DEAPCITY
스마트시티 혁신성장동력 프로젝트 사업단

KAIA

Urban Transformation by Smart City

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KAIA

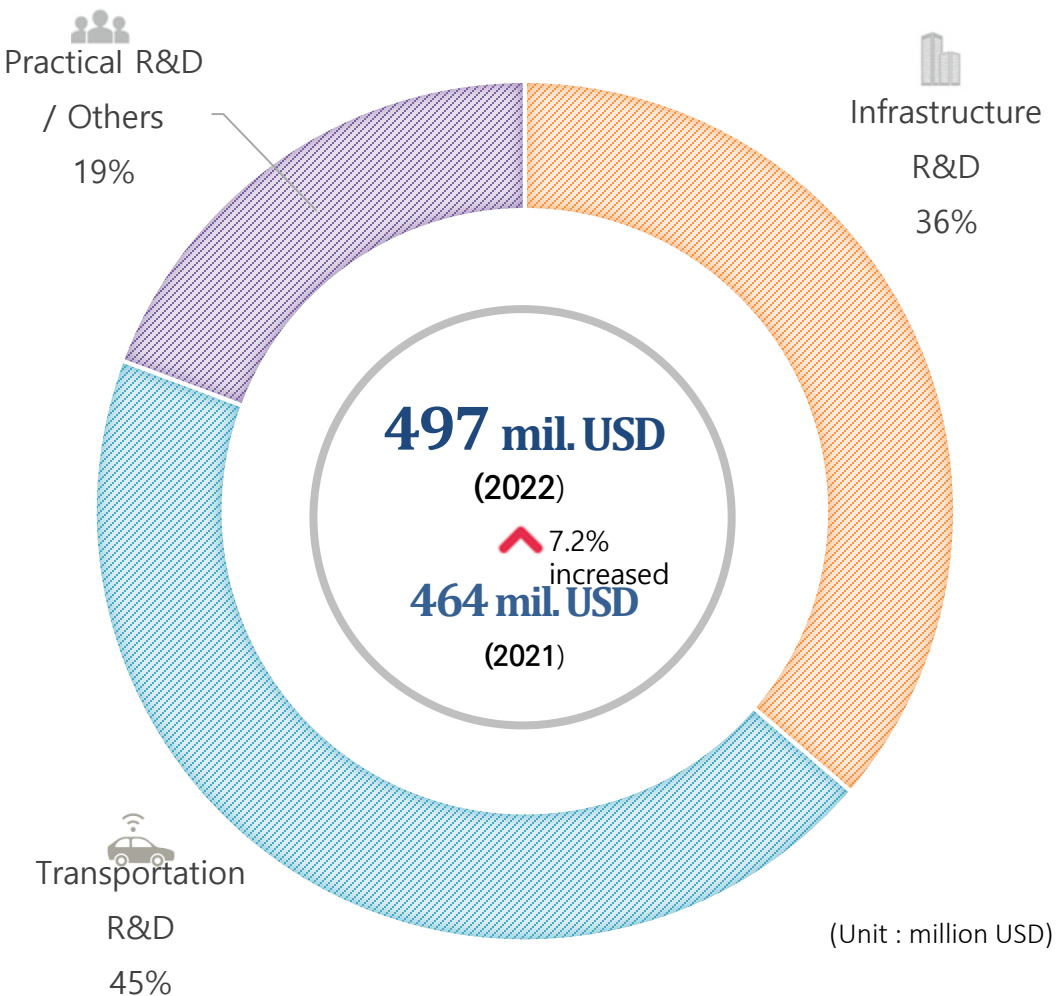
Contents

1. Introduction of KAIA

Introduction

Legal Basis : The Land, Infrastructure, and Transport Science and Technology Development Act

R&D Budget : 497 mil. USD in 2022 (land, infrastructure, urban planning, housing, and transporta



(Unit : million USD)

Infrastructure R&D	140 mil USD

- Construction Technology / Smart Construction
- Plant / Hydrogen Pilot City
- Urban Architecture
- Residential Environment
- Land Space Information
- Smart City

Transportation R&D	209 mil USD

- Transportation Logistics
- Autonomous Vehicle
- Railway Technology
- Aviation Safety Technology
- Unmanned Aerial Vehicle

