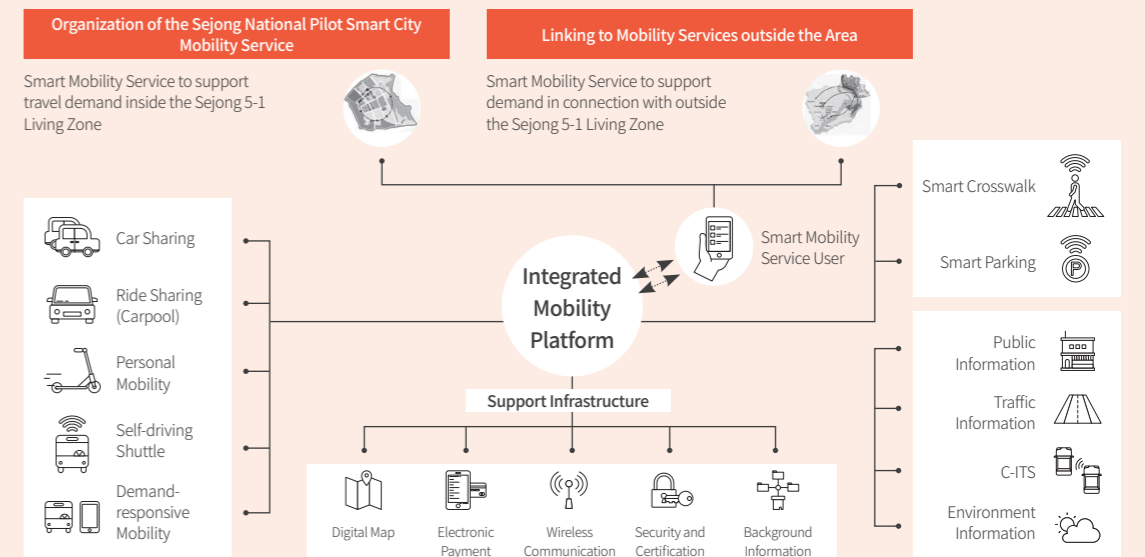
Mobility Service

Services

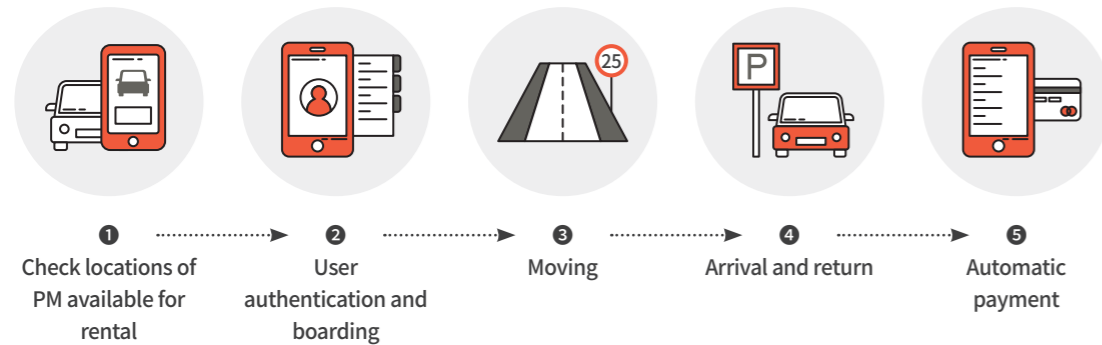
Personal Mobility	Personal Mobility Sharing Service ① Open Micro PM Sharing Service ② Closed Small PM Sharing Service ③ Small PM Sharing Service for the Mobility Handicapped	Car Sharing Service ① Free-Floating Car Sharing ② P2P Car Sharing ③ Ride Sharing
Group Mobility	Self-driving Mobility Service ① Low-speed Self-driving Shuttle (on Demand) within Circulation Ring ② Low-speed Self-driving Shuttle (Fixed) within Circulation Ring ③ Medium-speed Self-driving Shuttle within Circulation Ring ④ BRT High-speed Self-driving Bus	Demand-responsive Mobility Service
Mobility Integration	Integrated Mobility Service	
Parking Sharing	Parking Space Sharing Service ① Smart Parking Service ② P2P Parking Sharing Service	
Smart Road/ Pedestrian	Smart Road Service ① Smart Signal Control Service	Pedestrian Safety Service ① Smart Crosswalk Service ② School Zone Safety Service ③ Smart Road Surface Information Sign Service

Mobility Service Structure

You can choose efficient transportation using various Mobility Services in the course of moving to the destination. Also, you can use various services on a single platform through the integrated mobility platform. The platform recommends the best route and combination of transportation and allows you to pay and make reservations at once.



A Closed Small PM Sharing Service



What is a Closed Small PM Sharing Service?

Today, residents moving around on electric kickboards have become familiar scenes in the city. The 'Open Micro PM Sharing Service' is already familiar and convenient to us, and the service is spreading rapidly.

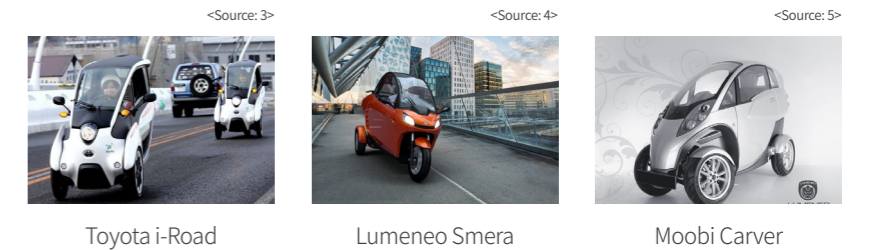
However, there are people who have difficulty in using the two-wheeled short-distance mobility devices, which can also be affected by the weather. The Sejong National Pilot Smart City has devised a new system, the 'Closed Small PM Sharing Service' to overcome these disadvantages and maximize the advantages of a convenient PM service. The Closed Small PM Sharing Service is a service that allows users to rent a closed small PM located on the street inside the Smart City and return it to a location that does not interfere with traffic near the destination after use.

It guarantees mobility rights for the vulnerable (senior citizens, children, challenged persons, etc.) and provides suitable protection from external weather environments (snow, rain, cold, strong wind, etc.). The Closed Small PM Sharing Service will gradually expand the scope of the pilot operation. The pilot operation is planned to start within the owned car restricted area inside the Sejong National Pilot Smart City's Circulation Ring, and expand to the entire National Pilot City and Sejong City phase-by-phase. To provide the service around when the residents begin to move into the Sejong National Pilot Smart City, it is necessary to find and supplement the problems that occur in the actual service. For this, the service will be piloted within Sejong City for a certain period of time for validation.

Closed Small PM Model

A closed small PM is a small mobility device that protects users from the external weather environment and can carry one or two people. Currently, most personal vehicles for travelling short distances are one- or two-wheeled structures, such as bicycles and kickboards.

For the model for a closed compact PM service, we are considering a highly stable lightweight ultra-small EV vehicle with three to four wheels. We plan to select a model that can be operated on a PM exclusive road in the domestic environment, and then test the suitability of the vehicle chassis through a pilot and apply it to the service.



Example of a Closed Small PM Model

Expected Effects from a Personal Mobility Service

Leading Changes in the Mobility Paradigm

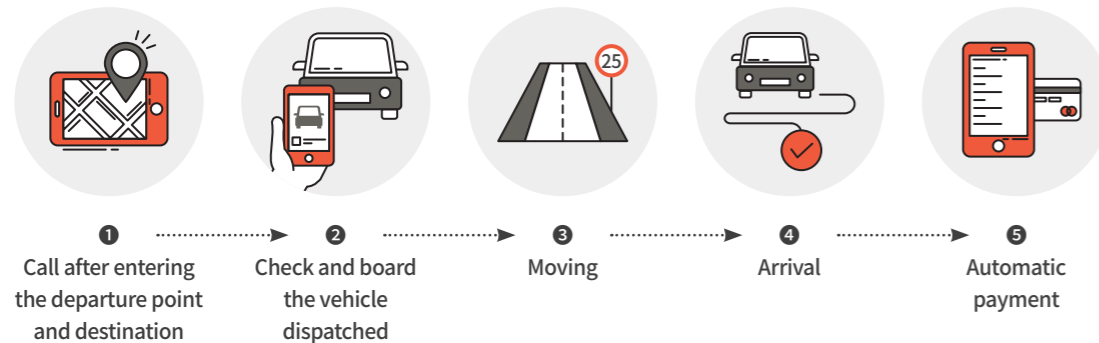
The concept of short-distance mobility is spreading mainly in mega cities abroad, and is expected to lead the paradigm shift of mobility and movement patterns by experimenting and providing various short-distance transportation means to the Sejong National Pilot Smart City. Various PM services are expected to have positive effects in a number of ways, such as reducing traffic demand for passenger cars inside the Sejong National Pilot Smart City, increasing the last mile connectivity of public transportation, and reducing carbon dioxide emissions and energy consumption through the use of electrically-based PM.

Personal Mobility (PM)

PM refers to a small personal transportation device that uses environmentally friendly fuels such as electricity and is often for 1 or 2 passengers, and includes medium and low-speed electric vehicles, single-person electric vehicles, and electric bicycles.

B

Demand-Responsive Self-driving Shuttle within the Circulation Ring



Self-driving Service of the Sejong National Pilot Smart City

With the advancement of self-driving technology, various means of transportation will be operated in self-driving mode in the near future. Currently, cities around the world are carrying out self-driving road tests and relaxing related regulations to actively continue technological development. In South Korea, even companies with excellent technology are conducting research abroad, as it is difficult to conduct self-driving tests and services due to strict regulations. The Sejong National Pilot Smart City plans to minimize regulations related to self-driving to support the activities of private sector business operators and create an environment that will serve as a foothold for South Korean companies to become leaders in global mobility. We hope the private business operators in the Sejong National Pilot Smart City test self-driving shuttle use the data on various patterns of residents and provide high-quality services so that the city becomes a pilot area with a virtuous cycle for the service.

What is a Low-speed Self-driving Shuttle (Demand-responsive)?

This service allows the user to reserve a self-driving car through the integrated mobility app and board the assigned vehicle to get to their destination. Until the stabilization of self-driving technology, the service will be provided with a driver inside the vehicle.

The service will be primarily provided in specific areas with high demand, such as the Complex Community Center, shopping facilities, and medical facilities, which are major locations inside the Circulation Ring, to verify the stability of the technology and validate the service in the early stages. The service will be validated and its problems will be supplemented through continuous monitoring and problem solving while op-

erating pilot projects to provide realistic services, and the scope of the service will be expanded to achieve full self-driving.

A case of related service application is the 'Waymo' (unmanned autonomous taxi service), which is being piloted in Phoenix, Arizona, USA.

Environmentally friendly EV Self-driving Car Model

The model considered is the environmentally friendly EV self-driving car that can be charged quickly (30 minutes) and at standard speeds (6 hours) according to the electric charging infrastructure method, shuttle operation hours, and demand in the Sejong National Pilot Smart City.

For the low-speed self-driving service (demand-responsive), we will choose an electric vehicle-based self-driving car, which is highly stable and has been successfully tested many times, to ensure residents' safety and convenience.



Example of a Self-driving Shuttle Model Type

Expected Effects from a Low-speed Self-driving Shuttle Service

Enhanced Competitiveness of the Public Transportation Service

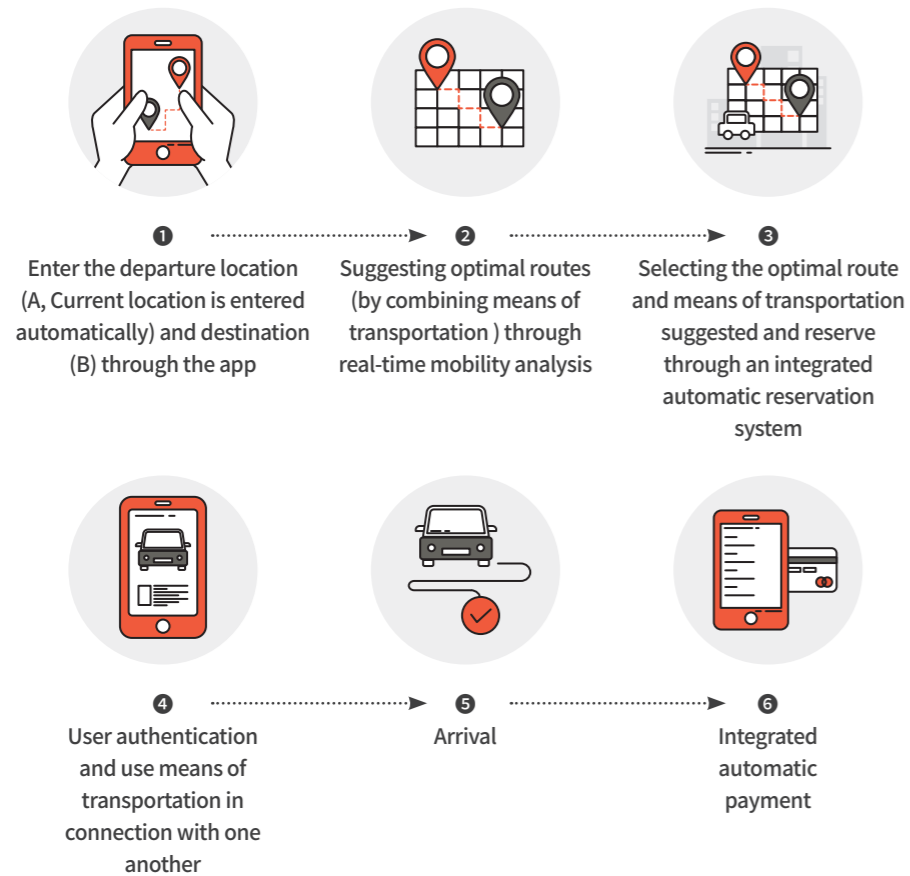
The increase of first-last mile connectivity can be expected due to the introduction of a self-driving car service which is operated based on demand. Since fully self-driving service enables unmanned vehicle operation, it lessens residents' cost burdens with reduced labor costs in the transportation industry.

Activation of Self-driving Cars and Validation

The Sejong National Pilot Smart City sees a future in which self-driving technology will act as an important axis of the future transportation system. It expects to play the role of a city platform that can verify the technologies of new and innovative transportation services and evaluate safety.

Also, the safety issues that arise through validation tests for self-driving service operation can be shared compulsorily to establish a response system.

C Integrated Mobility Service



A service that integrates public and private mobilities and allows the user to make the best transportation plan and reserve and pay at the same time through the platform

What is an Integrated Mobility Service?

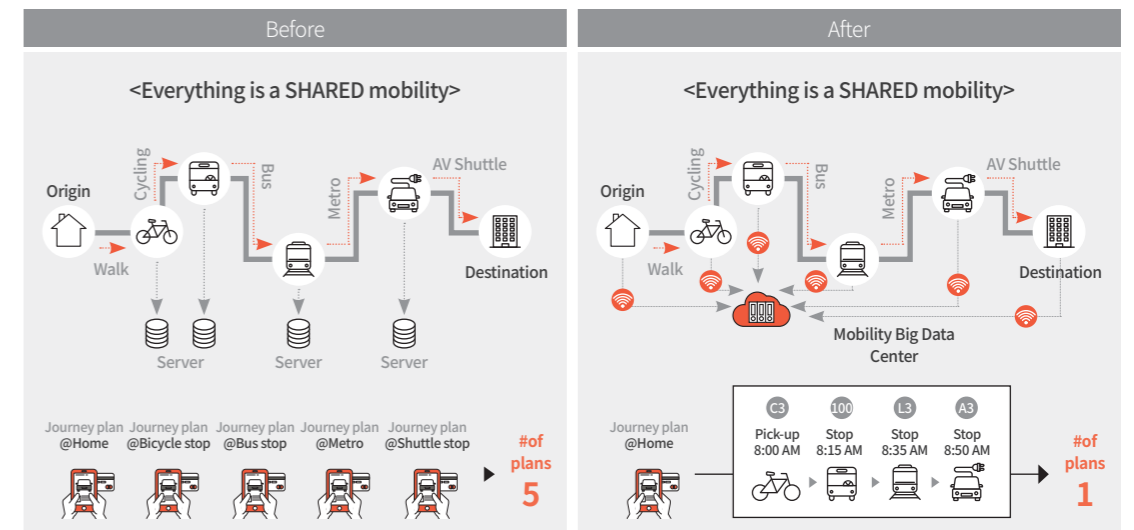
It provides a combination of optimal routes and means of transportation and alternatives according to the departure point and destination information the user provided and also provides reservation and payment services based on the preferred means of transportation and mode of travel entered by the user in advance. It provides an integrated door-to-door mobility solution from departure point to destination.

The Mobility Integration Platform integrates and manages the operation information of all mobilities in the city and analyzes the combination of optimal routes and means of transportation and alternatives according to the user's travel needs (departure point and destination, etc.). Users can establish an optimal transportation plan, select the means, make a reservation, and provide payment all at once through a single platform based on the suggestions made by the service.

The Integrated Mobility Platform integrates and manages the operating information of existing public transportation (bus, subway, etc.) and private mobility services (shared vehicles, personal mobility, etc.). Also, users can pay the charges for all modes of transportation (public and private) with a single reservation and payment.

Overseas Cases

- Finland WHIM:** This is the first case in the world that applied the concept of MaaS. It was first launched with the Whim Service in Helsinki, Finland in 2016. However, Finland has not achieved the integration of private mobility service operating information.
- Smile:** This is a project participated in by companies such as Wiener Linien, the Viennese public transportation company, the federal railroad company, and taxi and bicycle sharing companies.
- Moovel:** Providing services in Germany and tested in Boston, Portland, and Finland.



MaaS Conceptual Scheme

<Source: 10>

Expected Effects through Integrated Mobility Service

Promotion of Public Transportation

Integrating information, payments, and charges between means of transportation and thereby making it convenient to use public transport for residents may revitalize public transportation in the city.

- Reducing transfer times and distances compared to other cities
- Increasing transportation convenience and accessibility for residents through services personalized to users
- Reducing traffic congestion due to activation of public transportation, alleviating parking problems, and reducing travel costs
- Reducing environmental costs due to reduced carbon dioxide emissions

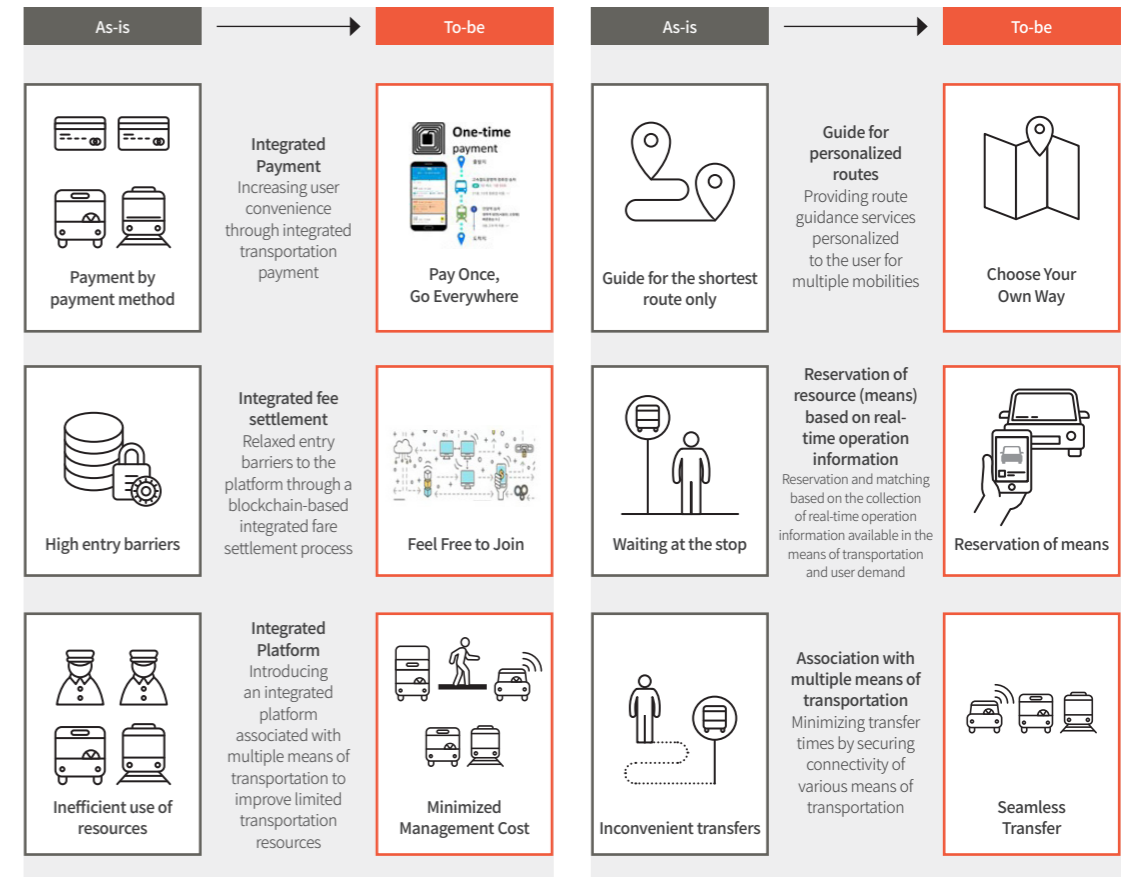
Activation of New Business

It is possible to support the development of various new services in the transportation sector by integrating existing public transportation and the Mobility Platform Service Information into a single platform. It will lay the foundations for developing a service model and business model.

- The existing transportation industry is also turning into an O2O Service Platform suitable for the Fourth Industrial Revolution.

Maximizing Resource Efficiency

Urban transportation demand and means (infrastructure) can be managed economically and efficiently by maximizing the utilization of resources through the integration of operational information between mobilities.

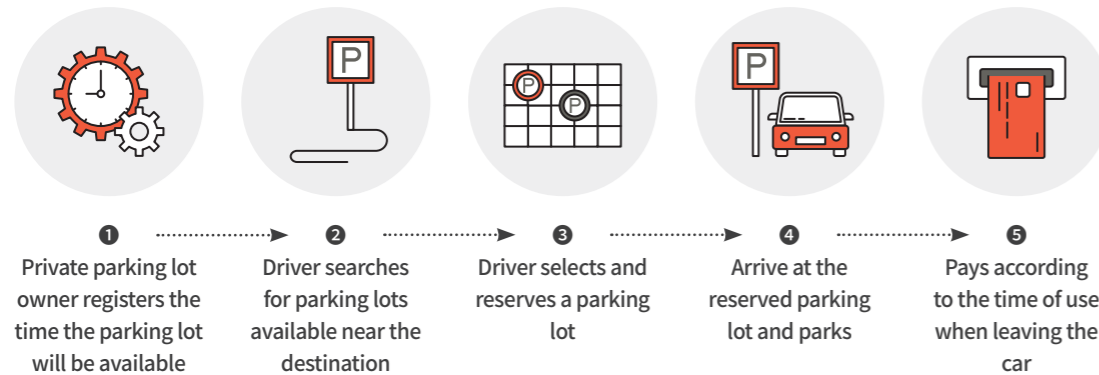


Expected Effects of MaaS

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D

Private Parking Lot (P2P) Sharing Service



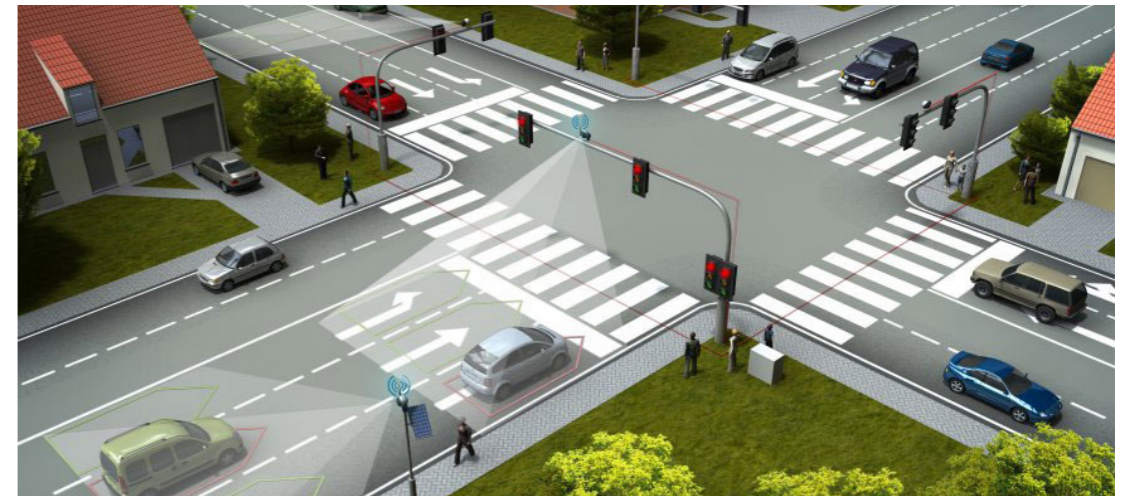
What is a P2P Parking Sharing Service?

Parking difficulties are a major problem in cities. Parking lots in residential facilities are often empty during rush hour. If you can use a residential complex near your destination or an empty parking lot within the facility for a certain period of time, it will be helpful in solving parking problems.

The Sejong National Pilot Smart City intends to provide a private parking lot sharing service that allows drivers to reserve, use, and pay for parking lots near their destinations using their smartphone for all public and private parking areas (permanent and private). Through this, we are trying to help alleviate parking difficulties by securing parking spaces that can be used not only in public parking lots, but also permanent and private parking lots. Domestic examples include Everyone's Parking Lot and Parking Friends.

E

Smart Signal Control Service



Efficient traffic flow control through demand-responsive traffic control system based on artificial intelligence image recognition technology and signal control algorithm.

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What is a Smart Signal Control Service?

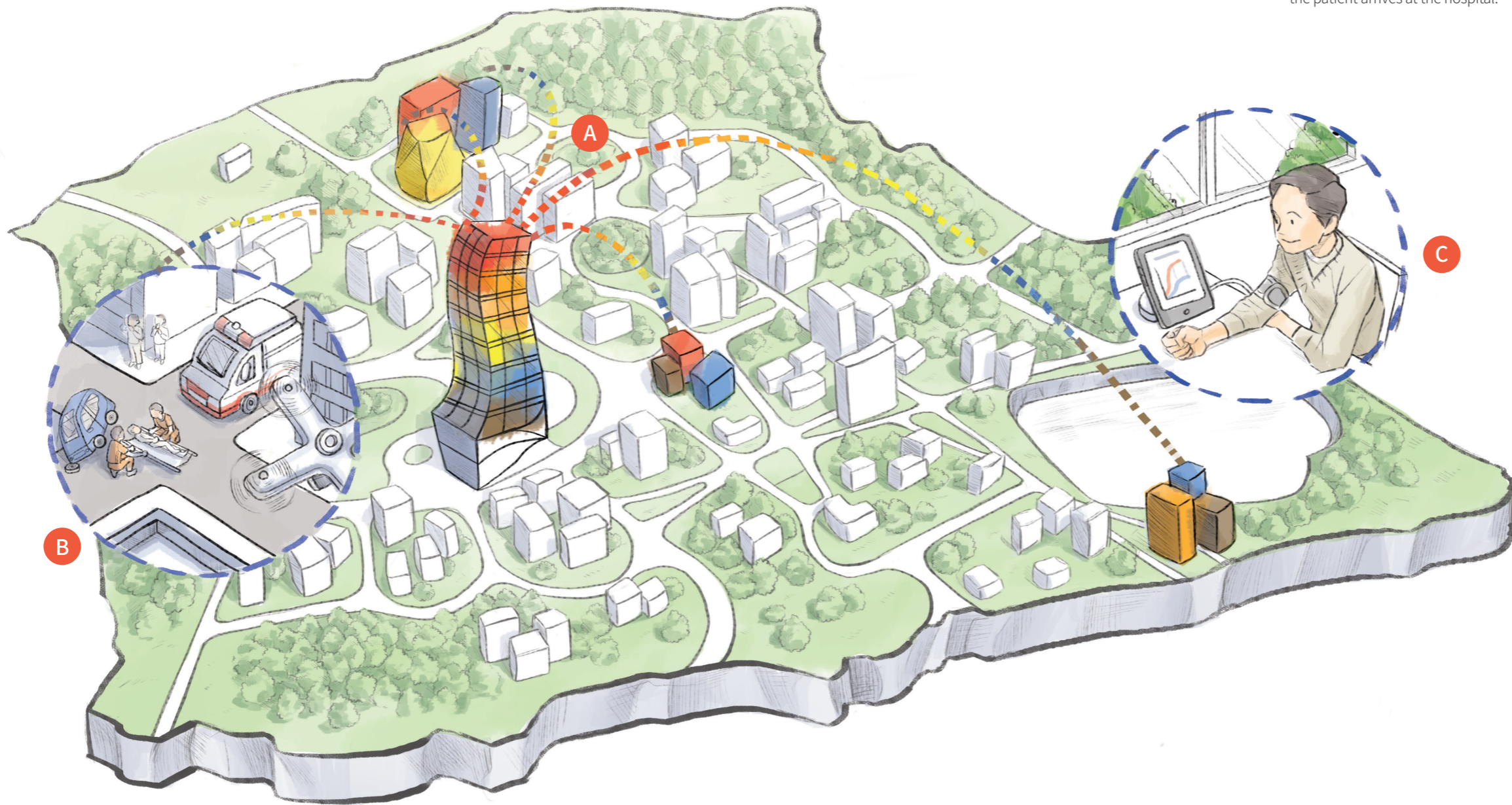
It is a signal control system for preventing traffic congestion in urban areas based on big data on traffic information. It is a next-generation signal system service that fuses information collected in real time between heterogeneous information observation systems, big data analysis, artificial intelligence image recognition technology, and signal control algorithm. It analyzes real-time traffic information collected by established traffic information infrastructure (various traffic detectors), smartphones, and private sector information, based on big data. It then interlocks with the signals from major links and operates a real-time intersection signal time to provide the optimized traffic flow. Individual links or Smart Traffic Centers calculate and operate signal cycles per link based on traffic volume information collected in real time. In a Smart Signal Control Service, it is possible to receive emergency vehicle preemption for emergency vehicles and priority bus vehicles. When an emergency vehicle with an onboard unit approaches an intersection, the emergency vehicle preemption signaling system will give straight and left signals at the same time in the direction of the emergency vehicle by communicating with roadside units to give the preemption signal so that the vehicle can pass the intersection safely and quickly.

Healthcare

“Manage health in everyday life and respond quickly in case of emergency.”

City as an Extended Hospital

The Sejong National Pilot Smart City provides a service that responds preemptively and promptly to the health, life, and safety needs of residents like a large hospital through a well-organized medical network environment. This enables making appointments and receiving treatment anywhere and at any time and secures a patient's golden time in case of emergency. Continuous healthcare by a Smart Home Doctor may prevent potential diseases in advance. These healthcare services are generally composed of three parts.



A. Integrated Network of Clinics Service

The information of medical institutions in Sejong City is integrated into a single network. This service allows residents to make appointments and receive examinations and treatments at the medical institutions they want.

B. Prompt Dispatch to Emergency Scenes and Emergency Medical Treatment Services

This service secures the golden time for treatment by sharing real-time patient information with a specialist in the emergency room of a general hospital from the moment an emergency occurs until the patient arrives at the hospital.

C. Smart Home Doctor Service

This service continuously manages the resident's health with the primary care physician of the resident's choice together with the artificial intelligence assistant.

Healthcare Service Infrastructure Components

There are eight essential infrastructure components for implementing three core services for healthcare. The components are as follows:

1 Urban Integrated Data AI Center

This center collects and analyzes all data generated within the Sejong National Pilot Smart City.

2 Artificial Intelligence-based Emergency Situation Control Center

This center collects and analyzes real-time information related to an emergency situation. Related information is classified and transmitted to fire departments, police stations, and hospitals. At the same time, it sends emergency medical drones to the scene of an accident and provides guidelines on emergency medical treatment to the people near the scene.

3 Healthcare Artificial Intelligence Center

This center analyzes and utilizes health and medical data collected from residents and hospitals. In the future, it can also be used as a space for data-driven healthcare start-ups.

4 Cloud-based Integrated Hospital Information Network System

It is an integrated medical information system that supports real-time hospital information search and sharing in general and emergency situations. This becomes the basis for sharing personal health and medical data and information.

5 Resident Health Management Total Application (for General Residents)

It is a service that allows residents to search in real time for hospital information according to the condition of their body based on personal health and medical data. This is provided in the form of apps, webapps, and bots.

6 Real-time Hospital and Pharmacy Information Sharing System (for Hospital Staff)

This service allows medical personnel such as paramedics and hospital staff to search and share highly reliable hospital status information in real-time in general or emergency situations.

7 Smart Ambulances

Smart ambulances are equipped

with a real-time high-definition video transmission devices (5G-based) to quickly share information between the staff in the ambulance and the hospital staff. Also, they include a remote-controlled surgical robot for emergency procedures and shares information with the police department to identify the patient. They are designed to arrive at the hospital in the shortest possible time through communication with vehicles nearby.

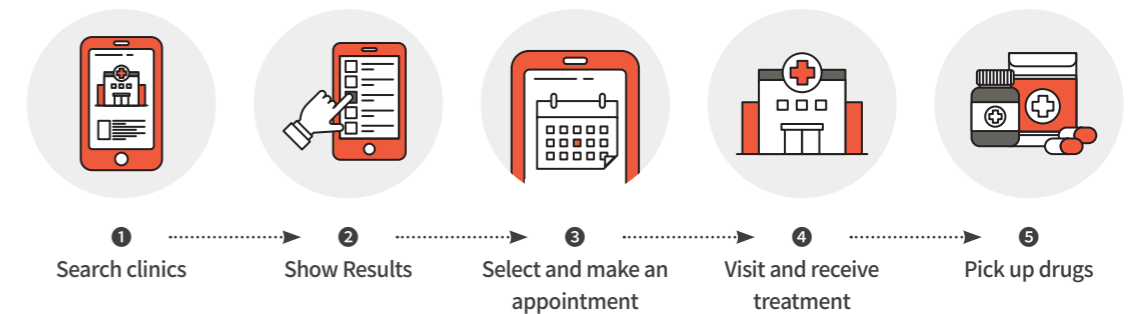
8 Smart Device

It is a device that can recognize and respond to various situations and can be used for communication at the same time. It is largely divided into personal and public devices, and the details are as follows.

· Personal Device: Smart home appliances, smartphones, wearable devices, etc.