Practical R&D / Others	148 mil USD

- Infrastructure and Transportation Technology Promotion (Facilitated Research)
- R&D Technology Commercialization Support
- Regional Specialization
- Research Planning
- R&D Performance Utilization

R&D Process

R&D Planning

- ☑ **Comprehensive R&D Plan** for Land, Infrastructure, and Transportation (Top-down, mid&long-term)
- ☑ **Technical Demand Survey** (Bottom-up, 2 times per year)

→

- ☑ **Planning Study** (about 1-2 year)
- ☑ **Reviewed by MOLIT**
- ☑ **R&D Preliminary Feasibility Study** (by Ministry of Science and ICT)

R&D Management

- ☑ **Announcement** of yearly plan (every Feb.)
- ☑ **Selection of Research Institution** (by participants' competition)
- ☑ **Contract** with selected researcher

→

- ☑ **Management** by communicating with the ministry and researcher
- ☑ **Annual Evaluation** (every Dec.)
- ☑ R&D **Outcome Sharing** and **Technology Commercialization**

1 Introduction of KAIA
Role of KAIA

Mission
Purpose of establishment

Contribute to creating future growth engines and improving people's quality of life by innovating and fostering science technology in the fields of land, Infrastructure, and transportation

History
History of Innovation

Dec 2002 Korea Institute of Construction and Transportation technology Evaluation and Planning was established

Apr 2007 Designated as a quasi-government organization

Apr 2013 Renamed to the Korea Agency for Infrastructure Technology Advancement (KAIA)

Jun 2016 Legal basis for the agency was enforced

* Article 16 of the Land, Infrastructure, and Transport Science and Technology Development Act

Assignments
Main Businesses

- Demand survey, planning, technical expectancy, evaluation, and management for R&D projects in Land, Infrastructure and Transport
- Certificate new technologies in construction, transportation, and logistics (including transportation card certification)
- Technology value evaluation and technology transaction
- Human resource development and technical finance support by fund raising

1 Introduction of KAIA
R&D Achievement_Infrastructure

Superlong-Span Bridge

- Domestic production of construction equipment for suspension bridge cables
- Applied to the Yi Sun-sin Bridge in Yeosu, Korea(2011), the Third Bosphorus Bridge(2016) and design of the world's longest suspension bridge in Turkey, the Canakkale bridge(2018)

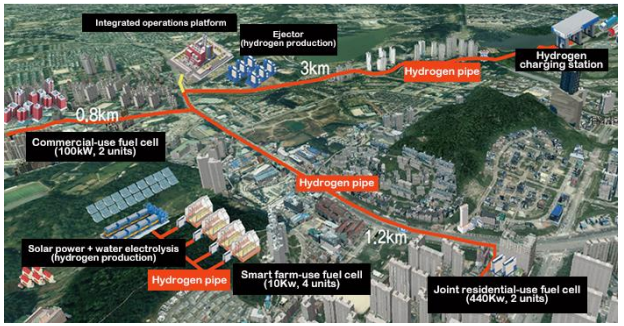
Skyscraper (High-rise building)

- Developed technology for high-rise building design and construction
- Applied to Kingdom tower (Saudi Arabia, 2017), Lotte World tower (Seoul, 2016), L-city tower (Busan, 2019), etc.

LNG Plant

- Developed technology for building the world's largest LNG storage tank (270 million liters)
- KOGAS applied the final design to build three plants at its Samcheok receiving terminal (2017)

Pilot Hydrogen City Project



- Creating a city which using hydrogen fuel as main power source for heating, cooling, electricity, and transportation, and etc.
- Building pilot cities in Ansan, Ulsan, Jeonju, Wanju, and Samcheok since 2019

1 Introduction of KAIA
R&D Achievement_Urban & Housing

Smart and Safety Security Service

- Developed Smart and Safety Security Service using precise positioning solutions and 3D object detecting technique based stereo CCTV
- Constructed an intelligent crime prevention zone based on spatial information in the Indeogwon District of Anyang (2016)