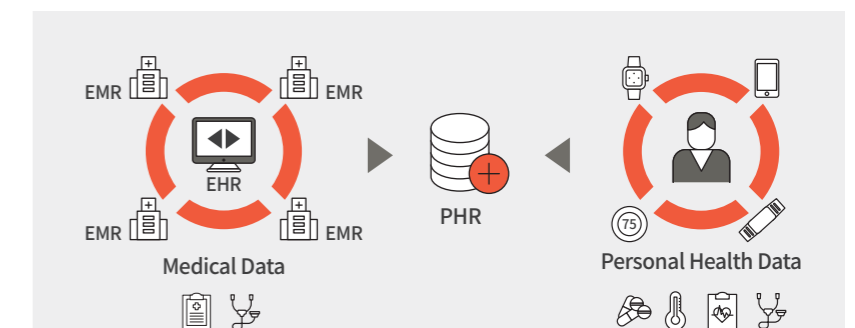
· Public Device: Drones, CCTVs, black boxes in public (self-driving) vehicles and mobilities, smart displays, medical devices (5G-based surgical robots capable of remote emergency procedures), etc.

A Integrated Network of Clinics Service



What is an integrated network of clinics service?

It is a service that integrates the Sejong National Pilot Smart City and medical institutions located in Sejong City into a single network. This enables residents to select, make appointments, and receive treatment at a medical institution anywhere at any time. At the same time, personal medical records can also be shared. Ultimately, we aim to build an integrated connection system of EMR – EHR – PHR.



EMR vs. EHR vs. PHR

EMR(Electronic Medical Record)

It means recording and preserving the personal medical history of patients in the hospital in electronic documents.

EHR(Electronic Health Record)

It is an electronic recording system that can integrate and operate patient medical information between medical institutions based on standardized information.

PHR(Personal Health Record)

It refers to health records that individuals manage and update directly. This concept includes not only health and medical information (blood glucose levels, etc.) but also a platform that provides personal health management services.

This service is provided as a healthcare service for residents and a cloud-based hospital information integrated system for hospital staff. However, both take the form of an integrated platform for real-time hospital information status management that allows you to check the location of all hospitals in Sejong City, possible treatment hours, status of professional medical staff, number of available beds, number of people waiting, and expected waiting times.

The Resident Healthcare Service is used by ordinary residents. It can be provided in various forms such as an app, webapp, and bot. The cloud-based hospital information integrated system will be used by hospital staff. This is a real-time information sharing service between hospitals, which enables the integrated management of medical institutions in the Sejong City.

Service Scenario

Step 1 Search Clinics

Residents can use multiple devices (smartphones, smart speakers, smart home appliances, etc.) to ask questions about their symptoms in real time. Answers to questions include hospital and pharmacy information related to the examinations and treatments for the symptom. In the event of an emergency, it can be linked to the second healthcare service, 'Quick Arrival to the Scene for Emergency and Emergency Treatment Service.'

Step 2 Show Results

Information of each recommended hospital is provided with content such as 'hospital location, hours available for reservations, resident's evaluation of the hospital, etc.' based on the 'user's current location.' Related issues include the following:

- Search results' exposure criteria (whether a Smart Home Doctor was considered)
- Whether information of hospitals not included in the hospital's integrated network is exposed
 - If you wish to receive treatment at a hospital outside the Sejong National Pilot Smart City
 - If you wish to receive treatment in the Sejong National Pilot Smart City area, but need to go to a hospital that is not included in the integrated network (e.g. dermatology, dentistry, etc.)
- Whether pharmacy information is included

Step 3 Select and Make an Appointment

When the user selects a specific hospital, they can check for more detailed information. If necessary, you can make an appointment and pay the fees at once. You can also change and cancel the appointment. When making an appointment at a hospital, you can transmit your health data collected through your usual wearable devices to the hospital in advance. This allows you to get a more accurate and reliable diagnosis.

Related issues include the following:

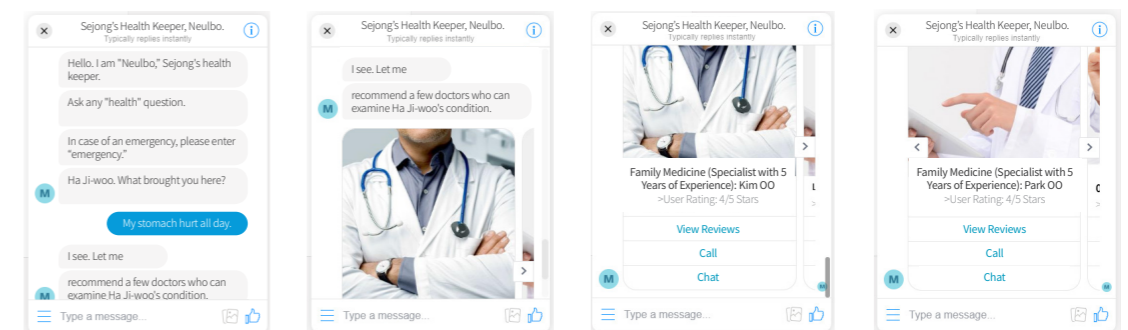
- Remote treatment on screen, remote monitoring
- If you are receiving treatment at a hospital that you did not designate as your primary care physician

Step 4 Visit and Receive Treatment

When a user visits the hospital, treatment starts immediately without any waiting time. Treatment is usually conducted based on health and medical data accumulated by patients. If the patient has not transmitted his or her health information in advance, the information can be transmitted directly through the kiosk installed in the hospital. Also, remote consultation in connection with the patient's primary care physician can be arranged. Upon the treatment's completion, information about the treatment results is also sent to the primary care physician. If necessary, you can make an appointment with a tertiary hospital immediately.

Step 5 Pick up Drugs

You will be issued an electronic prescription at the end of your treatment. Users can send their e-prescriptions to a pharmacy to visit in advance. This allows you to pick up your medication right away without waiting at the pharmacy. When you pick up your drugs, relevant information will also be sent to your primary care physician. If the patient is not prescribed a drug after some time, a message is delivered through a push alarm. There are issues regarding whether electronic prescriptions can be issued and whether a system can be developed in connection with hospital/pharmacy information.



Service Scenario (Draft)

Expected Effects

Residents enjoy the following through this service:

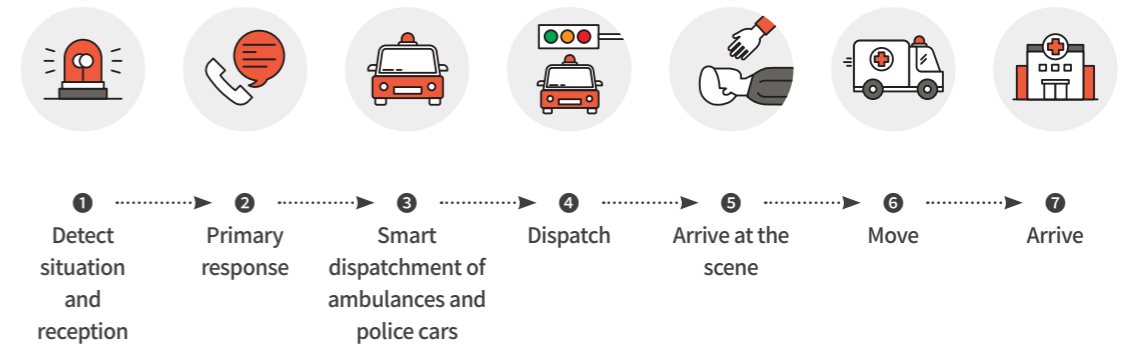
When you visit the hospital, you can receive medical treatment immediately without waiting.

The treatment can be provided by taking into account your personal health management records accumulated in advance. This enables a highly reliable examination.

If you are being examined in more than one hospital for the same symptom, you do not need to repeat the same test.

B

Prompt Dispatch to Emergency Scene and Emergency Medical Treatment Service



This service is...

(Potential) emergency situations are detected in real time through various channels (using CCTV, IoT, resident reports, and social media real-time analysis). It is an automated emergency service based on artificial intelligence that can be linked to emergency vehicle dispatches naturally when an actual situation occurs.

Service Scenario

Step 1 Detect situation and reception

When there is an emergency, the Urban Integrated Data AI Center and Emergency Situation Control Center receives the situation and hands over the information to the fire department and police stations. Various types of emergency situations (traffic accidents, fires, earthquakes, etc.) can be detected.

Step 2 Primary response

First, it provides emergency medical treatment guidelines for each situation to people at the scene. At the same time, a first aid kit will arrive at the scene through equipment such as drones. Meanwhile, the surrounding area is properly put under control by manipulating traffic signals and using drones to prevent secondary accidents. The current regulatory issues around drones must be resolved to enable this service.

Step③ Smart dispatchment of ambulances and police cars

Based on the emergency information received initially, a team will be dispatched with necessary equipment and staff. To minimize the traveling time to the scene, the control function of the traffic signal system linked to emergency vehicles and police vehicles may be used. Also, the service has a function that enables mutual communication between emergency vehicles, police vehicles, and nearby vehicles.

Step④ Ambulance at the scene

While the emergency medical treatment is given, the patient is identified through collaboration with the police. This is to identify the precautions to be considered in advance when treating the patient.

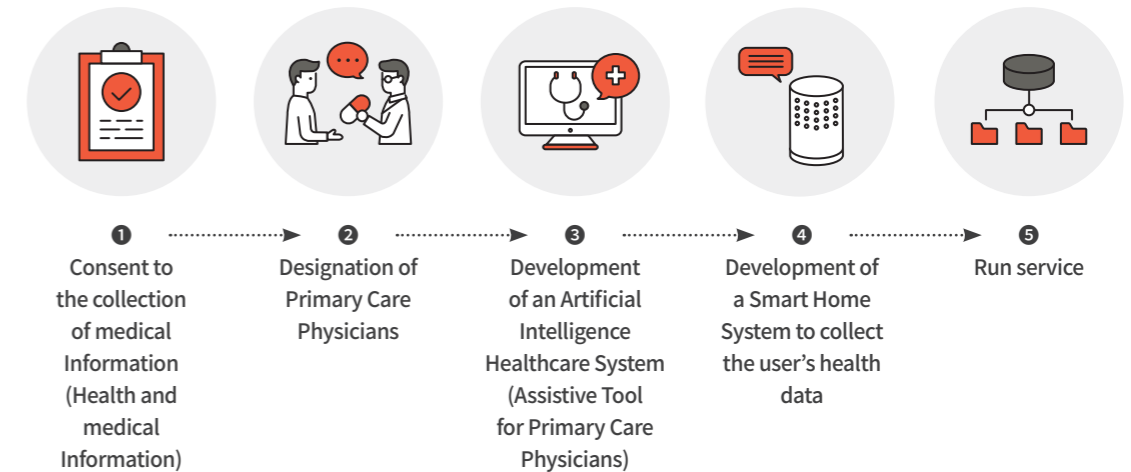
Step⑤ Move

From the moment the team arrives at the scene, the patient's condition is transmitted in real time to the emergency doctor through the remote image medical system. At the same time, it is possible to check the status of hospitals and medical staff that can be accommodated according to the patient's condition through real-time communication. Emergency helicopter use may also be considered during this process.

Step⑥ Arrive

After arriving at the hospital, the patient will be taken from the emergency vehicle to the hospital. Also, the contents of treatments given while transferring the patient are transmitted to the hospital in real time. This information is automatically uploaded to the hospital integrated network. If no hospital or medical staff is available to accommodate the patient during the transfer, the patient will be transferred to a remote hospital station. Afterward, it will be possible to try the first emergency surgery using remote collaboration and a surgical robot (5G-based). Here, it is necessary to check the possibility of surgical robots through remote collaboration (considering both technical and legal aspects).

C Smart Home Doctor Service



What is a Smart Home Doctor Service?

Smart home data measured inside the house and the health and medical data collected through wearable devices are transmitted to the primary care physician, who will then be able to continuously monitor the patient's health based on the data. When these data accumulate, they can be extended to an artificial intelligence (assisted) physician service who would provide preventive medicine in the future.

For this to work well, it is necessary to first establish a system for collecting health and medical data and detecting an emergency situation through the introduction of a smart home system. User's health data can be collected through home IoT and smart devices (such as AI speakers). This data is also linked to the hospital's integrated network service. It is also possible to detect abrupt emergency situations through various sensors attached to the house. Also, a disease prevention and management system using artificial intelligence must be developed, because the artificial intelligence assistant that has learned the health data in advance can provide meaningful information to lower false diagnosis rates for patients. Through this, it is possible to provide consistent healthcare to chronic disease-suffering patients and offer personalized and specialized medical services to ordinary patients.

Service Scenario

Step ① Consent to the collection of medical information (health and medical information)

When signing up for the service, it will ask for consent to the collection of personal medical information. There are various issues around this process.

- The scope of medical information collection (e.g. in case the user wishes to selectively decide the scope of disclosure of medical information)
- In case the domicile and the actual living area are different (e.g. the address is in Seoul, but the actual living area is mainly in the Sejong National Pilot Smart City, and vice versa)

Step ② Designation of a Primary Care Physician

Choose a primary care physician to take care of your health. In this case, the physician can be selected for preventive purposes (for the general population) or management purposes (for patients with chronic diseases, etc.). Related issues include the following:

- Method of selecting a physician and legal system issues
- Criteria for primary care physicians (up to primary and secondary vs. up to tertiary hospitals vs. whether a pharmacist can be chosen / possibility of designating and associating with physicians of hospitals outside the Sejong National Pilot Smart City region)
- Standards for medical expenses and scope of responsibilities when treated by primary care physician

Step ③ Development of an Artificial Intelligence Healthcare System (Assistive Tool for Primary Care Physicians)

Install artificial intelligence-based preventive and diagnostic assistance programs to assist the primary care physician. This program is provided in the form of app, webapp, and bot. Treatment practices using diagnostic assistance programs in particular must be reviewed in advance in terms of technical, economic, and legal aspects.

Step ④ Development of a Smart Home System to collect a user's health data

Build the infrastructure to collect health-related data from residents inside the house. This infrastructure can be linked to Smart Home appliances, smart speakers, smartphones, etc., and is naturally linked to the hospital's integrated network service. There are two main ways to collect data. One way is to automatically collect data through various IoT-based sensors. The other way is to collect them through conversations with artificial intelligence, push alarms, etc.

In addition to the user's physical information, the environmental information inside and outside the house can be collected. These accumulated data enable the analysis of factors affecting a resident's health in the future from various perspectives. Also,

medical devices that do not need to be installed in each home can be collected in a place called a Home IoT Common Zone. The use of standardized data is essential especially when installing smart home IoT sensors. However, it is known that most of the data standards used in smart homes built through construction companies and various smart home devices provided by the three communication carriers do not match.

Step ⑤ Run service

When the resident starts to live in the house after moving in, the health-related data collected in course will be continuously transmitted to the primary care physician. If there are signs of abnormalities in the health-related data, treatment (including treatment on screen) may be given based on the decision of the primary care physician. Also, various health related information (food information, etc.) can be provided. However, issues related to remote medicine must be resolved first for this service to work.

Expected Effects

Residents enjoy the following through this service:

It can alleviate dissatisfaction with short treatment hours

It enables a pre-diagnosis of the suspected disease
(Detection and treatment of severe disease in the early stages)

It can lower false positives and increase surgical and treatment accuracy

Patients suffering from chronic diseases can receive continuous healthcare
The general public will be able to receive personalized medical services

Also, it is possible to expect the development of various other services
(Possible to create new industries such as health management programs and healthy food ingredient services)

Education and Jobs

“City as an Extended School”

We lead the fostering of talented people needed by the new era.

We provide education to promote critical and creative thinking to adolescents and lifelong education for start-ups and employment and infrastructure to foster new industries, to adults.

This will spread various types of school environments and create a corporate ecosystem that provides creative opportunities to become a core base that drives innovative growth.

A. Introduction of an International Standard Curriculum

We will introduce a descriptive and debate-based curriculum in which students cultivate creative and critical thinking and express their thoughts to grow into talented people who can compete internationally and are demanded by the Fourth Industrial Revolution.

B. Design of a School Space Development and Operation Platform

We will develop educational spaces for production and creation within schools and across the city, and spaces that facilitate interactive discussions and team assignments.

C. Personally-customized and Self-learning Edutech Services

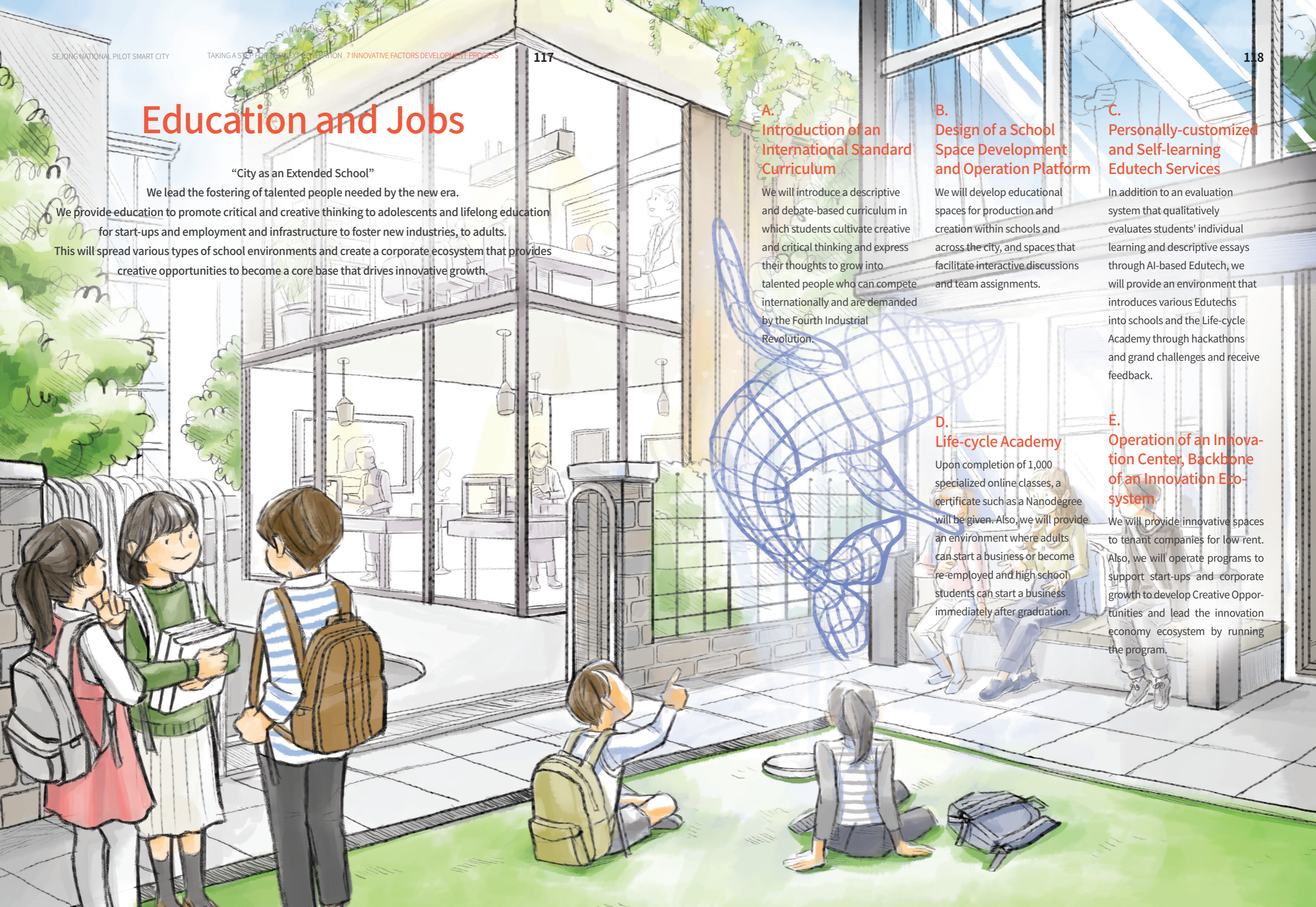
In addition to an evaluation system that qualitatively evaluates students' individual learning and descriptive essays through AI-based Edutech, we will provide an environment that introduces various Edutechs into schools and the Life-cycle Academy through hackathons and grand challenges and receive feedback.

D. Life-cycle Academy

Upon completion of 1,000 specialized online classes, a certificate such as a Nanodegree will be given. Also, we will provide an environment where adults can start a business or become re-employed and high school students can start a business immediately after graduation.

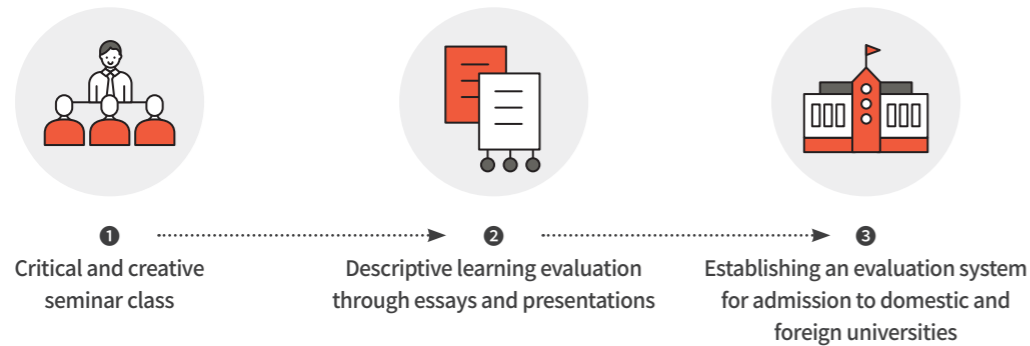
E. Operation of an Innovation Center, Backbone of an Innovation Ecosystem

We will provide innovative spaces to tenant companies for low rent. Also, we will operate programs to support start-ups and corporate growth to develop Creative Opportunities and lead the innovation economy ecosystem by running the program.



A

Introduction of an International Standard Curriculum



The international standard curriculum is carried out in the form of seminars that foster critical and creative thinking necessary for the Fourth Industrial Revolution and global competition. This will cultivate the ability to persuade others with individual logic rather than providing a single correct answer. Evaluation is conducted descriptively through essays and presentations.

Seminar classes that cultivate critical and creative thinking and learning evaluations based on descriptive essays and presentations will develop the creativity required by the Fourth Industrial Revolution and global competition, and the ability to directly develop, create, and start a business.

This service utilizes the learning and personal information of middle and high school students and strongly serves the public interest. The Sejong City Office of Education and schools will design, develop, and operate the curriculum and evaluation, and in the process, continuous consultations will be held between the Office of Education, the school, students, parents, and the Master Plan Team.

The scope of the population that would use this service is the students that applied for the service among those who are assigned to one middle school and one high school in the Sejong National Pilot Smart City.

Residents enjoy the following through this service:

Students can be fostered into talented people required by for the Fourth Industrial Revolution and global competition.

Students can enter domestic and foreign universities through a reliable qualitative learning evaluation system.

B

Design of School Spaces and the Development and Operation of the Platform



The Sejong National Pilot Smart City has many educational spaces developed inside the school and throughout the city. They are the spaces where students can study various fields, such as an interactive discussion space that fosters critical and creative thinking, and an invention production space that fosters students' ability to start a business immediately after high school. Students can use the entire city like a huge school.

It is a service that utilizes learning and personal information of middle and high school students and strongly serves the public interest. The Sejong City Office of

Education is in charge of designing and developing the service within schools and the Sejong City Office of Education and Sejong City for the service outside schools. Also, the Sejong City Office of Education will operate and manage the service within schools and the Sejong City Office of Education and Sejong City, outside schools. For spaces outside schools, the service will be operated through a collaboration system between the Sejong City Office of Education and Sejong City. The range of population that would use this service is all elementary, middle, and high school students living in Sejong.

Residents enjoy the following through this service:

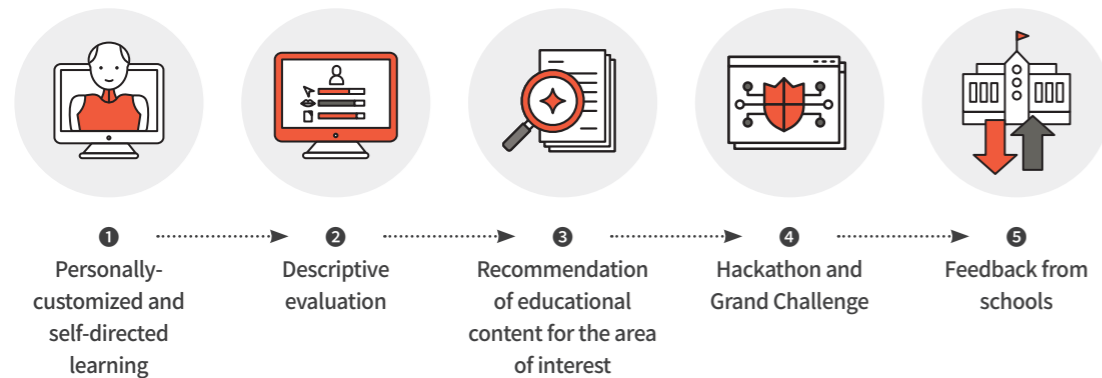
It will provide various learning experiences required by the Fourth Industrial Revolution and international competition by establishing learning spaces not only within schools, but also in various places across the city. This can enhance students' creative and critical thinking skills.

Components within Schools

- Establishment of maker's spaces and coding labs in schools (introduction of maker equipment such as 3D printers and robot arms)
- Spaces for immersion, installing one room per 20 students
- Design of schools in a streamline manner for collaborative work labs, group activity spaces, playgrounds, and performance halls, installing one debate room per 50 students.
- Installing one room per 50 students to enable collaborative work
- Developing a digital space that allows one laptop per person and uses AR and VR

C

Personally-customized and Self-Learning Edutech Service



Through Edutech's AI analysis, we provide personally-customized, self-directed learning suitable to the level of individual learning to elementary, middle, and high school students and adults who use the Life-cycle Academy. AI enables qualitative evaluation such as discussions and essays and grade management. The areas of interest analyzed based on course history, assignment results, and search content also constitute educational content. There will be an environment where companies moving into the Sejong National Pilot Smart City introduce new Edutech to schools and the Life-cycle Academy through hackathons and grand challenges and companies receiving feedback can improve Edutech and provide it again.

Edutech Service is the service that utilizes learning and personal information for elementary, middle, and high school students, adults attending the Life-cycle Academy, and adults preparing for start-ups and re-employment. It strongly serves the public interest. The Sejong City Office of Education will be in charge of designing and developing the service along with private companies operating and managing the service. Private companies operate services through a collaboration system with Sejong City.

The scope of the population that would use the service is all elementary, middle, and high school students living in Sejong and adults attending a Life-cycle Academy.

Residents enjoy the following through this service:

AI assists personally-customized self-directed learning according to individual learning levels and qualitative evaluations of descriptive discussions, essays, etc.

AI provides educational content in the individual areas of interest and assists completing assignments or studying in the areas of interest.

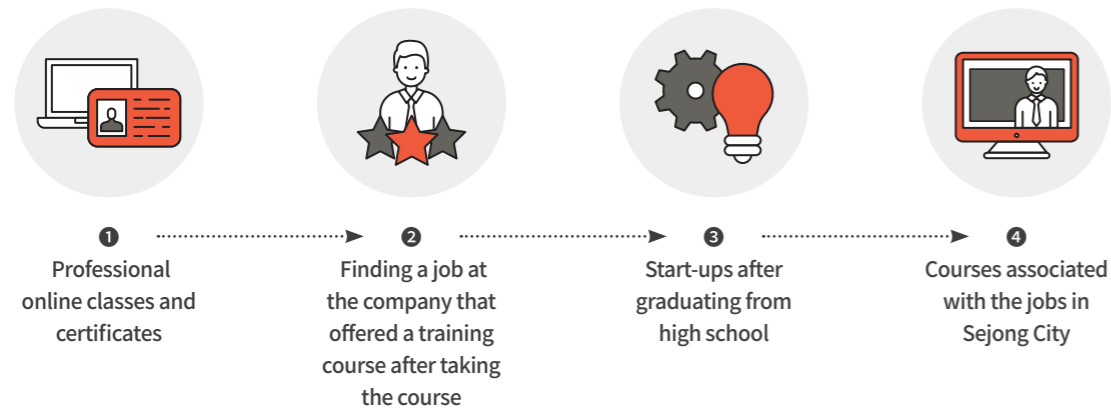
Residents can use the service, improved through feedback by various Edutech companies that have moved into the Sejong National Pilot Smart City.

The key functions include **personalized self-directed learning, qualitative evaluations of descriptive tests, and areas of interest forecasting and recommendation of educational content.**

- 1 Edutech can identify students' individual learning skills through AI analysis and provide learning content differently for each student to develop necessary learning skills.
- 2 AI assists evaluating descriptive tests such as essays and presentations, reducing administrative tasks by teachers.
- 3 Data are collected for AI to recommend relevant educational content, and students can use the information to learn based on the recommended content.

D

Life-cycle Academy



The Life-cycle Academy offers over 1,000 specialized online classes for adults to start a business or to be re-employed and high school students to start a business immediately after graduation. After completing the course, a certificate of completion is given and can be used for employment. The service utilizes the learning and personal information of adolescents and adults and strongly serves the public interest. Private companies will take charge of designing, constructing, operating, and managing the service through a collaboration system with Sejong City. The range of the population that would use the service is all elementary, middle, and high school students and adults living in Sejong.

Residents enjoy the following through this service:

For an adult or high school student looking for a job, re-employment, or to start a business, 1,000 specialized online classes will be offered.

After completing the course, students will receive a completion certificate such as a Nanodegree, which can be used for employment or re-employment.

If the student completes the professional training the company wants, the student may be hired immediately.

It will reduce the time to employment and decrease the unemployment rate in Sejong City.

The key functions include the professional fostering required for employment, start-ups, and re-employment, certificate acquisition, and the activation of the labor market.

- 1 The Life-cycle Academy is operated by a private company by opening classes that cover the desired areas of expertise. It guarantees the employment of talented people that complete the course and thereby increases the employment and re-employment rate of the academy's students. Also, students can start a business after completing a variety of classes that deal with the expertise required for starting a business.
- 2 Upon completion of the class, a certificate of completion such as a Nanodegree will be given to students, and it can be used for employment and re-employment.
- 3 Through Edutech and AI, students can receive personalized recommendations for educational content such as those related to their expertise after identifying their areas of interest and jobs that are lacking in Sejong City. It will expand expertise in areas of interest and reduce unemployment, benefiting both employers and job seekers, and improving the unemployment rate in the Sejong National Pilot Smart City.

E

Operation of an Innovation Center, Playing a Pivotal Role in the Innovation Ecosystem

What is the Innovation Center Operation Service?

The Innovation Center Operation Service aims to lead the innovative economic ecosystem of the Sejong National Pilot Smart City by providing innovative spaces to tenant companies for a low rent price and operating programs to support start-ups and to help businesses to grow.

The center's key functions can be described with five major functions.

First, it is to provide an innovation space and infrastructure. We operate co-working spaces such as open networking lounges, conference spaces, and basic office spaces, and innovation gyms such as maker's spaces and testbeds, and provide a variety of maker equipment. We plan to support not only a variety of equipment but also spaces for education, consulting, and mentoring. There will also be large spaces to accommodate events such as prototype exhibitions, investment IR, grand challenges, and hackathons. The biggest difference from other existing start-up support centers is that we are promoting a plan to secure complex residential spaces inside the center and provide them to the enrolled employees of the tenant companies. By doing this, we are realizing job-housing proximity, the philosophy of the Sejong National Pilot Smart City, and

we intend to provide an efficient and convenient environment for start-ups in particular.

Second, it is to offer training and consulting programs. Besides training programs on start-ups and job creation, the commercialization of technologies or products, technology transfer, and various patent management issues, we will provide individual companies with in-depth consulting on management, legal issues, tax, commercialization, and investment attraction strategies.

We will also offer a variety of programs to support the growth of companies. We plan to support various exchange activities such as networking, mentoring groups, and seminars between the managers and incumbents of the tenant companies, venture capital (VC) and investors, industry-academy and research institutions in the vicinity, and start-up support organizations. We will also operate programs such as hackathons and grand challenges to discover innovative and creative ideas and support commercialization.

Fourth, it provides an innovation testbed. We plan to operate an organization dedicated to managing the regulatory in-

novation process. It will review regulatory matters for the validation of products, technologies, and services of tenant companies, collect opinions on matters requiring regulatory reform, and deliver them to related government ministries and local governments. Also, we provide strategic consulting and how to use the regulatory sandbox system to individual companies. We support overseas cross-validation for global expansion of the testbed. We select excellent companies among tenant companies to provide opportunities for overseas expansion and professional consulting, and also support overseas cross-validation companies' domestic expansion costs and localization strategies. Also, we wish to maximize synergy by supporting collaboration activities with domestic and foreign companies.

Finally, it attracts urban smart farm companies and supports validation. It will support the development of a validation testbed using the Smart Farm complex site and support related professional start-up training education and consulting.