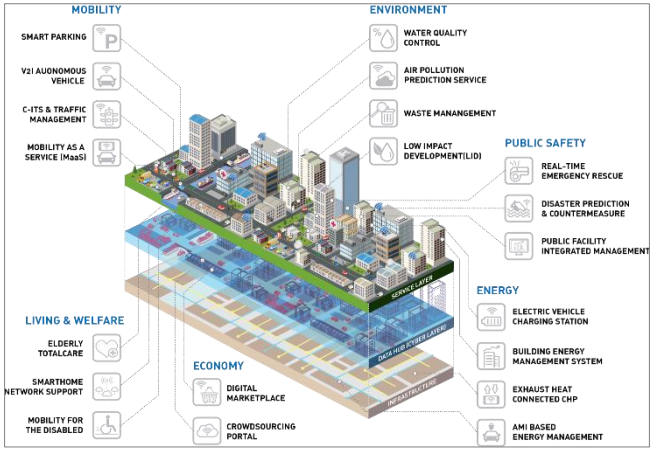
Modular Building (Prefabricated)

- Developed a prefabricated housing technology with high economic feasibility and residential performance
- Built test sites in Gayang-dong, Seoul and Dujeong-dong, Cheonan (2018)

Zero-Energy Housing

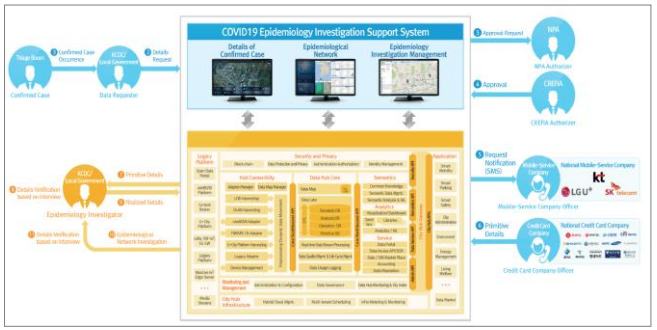
- Secured design and construction technology for zero-energy housing
- Constructed a multifamilty housing in the Nowon District of Seoul and was certified by the International Passive House Association in Germany (2017)

National Strategic Smart City R&D Program and COVID-19 Smart Management System (SMS)



- Launched for developing standardized Open Data Hub Architecture as a data-centric smart city
- Working on demonstration city at Daegu and Siheung since 2018

- COVID-19 SMS is enabled the automation of the epidemiological investigation process using huge amount of data from Smart City Data Hub Platform of NSSC



1 Introduction of KAIA
R&D Achievement_Transportation

Catenary-free Low-Floor Tram

- Developed technology for the commercial use of catenary-free low-floor trams
- Exported to the cities of Izmir (2014) and Antalya (2015) in Turkey

High-Speed Electric Multiple Unit

- Developed a commercialized technology for high-speed EMU, with a maximum speed of 421.4 km/hr (the fourth of its kind in the world)
- Received the Prime Minister's Award (the National Grand Prize in Technology) and was contracted to supply 130 models for commercial use

Urban Transit Maglev Train

- Commercialized the world's second urban transit maglev train
- Maximum speed of 110 km/hr; opened the Incheon International Airport Line (2016)

Autonomous Vehicle Testing City

- Constructed K-city, a virtual city where autonomous vehicles will be tested(2018)

Smart Tolling System

- Commercialized toll payment technology using a wireless communication and image recognition system
- Applied to tollgates in West Busan, South Incheon, West Yeongam, South Suncheon, and North Daegu

Two-Seater Light Aircraft

- Local production of two-seater light aircraft (KLA-100)
- Successful first flight (2017)

Automatic Immigration Clearance System

- Developed the world's first automatic immigration clearance system
- 52 machines in operation at the Incheon International Airport

2. Overview of Smart City

2 Overview of Smart Cities
Definition of Smart Green City

Smart Green City is one where there is "effective and sustainable integration of physical, digital and human systems in the built environment to deliver a green, prosperous and inclusive future for its citizens"

The Purpose of Smart city

Solution

Through a data-driven Smart City

Resolve urban problems

Sustain-ability

With protecting environment, energy and the underpreviledged

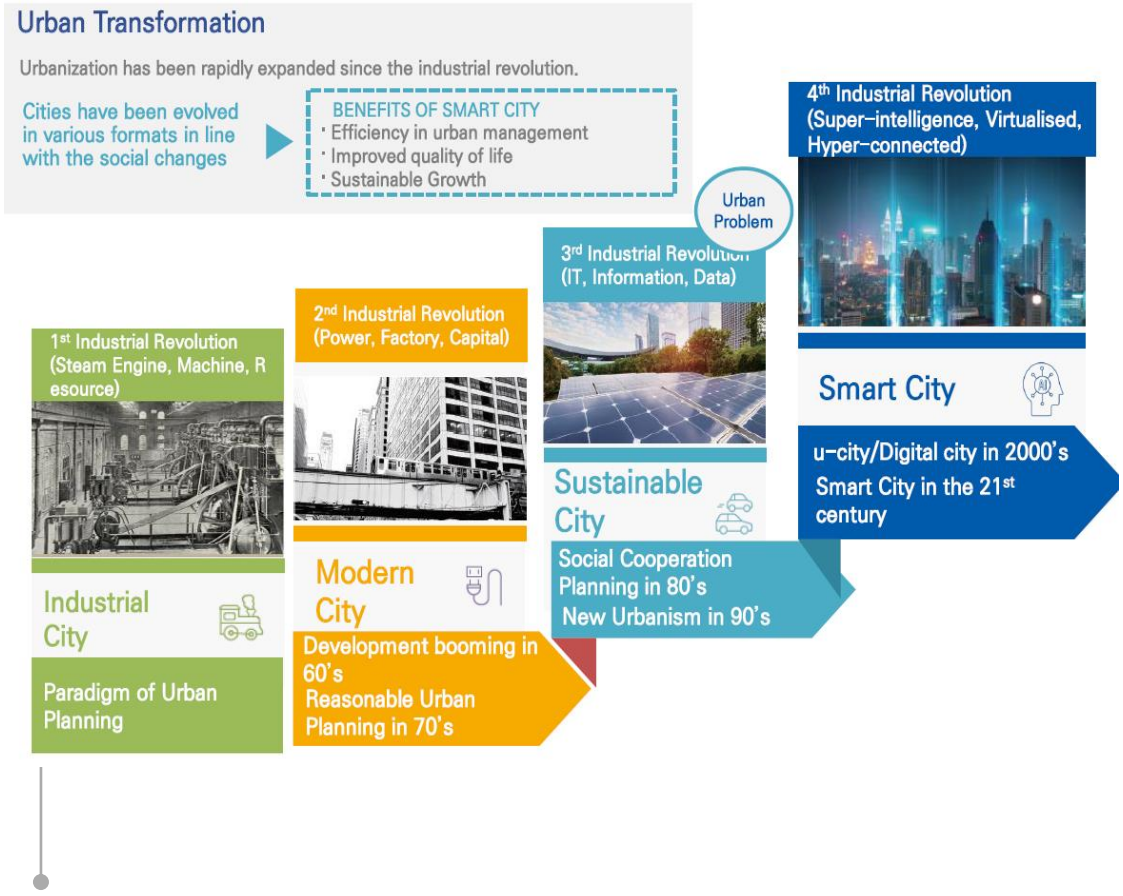