All of the major functions above are planned to be used by companies that physically and administratively moved

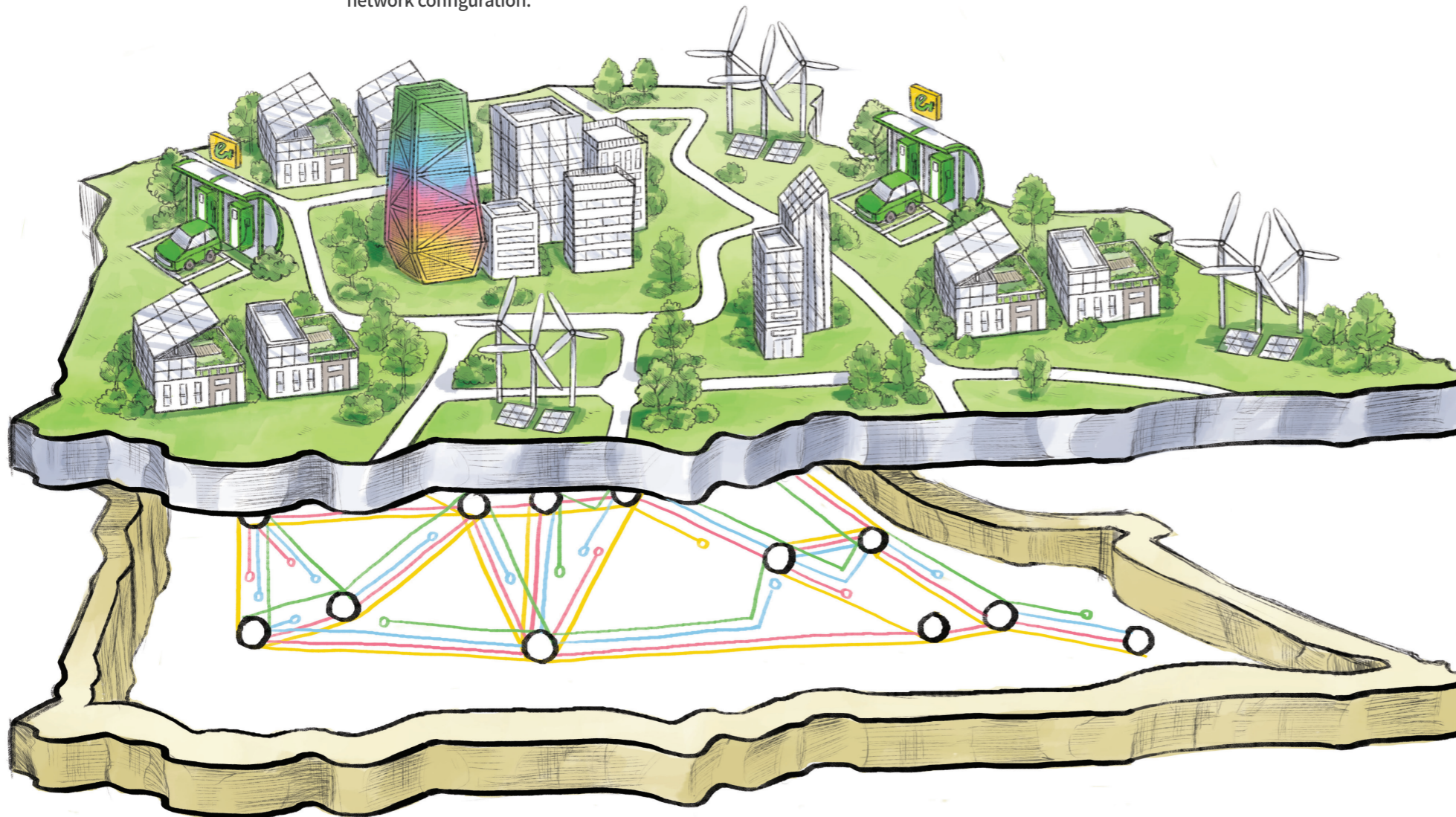
into the Innovation Center, or companies that move into the Sejong National Model City, if not the Innovation Center, without many restrictions by paying some fees for using some facilities and programs.

As there are various incentives and support given to tenant companies, it is necessary to establish first a system or a guideline on which companies are selected, discovered, and move in. Operating the Innovation Center is expected to significantly contribute to the creation of jobs and the establishment of an innovative economic ecosystem through the expansion of the start-up space, the establishment of a start-up platform such as support programs, and support for commercialization and market development. Particularly, it will be known as a successful case that provided efficient start-up support and realized housing welfare by developing start-up support facilities and public rental housing. Ultimately, it is necessary to provide and support opportunities for tenant companies to upgrade and validate smart city-related services and thereby pursuing coexistence between the Sejong National Model City and SPC, and building a sustainable industrial structure on their own.

Energy and the Environment

In supplying energy, carbon emissions can be minimized by reducing the use of fossil fuels by utilizing renewable energy such as solar and bio energy and new energy such as fuel cells and hydrogen energy, as well as by producing energy using waste such as food waste. The two pillars of urban energy consumption are building energy consumption and transportation energy consumption.

For building energy consumption, we will expand the spread of green buildings that have applied passive technologies such as high-performance insulation materials and natural ventilation, active technologies such as photovoltaic power generation, and energy management technologies such as BEMS. For transportation energy consumption, we will develop convenient charging infrastructure to promote the use of electric vehicles. Also, by using smart grid-based technology, we will provide a service that integrates and operates an energy-optimized supply network based on energy exchanges through an appropriate combination of distributed energy resources and energy storage systems and network configuration.



A. Smart Grid based Energy Management

We will develop a smart energy city through the efficient integrated management and operation of urban energy.

B. Development of an Energy Self-sufficient City

As part of the preemptive implementation of the Renewable Energy 3020 Plan, we will develop an environmentally friendly energy self-sufficient city by optimizing new renewable energy.

D. Futuristic Architecture

We will develop energy-friendly futuristic buildings and residential environments by introducing zero energy buildings.

C. Development of Charging Infrastructure

We embody a leading city for environmentally friendly electric vehicles that can be charged anywhere any time by developing a mobility charging infrastructure.

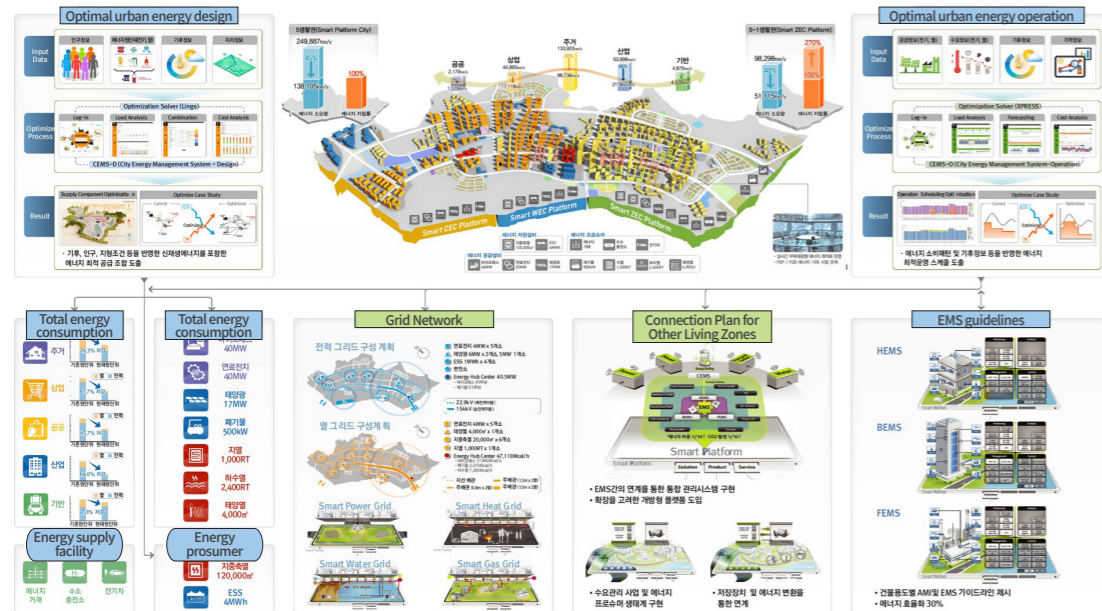
E. Environmentally Friendly Food Resource Recycling

Through the introduction of a food resource recycling system, we are converting food waste to resources, reducing odor, and improving user convenience and urban aesthetics.

A

Smart Grid based Energy Management

We will develop a smart energy city through the efficient integrated management and operation of urban energy. We will develop a Smart Zero Energy City in which 'energy production, exchange, and consumption' is managed and operated together by connecting the entire city with an energy grid.



Example of Smart Zero Energy

<Source:13>

A Net Zero Energy City maintains a balance between the total amount of energy it produces and the amount of final energy consumed each year. The city will apply the technology that optimally designs, manages, and operates energy by mixing electric and thermal energy into the smart grid infrastructure. Energy operators in the city supply electricity and thermal energy together, creating a variety of new energy industries through two-way communication. Also, by combining green energy and smart technologies,

they ultimately improve the quality of life for residents and the competitiveness of the city.

We will minimize the city's annual energy consumption and measure and forecast consumption by establishing a two-way communication infrastructure for optimal energy operation at the city level. Through the installation of new and renewable energy supplies connected to the grid network, we will ensure the total amount of energy consumed

is balanced with the total amount of energy produced in the city.

Also, we will carry out pilot projects, such as energy exchange and demand response (DR), in some areas (common housing or detached housing) in the city to assess feasibility.

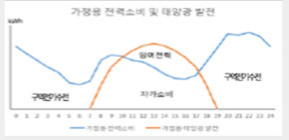

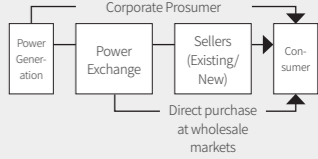
We will develop and verify an energy testbed by combining

energy exchanges, demand response (DR), E-prosumers, micro-grids, new energy technologies such as integrated energy management platforms, and new business models and expand it to the entire city.

We are introducing an urban E-prosumer that can trade surplus energy (power) to activate small-scale distributed power supply.

Energy Exchanges - Feasibility Analysis Results

Energy operators integrate and manage the energy of consumers, such as installing and managing photovoltaic roof panels and installing and operating fuel cells. Energy exchange services will expand from short-term inter-neighbor exchanges through initial KEPCO brokerage to corporate prosumers and blockchain-based P2P exchanges through deregulation in the future.

	Consumer Energy Integration	① Inter-neighbor Exchanges (Short-term)	Energy P2P Exchange Service
Service Model	<ul style="list-style-type: none"> Integrated Prosumer Group Supply and Demand Management (electricity business in the area) Installation, operation, and maintenance of roof-top photovoltaic panels Fuel cell installation and operation  <p><Source: 14></p>	<ul style="list-style-type: none"> Operator (SPC, demand management company) supplies prosumers' surplus power Selling surplus power to consumers in need through the brokerage of KEPCO (power sales business)  <p><Source: 15></p>	<ul style="list-style-type: none"> Corporate Prosumer <p>Power consuming firms purchase power through a power purchase agreement (PPA) with private power producers</p>  <p>Direct purchase at wholesale markets</p> <ul style="list-style-type: none"> Peer-to-Peer (P2P) <p>Blockchain-based power exchange service</p> <p>Completion of the design of KEPCO power exchange system and validation of power exchange between buildings (2017)</p>
Related System	<ul style="list-style-type: none"> Permission for a "district electricity business operator" (Article 7 (1) of Electric Utility Act) Supplying more than 60% of power demand in a specific supply area <p>* The district electricity business based on fuel cells has no business value, requiring support measures such as subsidies.</p>	<ul style="list-style-type: none"> Guidelines on Small-scale Exchanges of Power Generated with New Renewable Energy (Ministry of Commerce, Industry and Energy Notification, 2016) <p>* It is necessary to allow for the integrated brokerage of surplus power as the brokerage of the electricity seller (KEPCO) is required (currently, allowed for power exchange, KEPCO power supply contract only).</p>	<ul style="list-style-type: none"> Although a P2P power exchange pilot project is underway, blockchain-based P2P exchange and corporate prosumer businesses are not allowed until the revision of the Electric Utility Act (according to the provision prohibiting the concurrent operation of power generation and sales).

The economic and institutional restrictions and technologies required for each service model are as follows:

Service Model	Status	Meaning	Incentive for Participating in Exchanges	Institutional Constraints	Required Technologies
Inter-neighbor Exchanges	Preparation of the basis and validation due to the enactment of related guidelines in 2016	Difficult to regard as P2P as KEPCO acts as an intermediary and electricity bills are settled similarly to the net metering scheme ¹⁾	<ul style="list-style-type: none"> Participating Consumers: Avoiding the graduation pricing system of electricity consumers in the graduated fee, which is subjected to a rate higher than the basic electricity rate Prosumer: Higher profit than KEPCO PPA (SMP+REC) 	<ul style="list-style-type: none"> Prohibition of concurrent operation of electricity businesses – Prohibition of concurrent operation of demand management businesses and district electricity businesses Only electricity sellers may broker power exchanges 	<ul style="list-style-type: none"> Smart Grid Two-way power meter
Corporate PPA	Legislative initiative to establish the legal basis	SPC acts as a broker for consumers to directly conclude a contract for renewable energy produced by prosumers ²⁾	<ul style="list-style-type: none"> Participating Consumers: Social responsibility for expanding the use of renewable energy, purchasing inexpensive electricity, stability from long-term contracts Prosumer: Higher profit than KEPCO PPA (SMP+REC) Prosumer directly shoulders AMI installation 	<ul style="list-style-type: none"> Only the remaining electricity can be sold (within 50%) Reduction in the scale of consumers due to the three-stage reorganization of the progressive system – Expecting the increase of incentives when electricity rates are reorganized (time-of-use rates) Small-scale power brokerage businesses only exchange in the power market (Electric Utility Act) No standards for brokerage fees or electricity charges 	<ul style="list-style-type: none"> Smart Grid Two-way watt-hour meter
P2P	NO legal base	Power exchanges between individuals in the retail power market operated by SPC without a broker	<ul style="list-style-type: none"> Participating Consumers: Social responsibility for expanding the use of renewable energy, purchasing inexpensive electricity, stability from long-term contracts Prosumer: Higher profit than KEPCO PPA (SMP+REC) or power generation difference support system 	<ul style="list-style-type: none"> Small-scale power brokerage businesses only exchange in the power market (Electric Utility Act) No standards for network usage and electricity rates 	<ul style="list-style-type: none"> P2P Exchange Platform Blockchain (Optional)

1) Seoul Institute, "Energy Prosumer. Need to be Activated as New Power Supply and Demand Entity by Using Distributed Resource Brokerage Market" (2017)

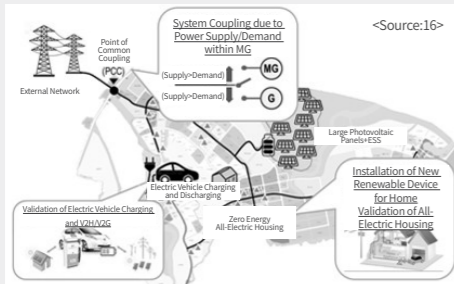
2) Presentation at the National Assembly Debate, "A Study on the System Design for Renewable Energy Purchase by Companies in Domestic Environment: Focused on Green Rate System and Corporate PPA, Kim Seung-wan" (2019)

B

Development of an Energy Self-sufficient City

As part of the preemptive implementation of the New Renewable Energy 3020 Plan, we will develop an environmentally friendly energy self-sufficient city by optimizing the supply of new renewable energy. To increase the proportion of new and renewable energy generation, we are expanding renewable energy facilities in various spaces within the city to improve energy self-sufficiency and create an environmentally friendly city that residents can feel. We are optimizing urban energy supply and consumption by establishing a new renewable energy infrastructure, such as photovoltaic power generators and fuel cells, to expand the energy self-sufficiency rate centered on distributed power sources, supported by an integrated urban energy management center.

Constructing an Energy Self-sufficient City Centering on Distributed Power



- Embodiment of a microgrid connected to the system that receives power from an external system and re-transmits excess power when power is insufficient
- Validation of smart consumption technologies such as electric vehicles and electricity-only houses in microgrids

Meaning of Energy Self-sufficiency

Country Expansion of Distributed Power Supply

- Contributing to energy conversion and the expansion of distributed power supply, the basic direction for the 8th Power Supply and Demand Plan
- Minimization of national transmission network costs

Region Implementation of Carbon Zero City

- Achieving the vision of an energy self-sufficient city based on new renewable energy that supplies 100% of power demand with solar power, and further, the vision of a zero-carbon city

Industry Securing Distributed Power Technologies

- Presenting a nation's standard microgrid model through continuous validations instead of one-off development
- Export to other cities and countries by securing advanced urban cases contributing to the transition of the energy paradigm to decentralized power

New Renewable Distributed Power Supply

- **Definition:** Small-scale power generation facilities using new renewable energy resources such as sunlight or wind to simplify and increase the efficiency of distribution facilities of transmission networks between regions or within regions
- **Main Function:** Distributes power and enables stable electricity supply as a number of prosumers produce power in the power grid based on a two-way transmission and distribution system (complementary to the existing power system), instead of the one-way configuration that delivers power generated at power plants to the consumer, which is the existing system.

- Expanding the installation of photovoltaic power generators, such as building-integrated photovoltaic (BIPV), roof type, and canopy type in houses, commercial buildings, bicycle roads, soundproof tunnels, and parking lots to expand energy self-sufficiency and new renewable energy
- Establishing new renewable energy infrastructure such as fuel cells to expand energy self-sufficiency
- Installing fuel cells on idle land to supply electricity and heat

Hydrogen Fuel Cells

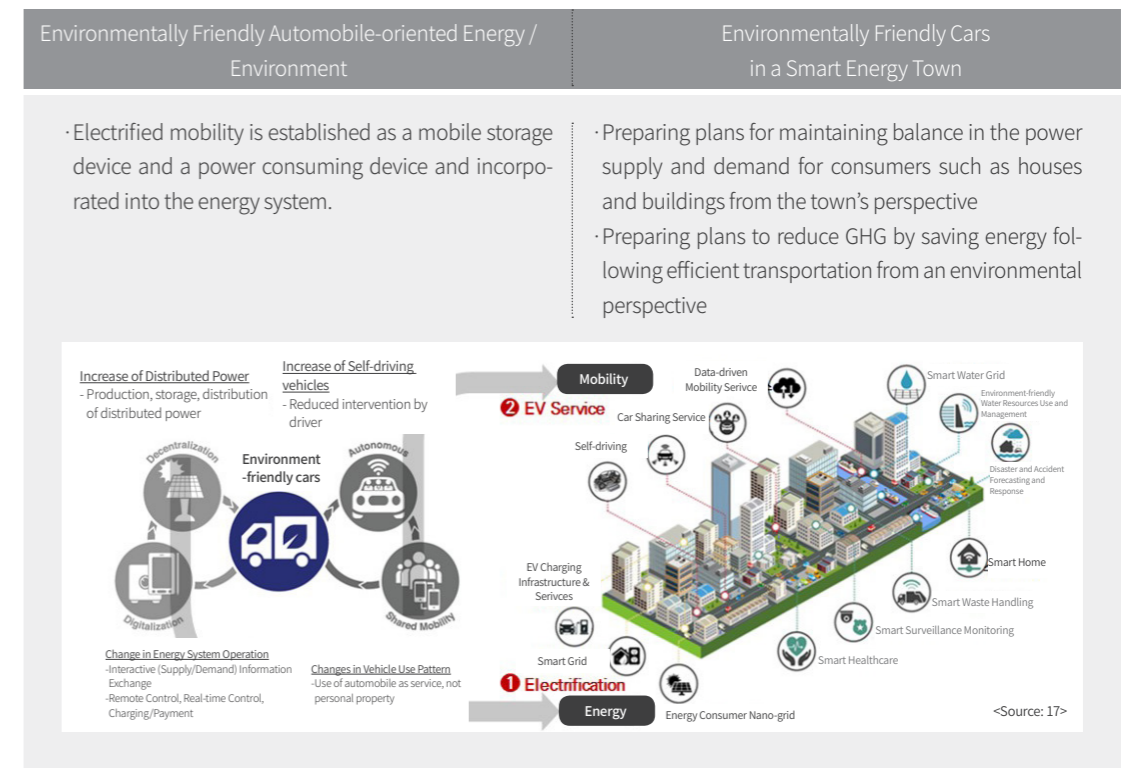
- **Definition:** A technology that directly converts chemical energy generated through the chemical reaction of hydrogen and oxygen in fuel into electrical energy, new energy that generates electricity and water
- **Main Function:** Produces electric energy and heat (steam) through the chemical reaction of hydrogen and oxygen. Generation efficiency is 30-60%, thermal efficiency is 40% or more, securing a total conversion efficiency of 70% or more

C

Development of Charging Infrastructure

We will embody a leading city for environmentally friendly electric vehicles where electric vehicles can be charged anywhere and at any time by developing mobility charging infrastructure. We will develop a power grid for super-fast charging facilities (300kw or more) and quick charging stations in the right locations, considering the increasing demand for shared and private electric vehicles in the future. Also, we will develop a standard charging system using charging outlets as well as fast charging.

- We will develop and operate a charging infrastructure to introduce electric vehicles to the Sejong National Pilot Smart City.
- We will calculate the appropriate number of charging locations in consideration of the increase in environmentally friendly vehicles in the Sejong National Pilot Smart City.
- We will review the optimal charging infrastructure technology that reflects the Fourth Industrial Revolution's new technologies and charging infrastructure trends.
- We will implement V2G (Vehicle-to-Grid) Service in stages.
- We present a business model for sustainable operation.



Securing Mobility Charging Facilities

Quick Charging Infrastructure

- Developing a charging base for public institutions, schools, and parks located on the outskirts of the Circulation Ring
- Quick charging infrastructure is an infrastructure facility that reflects the final demand during the initial construction of urban buildings in the Sejong National Pilot Smart City and should be installed efficiently

Standard Charging Infrastructure

- The standard charging infrastructure will be installed successively depending on the location of environmentally friendly automobiles.
- Centralized charging stations will be installed for collective housing facilities and individual charging stations for areas with detached houses.

D

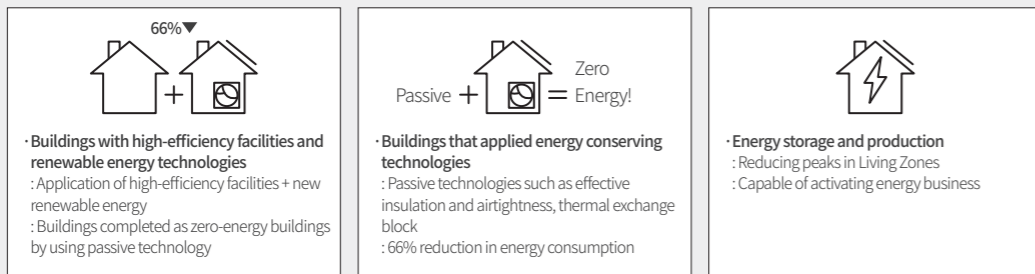
Futuristic Architecture

We create energy-friendly futuristic buildings and residential environments by introducing zero energy buildings. By introducing and spreading the “Zero Energy Building Certification (ZEB)” for buildings in cities, we simultaneously promote the passive aspects (reduc-

ing energy loss) and active aspects (energy production expansion) of energy. Some detached and apartment housings are designated as 'Zero Energy Housing Complexes' to create a new energy residential environment where residents participate autonomously.

Definition and Concept of Zero Energy Buildings

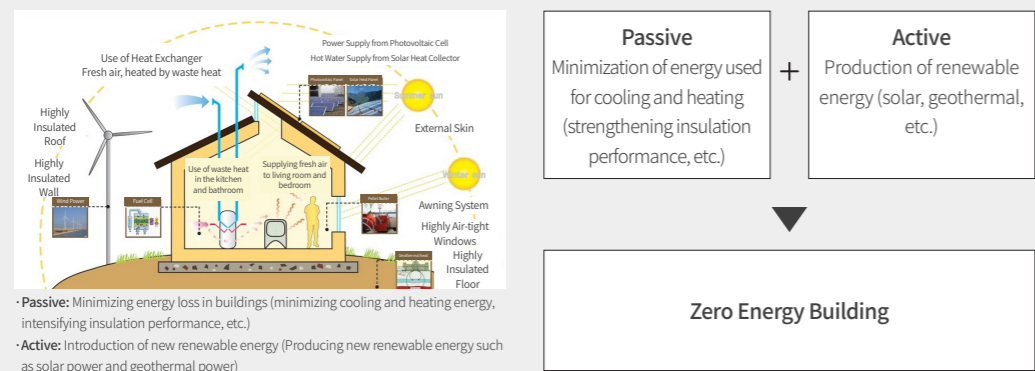
- Buildings that minimize their energy load by maximizing insulation performance (passive) and use new renewable energy (active) such as sunlight to minimize energy requirements for their functions
- A 'Zero Energy Building' is a building in which the sum of energy used and produced is zero (Net Zero). However, considering the current level of technology and economic efficiency, the policy promotes the idea that the building that minimizes energy consumption (90% reduction) (Nearly Zero) is a zero energy building.
- Regarding zero-energy building certification at the building level, it has been a compulsory requirement for market-based and quasi-market-based public corporations as of 2017, for public buildings from 2020, and for private buildings from 2025 phase-by-phase.



<Source: 18>

Promoting both passive (reducing energy loss) and active (maximum energy production) energy

Conceptual Scheme of a Zero Energy Building



<Source: 19>

E

Environmentally Friendly Food Resource Recycling

Through the introduction of a food resource recycling system, we are converting food waste to resources, reducing odor, and improving user convenience and urban aesthetics. By introducing a food-resource conversion biosystem in apartment complexes and detached housing complexes in the Sejong National Pilot Smart City, we are embodying a self-sufficient complex that

recycles and utilizes 100% of food waste and improves resident satisfaction. Also, we are embodying a community-based complex using environmentally friendly byproducts (compost) in apartment complexes and solving civil complaints such as odor issues within the complex.

Introduction of a Food Resource Conversion Biosystem

By introducing a food-resource conversion biosystem in the city's apartment complexes, we are implementing a self-sufficient complex where 100% of food waste is recycled and utilized and resident satisfaction is improved.

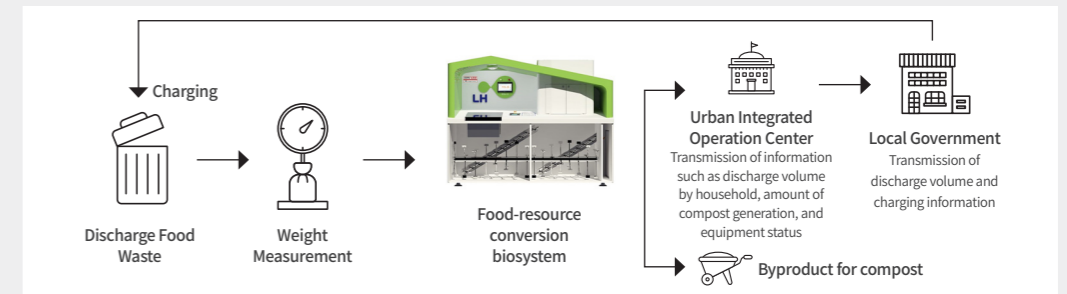


Image and conceptual diagram of food-resource conversion biosystem

<Source:20>

Introduction of a Smart Recycling System



- Food waste
- General (combustible) waste
- Sewage (waste water)

Instead of carrying food waste outside, it is crushed and discharged directly from the sink and is sent underground to be turned into a resource.

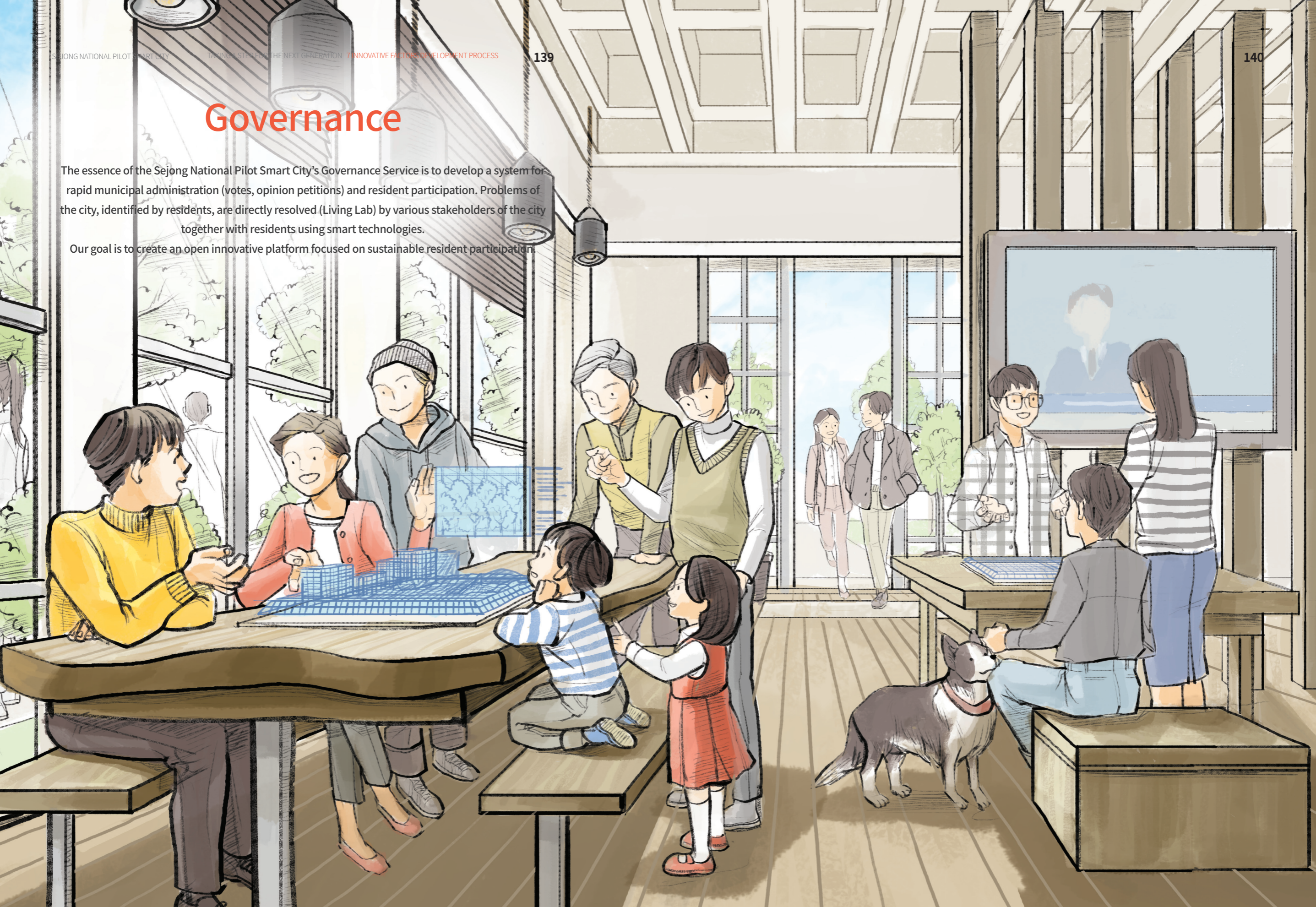
Concept Diagram of a Waste Smart Recycling City Model

<Source: 21>

Governance

The essence of the Sejong National Pilot Smart City's Governance Service is to develop a system for rapid municipal administration (votes, opinion petitions) and resident participation. Problems of the city, identified by residents, are directly resolved (Living Lab) by various stakeholders of the city together with residents using smart technologies.

Our goal is to create an open innovative platform focused on sustainable resident participation.



Developing a System for Rapid Municipal Administration (Votes, Opinion Petitions) and Resident Participation (Living Lab)

The rapid municipal administration (votes, opinion petitions) reflection and resident participation (living lab) system developing service is about providing a platform to solve the city's problems directly reported by residents with various stakeholders in the city by utilizing smart technologies. The key objective is to build an open innovative ecosystem platform for community-based cooperative governance. This requires various methods and technical elements such as an on/offline platform, Digital Twin, and M-voting.

The range of the population that would use the service is all residents of the Sejong National Pilot Smart City. Before the

construction of the city, however, we plan to monitor the results of the living lab in the 1-4 Living Zone, which is currently underway. We will expand and implement the results in the Sejong National Pilot City. In the long run, we will develop the system into an integrated living lab platform for the entire 5 Living Zone (about 60,000 people) and also Sejong City.

Since this service requires the cooperation of both public and private sectors and has an intense tone of public interest, Sejong City, LH, SPC, or all of the professional companies entrusted with the task will cooperate closely with each other in the entire process of service design, development, and operation.

- Residents enjoy the following through this service:**
- We can promote regional development and embody social values by solving problems in the city through online and offline platforms and creating an 'open' smart city where private companies and residents participate.
 - We expand resident participation in solving urban issues through the operation of the Living Lab.
 - It serves as a testbed to discover and introduce new private sector services.
 - We derive improvement plans through continuous project evaluation and feedback, and create a model that can be spread to other cities through archiving and sharing.
 - We promote the active participation of residents from the initial stage, and establish a new innovative model that creates results through social cooperation in the Public-Private-People Partnership (PPPP) system.
 - We improve residents' recognition and enhance smart city satisfaction by applying smart city solutions and solving the city's problems through residents participating with initiative.
 - It provides incentives to participating residents in the local blockchain currency and also becomes the place to discuss new labor and welfare paradigms by experimenting with basic income through the local currency.
 - We go beyond the stage of testing and validating individual technologies, products, and services as one-off events to commercialize them through continuous feedback through the Living Lab project, contributing to the creation of an innovative ecosystem.

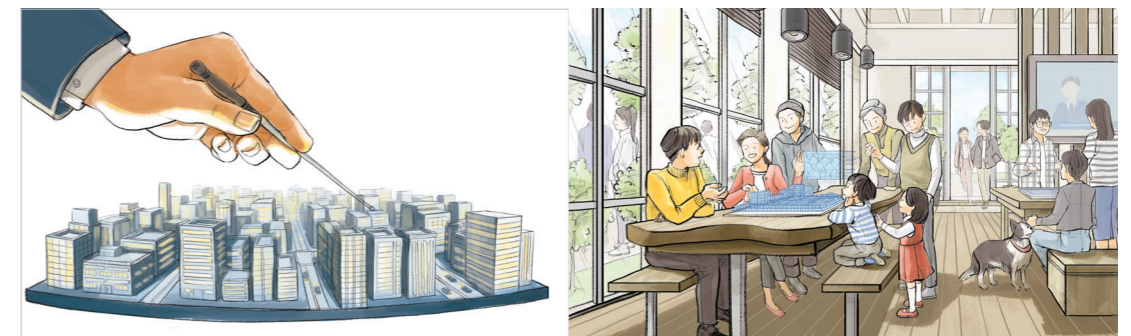
Key functions include providing rewards for resident participation, providing an opportunity for residents and various stakeholders of the city to participate in operating the city and solving its problems, providing support for the production of a prototype of the Living Lab project, and providing a window for spreading the Living Lab project results.

The failure to attract residents to actively participate in the city's administration was considered the biggest cause of failure in the city's community-based governance. Providing incentives for resident participation using the blockchain-based local currency (promote in stages from the administrative affairs where it is simple to apply and does not affect the market largely to promote economic revitalization through the virtuous cycle of money within the region by taking performance and market impact into consideration) will activate resident participation as sufficient incentives.

We build an online/offline Living Lab Platform so that residents and various stakeholders within the city can freely post, share, exchange opinions, and develop them into actual projects anywhere any time. We propose a micro-app approach that utilizes the app that many residents already have to increase the accessibility of this platform for residents. Also, we

have established an M-voting system (securing reliability and transparency of voting and counting through the application of a blockchain system) to collect residents' opinions easily and quickly and reflect them in policies. It will give us a chance to simulate projects proposed by residents in a virtual city through Digital Twin, a core technological element of the Sejong National Pilot Smart City.

By establishing an open innovative ecosystem platform through a variety of cooperation efforts between public and private sectors and academia, it is possible to realize prototypes of various projects that residents of the city participate in, and all these processes are promoted, monitored, archived, and shared on the online and offline platforms to create a scalable model. (We have many offline workshops, ideathons, and hackathon plans.)