Pursue Sustainable Growth

Digital

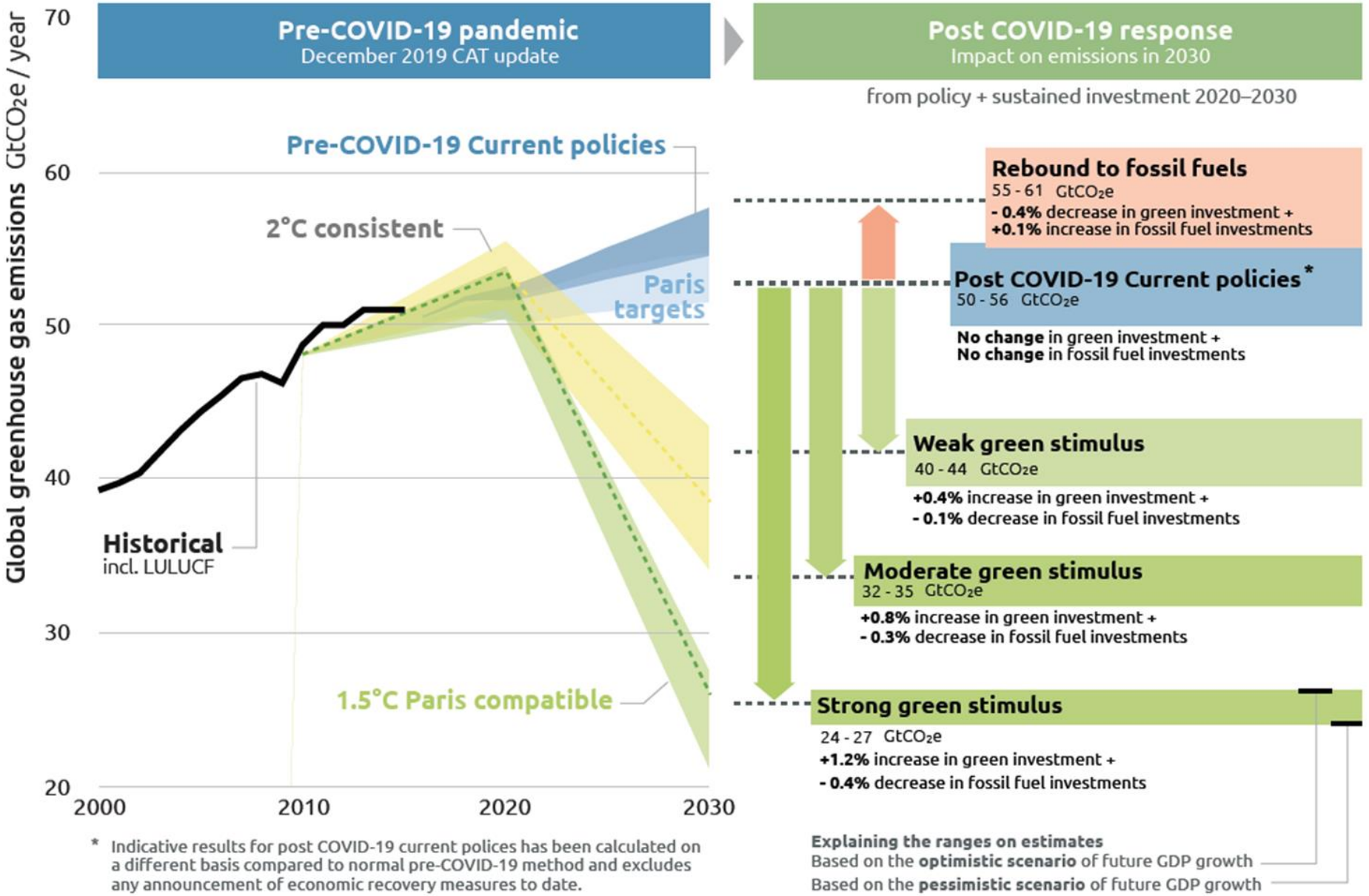
Through the spread of Smart City

Promote Digital Economic Development

Industrialization and Evolutionary City



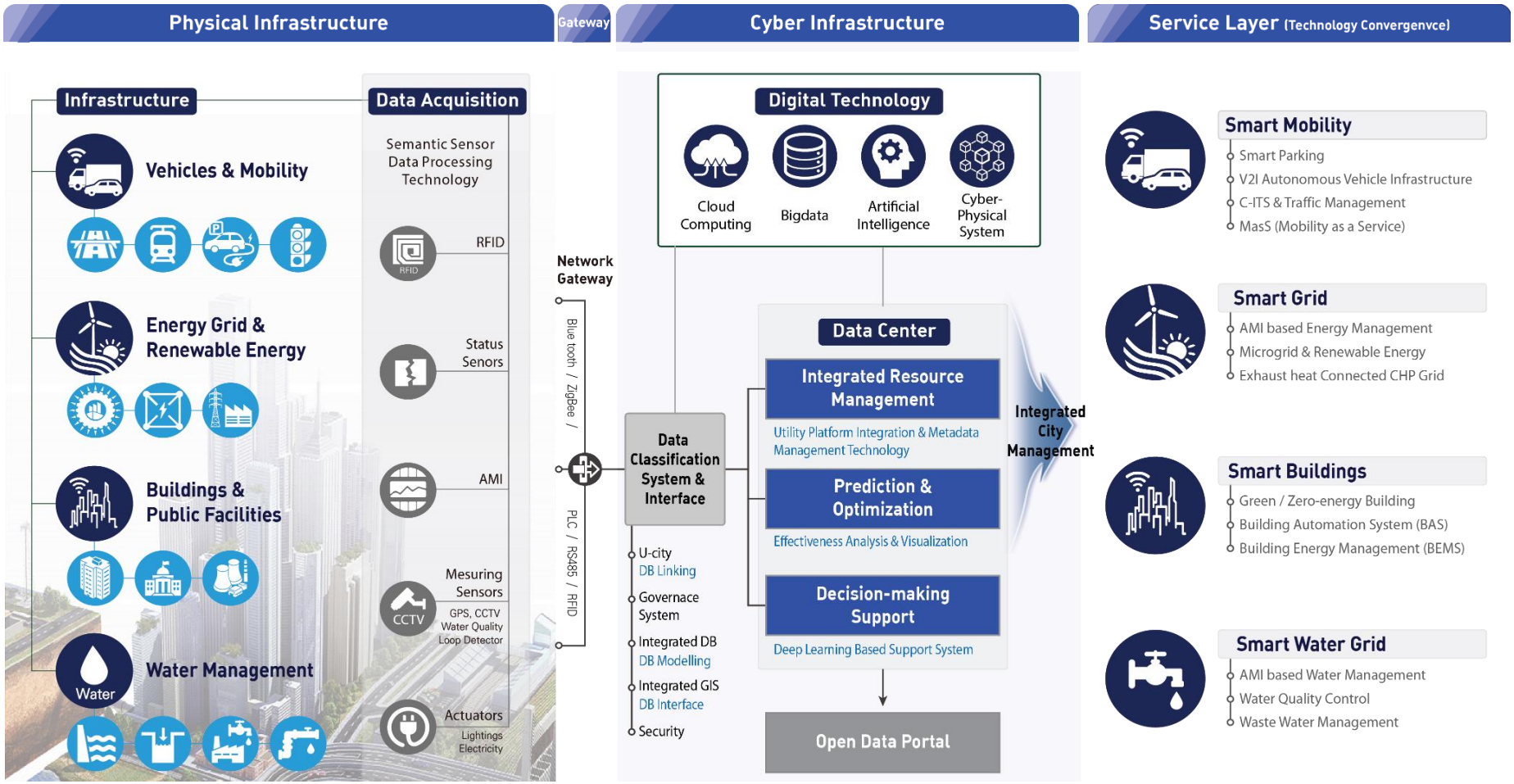
CO_2 Emission after COVID-19



* Indicative results for post COVID-19 current polices has been calculated on a different basis compared to normal pre-COVID-19 method and excludes any announcement of economic recovery measures to date.