Manager-centered city design and operation► Urban design and operation centering on resident participation

Culture and Shopping

The purpose of the Culture and Shopping Service is to provide residents with a variety of cultural experiences and convenient shopping environments.

Performances in various types and sizes will take place across the city so that residents do not feel culturally alienated even in a small city.

It will increase residents' leisure life and urban satisfaction, and expand the local cultural market.

Also, it will provide a convenient shopping experience where items that residents purchase from different stores are shipped altogether at once.

A. Customized Performer and Potential Audience Connection Service

The Sejong National Pilot Smart City provides a variety of cultural, artistic, and performance contents through a forecasting service according to the demand of residents. We provide a culturally personalized platform service that satisfies both users and suppliers, by managing the stable demand of users and increasing the profits of performers.

B. Establishing a Variable Performing Culture Space for Various Performances and Cultural Events

We provide stable and continuous cultural contents by providing flexible and variable performance culture spaces by size, area, and situation.

- By size: Small (30-50 people), medium (100-300 people), and large (500-700 people)
- By area: Concert, play, exhibition, conference, etc.

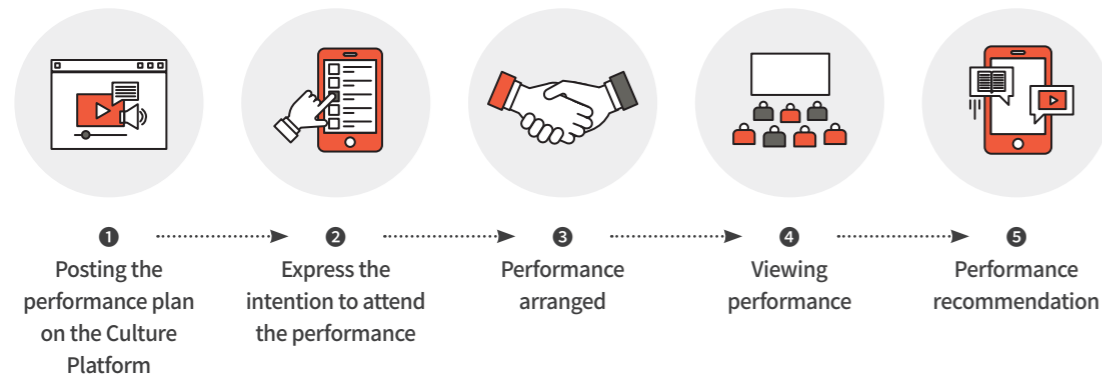
C. Integrated Shipping Services for Items Purchased at Individual Shops

We provide a service that integrates the shipping of all items purchased from individual stores in the city and also outside the city. Residents can conveniently experience various cultural interests and use mobility even after shopping.



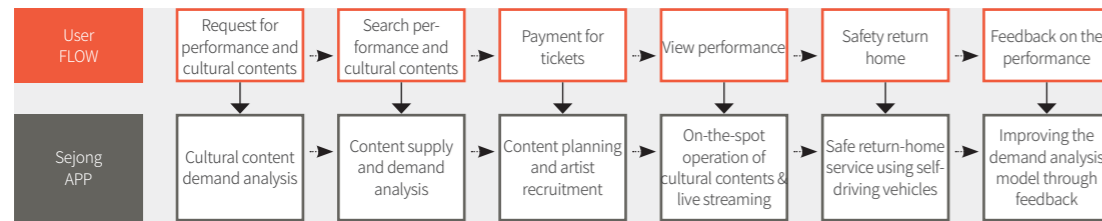
A

Customized Performer and Potential Audience Connection Service



With the Customized Performer and Potential Audience Connection Service, residents can experience a variety of culture, art, and performance contents even in the small city through the supply and demand forecasting

system. Performers can manage stable demand and increase profits, and residents can enjoy various satisfying performances.



Service Scenario

The scope of the population that would use the service is all residents living in or visiting the Sejong National Pilot Smart City, and the scope of culture includes books, movies, plays, musicals, dances, operas, classical music, concerts, and exhibitions. The Customized Performer

and Potential Audience Connection Service is a service designed to improve the cultural life and quality of life of residents. Private companies or SPC will take full charge of the service's design, development, operation, and management.

Residents enjoy the following through this service:

Residents can experience a wide spectrum of cultural contents,

performers can increase their profits and manage demand through demand forecasting,

and residents' satisfaction with urban life and leisure life increases through a rich cultural environment.

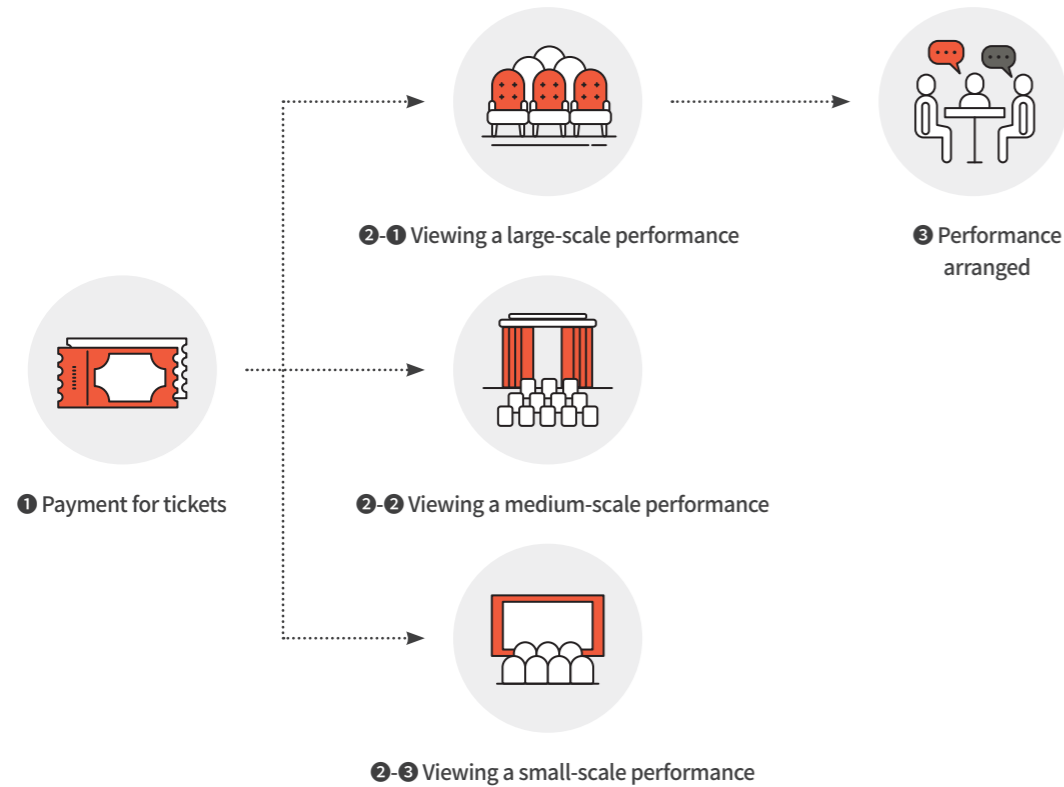
The main function of this service is to provide personalized culture, arts, and performances by analyzing audience preferences and experiences according to the demand for cultural content. Also, we create a safe payment system using local currency and provide and manage a comprehensive cultural activity experience throughout the content consuming process.

- 1 The cultural content demand and supply analysis function analyzes the supply and demand for cultural content by analyzing big data collected through online portals, apps, and offline. The demand for specific performances is forecasted by collecting and analyzing data on personal preferences for purchasing cultural content. In particular, through purchase price analysis, it presents prices and contract terms that both consumers and suppliers are satisfied with.
- 2 Providing personalized culture, arts, and performances according to audience preference and experience by supply and demand in a space that meets demand. This function is linked to the variable cultural spaces, and after the space is organized based on the audience to apply first, the performance is conducted by determining the appropriate rental fee. Sensors attached to the chairs of the concert hall collect the performance participation data of the audience and increase the accuracy of the personalized cultural content recommendation service.
- 3 The safe payment function using the local currency enables consumption in all processes of cultural content to be paid with the local currency with the consumer's consent. It enables safe and comfortable payments by allowing payment in the local currency for both the purchasing of tickets for the performance, consumption at the venue, and the consumption of related content after the performance. Through this, we can recommend cultural content for each individual with high degrees of accuracy.
- 4 From content consumption to afterwards, the overall cultural experience management function provides everything from the search of various content through the cultural platform to performance schedules and seat information guides, various content during performances, and a safe return-home service using self-driving vehicles. Also, it collects and analyzes consumer feedback to reinforce the content demand analysis model and improve the accuracy of cultural content recommendations.



B

Development of Variable Spaces for Various Performances and Cultural Events



The Sejong National Pilot Smart City is developing a variable performing culture space that can be used alone to provide continuous cultural content and can be flexibly changed in terms of size, field, and situation. Also, small performance spaces such as pocket parks are set up throughout the city, allowing residents to experience a diverse range of cultural content throughout the city.

Since it is a service that improves the quality of life and cultural life of residents, and requires a space for performances, Sejong City, the local government, can

exclusively take charge of design and construction and also operate and manage the service or entrust an SPC with operation and management. When developing a flexible performance hall in the Complex Community Center, the design and construction shall be carried out in collaboration with the National Agency for Administrative City Construction of Sejong City. The range of the population that would use the service is all residents living in or visiting the Sejong National Pilot Smart City, and potential “main users” are the residents who wish to experience various cultural performances.

Residents enjoy the following through this service:

It will provide a variety of performances, increase cultural satisfaction,

and raise culture and performance frequency through the efficient operation of the space.

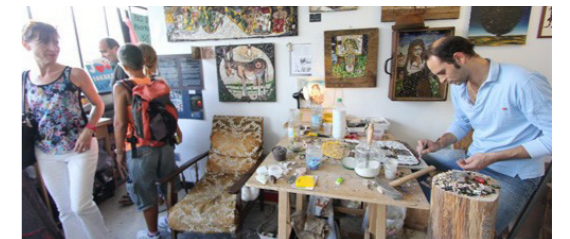
The main function is generally divided into the utilization of the variability of the theater and the measurement of the theater’s infrastructure data.

① To enable various cultural content (books, movies, plays, musicals, dances, operas, classical music, concerts, exhibitions, etc.), it is necessary to have a performance space that suits the characteristics of each performance by grouping cultural genres that require similar stage equipment and are of a similar scale (e.g. musicals, operas, and classics all require high-quality acoustics and many seats, while books, movies, and exhibitions can be held on a small scale and require different stage equipment.)

② The infrastructure data at the venue are measured by using technologies such as 2. RFSignal. By accumulating data generated during performances, we provide performers with accurate information on the tastes and preferences of residents, and provide services that more accurately recommend highly satisfactory performances to residents.



<Source: 22>



<Source: 23>



Variable Culture Space – Feasibility Analysis Result

Technical Feasibility Analysis Details

A variable cultural space that can change the position and size of seats and stage equipment according to the cultural performance’s genre is already in operation by the private sector.

Policy Feasibility Analysis Details

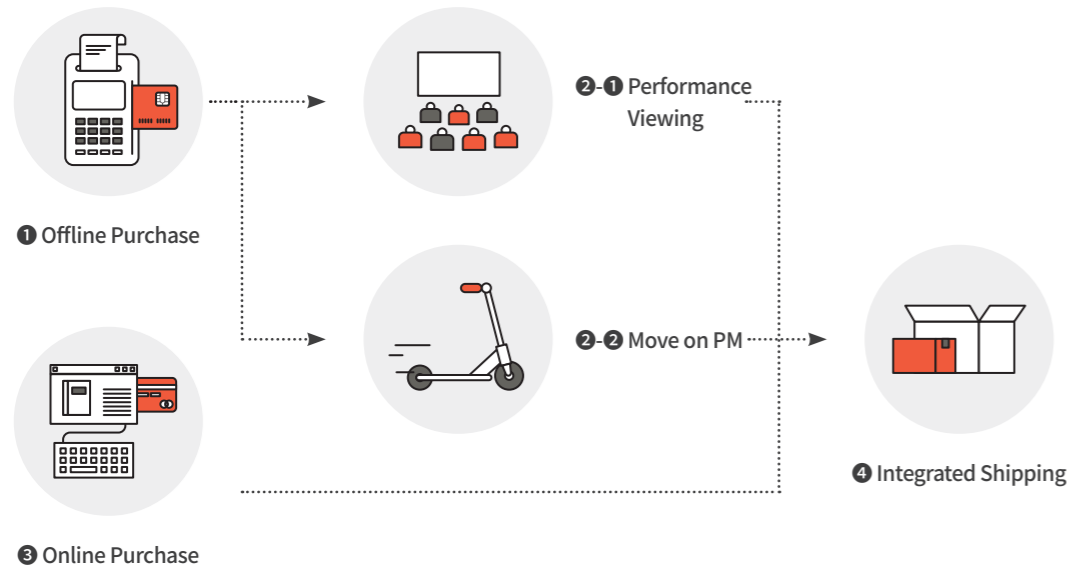
There is a policy consistency as the ‘cultural hub development’ plan to solve the problem of insufficient facilities for cultural and artistic activities is specified under the “Comprehensive National Territory Plan” and the “Sejong City Urban Master Plan”.

Economic Feasibility Analysis Details

Although the cost of traveling for cultural performances is lower than that of other regions, the average cost of enjoying cultural and art events in the Chungcheong region for the same content is lower than that of other regions, which results in a low cost and benefit ratio.

C

Integrated Shipping Service for Items Purchased at Individual Shops



We provide a convenient shopping experience for residents through a service that delivers items purchased from different stores in one package. It reduces the inconvenience of using various mobilities. Goods purchased outside the Sejong National Pilot City are also delivered together to provide a convenient shopping experience and environment even inside the city where owned vehicles are restricted.

The scope of the population using the services is all residents living in the Sejong National Pilot Smart City. Potential 'main users' are residents who wish to consume and ship goods within the Sejong National Pilot Smart City. An SPC or private companies are in charge of designing, developing, operating, and managing the services for convenient shopping for residents.

Residents enjoy the following through this service:

It provides a valuable and convenient shopping experience by minimizing the exhaustive process of shopping at various outlets.

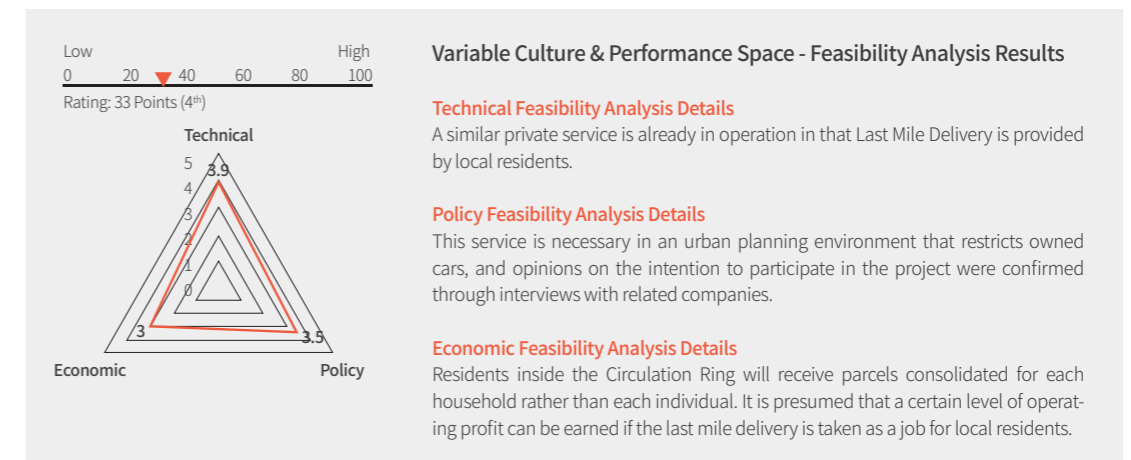
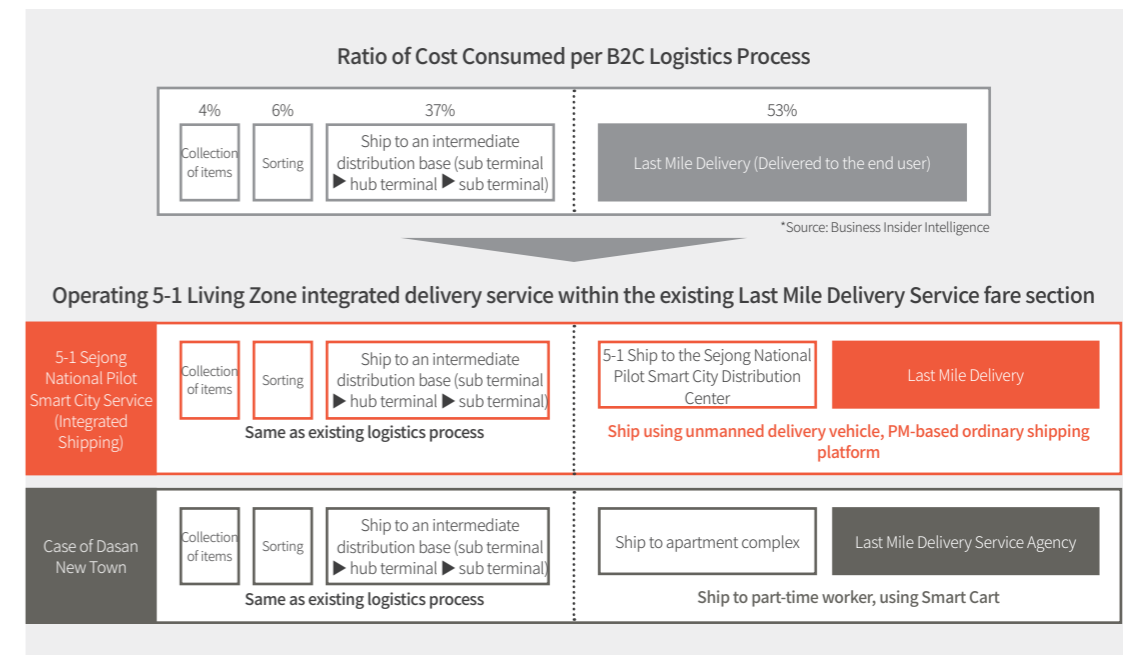
It develops economic vitality in the city and creates an economic ecosystem of a certain scale or larger.

This service can be compared and understood with the key base shipping service implemented in Dasan New Town. The shipping service in Dasan New Town faced problems such as the rejection of shipping at the beginning because the delivery vehicles were not allowed to enter the complexes due to safety concerns for pedestrians. Eventually, Dasan New Town solved the problem by introducing a key base shipping system that acts as an agent for the Last Mile Delivery Service. The key base

shipping platform allows existing home delivery service providers to deliver goods up to the entrance of the apartment complex and completes the delivery within the last mile where the goods are handed over to customers.

The Sejong National Pilot Smart City applies the same concept and ships goods to the Sejong National Pilot Smart City Distribution Center, which is constructed out-

side the Circulation Ring, instead of shipping goods into apartment complexes. Afterward, goods are delivered to customers using unmanned delivery vehicles and various PMs. The shared home delivery service, which acts as an agent for the Last Mile Delivery Service, charges 200 won per delivery for sorting parcels delivered by home delivery service into each building, and 300 won per delivery for delivering them from the front gate of each building to each household.



Living and Safety

The Sejong National Pilot Smart City monitors all areas in the city without dead zones through various channels (CCTVs, street lights, mobilities, drones, etc.), and detects dangerous situations in advance through artificial intelligence analysis to prevent accidents.

A particulate matter reduction experiment is simulated through Digital Twin and applied to real life. Road hazard information due to fog, rain, snow, etc. is delivered to residents' self-driving vehicles to support road safety.

The Smart Farm Service, an experimental space to solve the food problem of the city, is also provided.

A. Crime Prevention and Emergency Response Service

Data from various channels (CCTV, IoT sensors, drones, mobilities, etc.) in the city are integrated and managed and operated by the Urban Integrated Data AI Center.

B. Development of a Nature Conservation Area Observation Station

It provides a chance to observe and learn about the nature conservation area in the Sejong National Pilot Smart City, including the Hapgang Wetland, the largest urban wetland by the Geumgang River.

C. Particulate Matter Reduction and Fog Forecasting Service

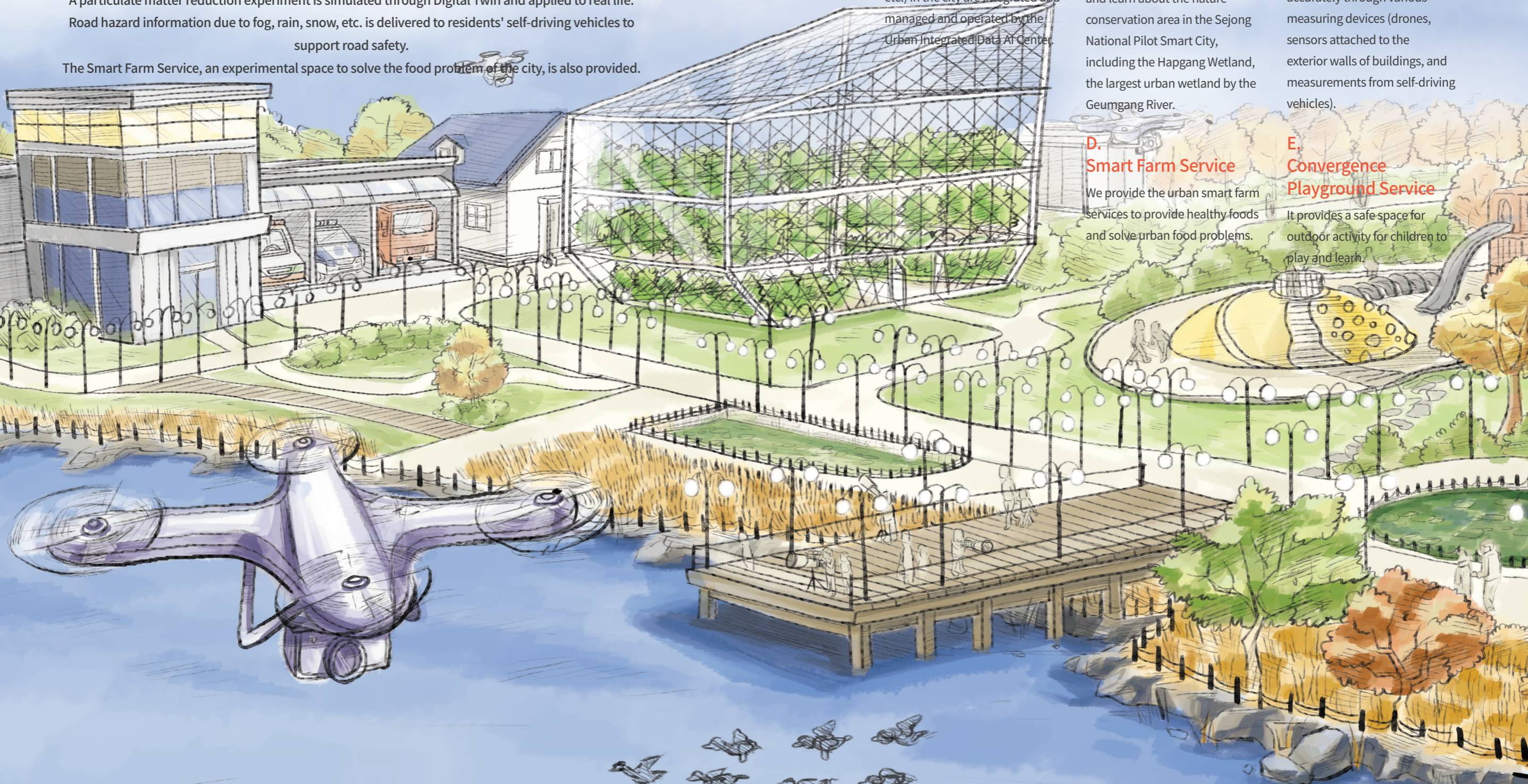
It measures particulate matters three-dimensionally and accurately through various measuring devices (drones, sensors attached to the exterior walls of buildings, and measurements from self-driving vehicles).

D. Smart Farm Service

We provide the urban smart farm services to provide healthy foods and solve urban food problems.

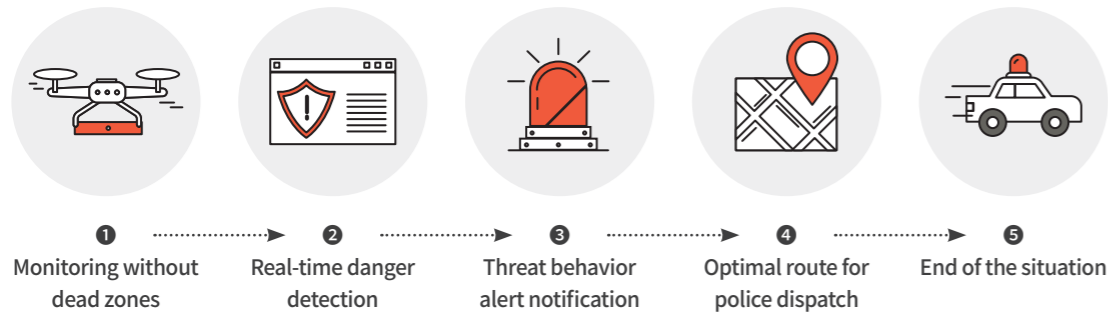
E. Convergence Playground Service

It provides a safe space for outdoor activity for children to play and learn.



A

Crime Prevention and Emergency Response Services



The Sejong National Pilot Smart City operates various channels (CCTV, IoT sensors, drones, mobilities, etc.) for crime prevention and emergency response services and delivers real-time data to the Urban Integrated Data AI Center for integrated management and operation. Particularly, it uses new measures (e.g. surveillance drones) to monitor parks and nature conservation areas without dead zones to minimize damage to undeveloped areas in line with the city's philosophy of minimizing damage to nature. As a service that utilizes personal information for the safety of residents, it strongly serves the public interest. LH, the project operator, is responsible for designing and building the service, and Sejong City is in charge of operation and management. Both Sejong City and LH are in charge of establishing an AI-based image analysis system and the Urban Integration Control Center of Sejong National Pilot Smart City. Sejong City will operate the service through cooperation with related organizations and must cooperate with the Sejong Fire Department for emergency dispatch to and control of site situations and with the Sejong Provincial Police Agency for emergency dispatch to crime and accident sites, site control, and resident safety.

The integrated data accumulated identify and share situations through an artificial intelligence-based video analysis system, providing a service that enables real-time response in case of an accident. Also, It provides follow-up guidelines for each situation by analyzing situations before and after an accident.

The scope of the population that would use the service is all residents living in or visiting the Sejong National Pilot Smart City, and potential "main users" are residents who are active in the early morning or late evening hours among Sejong National Pilot Smart City residents.

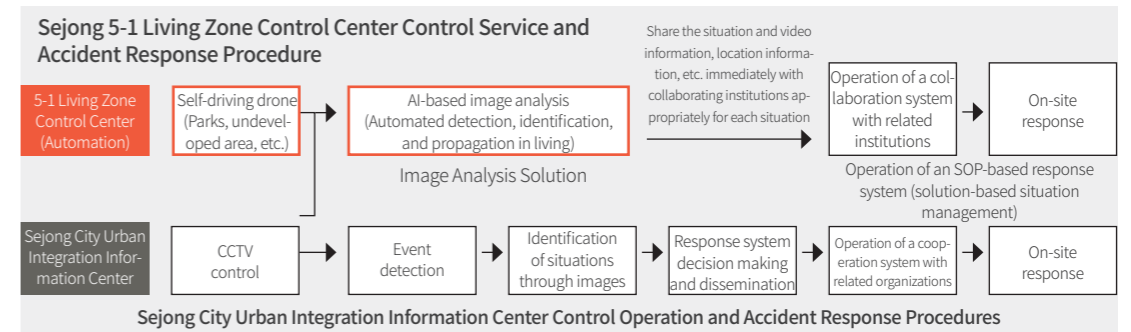
Residents enjoy the following through this service:

- Feel safe around the clock without safety dead zones (undeveloped parks, etc.)
- maintain a variety of distributed parks and preserved areas
- Quickly respond when a dangerous situation is detected, and secure golden time

The main functions include the monitoring function, the real-time image analysis function, the provision of real-time action guidelines for each situation, and a quick response using mobility around the accident area.

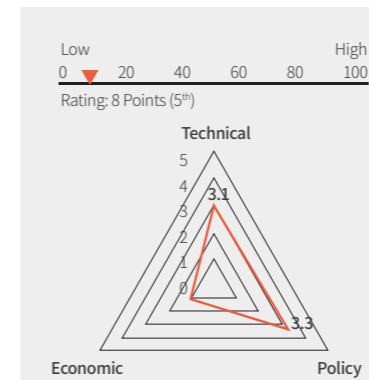
- Monitoring using drones minimizes resistance to monitoring by automatically adjusting the drone's path and the number of drones in real-time in crowded areas. Also, the presence of drones in advance of danger can have the effect of preventing dangerous situations.
- Various dangerous situations are detected in real time through real-time video analysis. Even when it is not an actual dangerous situation, the AI-based real-time video analysis technology can identify fires,

falls, climb-overs, intrusions into restricted areas, vehicles stopping inside tunnels, vehicles driving on the wrong side on the road, jaywalking pedestrians, etc., and additionally recognize more various emergency situations through continuous learning. The difference from the existing services is that it can quickly cope with situations by immediately sharing situation and image information, location information, etc. with relevant institutions.



- Before the arrival of a police car or fire engine, it provides guideline information to the person/s involved in the accident and the people around it. In the case of a cardiac arrest in infants and young children, a response manual will be provided as visual information using the nearby display (mobile, digital screen billboard, etc.). It provides information on accident location and situations on the road to surrounding mobilities and a response manual, as visual information.

- By utilizing mobilities around the accident area, it will transmit real-time situation information to the control center and neighboring entities and secures the optimal traveling path by analyzing the mobilities' traveling status within the city. Using Smart Tracking Technology, it notifies the emergency situation to the vehicles around the police car or fire engine on the move and secures a path to the scene.



Feasibility Analysis Results on the Real-time Image Analysis

Technical Feasibility Analysis Details

Some local governments are applying the AI-based image analysis function, but the false alarm rate is still high, and the automated response has not been implemented. Technological maturity is in the pilot application and testing stage, which is the prototype stage.

Policy Feasibility Analysis Details

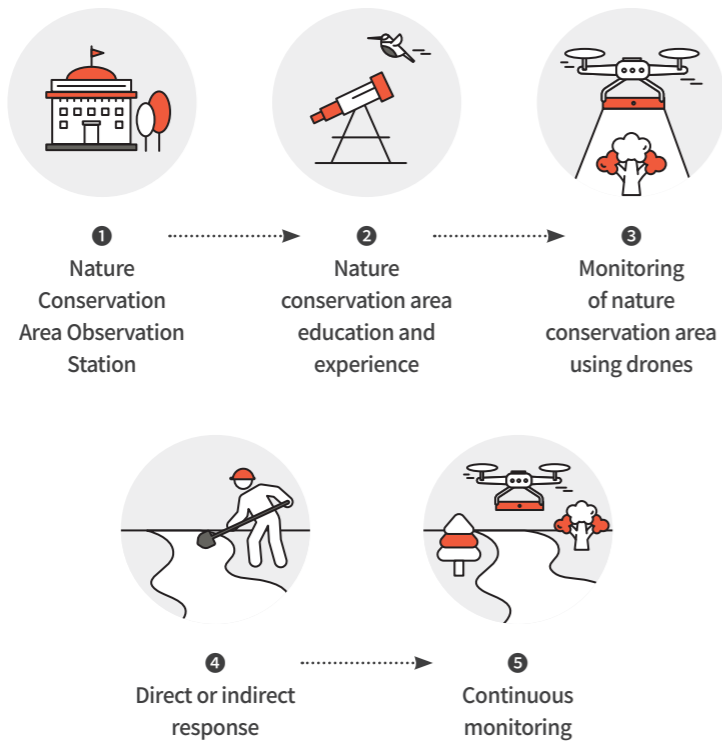
It is unlikely that there will be dispatch issues due to the interests with other cooperative organizations as the coherence of policy and the intent to promote the service are secured.

Economic Feasibility Analysis Details

When the crime reduction rate and the social cost of crime are applied through the application of an AI-based image analysis automation solution based on the study estimating the social cost of crime, negative economic feasibility was derived.

B

Development of a Nature Conservation Area Observation Station



The Nature Conservation Area Observation Station Development Service is provided based on the urban development philosophy to minimize damage to the nature of the Sejong National Pilot Smart City. It provides observation and education services for various nature conservation areas in the Sejong National Pilot Smart City and Hapgang Wetland, the largest urban wetland by the Geumgang River.

As a service for nature conservation and resident education with an intense tone of public interest, LH, the project operator, will take charge of designing and constructing the service, and Sejong City will operate and manage the service. According to the Wetlands Conservation Act, the local government, Sejong City, will lead the project and its operation and management, which requires cooperation with the Ministry of Environment.

The scope of the population that would use the service is all residents living in or visiting the Sejong National Pilot Smart City. Potential “main users” are residents visiting the Nature Conservation Area Observation Station and Wetland Center in the Sejong National Pilot Smart City.

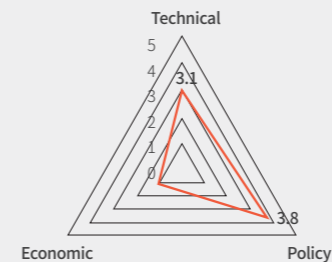
Residents enjoy the following through this service:

Residents can use the natural learning center near the Sejong National Pilot Smart City,

experience cultural diversity through the increased landscape-ecology value, and enjoy the benefits of increased economic value.

The main functions include ecological education, smart wetland management, and the particulate matter reduction policy experiment

- 1 The ecological education function raises residents' awareness of nature conservation and realizes the value of nature conservation through programs such as community-based ecological monitoring and ecological landscape map preparation.
- 2 The smart wetland management function uses drones to monitor nature conservation areas and areas around wetlands to enabling monitoring while minimizing damage to nature. It continuously monitors the natural and wetland conditions in the precise location, and responds directly or indirectly when abnormalities or damage are detected. If a fire, such as a forest fire, is detected, it promptly informs relevant institutions and uses a drone to extinguish the initial flames.
- 3 The particulate matter reduction policy experiment utilizes mountains and wetlands that exist in the Sejong National Pilot Smart City to study how much the mountains and wetlands affect the reduction of particulate matter.



Feasibility Analysis Results on the Development of a Nature Conservation Area Observation Station

Technical Feasibility Analysis Details

As for the service for a natural conservation area observation station, similar services are operated both domestically and overseas. It is possible to apply commercialized general construction technology instead of innovative technology for building the observation station.

Policy Feasibility Analysis Details

The '2030 Sejong City Basic Conception Plan' includes the preservation and restoration of ecological resources in the natural environment and the development of an environmentally friendly ecological park for experiential learning and resting.

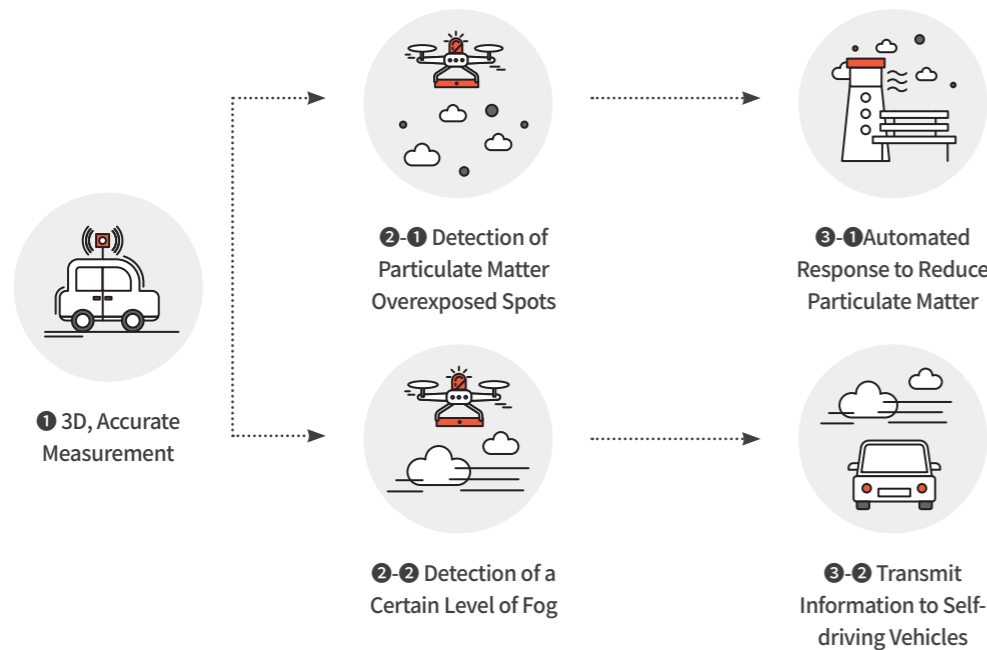
Economic Feasibility Analysis Details

Considering the benefits calculated based on the cost of traveling to the existing Millmaru Observatory*, the number of people who may use observatories in the 'Other' category of Sejong residents' leisure activities, and the economic ramifications of the Sejong National Pilot Smart City's operation of the observation station in comparison with Suncheon Bay Wetland in terms of the scale, structure, and program, low economic value is derived.

*Millmaru Observatory: It is an observatory erected in the center of Sejong City's Central Administrative Town. It offers views of the entire city (free admission to the observatory). 58, Sejong Doum-3-ro

C

Particulate Matter Reduction and Fog Forecasting Service



The Particulate Matter Reduction and Fog Forecasting Service precisely measures atmospheric information and monitors abnormal signs (particulate matter, fog, etc.) of the atmospheric environment with measured data in real time. When abnormal signs related to particulate matter are observed in a specific area, action guidelines against particulate matter are transmitted to residents, and indoor and outdoor air purifiers will be activated. The Sejong National Pilot Smart City is expected to have a noticeably smaller number of cars compared with other cities and the volume of particulate matter generated inside the city should be small. However, this is to respond to particulate matter coming from outside. When abnormal signs related to fog generation are detected, air hazard information is transmitted to self-driving vehicles to create a safe road

environment by automatically turning on taillights and reducing speeds in real time. It is also possible to simulate the technology that reduces particulate matter at the city level in the Digital Twin and apply it to the city.

As a service that contributes to residents' welfare, it strongly serves the public interest. The Korea Meteorological Administration will take charge of the research of technology, the LH, the project operator, designing and constructing the service, and Sejong City, the operation and management.

The scope of the population that would use the service is all residents living in or visiting the Sejong National Pilot Smart City, and potential 'main users' are residents who are engaged in many outside activities and use self-driving vehicles.

Residents enjoy the following through this service:

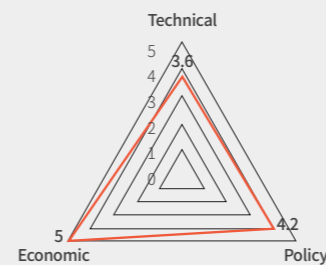
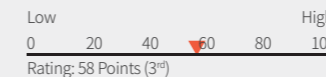
Residents will lead a safe and comfortable life in response to particulate matter and fog,

reduce unnecessary social costs by planning outdoor events effectively,

and it will satisfy the demand for active participation based on indoor and outdoor community facilities.

The main functions include the 3D measurement of atmospheric information, automatic response to particulate matter, Digital Twin simulation, AI-based particulate matter and fog generation and dissipation forecasting, and transmission of weather information and possible risks to self-driving vehicles.

- 1 The 3D measurement function of atmospheric Information feature collects accurate atmospheric information by region, altitude, and time using sensors attached to drones and to self-driving vehicles.
- 2 The automated response to particulate matter feature automatically activates indoor/outdoor air purifiers when particulate matter is observed above the level that would trigger emergency reduction measures and transmits the everyday guidelines in response to particulate matter. Particularly, the indoor/outdoor air purifiers in areas where there is a large floating population, such as hospitals, schools, bus stops, shopping centers, etc. or where people vulnerable to particulate matter such as patients with respiratory disease, children, and elderly residents are concentrated are operated first.
- 3 The Digital Twin Simulation feature performs a simulation with the Digital Twin to determine the number, capacity, and location of the air purifier, and to derive the best solution.



Fog Generation Forecasting Service - Feasibility Analysis Results

Technical Feasibility Analysis Details

R&D on detailed fog generation forecasting information has no similar cases. It is in the basic research stage, as the basic forecasting model is under development.

Policy Feasibility Analysis Details

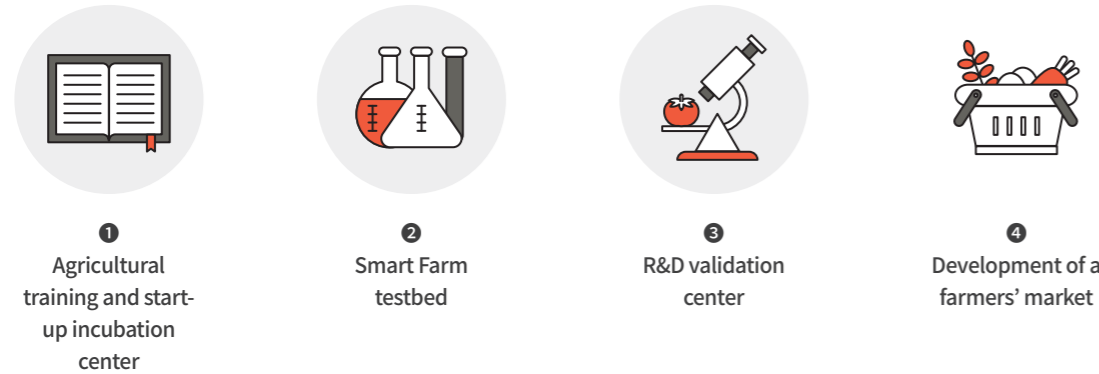
Specify the plans for the fog generation forecasting service to 'provide weather information related to road hazards'.

Economic Feasibility Analysis Details

Considering the social cost reduction effect of traffic accidents, where the rate of traffic accidents falls when weather information is provided, low economic feasibility is derived when the service is provided only to about 20,000 residents in the pilot city. However, it is possible to secure economic feasibility by applying the service nationwide.

D

Smart Farm Service



The Sejong National Pilot Smart City operates a Smart Farm that provides safe food materials to residents and tests new technologies to solve food problems in the city. We will develop an urban smart farm valley based on IoT and big data and provide services connecting from education to start-up, validation, and continuous operation, in association with the fostering of innovative companies. The scope of the population that would use the service is all residents living in or visiting the Sejong National Pilot Smart City, and potential “main users” are Smart Farm residents and users in the Sejong National Pilot Smart City.

Residents enjoy the following through this service:

It can conduct experiments to solve urban food problems such as reduced food mileage and create jobs in connection with start-ups.

Key functions include agricultural training and a start-up incubation center, Smart Farm testbed, R&D verification center, and the farmers' market

- 1 The Agricultural Training and Start-up Incubation Center is operated by the Start-up Incubation Center in the Innovative Growth Promotion Area of Sejong National Pilot Smart City. The theoretical education comprises the highest level of educational programs and supports start-ups. In addition, there are smart farms for lease for entrepreneurs who have completed the training to start a business.
- 2 A Smart Farm testbed is for studying new smart farm technologies. It is sold smart farm ventures and start-ups by lot, or having them participate in relevant projects.
- 3 The R&D Verification Center researches and develops, verifies, and demonstrates the latest Smart Farm technologies. It attracts companies with the latest technology and is provided as a venue for joint R&D and technology commercialization.
- 4 The Farmers' Market is associated with a commercial complex in the cultural shopping street in the Sejong National Pilot Smart City to sell products offline and operates a restaurant that cooks dishes with crops directly harvested from the smart farm. It also runs an online marketplace.

E

Convergence Playground Service

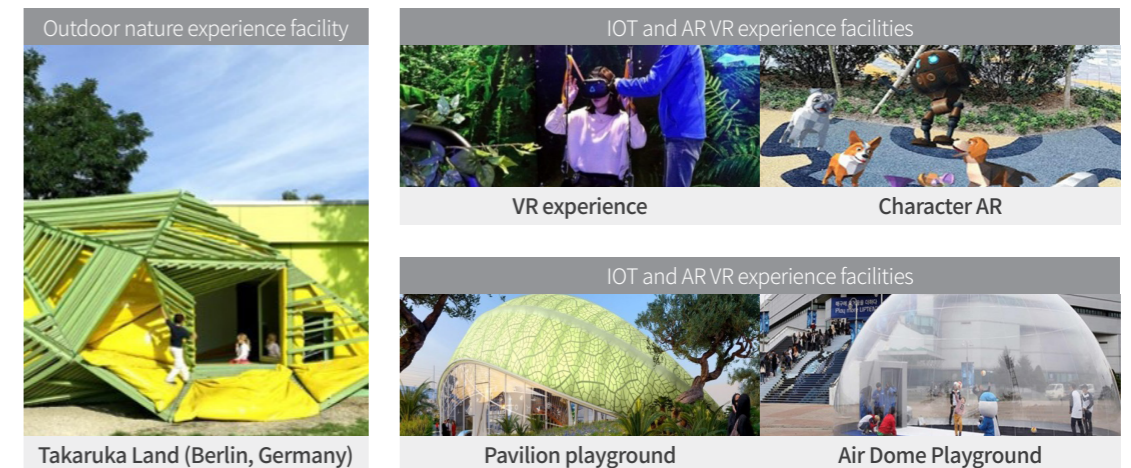


The Convergence Playground Service is about developing an indoor/outdoor convergence play space using smart technologies in the Sejong National Pilot Smart City to respond to intensified climate disasters and satisfy various demands for culture and leisure. It derives ways to create a children's play space suitable for the brain and body development cycles and emotional content, and secures a play space that responds to environmental changes such as particulate matter and warming. The play area is largely divided into indoor type, transition type, and outdoor type. The scope of the

population that would use the service is all residents living in or visiting the Sejong National Pilot Smart City, and potential 'main users' are children at elementary school age in the Sejong National Pilot Smart City. As a service for residents' cultural life and leisure, it strongly serves the public interest. After the local government or the project operator establishes the business model of the service, the principal agents to develop and operate the detailed services will be determined. It is necessary to specify which content to select and implement.

Residents enjoy the following through this service:

We could develop a public play space where children can use the playground safely and comfortably in response to particulate matter and heat waves and that includes innovative play facilities and contents.



Data Operation and Development Process

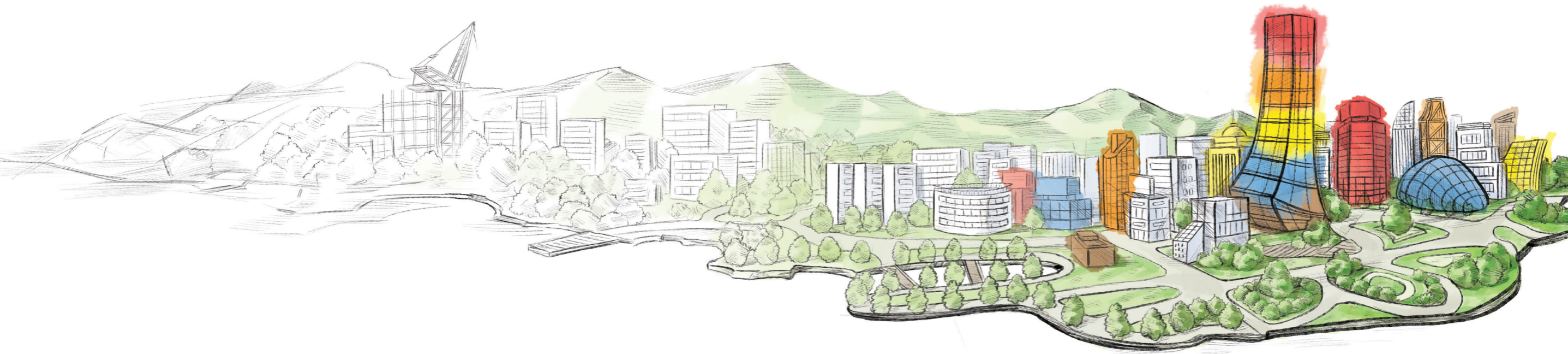
It is very important to decide how to manage data. This includes the collection, analysis, association, and utilization of urban data to provide personalized forecasting services to residents according to the definition of the Sejong National Pilot Smart City.

We will use Digital Twin from the planning and construction stage of the Sejong National Pilot Smart City and fuse data of different innovative factors through artificial intelligence analysis to create newer services and build a platform to secure the anonymity and transparency of personal information.

- Digital Twin
- Data and Artificial Intelligence
- Blockchain

Currently, the Sejong National Pilot Smart City area is in its natural state.
We will be creating a new smart city on an empty site by combining people and technology where nothing has been built.

We will be drawing the first sketch of the National Pilot City with the residents using **Digital Twin**.
With personalized forecasting services provided by **artificial intelligence**, residents will discover new happiness in their daily living.
Residents will be able to use resident participation-based public services of which transparency has been secured through the **blockchain platform**



Digital Twin

Digital Twin in the Sejong National Pilot Smart City is a 3D-based smart city data sharing platform used throughout the life cycle, from urban planning to operation.

It analyzes all integrated city data in a virtual space to cause convergence between fields and create new services and creative opportunities.

Through Digital Twin, residents and operators of the Sejong National Pilot Smart City can communicate and collaborate with each other and solve various city problems.

This will be a new data-driven and sustainable city operation model.

Also, it will lay the foundation for the smart city export model as a global reference.

Urban Planning and Designing Stage 2018~2020

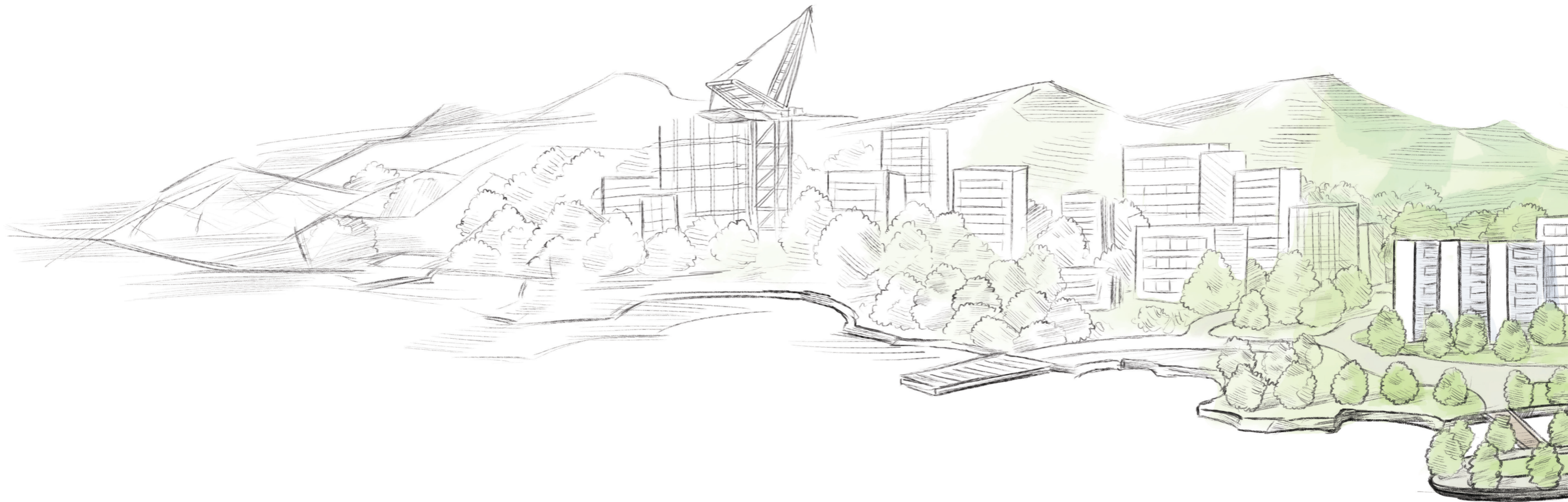
It helps the establishment of optimized urban planning that can reflect the National Pilot City's innovative services on a clean slate.

Urban Construction Stage 2021~

It helps build infrastructure economically and effectively through pre-simulation and the integrated management of businesses.

Move-in and Urban Operation Stage 2023~

It helps the resolution of urban problems and provides better services as a platform for residents and city management officials to actually participate and collaborate.



Detailed Progress on Digital Twin

Basic Conception Plan and Implementation Plan

The basic concept of the Digital Twin began with the question, 'What is an innovative way to minimize trial and error and solve urban problems from the planning to operation stages of the city?'

One of the most powerful tools that can improve the quality of life of residents through innovative services and fourth industrial revolution technologies is urban data. As a result of researching and reviewing examples of other advanced cities and innovative technologies of the upcoming digital age, we decided to apply the Digital Twin, which is capable of transferring the real world to the virtual world to analyze various problems and find solutions for them, to the Sejong National Pilot Smart City.

For cities, the Digital Twin is a technology that has just passed the quickening period and is not mature yet.

Cases of using the technology partially are increasing in foreign cities. Also, there are attempts to apply Digital Twin to cities at a national level, such as in Singapore. However, there is no specific case of application in South Korea, and most cases are in the stage of starting technology development centering on visualization-based R&D projects through 3D space modeling.

The Sejong National Pilot Smart City's essential role is to function as a testbed for innovation as the National Pilot Smart City. Therefore, we will apply the Digital Twin in all stages from planning to operation of the city, which is currently a green field, by utilizing globally verified technologies and technologies purely developed in South Korea. Digital Twin is a single communication space across the life cycle of a city, and it prevents and solves urban problems proactively through analysis and simulation. Also, we designed the city to develop into a sustainable city by improving innovative services through data convergence before and after the move-in phase.

In the implementation plan, we defined and concretized the vision of the Digital Twin. It is to ensure the Sejong National Pilot Smart City provides a variety of convergence services centered on seven innovative elements to improve the quality of life of residents and encourages direct participation of residents so that they can contribute to resolving urban problems on their own. A data-based urban operation system should be secured. We chose the application of the Digital Twin technology as the base as our main strategy.

Still, there are many cases where the Digital Twin technology is used and approached only in terms of 3D-based spatial data in South Korea. This makes it necessary to establish a consensus with stakeholders on the expansion and application of the concept of the Digital Twin, which started from the manufacturing industry, at the urban level, before promoting the business. In other words, it is necessary to make efforts to pursue a common goal through continuous consultation with stakeholders to simulate by fusing various data of the city on the Digital Twin or analyze data through artificial intelligence technology.

We had continuous consultations to narrow the gaps in various concepts regarding the Sejong National Pilot Smart City project, including Digital Twin, in the process of creating an implementation plan with the Master Plan Team, LH, which is the project operator, and the Ministry of Land, Infrastructure, and Transport. LH has carried out a project of constructing aboveground and underground facilities with integrated 3D information for the

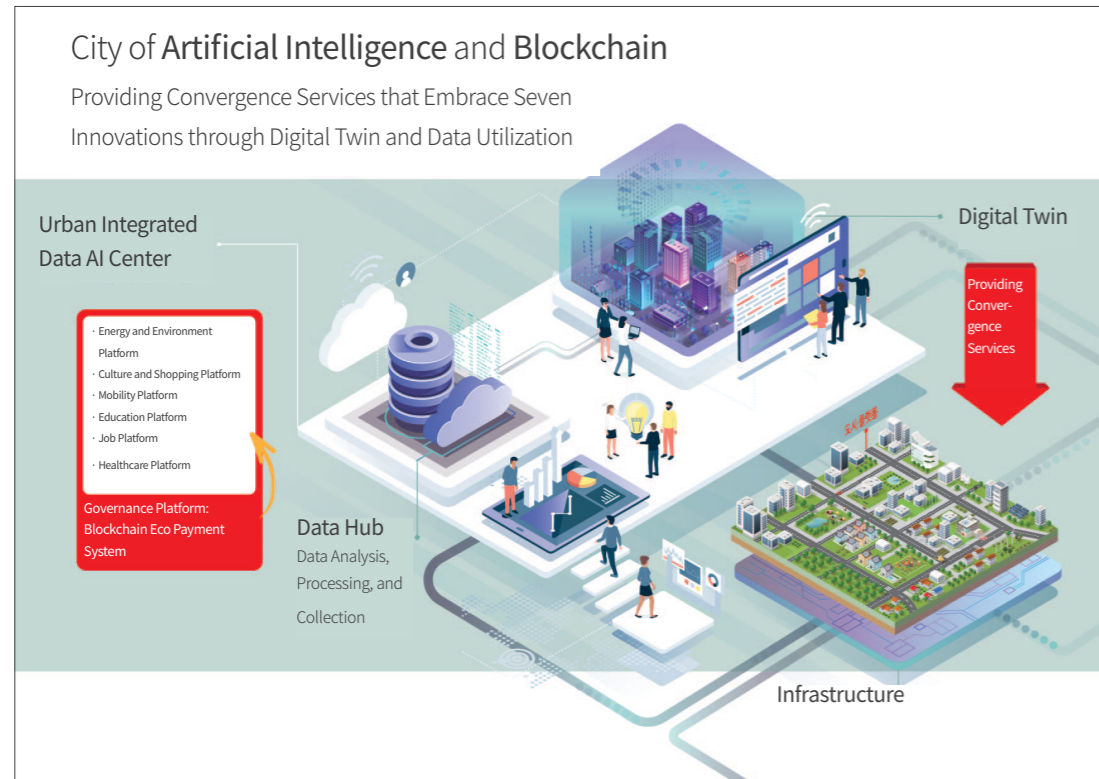
Administrative City and Yangju New Town, in addition to the U-City project. Based on this experience, it focused on building the Digital Twin of the Sejong National Pilot Smart City with a 3D map based on open source software. It required adjustments with the implementation direction of the Master Plan Team, and it was necessary to supplement the aspects of data links and service utilization based on artificial intelligence. While considering these aspects, we also had a discussion that it was necessary to review the tools that were internationally verified. As described, it took a lot of time and effort to gather and organize the opinions of each stakeholder and reflect them in the plan. We also need to have continuous discussions while promoting the Sejong National Pilot Smart City project.

We aimed to embody the optimized functions of the Sejong National Pilot Smart City Digital Twin by establishing the following three promotion strategies:

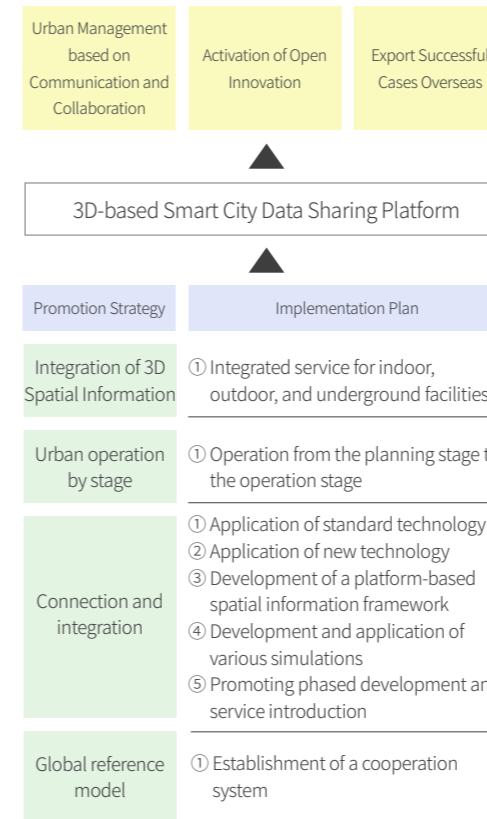
First, we pursue a role as a platform for solving urban problems in which residents, and public and private companies participate based on 3D spatial information over the entire life cycle of the city.

Second, we will expand its role as an open innovation platform in the future and embody a city that becomes a global reference used as the core technology for sustainable city operation.

Third, we will build experiences in solving urban problems through various simulations based on residents' communication and participation and lay the foundations for exporting it to overseas cities.



Implementation Plan: A Structure that 'Provides Convergence Service through Digital Twin and Data Utilization'



Division	2019	2020	2021	2022
	Basic Application Services	Extended Function Application Services		
Providing Services	(Participation/collaboration space, BIM integration and visualization, right to sunlight, wind path, determination of CCTV location selection, etc.)	(Traffic flow, noise analysis, commercial district analysis, disaster response, etc.) Provision of shared spaces for resident participation		
Platform Development	Standard API Functions	3D Underground Space Information		
	3D Inside/Outside Visualization Function	Link to Data Hub and Algorithm Development		
	Cloud Infrastructure	Coupled to Integrated Control Center		
Data Development	Underground Facilities			
	Indoor: Public Buildings around 5-1 Living Zone	Outdoor: Whole 5-1 Living Zone		
	Outdoor: Part of 5-1 Living Zone	Indoor: Inside Public Buildings in the 5-1 Living Zone		
ISP	ISP			

Implementation Plan: Digital Twin Promotion Plan and Roadmap

Detailed action plans based on promotion strategies are established as follows:

1 Urban Data Integration

- Maximizing synergy by associating related data
- Reflecting the Smart City Act and pre-coordination between ministries

2 Early Development of the Platform

- Quickening platform introduction and reducing costs by introducing internationally proven solutions
- Considering 3D, spatial information (GIS), IoT associated standard application scalability

3 Agile Promotion

- Early pilot opening of the platform ▶ Verification of use scenarios ▶ Enhancement of quality by gathering and reflecting requirements
- Gathering opinions through early participation of

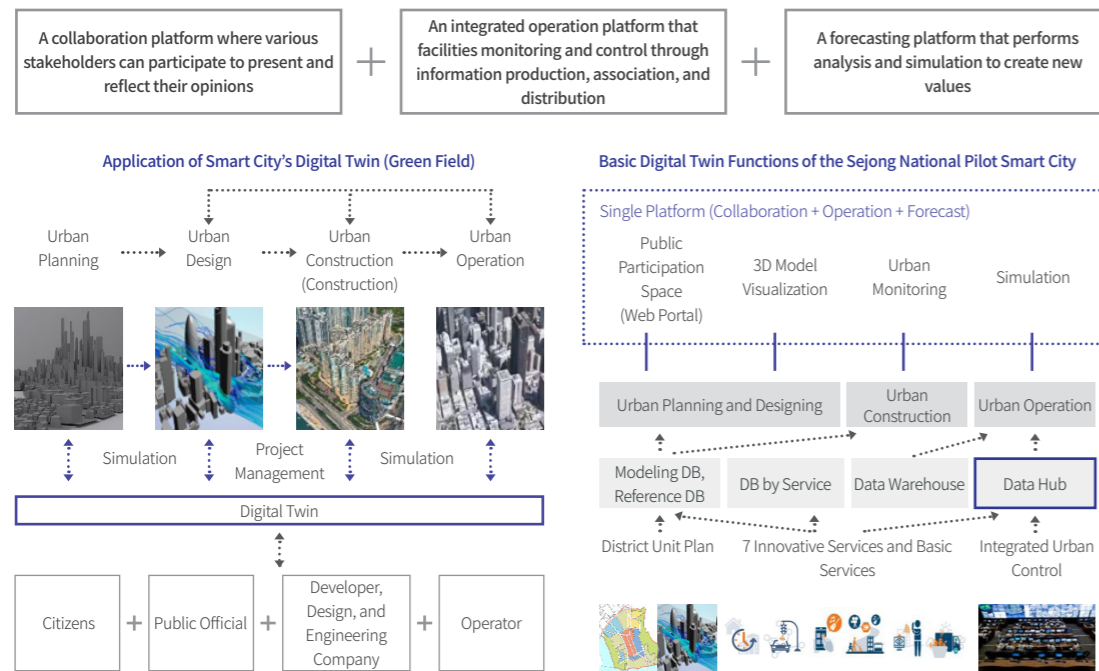
virtual residents in addition to city planners and implementers/constructors

4 Develop a Sustainable Operating System

- Preparing the foundation for the industrial ecosystem for the establishment and operation of the Digital Twin, such as platform, GIS construction, IoT construction, etc.
- Expecting nationwide spread based on Sejong City's success (developing an ecosystem and reducing costs)

This plan will be put under the PoC (Proof of Concepts) stage, which verifies the platform's elemental technology and integrated system according to the aforementioned annual implementation roadmap, and functional and regional expansion will be promoted in the pilot environment in the pilot project.

As shown in the diagram below, the contents have become clearer and more detailed than when the implementation plan was announced. Most of all, Digital Twin can be described as a platform that plays three roles in the Sejong National Pilot Smart City: a platform as a collaborative space where various stakeholders can participate to present and reflect their opinions to solve urban problems; a platform for integrated operation capable of monitoring and control through an association with, and distribution of, the production of information; and a platform for forecasting, which serves analysis and simulation functions to create new values. It also shows how the structure and relationship between each service platform, data hub, and data analysis should be established to embody these roles.

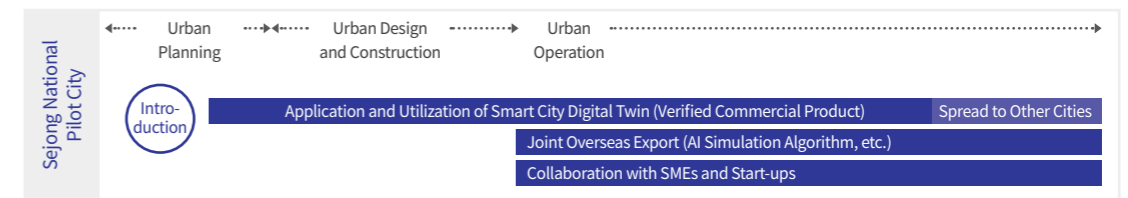


Sejong National Pilot Smart City's Digital Twin Function

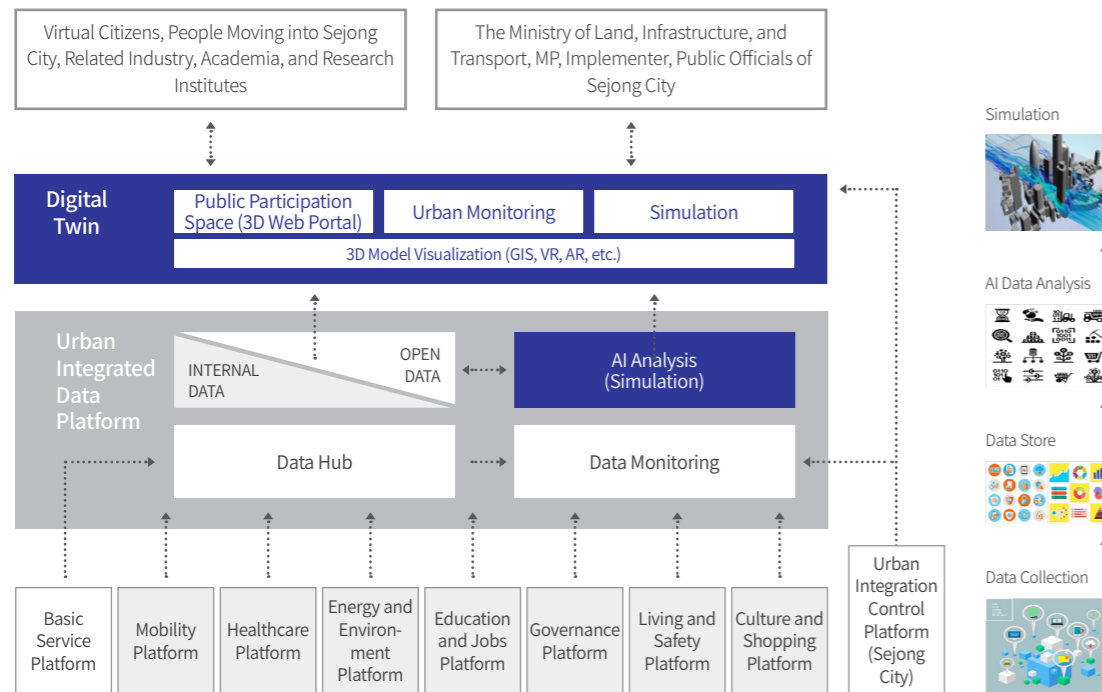
The Sejong National Pilot Smart City - Establishment of Direction for the Digital Twin

1. The Sejong National Pilot Smart City has already defined the functions and roles of the Digital Twin it desires.
2. Progress in other projects were reviewed. They have been in progress in a manner that suits each situation, and most of them are in the beginning stage (partially prototype and focused on visualization).
3. As Sejong National Pilot Smart City is a Green Field and aims to export as a global city:
 - It requires a verified integrated solution that can be managed over the entire life cycle of the city (urban planning and design, construction, operation and optimization, urban regeneration, etc.);
 - It is built through continuous communication with residents;
 - It requires a chance to utilize key functions (communication and simulation) as an integrated tool to minimize trial and error from the urban planning stage;
 - It requires an opportunity to utilize a 3D-based simulation application experience and advanced cases for the Sejong National Pilot Smart City;
 - It requires a model that enables collaboration with domestic companies (start-ups, etc.) and can be exported.
4. As for the development of the Digital Twin, there are no Digital Twin experts, there are issues with time and verification, and a lack of confidence in quality. Also, it is difficult to keep up with the changes in technology development.