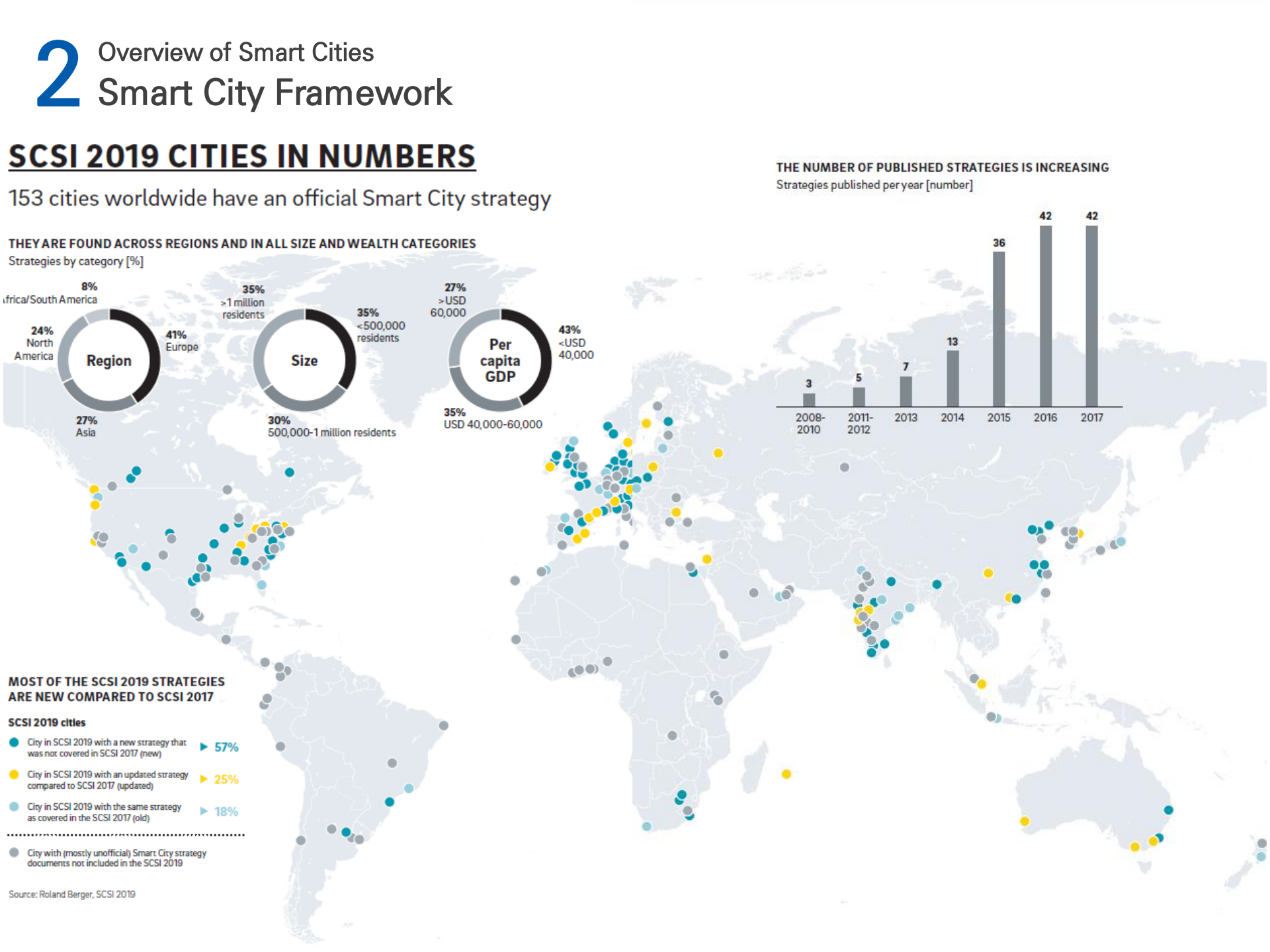
2 Overview of Smart Cities
Smart City Framework

Smart City can be structurized and connected with Built environment, Cyber infrastructure, and Social systems



SCSI 2019 CITIES IN NUMBERS

153 cities worldwide have an official Smart City strategy



Source: Roland Berger, SCSI 2019

2 Overview of Smart Cities
Smart City Innovation

Innovative projects are breakthrough for protracted economic depression while Cities are deriving creative solutions on city issues through citizen-engaged Living Labs.

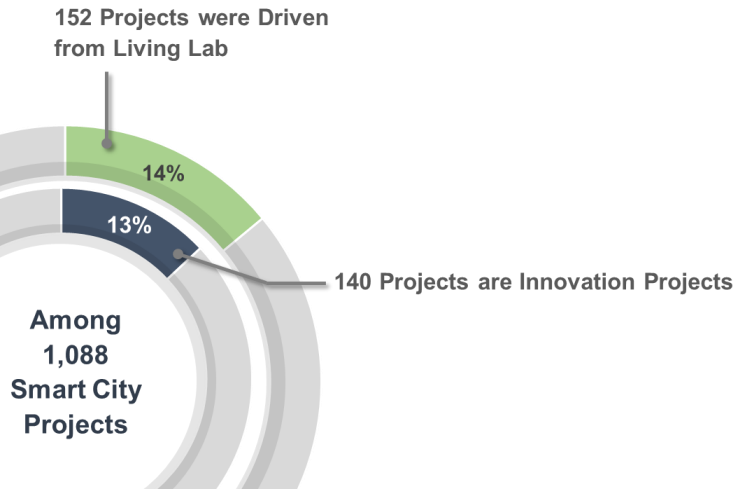
Living Lab Driven or Innovative Smart City Projects