Recommendation With the absence of cases and experts, globally proven commercial product functions and know-how are reflected through the Sejong National Pilot Smart City



Proposed Direction for the Sejong National Pilot Smart City's Digital Twin



Sejong National Pilot Smart City's Digital Twin Structure

Division	2019 (Planning and Design)	2020 (Design and Construction)	2021 (Construction)	2022 (Operation)
Provision of Services	<ul style="list-style-type: none"> Basic Application Service Urban Planning Simulation Design (BIM) based Simulation 	<ul style="list-style-type: none"> Project (Construction) Management Expansion of service applications and developed algorithm (Right to sunlight, wind path, CCTV location, resident participation space, etc.) 		<ul style="list-style-type: none"> Simulation using real data Expansion of service applications (Traffic flow, noise analysis, commercial district analysis, disaster response, etc.) Expansion of resident participation space (connecting to the Living Lab, etc.)
Platform Development	<ul style="list-style-type: none"> Standard API functions 3D indoor/outdoor visualization function Cloud infrastructure 	<ul style="list-style-type: none"> IoT associated standards Design in connection with data hub design (including Sejong City) Design in connection with Integrated control (Sejong City Control Center) 	<ul style="list-style-type: none"> Indoor (surrounding public buildings of 5-1) 	<ul style="list-style-type: none"> IoT associated monitoring Monitoring in connection with AI analysis data, etc. Monitoring in connection with integrated control
Data Development	<ul style="list-style-type: none"> Develop reference data for simulation Pilot application through PoC Standard compatible format for OGC standards BIM data 	<ul style="list-style-type: none"> Outdoor (part of 5-1) Develop reference data for simulation Develop indoor/outdoor 3D data (Standard compatible format for OGC standards) 	<ul style="list-style-type: none"> Indoor (surrounding public buildings of 5-1) Develop reference data for simulation Develop indoor/outdoor 3D data (Standard compatible format for OGC standards) 	<ul style="list-style-type: none"> Develop operational data and connect Develop indoor/outdoor 3D data (Standard compatible format for OGC standards) Algorithm development
User	Master Plan Team, Implementer, the Ministry of Land, Infrastructure, and Transport, National Agency for Administrative City Construction, Sejong City, City Residents (Web Portal)			Sejong City, City Residents (Web Portal), SPC (Operation)
Participant	Engineering Company	Engineering Company, Construction		
Remarks	Publicize Application Cases in Each Stage Domestically and Overseas			

Application of the Sejong National Pilot Smart City's Digital Twin in Each Stage

The table above presents the services we wish to provide through Digital Twin in each stage of city development and by the project year of the Sejong National Pilot Smart City, as well as the contents of the platform and data that need to be built for the services.

This idea was concretized and presented in relation to the innovative growth engine project, the establishment of the Sejong National Pilot Smart City Digital Twin implementation strategies through the review of Digital Twin related R&D and development projects carried out by various local governments (Seoul, Sejong, and Jeonju), and the establishment of the plans related to connections and utilizations of the technology in the future. The National Pilot City - Busan Eco Delta City focuses on the AR service that uses the Digital Twin. Therefore, it is being promoted differently from the Sejong National Pilot Smart City in terms of the direction of application, scope of application, and importance. Also, Sejong City is jointly promoting platform development and validation projects with the Electronics and Telecommunications Research Institute (ETRI) to establish policies through Digital Twin from 2018 to 2022.

As described, the Master Plan Team had held meetings with working level officials of various relevant organizations that are promoting or developing the Digital Twin projects to closely review the current progress and the level of implementation and application of related technologies. (June 2019) As a result, it identified that basic technological applications of the 3D model using BIM (Building Information Modeling) are in progress, and improvements are required until the simulation based on precise analysis of wind path, disaster situations, etc. is reliable.

Data and Artificial Intelligence

It converts and analyzes all phenomena and movements taking place inside the city and the behavior of residents into data. Through this, it aims at creating a city as a platform that provides personalized forecasting services that improve the quality of life and happiness of residents.

City of Big Data

- Ensuring data anonymity
- Decentralized Data Management
- Securing data transparency
- Providing incentives through data exchanges

We protect personal information and privacy and will build an innovative data ecosystem for collecting and using various data of the city in which we live.

City of Artificial Intelligence

- Efficient operation and management of the city
- Providing optimized solutions
- Forecasting and preventing urban outliers
- Providing personalized services

All data collected and produced through various services and IoT will be converged on the Urban Integrated Data AI Center. By analyzing the data collected, it is possible to resolve various problems occurring in the city. This ultimately improves the quality of life of residents and increases the sustainability of the city.

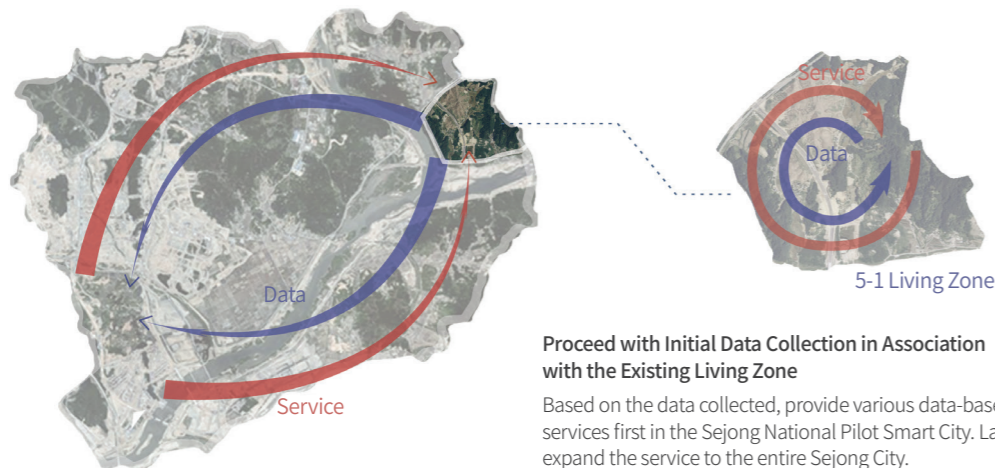


Detailed Progress on Data and Artificial Intelligence

"City of Big Data and Artificial Intelligence "

The Sejong National Pilot Smart City aims to serve as a platform that suggests how to improve the quality of life and happiness of residents. First, all phenomena taking place within the city are converted into data and analyzed through artificial intelligence. The result is then used in various fields such as service, safety, and governance. Of course, sensitive personal information is non-identified and handled safely through technologies such as blockchain.

An artificial intelligence element called Digital Twin is at the heart of these cities. For the Digital Twin to work, it needs a lot of data. However, the Sejong National Pilot Smart City area is in its natural undeveloped state. To overcome this problem, MP Jeong Jae-seung and the Master Plan Team proposed the establishment of an open data hub and urban data analysis center through a phased strategy.

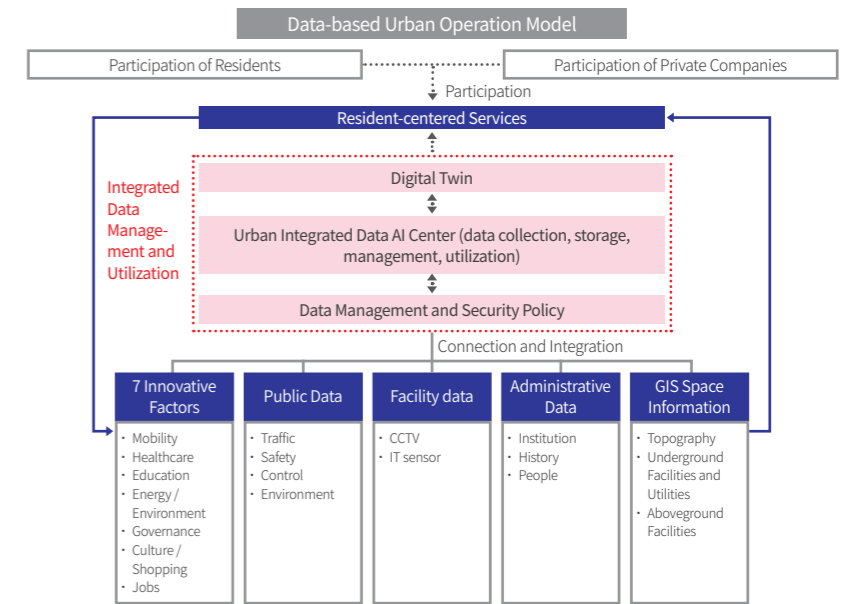


Proceed with Initial Data Collection in Association with the Existing Living Zone

Based on the data collected, provide various data-based services first in the Sejong National Pilot Smart City. Later, expand the service to the entire Sejong City.

Open Data Hub and Urban Data Analysis Center in Phased Development Strategy

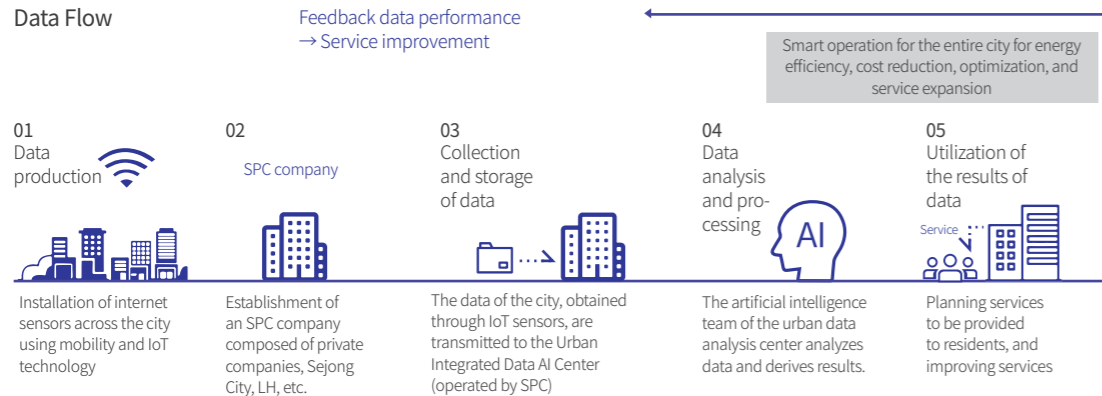
Data are produced in various parts of the city (e.g. city's infrastructure, services provided, etc.). The Master Plan Team has concretized the Seven Innovative Factors and services that can be created through the convergence between factors. From there, we established a basic model for establishing a data-based urban operation system as follows:



Data-based Urban Operation Model

We continued discussions with LH, the Ministry of Land, Infrastructure, and Transport, and Sejong City to narrow the opinion gap by focusing on this model. The important details of the discussions are as follows:

- 1 A city based on the data flow in all stages from collection, processing, analysis, and utilization of the data generated inside the Sejong National Pilot Smart City



- 2 Opening and utilizing the data from the city and establish resident-centered governance. Creating a sustainable innovative ecosystem by creating a new business model through governance
- 3 Data standardization to secure urban operation data based on Seven Innovative Factors. Establishment of a Clean Data Hub to prepare a data standard collection system

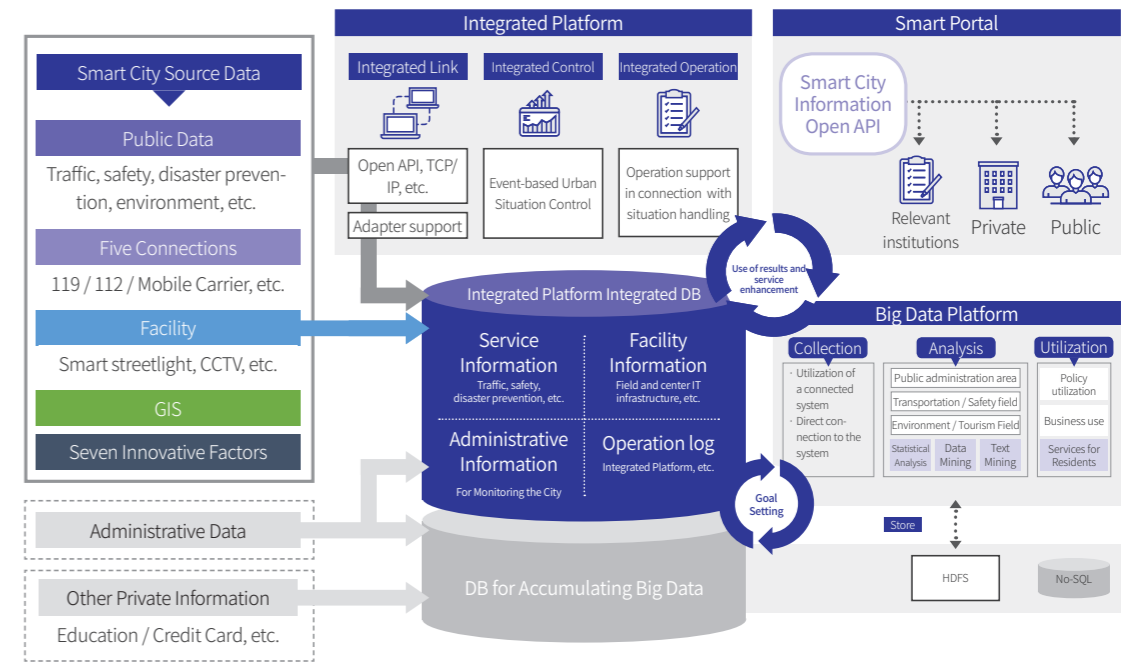
We derived three key strategies through this consultation process.

Preparation of the Base for the Data Ecosystem

Anonymized information can be used inside the Sejong National Pilot Smart City in accordance with the Smart City Act (Article 37). However, the introduction of a regulatory sandbox can be considered to avoid confusion with other relevant legal systems. The standardization of data related to IoT and sensors is an important factor to consider when entering overseas markets in the future. Also, AI analysis solution development and validation should be carried out in association with industry, academia, and research institutes. This can naturally lead to various start-up support projects related to job creation.

Development of the Data Ecosystem

Compare the whole city to a smartphone. The Urban Integrated Data AI Center would be the operating system (OS). Just as there are various app services in a smartphone, the AI Data Center must provide an environment that can attract the participation of various start-ups. As for the Sejong National Pilot Smart City, data can be collected from 2023, when entities begin to move in. For this, it is necessary to consider how to connect to and utilize the existing data of Sejong City and prepare a plan to expand it to neighboring cities. (Results of the “Third Research Services for Phase 2 of the Sejong City Project (November, 2017-July, 2019)”) and ultimately, the collection, storage, analysis, and visualization of data should be implemented on the Digital Twin Platform.



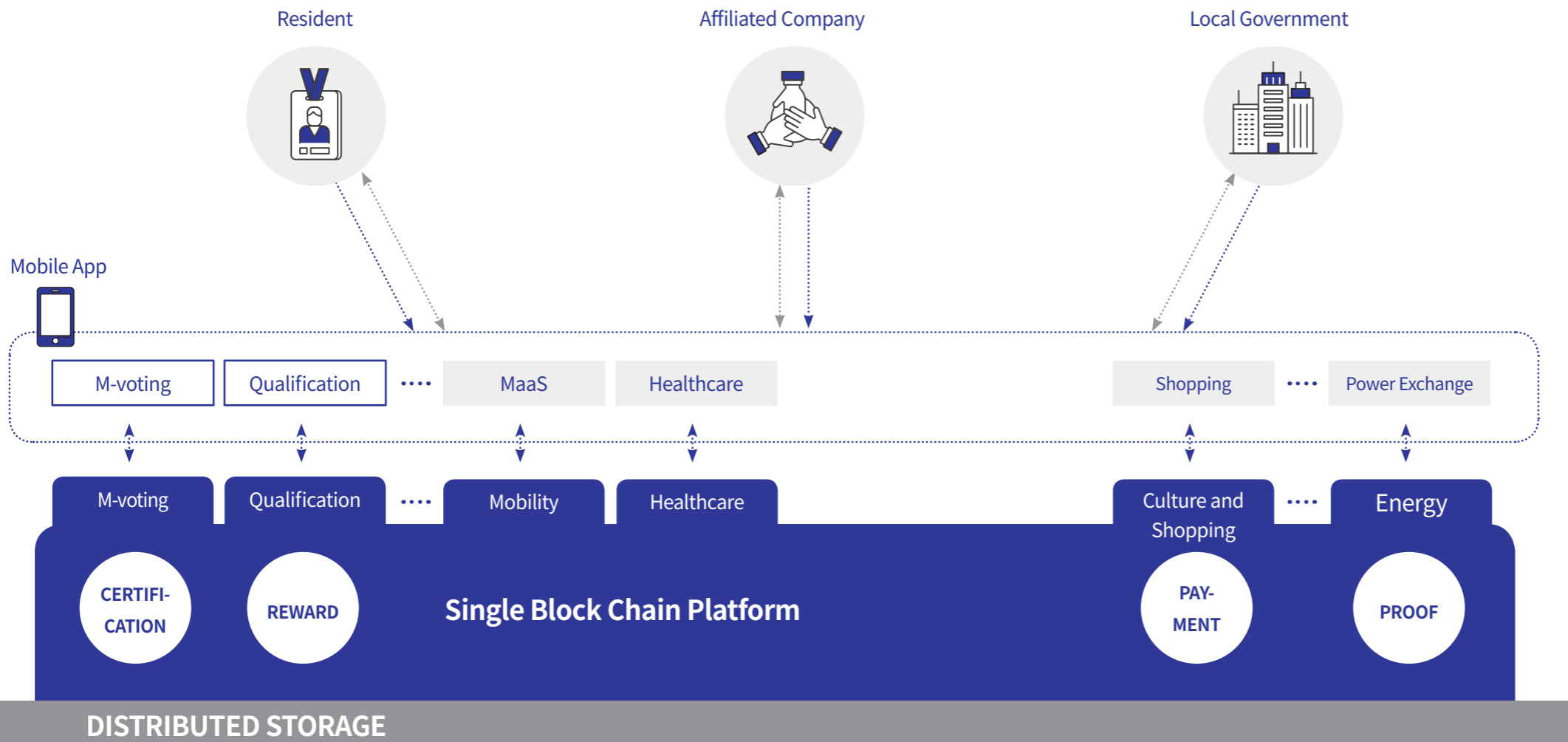
Data Platform System Configuration (Draft)

Blockchain

One of the characteristics of the Sejong National Pilot Smart City is the provision of a service using a blockchain-based platform, which is Fourth Industrial Revolution technology.

It can secure transparency in public services within the city through resident participation such as the application of a blockchain-based local currency, certification and notarization, and M-voting. It can contribute to the local economic revitalization by associating the services of Seven Innovative Factors and the convergence service.

Its goal is to integrate and operate various services on a single platform of an integrated blockchain and use tokens functioning as local currency to implement an environment enabling free payment and compensation between services.



Embodiment of a Book Management Function

- Movable assets and real estate registration and management
- Document management and sharing/notarization service
- Contracts associated with currency functions and enhancement of contract transparency

Implementation of Personal Authentication and Notarization

- Personal authentication and ID management
- Identity management and personal information management
- Personal authentication in public services, etc.

M-voting and Election Application

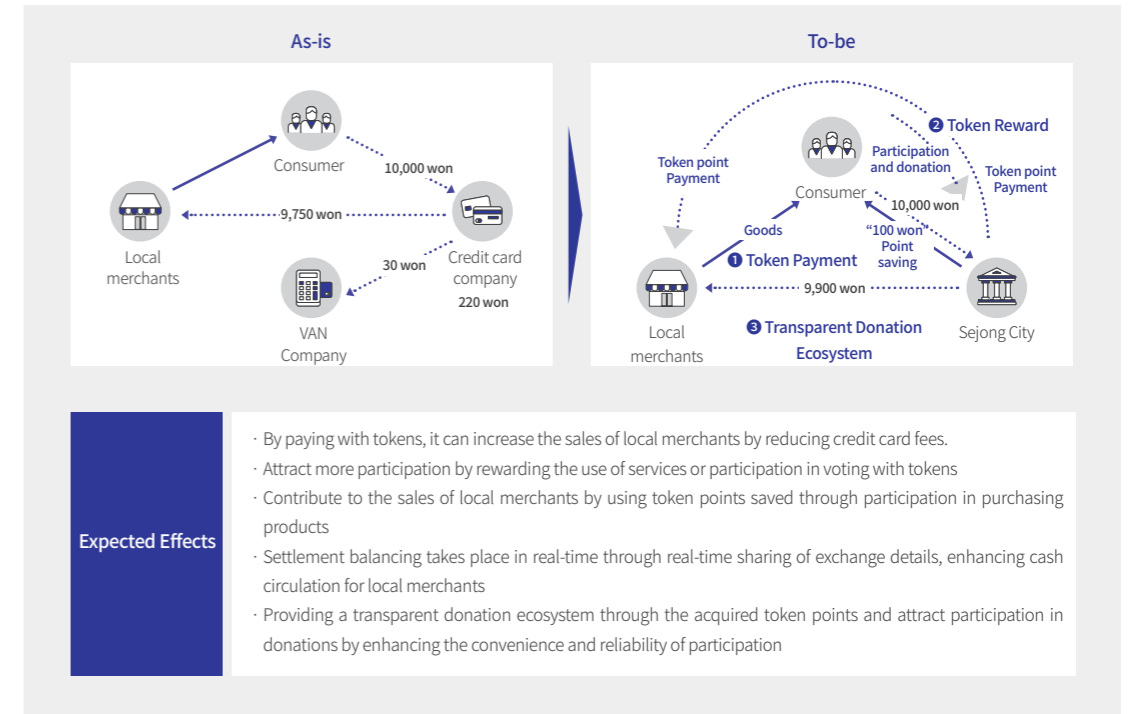
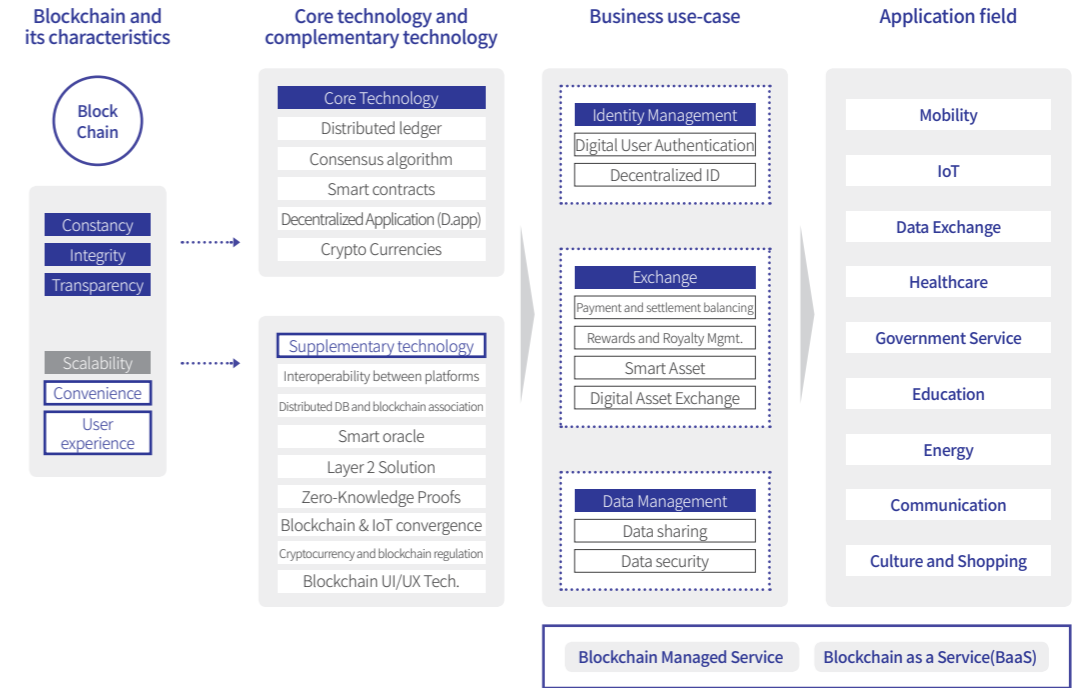
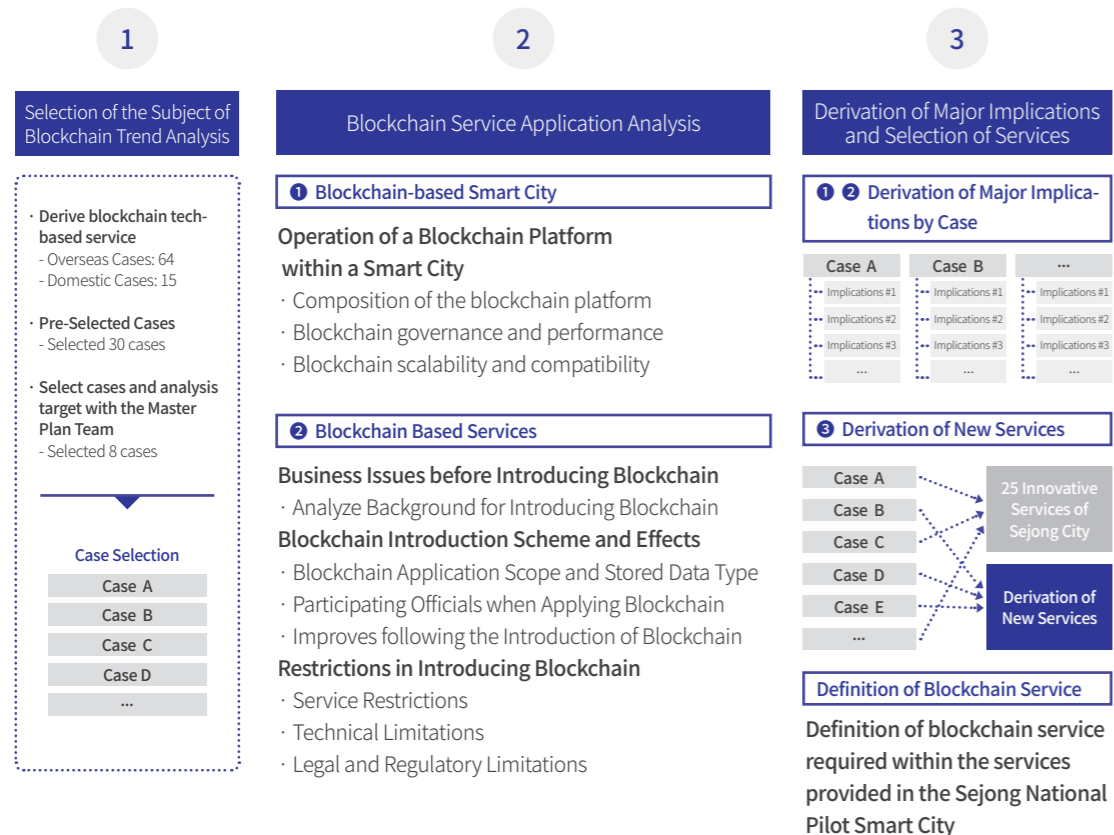
- Electronic voting and election system
- Realization of direct democracy in association with personal authentication
- Improvement of speed, transparency, and reliability of progress

Implementation of a Local Currency Function

- Provision of a payment account management service
- Public exchanges such as various taxes, utility bills, and welfare allowances
- Associating benefits for volunteer work, PM use, and personal healthcare with the reward system

Detailed Progress on Blockchain Development

The service design using blockchain in the implementation plan stage was to form a single integrated blockchain platform. We will form a single integrated blockchain platform to use blockchain tokens for local currency functions in the city. Also, tokens in the form of a local currency must be used as a means of payment that can be exchanged within the city. We aim for a standardized platform that can accommodate various services and can be operated in association with blockchains in other cities (Cross-chain interoperability).



Sejong National Pilot Smart City Token Service Example

Important Promotion Strategy Development Process

Establishing an SPC led by a private company and supported by the public sector is essential to develop and sustainably operate the Sejong National Pilot Smart City's innovative services and a city that accommodates them.

We will accompany bold regulatory innovations for private sector leadership and support and attract the cross-entry of start-ups through agreements with overseas smart cities.

We plan to promote the Sejong National Pilot Smart City phase-by-phase to domestic and foreign residents, corporations, central and local governments, and institutions by creating a city brand reflecting the philosophy of the master plan and utilizing various media.

- Private Company Participation
- Regulation
- Overseas Cross-validation and Smart City Model Export
- City Brand Marketing and Public Relations

Private Company Participation

A promotion strategy for a new smart city project led by private companies is required to create and operate a sustainable and innovative Sejong National Pilot Smart City.

In other words, the special purpose corporation (SPC) led by private companies should become the subject of new governance to realize the philosophy and vision of the Smart City and operate a Sustainable City beyond the role assigned to existing real estate development-centered business. Also, we will create an appropriate city brand to support the city to grow into a global reference example.



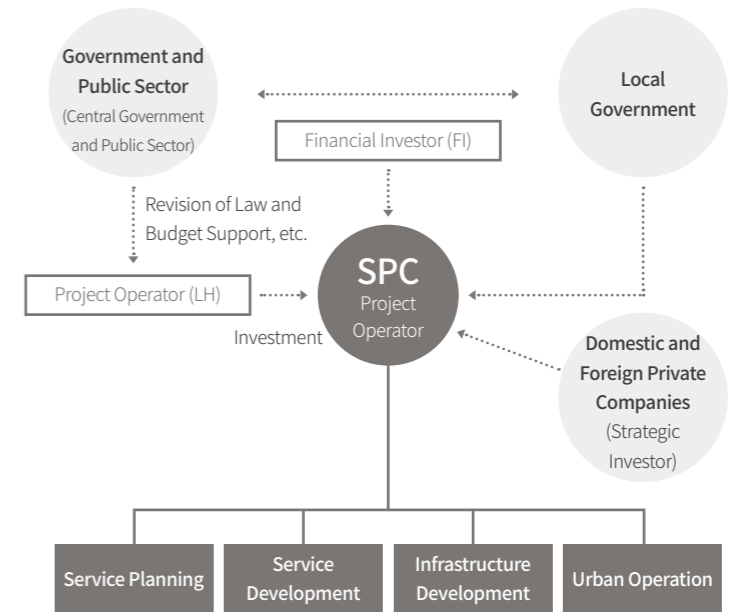
Existing SPC

Established to distribute business risk and financing in the existing business model that focuses on real estate development, dismantled after development

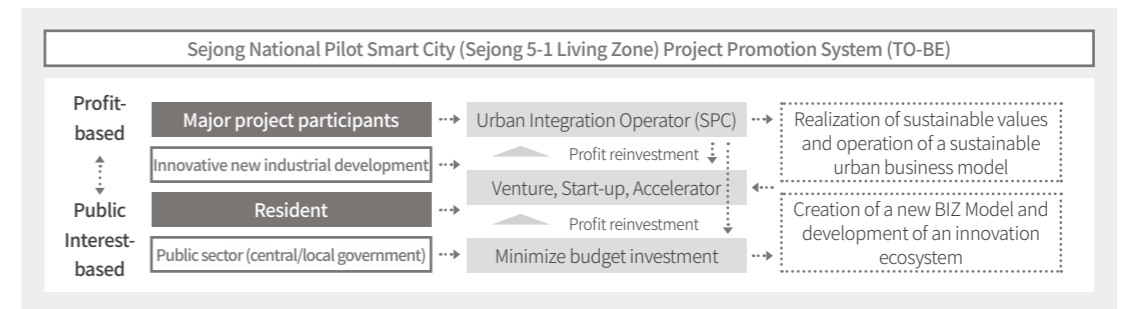
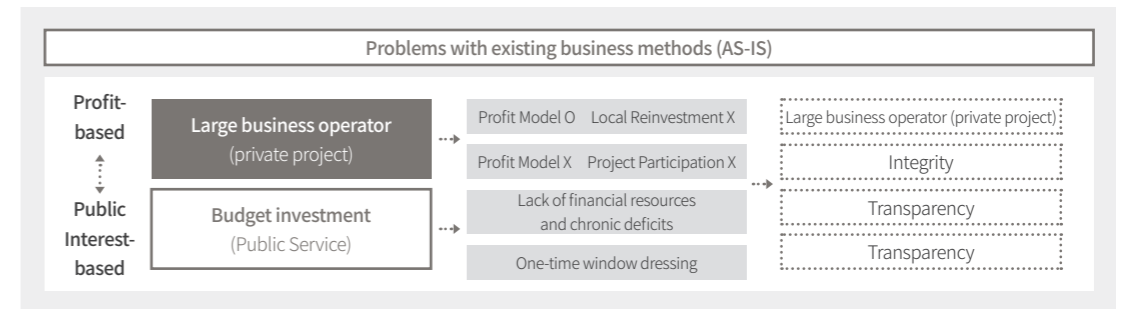


Sejong National Pilot Smart City SPC

The principal agent of the new governance that realizes the philosophy and vision of the smart city and leads the operation of the sustainable city



Sejong National Pilot Smart City SPC Structure (Draft)



Comparison with Existing Project Methods (U-CITY, etc.)

Regulations

The goal is to ensure that the entire Sejong National Pilot Smart City is not restricted by regulations in serving as a testbed.

First of all, we will introduce a regulatory sandbox*

which enables demonstrative testing of new and emerging technologies.

With the passage of time, the current Smart City Act will be constantly revised to enable space utilization such as R&D and validation to support smart city development and activate industry. Afterwards, we will promote the enactment of the Special Act on Smart City to support smart city development and actively resolve regulatory issues, in order to eliminate insufficient or inadequate clauses and regulation by other laws.

Division	Purpose of validation/test (Limit on area, period, scale, etc.)	Purpose of market release (Little or no limit on area/scale)
Ambiguous Regulations	<p>① Quick Regulation Check System</p> <ul style="list-style-type: none"> Quickly check whether a permit is required, whether a regulation exists Application for operator → Minister of the Ministry of Land, Infrastructure, and Transport → Related department shall reply within 30 days 	
Absence of Laws and Regulations, Inadequate for Application	<p>② Special Exceptions to Regulations for Validation</p> <ul style="list-style-type: none"> Give immunity from regulations to allow testing and validation of safety, etc. (within 2 years, can be extended once) Business operator → Minister of the Ministry of Land, Infrastructure, and Transport → Decision of Deliberative Committee of Special Regulations (public-private joint) 	<p>③ Temporary Permit</p> <p>Temporary permits are granted for 2 years or less for market release (can be extended once, deemed extended until legal revision is completed)</p> <ul style="list-style-type: none"> Business operator → Minister of the Ministry of Land, Infrastructure, and Transport → Decision of Deliberative Committee of Special Regulations (public-private joint)
Prohibited/ Not Permitted	Requires enactment or revision of relevant laws	

**A regulatory sandbox refers to a system that exempts or postpones the application of existing regulations for a certain period of time when a new product or service is released, like a sandbox for children to play in freely. In other words, it supports validations (special exemption for validations) or market release (temporary permit) regardless of existing laws and regulations, as long as new technologies and services do not impair the lives and safety of the public.

Smart City Regulatory Sandbox System

We established a smart city regulatory sandbox system that collectively eliminates regulations that restrict the promotion of the smart city project. The key contents of the system are to stipulate the spatial scope, promotion procedure, securing safety, and institutional management plans for the operation of a smart city regulatory sandbox through the revision of the Smart City Act.

① Spatial Scope

We will establish the Smart Regulatory Innovation District within the scope of the competent local government, which includes the smart city project site. The project to be carried out in the Smart Regulatory Innovation District consists of the Smart Innovation Project that can be used and commercialized according to the purpose and the Smart validation Project for testing and verification.

② Promotion Procedure

The Smart Regulatory Innovation District is designated after the head of the local government applies for it and related organizations consult with each other. Projects that have been approved after deliberations will have immunity against regulations for four years (can be extended once within the length of two years) by applying for a regulatory exemption. Post-management measures include the suspension of projects, correction orders, adjustment in terms and conditions, and restrictions of the areal scope of the project when the project causes adverse effects or has safety issues.

③ Securing Safety

We will prepare safety assurance mechanisms before and after project implementation, such as obligating project operators to purchase liability insurance policies and assigning liability without fault for damages inflicted.

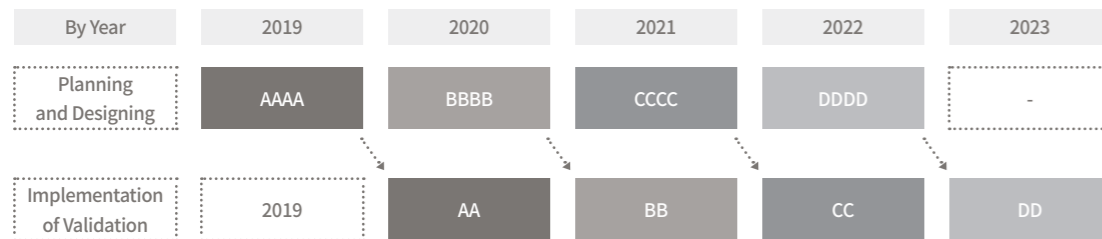
④ Institutional Management

It stipulates the basis for entrusting a dedicated institution with tasks such as management and operation of smart innovation projects and validation projects, and project operators' obligations to submit results.

2019 Sejong National Pilot Smart City Regulatory Sandbox Validation Project

Since the Sejong National Pilot Smart City integrates various areas, there are many unseen regulations, which makes improving regulations take considerable time, limiting the use of new technologies and services. Under the circumstances, we will use the regulatory sandbox system to validate the service of the Sejong National Pilot Smart City implementation plan and promote a project that supports the implementation of the service without regulatory restrictions. The purpose is to promote the commercialization of new technologies and services that could not otherwise be applied due to various regulations through the 'Regulatory Sandbox Revitalization Project', thereby eliminating regulation-related difficulties.

The main purpose of the validation project is to select services that can be applied to and commercialized in the National Pilot Cities in Sejong and Busan to support planning, designing, and validation costs. The target is a private company or a consortium organized by a private company. For Sejong, it will be supported through a free competition where only the innovation fields of the Sejong National Pilot Smart City are presented and proposals are received and selected in a bottom-up system. The selected projects will receive the support for planning and designing costs (around 200 to 300 million won) for the services to be validated as of the end of 2019 and the companies that won high priority after undergoing a follow-up evaluation, the validation costs (500 to 1 billion won) and regulatory exemption in 2020.



Validation Project Execution Summary

Validation projects that target the Sejong National Pilot Smart City were carried out in seven public subscription fields of Mobility, Healthcare, Education and Jobs, Energy and the Environment, Governance, Culture and Shopping, and Living and Safety. This year, two companies were selected for Healthcare, two for Living and Safety, one for Mobility, one for Energy and the Environment, and one for Education and Jobs. The companies selected will prepare for each process of validation, such as finding appropriate validation targets through consultation with Sejong City as of the end of the year and identifying the limits expected during validation and preparing a supplementation method.

Overseas Cross-validation and Export of a Smart City Model

By connecting with major cities worldwide, similar in scale and characteristics to the Sejong National Pilot Smart City, we cross-validate the services and products of the smart city in other cities overseas and share problems arising from each city to seek solutions together.

It will enhance the services of the residents of the Sejong National Pilot Smart City as well as smart cities worldwide and expand the innovative economic ecosystem abroad, laying the foundations for the export of the smart city model.



Selected as a Cross-validation City Led by the Public Sector

Discovering promising cities for overseas cross-validation based on intergovernmental cooperation and establishing strategic partnerships by signing MOUs and forming working groups

Forming a structure for cooperation between relevant ministries to promote effective overseas cross-validation

Selecting excellent overseas start-ups using the 'auditioning system' and providing concentrated support

Operation of a Cross-validation City Led by the Private Sector

Attracting hubs and clusters of global accelerators and incubators that have hubs in smart cities around the world

Exporting the Smart City Model

Forming a consortium based on experience in planning the Sejong National Pilot Smart City, and exporting the smart city model to various cities around the world

Detailed Progress on Overseas Cross-validation and Smart City Model Exportation

Step 1

Basic Conception Plan to Embody the Philosophy of the Smart City

The overseas cross-validation and export of the smart city model are major promotion strategies to lead the Sejong National Pilot Smart City project and Seven Innovative Factors. The Sejong National Pilot Smart City will lead the global smart city market by establishing a system to directly exchange and cooperate with other smart cities around the world.

We planned to support the cross-validation of each company by selecting cities that are high in the global Smart City ranking and also similar to the Sejong National Pilot Smart City project in size and characteristics. We will make it possible to test the company's services and products in other cities overseas, and ultimately improve the services of both cities through mutual validation.

Development Process

- ① Connect cities for cross-validation
- ② Experience the testbed environment of other cities through start-up cross-validation, provide mutual feedback, enhance the services of each city
- ③ Attract innovative start-ups
- ④ Support domestic start-ups to develop and provide global services
- ⑤ Export the smart city model overseas
- ⑥ Develop a smart city planning process, record a white paper in English, hold the Sejong National Pilot Smart City Global Conference

This will serve as an incentive for a number of competent companies, including start-ups and global companies, to move into the Sejong National Pilot Smart City. Also, we designed the city in such a way that it can form a sustainable innovation ecosystem and expand globally by supporting domestic innovative companies to develop services and products for the global market.

Also, we intend to expand globally as well as domestically based on innovative and experimental trials and experiences in line with the purpose of the Sejong National Pilot Smart City business. We will establish and export the purpose and strategy of the smart city, i.e. the master plan, suitable to the environment and culture of each country.

Step 2

Implementation Plan

The operation of the cross-validation city is based on its connection with major cities around the world that are similar to the Sejong National Pilot Smart City in size and characteristics to expand the city's service market. We let cities prevent problems and seek solutions together by mutually validating the companies' services and products and sharing various problems of the cities. We also aim to form an innovative economic ecosystem by documenting these series of processes.

Promotion is generally divided into two models, one led by the public sector and one by the private sector.

The model led by the public sector is about discovering promising city candidates and building strategic partnerships based on intergovernmental cooperation. We plan to support effective cross-validation by establishing a collaboration system between related ministries and agencies. This requires the development of a foundation and system for cooperation at the level of each government by reviewing and selecting cities for cross-validation in various fields, and expanding MOUs and MOAs with target regions and countries. Also, government agencies, local governments, and project operators should closely review and discuss what systems and infrastructure can be supported for cities and businesses subject to cross-validation.

For the model led by the private sector, we will utilize a network of global accelerators and incubators. We wish to attract Korean hubs and clusters to the Sejong National Pilot Smart City project, centering on global companies that have a hub in a smart city, which serves as a global base. To achieve this, it is important to develop a business model appropriate for the environment and conditions of South Korea and the Sejong National Pilot Smart City based on the experiences and cases of global companies.

Development Process

- ① **Cross-validation Model Led by the Public Sector**
 - Develop a collaboration system by strategy and stage
 - Discover promising cities and secure strategic partnerships
- ② **Discover promising cities and secure strategic partnerships**
 - Attract global accelerators and incubators
- ③ **Exporting the Smart City Model**

Step 3

Concluding Consignment Agreements

The Ministry of Land, Infrastructure, and Transport, the supervisory ministry for the National Pilot Smart City project, has selected specialized consignment agencies for each field to promote the project in 2019. For the overseas cross-validation field, we reviewed agencies in connection with the global innovative company attracting project that the National IT Industry Promotion Agency (NIPA) was entrusted with.

The Ministry of Land, Infrastructure, and Transport sought ways to establish the basis for efficient operation of the Sejong National Pilot Smart City in the future, including the global smart city operation status, survey of the demand for cross-validations, and the analysis of actual conditions, concluding an agreement between ministries and entrusted agencies. We have endeavored to successfully carry out the business, such as reviewing methods.

Currently, we need to have in-depth discussions between the Master Planner, the Master Plan Team, and related institutions on which areas of the Sejong National Pilot Smart City plan to implement and which organizations will be entrusted with the implementation.

As described, the 2019 global innovative company attraction project was implemented with an emphasis on establishing a global networking group to secure a virtuous cycle system of smart cities, such as discovering global collaborating companies. The National IT Industry Promotion Agency (NIPA) promoted the project with professional agencies (overseas: KIC Europe, South Korea: Sejong Technopark and Busan IT Industry Promotion Agency).

Step 4

Interim Report

The global innovative company attraction project has been promoted in two main directions. First, establishing a smart city global networking group and second, promoting regional pilot projects through collaboration with global companies. We will investigate the status of domestic and foreign smart city companies and analyze the feasibility of cooperation with global companies. We will list domestic companies with excellent smart city related technologies and a clear intent to promote projects to couple them with overseas global companies, thereby helping them to participate in regional pilot projects. It is expected that this would naturally lead overseas cross-validation projects and create best practices and incentives for attracting smart city companies.

Also, we intended to increase the understanding of companies and encourage their participation in the Sejong National Pilot Smart City project by holding briefing sessions and conferences on the theme of cross-validation and attracting global companies.

Step 5

Future Plans and Suggestions

In the remaining period of the 2019 project, there are many events planned and carried out by entrusted agencies and service companies. At the '2019 Presentation on Smart City Global Company Attraction', we will introduce the Sejong National Pilot Smart City master plan and regional pilot support projects to smart city-related companies in the UK and neighboring countries. Also, we plan to hold a second presentation to attract global companies at the '2019 SCEWC' in Barcelona, Spain to have business negotiations to explore the possibilities for cooperation with local European smart city related institutions and companies on business implementation, by targeting many European smart city companies and companies participating in SCEWC, and develop a structure for cooperation with relevant organizations.

Until the end of the task, we will derive the results from the current status survey of domestic smart city related companies and the feasibility analysis on global cooperation and reflect them in the 2020 project plan.

The most important aspect in promoting future projects is to establish a mid-to long-term strategy and roadmap to operate overseas cross-validation cities effectively and sustainably. It is necessary to make sure the MOUs with global companies and regions that have been planned and carried out, briefings to attract companies, and technical information seminars and workshops are continuously promoted in the future while ensuring that such global cooperation does not end as a one-time deal. This needs practical incentives and mechanisms that work, above all else. In other words, it is necessary to promote the establishment of the Sejong National Pilot Smart City as a global testbed by making full use of the tools for mitigating the system such as a regulatory sandbox. Also, we must continue to promote the vision and values of the Sejong National Pilot Smart City's innovation ecosystem model so that the model can reach out to the world, helping us to export innovative trials and experiences as meaningful know-how.

4

Chapter

Finding
a New Path

-
- 1 Main Tasks for the Success of the Sejong National Pilot Smart City

Main Tasks for the Success of the Sejong National Pilot Smart City

Regulatory Innovation Should be Bold

As mentioned in Part 1, the Sejong National Pilot Smart City has three main visions: a new technology testbed, resolution of various urban problems, and the development of an innovative industrial ecosystem. Core services for each of the Seven Innovative Factors pursued by the Sejong National Pilot Smart City Master Plan, new convergence technologies, and various future technologies must be tested within the city. All city data shall be collected and analyzed to implement a service that can solve various urban problems, such as transportation and energy. Also, private companies must participate with a creative business model from the beginning of urban planning to provide new and innovative services using the city's data platform.

In the Sejong National Pilot Smart City, these three visions above should be properly manifested from the time the entities move into the city. For this, the practical implementation of the innovative and creative Fourth Industrial Revolution new technology service is required above all else, and regulations that impair the implementation should be drastically improved (exemptions and postponement).

Many regulations are involved with the service, data, urban space, and strategy that the Sejong National Pilot Smart City Master Plan Team wishes to promote. For example, the most kernel platform, which is related to the collection, storage, and analysis of data, is concerned with the Wireless Facility Regulation, the Personal Information Protection Act, the Act on the Promotion of Information and Communication Network Utilization and Information Protection, etc., and the Act

on the Protection, Use, etc. of Location Information. Also, the Medical Service Act is applied to data in the healthcare field, the Framework Act on Electronic Documents and Transactions and the Electronic Financial Transactions Act to data in the culture and shopping fields. The Passenger Transport Service Act is applied to the personal mobility sharing service field and the Road Traffic Act as well as insurance related regulations being closely related to the self-driving service area.

It is practically impossible to review and exempt a number of currently active regulations for the implementation of 25 key services, various future technology services, data operation, and district unit plans. As described under the 'Regulation' section in Part 3 among the important implementation strategies, the government has introduced a regulatory sandbox and has promoted the establishment of a special exemption and temporary permit system phase-by-phase for prompt regulatory checks and validations. As part of these initiatives, the government has designated a Smart Regulatory Innovation District to which regulatory exemptions are applied, and promoted the revision of the Act on the Promotion of Smart City Development and Industry to pass the National Assembly (the "Smart City Act"), so as to apply regulatory exemptions to projects that have been approved by the committee within the designated Smart Regulatory Innovation District. (※ Revised in November 2019 based on the descriptions above and will be enacted on February 27, 2020.)

The public sector must support bolder regulatory innovation to allow various private companies to actively move into the city so that start-ups, SMEs, large corporations, and global corporations can unleash their potential without limit in the Sejong National Pilot Smart City initiative and that such benefits can be delivered intact to residents as innovative and creative services. Only then will the real success of the Sejong National Pilot Smart City be assured.

Led by Private Companies

As we can see from the case of U-City in the past, the continued participation of private companies is very important in the development, operation, and management of cities. In some U-Cities, an SPC consisting of public and private sectors developed the city, but private companies left for various reasons afterward, and the company failed to continue to provide innovative services. There were also difficulties with professional operation and management. As public institu-

tions took over the parts that private companies used to operate and manage, they failed to provide more creative services to residents. In fact, a considerable number of services developed by U-City R&D in the past were hoarded during the operation stage.

The success or failure of the National Pilot City depends on how much the creativity, technology, and capital of private companies can be utilized to the fullest throughout the development, operation, and management of the city. The autonomy and creativity of private companies cannot be reflected in the current top-down system, in which the government plans everything and even leads development. Under the current system, it is expected that a number of dedicated consignment agencies will separately order construction projects for each field, and private companies will only participate in the process of receiving orders for each budget project and carry out the project by individual service units, as before, from 2020. Most of all, we need to establish a special purpose company (SPC) with a PPP (Private-Public Partnership) model organized, operated, and managed by both public and private sector interests to avoid following that precedent.

Considering the large number of innovative services that the Sejong National Pilot Smart City intends to promote, the technological complexity involved, and the rapidly changing technology environment, a variety of specialized private companies should operate and manage them with initiative for a long-term. However, when we look at the size and service of the Sejong National Pilot Smart City, it lacks business value, which is the most important factor for participation for private companies. With the design population of 20,000, the scale of service application is small while the innovativeness of the services proposed in the current master plan is high. In other words, the business value is expected to be very low when considering revenues compared with expenses.

We are currently in transition from the planning stage (2018 to 2019) to the construction stage (2020 to 2023), and we need to clarify the business structure, implementation system, and core services to prepare a strategy for maximizing the innovativeness and autonomy of private companies to develop a sustainable national pilot city based on a private and public SPC. After all, the basic direction for the establishment of the National Pilot City SPC should focus on how the public sector supports the continued participation and initiative of private enterprise.

Sustainability is the Key

The currently discussed and promoted basic directions for the establishment of the National Pilot City's SPC are as follows:

First, corporate autonomy should be maximized. The Sejong National Pilot Smart City master plan has to consider not only essential services but also future scalability, so that companies can freely select and operate innovative services. The advantage of the National Pilot City, which is to start from a clean slate, must be maximized for private companies so that they can benefit from it.

Second, private companies should be given realistic incentives. A practical incentive system such as financial support, land supply, and tax incentives should be prepared to minimize the initial losses in service business values, and it should be reflected in the RFP (Request for Proposal) for the establishment of an SPC.

Third, companies should be given an opportunity to create references called validation results. We should let companies create a national reference through the establishment of a testbed and city brand and pioneer the new market, the global smart city. Eventually, companies would be able to generate profits by constantly testing (R&D) new technologies and services through the Sejong National Pilot Smart City and spreading those validation results (references) to other cities at home and abroad. A bold regulatory innovation mentioned earlier is essential to developing a testbed environment that can create profits.

Fourth, we need a device to secure publicity so that public benefits provided to residents do not decrease after being biased toward the interests of private companies only. Securing the public concern is very important to realize the Sejong National Pilot Smart City's philosophy and operate sustainable services. In a case where there are excessive profits for an SPC operation, it is necessary to have a plan to reinvest some of them in public services and public infrastructure. It is important to let residents feel that they are enjoying a lot of public benefits even when the Sejong National Pilot Smart City is led and operated by private companies.

Fifth is the expansion of spatial extent and temporal persistence. It will be difficult to secure the business value of most innovation services with the Sejong National Pilot Smart City 5-1 Living Zone with 830,000 pyeong of land and a design population of 20,000. In the future, it is necessary to secure a plan to expand the scope of provision to a Multifunctional Administrative City within Sejong City with more than a 200,000-person population per service phase-by-phase, or to the entire Sejong City, with more than a 300,000-person population per service. Also, it is necessary to continue to involve the SPC to develop and provide sustainable services after the development and establishment of the National Pilot City. The SPC project period should be set for a long period (e.g. 15 years, 20 years, etc.), and it is necessary to have a plan to determine whether to extend it through a fair evaluation after the completion of the project period.

5

Chapter

Opening
Communication for
a Sustainable Path

1 Master Planner
Jeong Jae-seung Column

Master Planner Jeong Jae-seung Column

Teaching Cultural Diversity in the Classroom

America has a well-developed curriculum for teaching cultural diversity, even from elementary school. They learn how to count in different languages during class, try traditional costumes from various countries, and prepare and eat traditional dishes. When learning how to count in Chinese, a Chinese American student comes forward and leads the class by counting 'l, er, san, si...' with a fluent pronunciation. When learning how to make pizza, an Italian American student introduces the food, feeling a bit flattered. Being the 'melting pot of races,' America realized that understanding various cultures is the first step in building an open-minded society and has taught cultural diversity from elementary school up for the past 30 years.

In the 21st century, South Korea has quickly changed into a multicultural society, where a variety of races live together. In the past three years, an average of 30,000 couples have formed multicultural families each year. It is estimated that about 200,000 multi-racial households have settled in South Korea. The number of children from these households alone number as many as 150,000. According to data from

the Korea Institute for Health and Social Affairs, the estimated population of multicultural families will reach 2.16 million by 2050. Are we ready to live alongside people with different skin colors and features without prejudice? How is our society preparing to live with others in harmony? In a survey on discrimination in multicultural families, 41.3% responded that they experienced social discrimination. It seems that we are not ready yet.

If we do not pay particular attention from an early age, the human instinct for grouping can naturally manifest into hostile behavior toward other races. Our society, where Korean ethnicity is overemphasized and a false prejudice against weak countries prevails, is probably one of the most difficult societies for immigrants to live in. Social awareness against bullying culture has increased significantly. Even so, the psychological violence against multicultural families is still an issue.

A nation's dignity is determined by its breadth of care and inclusiveness. By now, we should realize that everyone living together in our land needs careful

concern and magnanimity. Understanding cultural diversity is the most basic sense that a global citizen must have.

In multicultural families, parents want their children to get along with their friends at school, but they also want them to remember their roots. A Vietnamese woman who has immigrated to Korea wants to tell their children about Vietnam. A man who has immigrated from Cambodia wants to teach their children Khmer. Just as Koreans in Japan did and Koreans in the USA have done. A mature society is not busy making them Koreans, but shows deeper consideration in raising them into whole people who love their parents' countries.

The Daum Foundation, a non-profit organization, has been running a program called "Ollybolly (www.ollybolly.org)" for five years. They transcribe children's books from various countries into e-books so that anyone can read them online. They offer both the Korean translated version and the original language version. Also, the books are not just served in text, but also in voice. There is an Ollybolly Hall in the local libraries in Incheon, Hwaseong, Jecheon, and Namyangju, where you can read children's books in their original languages.

Children's books from eleven countries - the Philippines, Vietnam, Indonesia, Thailand, Cambodia, Mongolia, Uzbekistan, Iran, Tibet, Palestine, and Lebanon - are available on the Ollybolly site. They translate 20 to 30 children's books from these countries each year, and the total number of the books

has already exceeded a hundred. This program provides invaluable textbooks for Vietnamese mothers to teach their children the Vietnamese language and culture. Children can also learn Korean through Vietnamese children's books. The Ollybolly Project won the Presidential Prize for Sejong Culture Awards last year.

The children's books are not only for multicultural families. These are books that we and our children, who will live with multicultural families, should read together to treat multicultural families without prejudice and realize that it is a blessing to live among different races. Children who grew up hearing only about Cinderella and the Ugly Duckling are unlikely to become citizens who can embrace the world.

Currently, projects like Ollybolly are mainly running in libraries. They should be brought into classrooms. Teachers should tell children in the classroom where they learn together with others with different origins how interesting the children's books around the world are for us who will someday live with different races. We must ensure that children grow into balanced elementary school students through unique and universal children's books from various countries. We must not repeat the pain experienced by Korean Americans, Korean Germans, and Korean Japanese. Cultural diversity is one of the most important values we must convey to the next generation.

The JoongAng Ilbo, February 22, 2014

City as a Platform for Human Civilization

A platform is a "vessel that holds life." The platform, the basic framework for recording and processing the trajectory of life created by humans, is the foundation of human survival and the basic unit of human civilization. The platform is becoming increasingly important, as a company that seizes the platform can monopolize people's data and have a huge impact on their lives.

In the past 10 years, smartphones have grown rapidly as a platform for digital civilization. Humanity has created a huge mobile civilization as every action of all people, their writings and drawings posted on social media, and a variety of personal information are accumulated and processed in them. Following the emergence of the Internet of Things, the house is drawing attention as a platform. TVs, laptops, CCTV, refrigerators, boilers, scales, and so on exchange information with each other, and forecast and provide services that you might need. Smart homes manage energy efficiently and manage family life conveniently and safely.

In the era of the "platform war," the ultimate platform will become the city. A huge device called a smart city will cleverly care for citizens in all areas of human

society, including health, safety, education, culture, and transportation. It means that the platform of human civilization will eventually expand to the city scale. The forecast that a city will become a platform also means that there will be companies or countries selling cities. A country that can elaborately build an urban ecosystem like a "full package of technologies" will dominate the world. Think of the company that came to dominate the world with a single item, a cellular phone.

Singapore is already one of the most noticeable countries in the smart city industry. It is because they declared the "Smart Country" vision in 2014 and have pushed forward with the "Virtual Singapore Plan" to convert the entire country into a digital platform. It is a project to embody the entirety of Singapore, including roads, buildings, and parks, in a three dimensional online space. There is an ambitious plan worth 80 billion won to solve the problems of the city through this project.

In fact, Singapore found a solution for the urban noise issues in Virtual Singapore. By running a simulation of planting street trees in Virtual Singapore, they found that city noise is significantly reduced

when the appropriate number of trees are planted in appropriate locations. What is the most appropriate speed for escalators in a building to reduce congestion in the downtown area? Singapore used 'virtual Singapore' to answer this question. The best speed was found in a simulation that applied Singapore's urban environment and population flow to the system.

Barcelona and San Francisco are already evolving into smart cities. You might be somewhat disappointed when you actually visit them, considering their reputation of being the "world's No. 1 and No. 2 smart cities," but major changes have been developed under the leadership of the government. Xi Jinping of China announced an ambitious plan to develop 500 smart cities in China over the next decade. India has already selected 20 cities in 2015, and central and local governments are investing and working on plans to grow them into smart cities.

Why are countries so fascinated by the concept of the Smart City? It is because current urban civilization is no longer sustainable. The environment of job-housing separation, where the workplace and home are separated, is causing severe traffic congestion, and the increase of environmental pollution and crime have already exceeded their limits. Cultivating creative and diverse human resources seems impossible with today's collective education, and the separation of rural areas that produce food and cities that only consume food is causing numerous food problems on a global scale.

The world is paying attention to South Korea as the most probable place that can sell the platform called a smart city to the world. It is because South Korea has accumulated the most experience in building

new cities from scratch in the 20th century. While we are somewhat ashamed of the new town development projects and the developments in Gangnam in Seoul, they must have looked like amazing constructions of civilization to the world.

However, what we must understand is that the most important value that the city, which will become a platform, should pursue in the future is 'human happiness.' Unlike ubiquitous cities that pursued efficiency and convenience, the Internet of Things, big data, and artificial intelligence should make a contribution to humanity's happiness. Even in Dubai, which is most enthusiastically promoting the smart city project, the project is led by the National Agency for Administrative City Construction. Their goal is to 'make the world's happiest city through smart technologies.' We must move away from construction and civil engineering based thoughts first to build a city as a vessel that promotes a happy human civilization.

We must prize the value of data and orient our thoughts toward technology for service. Humanistic introspection is in desperate need for cities to contain a grand vision for humanity's urban civilization and the essence of human happiness. We must begin the work of building a sustainable urban civilization based on science and technology, humanities and social sciences, and art. And we must do it now.

The JoongAng Ilbo, February 22, 2014

People are Happy when the City Changes

Those who live in the city today spend 100 minutes (1 hour and 40 minutes) a day on average commuting. They spend an average of 48.1 minutes to get to work and 53 minutes to get home. For office workers living in Seoul, it is 134.7 minutes, which is by far the longest in the nation and also the longest among OECD countries.

If we estimate that our work life is about 30 years, we are literally wasting 14,400 hours (600 days) on the road. Considering that our body becomes exhausted and our minds harmed on the subways and buses during rush hour, this damn city is incorrigible. While citizens are spending 1/3 of their average sleep hours (6 hours) getting to and from work, how would the city change to return this time to its residents?

First, the transportation system needs to be much smarter than now. With artificial intelligence, we should adjust the signals and so on to minimize the waiting time for people and cars while observing the flow of the pedestrians and cars. If self-driving cars become common, they can even sleep or work in the car during rush hour. If self-driving taxis emerge, we can significantly increase their numbers only during rush hour. If we ease the connection to the network,

while not worrying about security so that we can use work computers at home, you can work from home a few days a week. If 5G mobile communication becomes common and video conferencing improves, the number of office workers as well as one-person companies and freelancers working at home will increase significantly.

Ultimately, if we redesign the city as an environment that fulfills job-housing proximity instead of today's environment where residential areas, commercial districts, and workplaces are separated, it will significantly reduce commuting time. Like old European cities, if the place of living and the place of work are closely connected, and the place of culture and shopping is adjacent to the place of living, we do not need to waste 600 days of our lives commuting.

In fact, in Kalasatama, the famous smart city developed by Helsinki, Finland, they have a campaign 'to give back an hour each day' to the residents by using fourth industrial revolution technologies to increase the efficiency of the city. Kalasatama, an abandoned port until 2008, remarkably improved its transportation system with the Internet of Things and artificial intelligence and runs a self-driving bus called Sohjoa,

around housing complexes to allow residents to travel safely. The Juniper Research Report, sponsored by Intel and released recently, includes an analysis that smart cities have the potential to return 125 hours a year to residents.

Cities are not sustainable.

Cities around the world only take up 1% of the land area, but 54% of the Earth's population lives in cities, much like the coral area in the sea only takes up 2% of the sea, but 30% of the sea creatures live near corals.

Cities where 4 billion people live emit 80% of the world's greenhouse gases and are plagued by severe traffic jams, environmental contamination, waste issues, and excessive water consumption. Also, crime and accidents occur overwhelmingly in cities. The 'society of strange cohabitants' who would only pass by and would not offer help even when you are injured or assaulted! The city becomes ill in this anonymous space. What about education? It has turned into a department store and a breeding ground of excessive competition where we have to forego education that respects diversity and individuality. The city is turning into an educational hell that believes that convenient quantitative evaluation is "fairness" and lining up students is the "lesser evil," sacrificing adolescents for competition. All of these things ruin our happiness and deteriorate the quality of life. The city is no longer a sustainable space that creates happiness that buttresses our lives. It is no longer a safe vessel that can hold our civilization together happily. We should not leave the city to expand in this way anymore. However, a UN report estimates that urbanization will accelerate further and 6.6 billion people, two-thirds of the world's population, will live in cities as of 2050. How can we develop a sustainable city that would hold the new civilization? How

can we regenerate a huge city with people in it? Engineers of the 21st century are looking for the answers in the 'smart city.'

A smart city is a city that serves as a platform providing personalized forecasting services that improve the quality of life and happiness of city dwellers by converting all phenomena, trends, and resident behaviors in the city into data and analyzing them through artificial intelligence. In other words, it means that the city will be transformed into a 'space that cares for residents' using the technologies of the fourth industrial revolution. The reason it is possible to think of this is that information technology, the outcome of the digital revolution, has developed rapidly over the years, but more significantly that convergence technologies that can be used in the manufacturing and distribution industries have evolved together. For example, we became a society that can apply digital technologies because it is possible to convert all of the phenomena and behaviors of residents into data through the Internet of Things.

The smart city is the origin of the fourth industrial revolution.

Take medical services, for example. Remarkable changes are expected in the next ten years. Since the patient's condition is monitored at home and transmitted to the hospital, the doctor can provide remote treatment without you going to a hospital in person. It can provide better treatment than treatment that patients receive in a general hospital in less than five minutes.

The Xi Jinping Administration of China has already declared that it will build 500 smart cities in China. In this project, led by Premier Li Keqiang, each city has a key theme, one of which is 'Healthcare.' The intention is to provide wealthy people in China with the

latest medical services at home instead of going to the USA or Europe.

How would a healthcare-centered smart city treat patients, then? When there is an emergency, a drone will fly in within three minutes for the most urgent primary emergency treatment before the ambulance arrives through busy roads. It will help a guardian next to the patient provide emergency treatment. When an ambulance subsequently arrives, most imaging and examinations are completed while transporting the patient. While transferring the patient to a hospital, an emergency medical doctor waiting at the hospital can examine the patient's condition in the ambulance and guide the emergency treatment so that the patient may undergo surgery as soon as they arrive at the hospital.

China is preparing to construct a healthcare-centered smart city in Weifang, near Qingdao. Weifang is located in the Xiashan Ecological Zone and considers supplying fresh food materials from this area as the most important healthcare service.

The reason the types of fruits, vegetables, and meats the world consumes have been simplified even by impairing species diversity is essentially because the distance between consumers and producers is too far. It is because most food consumers live in large cities, while major producers are located in rural areas of each country. To feed a city, farmland a hundred times the size is required. Cities need to become producers to reduce food mileage (the distance between producers and consumers of food materials).

It would not be a huge problem if there was a clean district like Xiashan nearby, but cities that do not have a place like that nearby are developing "smart farms." It is an attempt to grow vegetables and fruits

in a single building.

Chicago and Toronto are trying smart farms, which manage building efficiently to grow crops. Many smart cities pay attention to smart farms in terms of providing healthy food materials to cities.

Overcome Representative Democracy and Move on to Smart Governance

We can also have smart governance, which quickly collects residents' opinions on local issues and manages them according to their will. It develops an app for residents and asks public opinions through it, and the city council, city hall, and constituency Member of National Assembly can engage in administrative activities that reflect the will of the people. In the past, when personal identification was difficult and there was a risk of hacking, it was difficult to implement this idea, but now biometrics and blockchain technology will make it possible.

In fact, Barcelona, which is referred to as the "No. 1 Smart City" in the world, focuses on smart governance that immediately reflects the opinions of its residents. In particular, it is making efforts to transform the entire city into a sharing economy platform. For example, they are operating a bicycle sharing system, but a change on the city scale is required to communize the sharing economy service.

To solve the problems of the city, it is possible to create a virtual city on a computer and transfer all phenomena occurring in the city to find a solution. Singapore and is attracting worldwide attention for trying this simulation project, the so-called "Digital Twin." It became a topic around the world as it seeks a way to efficiently resolve urban noise issues by transferring Singapore's city onto the platform of Dassault Systèmes of France.

The city is the vessel to carry a new civilization.

According to Dr. Jeffrey West of the Santa Fe Institute, when a city expands tenfold in size, its creativity increases by seventeen times. The productivity and creativity of a city does not increase in proportion to the number of people or the size of the area, but they increase exponentially because they are created through interactions between people. A city has been operating as the creative engine of 20th century civilization. Rural areas are transformed into cities and small cities are growing into large cities. It is because of the saying, 'Send horses to Jejudo (famous for horses) and people to Seoul (capital city).'

Cities have numerous advantages but also cause critical problems, becoming a threat to world civilization. If urbanization continues to accelerate at current rates, the planet could face disaster one day. Cities that are not self-sustainable and not sustainable mean the 'end of civilization.'

If modern civilization was a "hub civilization" centered on cities, where we could participate in a more creative and productive society when more people flock to large cities, the next era should turn to a "distributed civilization." We believed that the Internet disperses power and populations by sharing information and connecting people through networks. However, it intensifies the hub society even further.

That is also the reason we pay attention to blockchain when we plan a smart city in the 21st century. The world is making efforts to realize the ideals of incorporating the blockchain's decentralization philosophy into cities. Paying residents who provide data with local currency as a cryptocurrency can enable an economic structure that actually benefits resi-

dents who generate data. If interpersonal exchanges can be activated and if we can move away from a centralized society, it would be possible to achieve a smart and happy small giant city.

Growth into a big city is not the answer.

Mega cities with 5 or 10 million people are now becoming vessels that cannot create a happy civilization. However, it is difficult for small cities with a population of less than 100,000 to create good education, diverse jobs, and reliable medical environments. Then, embodying a city in the most appropriate size, a city that maximizes productivity and creativity, but respects the diversity and happiness of its residents, will be the most important topic of our era.

Smart technologies will not cleanly solve the problems of the city and guarantee happiness for us. The idea that technologies can eliminate the problems of the city that we have suffered for the past two centuries may be too naive or technology-oriented. However, the important thing is that we only have a few cards left to play, and one of them is a card called 'smart technologies.'

The JoongAng Ilbo, May 2, 2018

The Meaning of Place is Changing

One of the attractions you should not miss in Rome is the Trevi Fountain. It is named Trevi because it is located at the intersection of three roads (Trevia). There, you can see people from all over the world throwing coins into the fountain, because of the myth that 'if you stand with your back against the fountain and throw a coin over your left shoulder with your right hand, you will return to Rome.' Due to the scene where Audrey Hepburn throws a coin into the Trevi Fountain in the movie <Roman Holiday>, the Trevi Fountain is remembered as a romantic place to people around the world. Rome makes 1.8 billion won each year with the Trevi Fountain this way. The amount is much greater if we add the money that tourists spend on food and beverages near the fountain.

For those who are in business, the Trevi Fountain gives new inspiration. What is the magic that a story has to make tourists come a long way and throw coins for virtually no reward? They do not even complain even if they do not get to return to Rome even after tossing the coin. Tourists remember this place as a nice place just for the memories of throwing a

coin at Trevi Fountain. We should do business like this.

The biggest change we faced after the emergence of the world wide web by Tim Berners Lee in 1991 and the so-called Internet era, is that all the things we did offline can be done online.

We do not need to go to a shop to handle things because the world that exists offline has been created online, like a mirror.

For example, we do not have to go to bookstores. Books can be purchased at online bookstores. Because the annual volume of reading has decreased by nearly 40% and we buy books at online stores using smartphones, two-thirds of local bookstores have disappeared.

We have felt less of a need to go to the bank during the past decade. Due to fintech companies, we can handle simple account transfers, remittances, and utility bills on a smartphone. There is no reason to go to the bank other than to open a bank account or

get a loan. The fact that many teenagers today have not been to a bank, even people in their 20s have few reasons to find a bank, and most people we see at the bank these days are seniors, makes it easy to predict the future.

While huge stores are still crowded with customers, we can buy and have products delivered online. Even when we order in the evening, before 11 p.m., we will find the products delivered early morning the next day, in just six hours. There will be fewer days we go to the supermarket. The number of visitors to banks across the country will be reduced to less than half of what we have now in the next five years. The number of people who shop at the supermarket will fall to less than half of current levels within ten years.

There is no cause to increase the number of local bookstores at all. In the past, the reason we went to a specific place was to perform a specific task. Today, we can do most of those tasks online and face the situation where the meaning of 'place' must change. Now, the place must have a purpose to go there, and we are at the point where business needs to be changed into one that sells experiences at a place. In fact, this has actually been the case for a long time.

We need a strategy to make people, who have no business with the bank, come to the bank and have them take care of banking matters while there. Recently, a bank has set up a small library inside. The bank is playing the role as a local library so that potential customers who visit the bank can read a book in a cool, air conditioned space during the hot summer, and can be consulted on taking out a loan while

there. Now, the 'essence of work' of the bank staff must change, from calculating money to everything they can do to eliminate customers' inconveniences and satisfy them.

Perhaps the huge stores should change into completely new spaces within the next ten years. They must change into spaces that help us fill in time, helping busy modern people enjoy experiences with family and friends on weekends. Stores need to become places where you can live a cultural life. Huge stores will not stand much chance unless they are reborn into new cultural spaces in a country with advanced delivery systems where you can purchase goods without waiting in line at the cash register and do not even have to come to a store, like 'Amazon Go.'

Independent bookstores are emerging as an alternative in that aspect. They create a unique space with unique brands and sell experiences beyond selling books. The number of local bookstores that sell best-sellers, magazines, and study papers has decreased, but there are more than 100 unique independent bookstores opening each year. As a result, the entire city is going to have less functional spaces but increasingly many cultural spaces, because all you can do outside is hang out with people in a world where everything can be done inside your room. The theater is not only a space to see a movie, but also a 'dark space with a big screen where people gather and enjoy a movie only when they want to see a movie.'

But the problem is rent. To create a space charming enough to cover the rent among the overflowing shops in the same industry, it takes creativity

and considerable time and effort, but it is difficult for those in their 50s to 60s, who retired early from a company, to open such a place to earn a pension. It might be suitable for enthusiastic young people in their 20s and 30s, but it is still tough to cover the rent. Two-thirds of independent bookstores also suffer from deficits.

People who love drama create plays solely out of passion, but the only ones that make profits are the theater owners. Even if it is not for play, the situation could be similar for many performers. When coffee shops and restaurants form attractive commercial districts that people want to visit, greedy landlords eventually raise their rents and drive them out to other areas. Soon after the franchise shops run by large corporations that can afford the rent move into the space, the place becomes an ordinary space without any particular attraction. We lost Rodeo Street and Garosu-gil Road in Cheongdam-dong and Gyeongnidan-gil Road in Itaewon this way. A fundamental solution is needed to solve this problem. If you want to open a takeout coffee shop or chicken restaurant with your severance pay, without knowing much about business, stop and save your money. Develop your own service and start a business from the view that a place is a space that provides experiences to customers.

The city is gradually evolving into a lifestyle-oriented place. Landowners should also sign long-term contracts with their tenants so that they can pour in their passion for ten years and turn the place into one of the coolest places in town, instead of being obsessed with rent and facing a long-term decline in land prices. Sign a new contract as equal partners, instead of owner and tenant. It can prevent gentrification from holding sway over the city.

Imagine the future of your city where land is purchased from a macro perspective and leased to people who can revitalize the city. Without fundamentally changing current laws and regulations, a future city that cares for the lives of its people is impossible.

The JoongAng Ilbo, July 14, 2018

100 Days for a Smart City

Designing a smart city is not urban development, but a holistic process that realizes the future of civilization.

It must reflect the master planner's philosophy.

Still, the devil is in the regulatory detail. There is no hope for urban civilization if we try to complete a city within the reign of a single administration.

A hundred days have passed since I was appointed as the master planner of Sejong (5-1 Living Zone), which is the site for the National Pilot Smart City in early May. This summer was probably the hottest in history, but for me, the last 100 days were hotter than ever. I was thrilled and excited, sometimes pained and frustrated, and my head was filled with concerns and headaches.

I still cannot forget the conversation I had with the Korea Land and Housing Corporation (the "LH"), the project operator, for the first time after being appointed master planner. After they briefed me on the progress, I explained my vision as a master planner for a smart city. Their response was, "Are you planning to make the master plan (basic conception plan) yourself?" Confused, I replied, "Is it not what the Mas-

ter Planner does?" They returned with an even more absurd response. "We will draw up the master plan through a service company. You only need to give us advice based on the master plan we make."

According to LH, master planners they worked with while constructing myriads of new towns and U-cities have only given advice on the master plan. In fact, the role of the master planner was defined as 'advisor' even in the Regulations for the Operation of Master Planner. If that is the case, it would be impossible to properly render the philosophy and vision into the basic conception plan. I could understand why the new cities and U-Cities that have been developed so far have looked the same, without any vision or philosophy.

The first thing I did after being appointed as master planner was to create a new "Regulations for the Operation of a Master Planner for a Smart City" through the Ministry of Land, Infrastructure, and Transport. Do you know what the regulations were about? In short, it is about 'letting the master planner establish the master plan.' In establishing something that is a matter of course, I prepared a draft of the master plan without being properly appointed and without pay over the last 100 days.

Arguably, no service company in any city can properly establish a master plan. It has to be established by a master planner with a vision for the residents based on his or her own philosophy of a city. That is the beginning of regional revitalization, the beginning of a tourism and travel center, and the basis for the exportation of a city. Achromatic cities that look the same wherever you go cannot compete with Seoul or any other city in the world as a base of living or a travel destination.

After I examined urban planning in the past as a master planner, I realized that South Korea's urban planning has looked at the city only in two dimensions. It divided residential areas and commercial and business areas according to purpose, and focused on urban development to sell land at the highest possible price. Urban planners must view and design the city in three dimensions. For Smart City Sejong, I suggested using a 'shape-based code' to manage the appearance of the city in three dimensions, introduce a usage exchange system, and to let the government directly operate specific areas in the form of long-term leases instead of selling in lots. In fact,

urban planners must look at the city in four dimensions by also taking time into account. That way, it is possible to prevent the old evil of turning the place into a zombie city soon after large corporations close down their factories.

A smart city is a city that captures all activities taking place within the city as data to improve the quality of life for residents, enhance the city's sustainability, and expand creative opportunities. In the future, we cannot build a school without thinking about how to educate the next generation. Cities cannot plan healthcare services without understanding how to promote national health. It is impossible to build a cultural facility without knowing which technologies should be applied to constantly hold cultural events in a small city with a population of less than a million.

Planning a smart city is not an urban development plan, but a comprehensive and holistic process that realizes the vision for the future of civilization. It is the plan that LH (Land and Housing Corporation) or the Ministry of Land, Transport and Maritime Affairs have never thought about, and therefore, I needed active cooperation from various ministries such as the Ministry of Science and ICT. However, the impression I had over the past 100 days is that there is no ministry that is actively cooperating with the smart city project. Instead, there was this attitude, 'Let's see how well the Ministry of Land, Infrastructure, and Transport does.'

To properly provide services to city dwellers and to constantly improve them, the city needs an agent with the ability to integrate, collect, and operate city

data and develop services. It is also necessary for the private sector, the government, and local governments to form and operate a special purpose company together. Until now, regulations have been quite strict, preventing many things that could be tried. The Special Smart City Act was initiated. There is a discussion that a regulatory sandbox is needed, but progress is extremely slow. They say everyone is free to imagine anything without being restricted by regulations, but still the devil is in the detail of the regulations. After all, nothing has changed in the field.

To properly develop the basic conception plan, it is necessary to listen to the opinions of various ministries and related organizations, scrutinize overseas cases, and select residents to move in and listen to their voices. But they say they have no time because they follow their schedules, in which the first tenants must be determined within this administration. There is no hope for urban civilization if we have to complete the city, which should stand for centuries, within a single administration.

The JoongAng Ilbo, August 11, 2018

From Mammonism to National Happiness

Much more varying phenomena occur in the brain when the person is happy than when he or she is momentarily having fun. First, dopamine is secreted in the reward center, creating pleasure. A dopamine party is held in our brains when we have a delicious dinner with a lover. Pleasure or enjoyment is one of the most important factors in creating the feeling of happiness.

However, happiness is more than pleasure. Serotonin, secreted from the amygdala and the limbic system, enhances satisfaction with life. It makes us look at life positively without falling into depression, and it makes us act positively. Endorphins, which help you overcome pain, also contribute to the feeling of happiness. With the sweat we shed after working hard, endorphins act as pain relievers for us to overcome tough moments.

Oxytocin also plays a part. Oxytocin reminds you of the meaning of a relationship when you spend a comfortable and relaxing time with your lover. Making decisions or controlling situations without interference from others is important for happiness, but

it is difficult to reach happiness without having relationships with people. Happiness requires the time to focus on yourself and the healthy relationships established with others. Human beings are complex beings, and happiness is a much more complex concept than pleasure or stability. However, over the past decade, neuroscientists have devoted a lot of time to scientifically dissect and analyze the abstract concept of happiness for one reason; to systematically approach happiness, the most important goal of human life.

The value of a nation's existence also lies in its national happiness. The reason we operate a system called a nation instead of living in groups with the people we can relate to is because we believe that a 'nation' will contribute to our well-being and happiness much further. For a long time, the most important goal under which South Korea operated has been economic growth. It was because we believed that a materially prosperous life would bring happiness. Thanks to this, the Republic of Korea escaped from poverty at the fastest rate in the world. However, as the Easterlin's paradox suggests, material abun-

dance does not guarantee happiness. When gross domestic product (GDP) is low, happiness increases as incomes increase, but economic growth no longer guarantees national happiness when the standard of living reaches a certain point.

Moreover, Korea is one of the unhappiest among countries with similar levels of GDP. It may be because economic growth has been achieved in a way that impairs national happiness. Office workers have lost their work-life balance while living only as social people. Health, family relations, warm friendships with acquaintances, and healthy questions about why I live are buried in piles of work on the desk. We have no ability to overcome the harsh storm of the world by ourselves when we come out of the umbrella of work. We are only aging as replaceable beings unable to think of alternatives other than opening a chicken restaurant or convenience store.

For example, even when the economy grows, if the process deepens polarization and inequality, it eventually hinders economic growth. Social conflicts intensify and hatred and anger against others escalate,

destroying social assets such as trust. Eventually, the process involved in making the economy grow is important, and the criteria of judgment and the final goal should be national happiness. The economy should progress and policies should be implemented in a way that makes people happy.

Why have we overlooked this self-evident proposition, 'people's happiness should come before economic growth?' As American Express's Chief Marketing Officer John Hayes said, we tend to overestimate what we can measure and underestimate what we cannot measure. Economic growth can be expressed with a single number, GDP, and is measurable, creating a strong sense of a goal.

Gross domestic product (GDP), which appeared when we expanded the national income accounts in the 1930s, is obtained by evaluating added value or final products that all economic entities such as households, companies, and government created by participating in production activities in South Korea at market value. However, it hardly reflects other important indicators that are very important for our

happiness, such as pleasant environments, creative education, public health, or democracy. That may be the reason we have made economic progress at the expense of these precious elements. The happiness index such as "Gross National Happiness" is not a unique attempt made by a small country like Bhutan, but has become a concept that is attracting the attention of Europe as well. President Sarkozy of France, with the help of world-renowned economists such as Joseph Stiglitz, Amartya Sen, and Jean Paul Fitoussi, has set out to develop new indicators that can properly measure economic and social development. "GDP is Wrong" (Dongnyeok, 2011), which was written in the process, shows example after example where a developing country may increase its GDP when it takes a cheap fee for licensing mining development that causes severe environmental damage without proper regulation, but the welfare of its people will be degraded. If South Korea proposes to develop knowledge by making good use of leisure rather than consuming money and increases productivity based on that proposition, it will be regarded as an act that would not contribute to growth in the current method of calculating GDP.

Economic growth centering on GDP has the risk of making our lives neither happy nor sustainable. Material abundance is not the goal that we must seek by undermining national happiness or national sustainability. We must not commit the foolishness of not recognizing its value because it cannot be measured. That is why neuroscientists are also taking the first steps to dissecting happiness.

The JoongAng Ilbo, September 8, 2018

European Smart Cities Evolve Slowly but Robustly

Rotterdam is a small city with a population of 620,000. It is about an hour away from Amsterdam, the Netherlands, by car and is Europe's largest trading port. During World War II, Nazi German air raids completely devastated the city, but it has turned into a modern city completely after the war. This made Rotterdam a mecca for Dutch architecture.

An innovation cluster is located near the port adjacent to start-ups and corporate research institutes. A self-driving shuttle crosses this place. This self-driving shuttle, called a parkshuttle, operates without a driver and can be managed, operated, and controlled from the central control system.

The fare is about 1,000 won. But what is surprising is that it was as many as 30 years ago when the company that operates the self-driving shuttle started researching autonomous driving technology. The city has consistently invested approximately 50 billion won over the past 30 years and has eventually realized the self-driving shuttle now. Today, the city is now helping the company to become self-reliant. This is how the world is preparing for a smart city.

Why are we trying to create a smart city?

A smart city refers to a city that serves as a platform that converts all phenomena, movements, and residents' behaviors within the city into data and analyzes them with artificial intelligence to provide personalized forecasting services that improve the quality of life and happiness of city dwellers. In other words, it uses the technology of the fourth industrial revolution to turn into a 'space that embraces residents.' The key philosophy of a smart city is to create a city centered on the people, the users, unlike the old practice which developed and operated the city centering on suppliers, such as the municipal government, the implementation company, and the construction company.

Until now, residents have used the city passively by seeing it as a given environment and resolved the problems of the city by filing complaints. However, in a future city, allowing residents to directly discover the problems and become the principal agents tackling the problems will help promote resident happiness. Forming a community through exchanges between people is most important, and smart tech-

nologies will help realize it at a low cost and by reading peoples' minds effectively.

The concept of the smart city, which originated in Europe, actually began from the efforts to solve various problems of old European cities using smart technologies. Above all, the topic of 'sustainability' rests on the core of this approach. It is because human civilization on earth will no longer be sustainable unless global warming is prevented, the use of carbon energy is minimized, and waste is recycled into resources.

There is a place called District 22@ in Barcelona, Spain, which is known as Europe's representative smart city. This place, which is pronounced "22 Arba," is Spain's representative urban regenerating industry-academy-research institute-public sector innovation cluster centering on information and communication, media, design, energy, and medical technology. Various things are taking place here, including free Wi-Fi available across the city, free electric car chargers, smart trash cans, motorcycle sharing, and energy production using the heat from waste incineration.

Barcelona collects and analyzes the big data of free Wi-Fi users and uses them as a public service for residents with Cisco or Amazon. Also, the 'Superblock Project' demonstrates a paragon of the city that people want to live in by restricting vehicle access to roads in certain areas and transforming them into green spaces and spaces for exchange between people. The aspect of District 22@ that deserves our attention is that residents, start-ups, and SMEs can freely participate in this project and provide and support spaces to derive solutions for urban innovation. Developing attractive spaces and supporting the Living Lab (community-based urban problem solving project) is a typical best practice of a smart city.

Realizing a City's Sustainability through Smart Technologies

Those who live in the city today spend 100 minutes (1 hour and 40 minutes) a day, on average, commuting. For office workers living in Seoul, it is 134.7 minutes, which is by far the longest among OECD countries, but traffic congestion is everyone's problem. It is a social problem that all European cities face. Also, urban problems created by automobiles, such as air pollution from exhaust and the excessive use of fossil fuels, are very serious. 96% of cars driving through the city are resting in parking lots. We have to solve the reality that cars in the city are parked in the parking lots of the workplace all day or in the parking lot of the apartment complexes overnight. Eventually, Europe's concern is to reduce the number of available cars that are responsible for urban mobility. In fact, the Norwegian government is providing various free incentives to expand the supply of electric vehicles as part of its low-carbon policy. For an ordinary electric vehicle user, the registration tax as well as tolls, parking fees, and charging fees are exempted entirely. Because of this policy, Norway boasts the world's top electric vehicle penetration rate.

Above all, the reason why the world is so fascinated about the smart city is that they wish to create an innovative economic ecosystem to create jobs and to solve urban problems with the help of companies. They are trying to solve the problems by attaching economic value to social innovation. Cities have evolved slowly for a long time. Not everything can be designed in the head of a city planner from the beginning. With innovative services and products made by companies, urban problems should be solved and the quality of life of residents should be improved, which is why they seek the private sector's help.

In this context, Brainport, an innovation cluster in Ein-

dhoven, the Netherlands, or “StartupAmsterdam,” in Amsterdam, has recently evolved into the center of European start-ups. It operates special programs to support start-ups and provides common spaces. The city’s government directly helps them to advance into Asian markets such as South Korea.

Start-ups most primarily try to identify the problems of city dwellers and solve them with smart technologies, and the companies also make progress in that process. From the cooling and heating system using geothermal and hydrothermal heat to long-distance data transmission through the Internet of Things with the world’s first beacon living lab, and the introduction of the smart home system that checks energy usage in real time, all of these were created here. Start-ups of innovative young people are turning underdeveloped cities into new cities.

Lessons from smart cities around the world

The most important thing that the government officials of smart cities emphasized, when I had conversations with them, was the so-called public-private partnership, in which the city and companies work together to manage the city. In fact, the city’s government is not well aware of information technology (IT), biotechnology (BT), and energy technology (ET), and lacks the capacity to operate them.

They admit it as a fact honestly and recruit a Chief Technology Officer (CTO) from outside to lead the smart city project. The city solves its problems by consulting with private companies, and the thing they consider most important was the process of educating and persuading stakeholders to reach consensus. The emergence of a new city service always faces conflicts of interest with the principal agents of existing services. It is inevitable to move away from a system centering on owned cars and expand the

shared car service that shares existing cars to reduce the number of cars in the city. However, the emergence of such a service inevitably faces a backlash from existing operators such as the taxi industry. For residents, however, there is no choice but to move toward a sharing-based economy and the governments of European cities have been faithfully playing a major role mediating and deriving consensus among private enterprises.

According to an official from the Eindhoven government, it was necessary to persuade the police to introduce a system that analyzed the traffic flow with artificial intelligence and manage it efficiently, and they spent as many as three years to educate and persuade them. The message of the city government is that they will recognize the point and try to reach consensus once they realize the necessity of technology and that the benefits are returned fully to the residents. At a glance, the appearance and service of European smart cities does not look very different from that of ours. South Korea may complete it faster and make tangible results sooner or later. However, the governments in European cities are spending a slow but meaningful time because reaching consensus between stakeholders is quite important and those governments are active as the principal agents to mediate and resolve this.

Data are most important.

The essence of the successful smart city strategies of smart cities in Europe are ‘data and artificial intelligence.’

They need to obtain data about residents to identify their needs, understand their mindsets, and provide the service they demand. For this, all smart cities put in the greatest effort to obtain various data generated within them.

For example, there were 800 exhibition booths and 400 presentations at the Smart City Expo World Congress (SCEWC 2018) held in Barcelona, Spain in mid-November, and most of them were the introduction of the platforms that measure data with IoT, store the data using the cloud system, and analyze them with artificial intelligence.

In fact, even a data exchange opened in Copenhagen, Denmark. The city’s government as well as companies are making efforts to create synergy through data analysis by trading the data they obtain. The exchange has been running for only about a year and a half, and data trading is not active yet. Although they would need regulations on data to protect personal information, since data utilization is essential in improving public services, they explained that their role is to find a wise solution between the two needs.

A city becomes a smart city when they put data on the platform and analyze them with artificial intelligence to provide services for the city. There is no such city in South Korea yet, and the application of artificial intelligence is in the very early stages, even in Europe. There are many stakeholders and divided opinions on who will be responsible for the results when there is a problem with the services. However, since they took the first step to test the possibility, all trials and errors in the future will become the foundation for good services.

‘Selection and Concentration’ to ‘Connection and Fusion’

A characteristic of European smart cities is that they are led by the city’s government, not the central government. In each city, the local government chooses a topic and focuses on services and technologies related to it. From mobility to energy, urban regeneration, education, and healthcare, the subjects are

vast. What they most envy about South Korea’s smart city, the National Pilot City Sejong, is the city’s condition in which they can try mobility, energy, education, healthcare, governance, culture, and shopping in a single city, centering on the central government. In fact, the energy data can create enormous synergies when combined with mobility data. Healthcare and education data are essential for governance, and combining them can create a new service. I said, ‘South Korea is anxious about whether it should have chosen and concentrated on particular topics,’ and they said a city is a holistic space where you should not choose and concentrate. They thought there is no city in the world where they can miss out on any of the topics such as mobility, energy, education, healthcare, governance, culture and shopping, or jobs. In other words, ‘connection and fusion’ are the future of the city. Now, we can start with confidence.

The JoongAng Ilbo, December 14, 2018

Postscript: This article is the summary of what I felt from my visit to European smart cities with officials from the Ministry of Land, Infrastructure, and Transport and the Presidential Committee on the Fourth Industrial Revolution from November 11-22.

Establish an Office of Data and Data Exchange

Denmark established a data exchange three years ago.

India introduced electronic voting in the late 1990s.

Need for strategic data collection, effective management, and fair resolution of disputes

Expected to act as a catalyst for data capitalism

“I don’t need to know who it is. I only need to know if you are a man or a woman, and how old you are. Please let me buy just the data on movement, like which streets people flock to, which direction they usually go.”

“I want to sell my data to companies that can make use of where I go, what I eat, and what I buy.”

“It would be nice if we could trade particulate matter data or energy data between countries. Cross-border data exchanges are essential in building a particulate matter reduction system or in establishing an energy policy.”

The owner-operator who is preparing to open a café wants to obtain data about the population flow, but

it is difficult to know where and how to find them.

Also, it is possible to create new values with various data generated by individuals, but there is no intermediary agency to mediate data exchanges. It is necessary to share the data generated by each country to establish national policies elaborately on a global scale, but there is no agent to carry it out.

These are the examples that the person in charge at the data exchange in Copenhagen, Denmark told me while explaining why the exchange was established. Denmark has had such demand for a few years, and the government created an exchange that could manage data exchanges three years ago. Their logic is quite clear. If we agree that “data is money and oil in the 21st century,” they should make sure that data

with asset value can be properly traded, just like gold or stock exchanges.

‘If you think it is unfair, make a platform and gather your own data! It’s the age of the platform, now!’ This is not wrong.

Even for the data exchanged on the platform, the owner is not the platform operator, but the data producer. If so, the platform operator must also seek consent from the data owner and pay a reasonable price to use them. A few lines in the terms and conditions would not do. What about India? India’s general election, which is held every five years, began not long ago. There are a whopping 900 million voters in the 1.35 billion population of India. The voting period is as many as 39 days and there are 1 million polling places nationwide. The turnout is also high and more than 600 million people voted in the general election five years ago.

How does India manage so many votes, then? According to Shin Bong-gil, Ambassador to India, they solve the problem through 100% electronic voting. The number, name, and photograph of local candidates are listed on the electronic ballot at the polling place, and voters can simply press the button next to the candidate they support. Counting is done nationwide and simultaneously in a day, and the result is announced immediately. In other words, voting takes 39 days but counting, just a few hours.

One might think, “Everything is possible in the era of the fourth industrial revolution.” However, the elec-

tronic voting system was introduced in India only in the late 1990s. In the past, they voted on paper like we do now, but since there was no end to disputes over vote counting, they switched to electronic voting. One of the problems of the old system was that it took a whole week just to open the ballot boxes across India.

In the meantime, three federal general elections and 113 state elections were held through electronic voting. Once they introduced the system, they made continuous efforts to improve the voting system. The software has been upgraded every year, and voting machines were also improved with each vote. This also has greatly improved the security technology of India.

If you look at the technology only, there are many countries that can carry out electronic voting, but the problem is ‘social trust’. If there is a lack of trust between the government or political parties, it is difficult to introduce the system. For example, South Korea currently uses electronic voting in internal political party elections, but not in the national election, even when the electronic voting system the National Election Commission developed is considered the world’s best. The government should establish a data agency as soon as possible to solve this problem.

We must have a government agency that manages all of the country’s data and establishes a system that strategically collects data, manages it efficiently, and settles disputes fairly. The establishment of a data exchange and a data administration will be an op-

portunity for South Korea to adapt to data capitalism and to mature social trust further. Just as the establishment of a nationwide Internet network in the late 1990s fueled the development of IT technology, the establishment of an exchange and an organization in charge will make an immense contribution to the country in becoming a data powerhouse. It would be needed more urgently when a next-generation network, such as 5G, is built. South Korea is a country with very well-developed e-government, but has little quality data. It does even less efficient analysis or exchanges of data. According to the Future Consensus Institute, the UK established a “Digital Service Administration” in 2011. Also, 25 government departments and 376 government agencies have integrated their websites since 2017, and all policies, announcements, publications, and statistical information are serviced through a single window.

There are things to do first when the Data Administration is established and a data exchange is established. First, you need to properly establish data standards. Data, fragmented without standards, are useless. The Data Administration should establish standards and establish and manage inter-compatible protocols. Laws and systems must be innovated. Current data-related laws are outdated, not suitable for a super-connected intelligent network-based data society at all. Privacy should be protected thoroughly, but the use of various data should be encouraged, and users should tighten the security by themselves to prevent damage to citizens.

“Is the exchange working well?” I asked the person in charge of the data exchange in Denmark. The answer

was an unexpected one. “We still have trials and errors. There is a long way to go, but I think this experience is an asset. Even trials and errors are converted into data. Others will need our trials and errors data first in the future.” Dumbstruck, but my mind was clear.

The JoongAng Ilbo, April 20, 2019

Meaning of a Place in a City

Unique independent bookstore, local hub bookstore

Building trust by forming a connection with local residents

Now, find “necessities and functions” online

What does the place mean in the future city, then?

Digital Twin changes the meaning of urban space

A space that provides experience and community is the future

The summer holidays began. I took the time I hadn’t been able to for a while and took a lecture tour around local bookstores. Starting from the Indigo Seowon in Busan, I visited Spring Day in Tongyeong, Sum in Gwangju, Jinju Mungo in Jinju, and Hangil Mungo in Gunsan.

I had a great time, giving free lectures for about an hour, signing books for readers, and taking pictures with people. Some bookstores offered local specialties by putting more hearts into them instead of lecture fees, and some others treated me to delicious local food. The best part of the joy I get from publishing books are the times I get to meet my readers.

During the past 20 years, the publication market was halved in South Korea. The number of books sold

has dropped significantly, and since most of them were sold at internet bookstores, the number of local offline bookstores decreased drastically. Only stationery stores selling home-study materials survived to supply books to local communities. Meanwhile, large bookstores are opening branches one after another in local cities and selling books through their strong brand power and distribution networks. By applying the strategies of Tsutaya, the hit bookstore chain of Japan, they adopted a new form of curation to display books by keyword and provide a space to read books. Large bookstores are transforming into complex cultural spaces that sell other products like beverages.

In the meantime, local hub bookstores with years of tradition and independent bookstores with distinct

character are making some progress in the region. It was these local hub bookstores and independent bookstores that I visited during my lecture tour last week. It was intended to rekindle the “reading culture” which has faded and to add a little strength to these bookstores that have to put up a fight against large bookstores.

Local hub bookstores usually take up a whole building. Their strength is the network of local residents who have given their trust and become regulars.

They hold lectures by authors, operate courses on various topics, and provide locals with a place to hold book club meetings. When there is an event, they promote it through social media or text services, and the seats are filled in no time, indicating that local residents are thirsty for cultural events.

Having a unique character is the key to independent bookstores. Books on ecology, the environment, literature and art, and local culture, the ones that show the owner’s philosophy, fill the shelves in these book stores. In each corner, there are books that the owner actually read and selected carefully, raising the chances of finding valuable books. There is joy in discovering books just by looking around. Also, these independent bookstores are so pretty and full of character, making a tour of local bookstores an essential part of traveling to different regions.

In terms of sales, local hub bookstores and independent bookstores are still struggling. However, they prepare and show us ‘how the city will change in the future.’ As we are approaching the so-called

fourth industrial revolution, most of the phenomena that are taking place offline will turn into online data. If the real world is completely replicated as an online world of bits, to the extent that it is called a ‘digital twin,’ we can handle most of our work online, where it is faster and costs less.

Today, books are not the only thing that you buy online. The culture of shopping at large discount stores is gradually disappearing, and more people purchase household goods and food from online markets that even operate special delivery policies such as “Rocket Delivery” and “Early Morning Delivery.” Even a few years ago, when I gave a lecture like this at a company that operates large discount stores, they responded, “They can do that with bottled water and chips, but they would have difficulty with meat, vegetables, fruits, and the like, which account for a huge portion of sales.” However, as online markets build trust, it is already a world where consumers are purchasing even those hard-to-handle items online.

We even buy clothes online. “Wait a minute, professor. You know nothing about the fashion industry. People don’t buy clothes even after trying them out, and you are saying that the time will come when people would buy them even without trying them?” The companies that asked this are now having trouble because they could not join the online shopping industry in a timely manner. We are living in an era when some companies analyze your fashion preferences with artificial intelligence to coordinate and deliver clothes to you every week, but South Korean fashion companies still cannot afford to use IT.

“PAY” or online banking is now replacing banking, making it unnecessary to actually visit a bank branch. In a world where food is delivered in 30 minutes once you place an order, everything you need is delivered to your door in a day, and as even work recommends you to work at home, ‘places you need to go’ and ‘places that perform certain functions’ are gradually disappearing in the city.

In the future, we will be asking ourselves why we even leave our homes, what physical space means to us, and so on. In the digital twin, the real world faces very fundamental questions. What would a place mean in the future city?

Cities will have fewer ‘spaces that fulfill needs’ and more ‘places that provide chances to experience things and spaces for communities.’ In other words, we will look for places to experience something and visit places to meet someone. We will buy books at Internet bookstores, but visit a local bookstore to meet authors and hold book club gatherings with fellow readers. We will visit independent bookstores to explore the uniquely coordinated bookshelves, drink tea, and taste the scent of the place. We will take a trip to spend the night with books at the bookstore.

How would bank branches change? How would a large discount store provide new experiences and satisfy the social nature of people? What would a clothing store offer its customers that online shopping malls cannot offer?

Companies and local governments must answer these questions. They should understand that ad-

vanced science and technology transforms the future city into a human city rather than a Technopolis. Technology will take on the role of efficiently providing functions and needs to people in an invisible place, and urban spaces will gradually evolve toward intensifying human relationships and direct experiences. Companies and local governments that realize this lesson before others will bring the future of the city forward.

The JoongAng Ilbo, July 9, 2019

Index for Abbreviations

- Sejong National Pilot Smart City ▶ **National Pilot City**
- Sejong National Pilot Smart City Master Planner Jeong Jae-seung ▶ **Master Planner Jeong Jae-seung**
- Sejong National Pilot Smart City Master Plan Team ▶ **Master Plan Team**
- The Ministry of Land, Infrastructure, and Transport ▶ **MOLIT**
- Korea Land & Housing Corporation ▶ **LH**
- Sejong Metropolitan Autonomous City ▶ **Sejong City**
- National Agency for Administrative City Construction ▶ **NAACC**

Sources

- p.039_Source 1:** Excellent Cities by Element among Top 10 Cities / National Strategic Project - Smart City, January 2018, Korea Agency for Infrastructure Technology Advancement (KAIA)
- p.129_Source 10:** Internal Data, Korea Transport Institute
- p.170_Source 13:** Energy and Environment Task Management Card
- p.171_Source 14:** Interim Report, Research Service on the Introduction of Innovative Technologies for Energy and Environment
- p.209_Source 24:** Final Report, Research Service on the Introduction of Innovative Technologies for Smart Living (Park Area), EM Design

Jeong Jae-seung Master Planner · Master Plan Team

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Sejong National Pilot Smart City

Masterplanner & Masterplan team

2018.01 - 2019.10