*

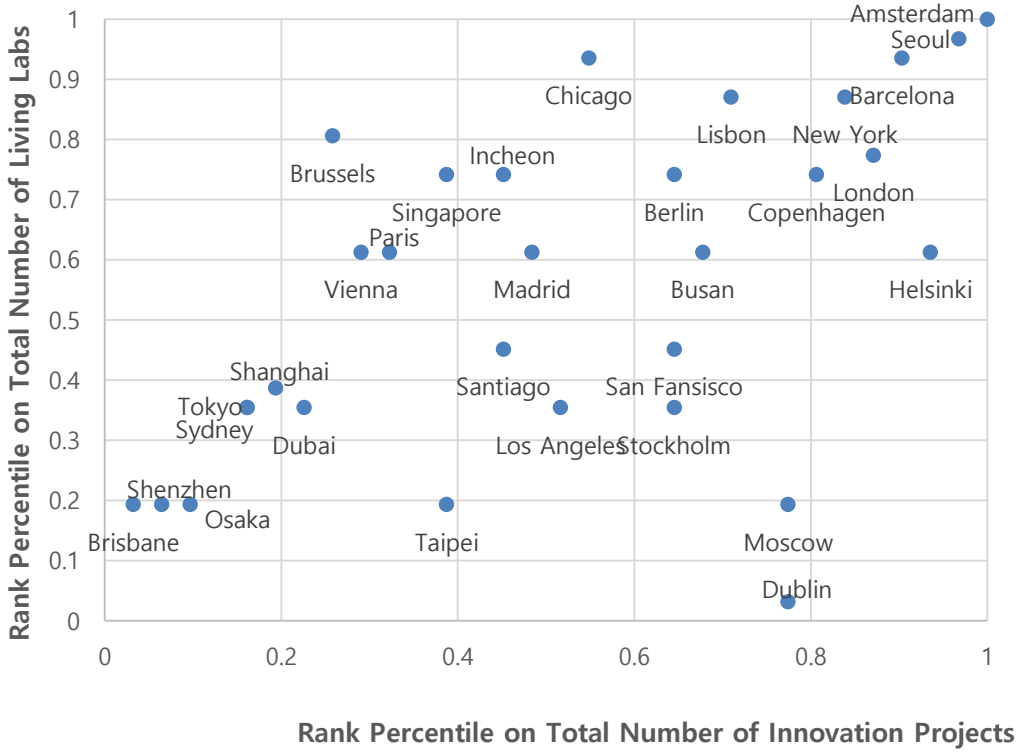
Missions of Innovation Projects▼

■ : New Business model ■ : Start-up Incubation □ : Job Creation

□ : Special Business Zone ■ : Others



Rank Percentile of 31 Smart Cities on Innovation Projets and Living Labs



3. Smart City Activites in Korea

3 Smart City Activities in Korea
Overview – Korea Smart Cities Activities

Korea Smart City Activities are spreading out across the country

Seoul•Incheon•Gyunggi(21)

- Seoul
- Mapo-gu, Eunpyeong-gu, Seocho-gu, Sungdong-gu Koyang, Kwangmyeong Namyangju, Suwon, Siheong, Ansan, Yongin
- Incheon, Bucheon, Suwon
- Namyangju, Bupyung-gu, Koyang
- Bucheon, Sungdong-gu
- Siheong

Chungbuk(5)

- Yongdong-gun, Jinchun-gun, Chungju
- Jinchun, Jechun

Daejeon•Sejong•Chungnam(8)

- Seosan, Asan, Chunan
- Daejeon
- Daejeon, Buyeo-gun
- Sejong
- Sejong Jochiwon
- (5-1 Living Zone)

Jeonbuk(3)

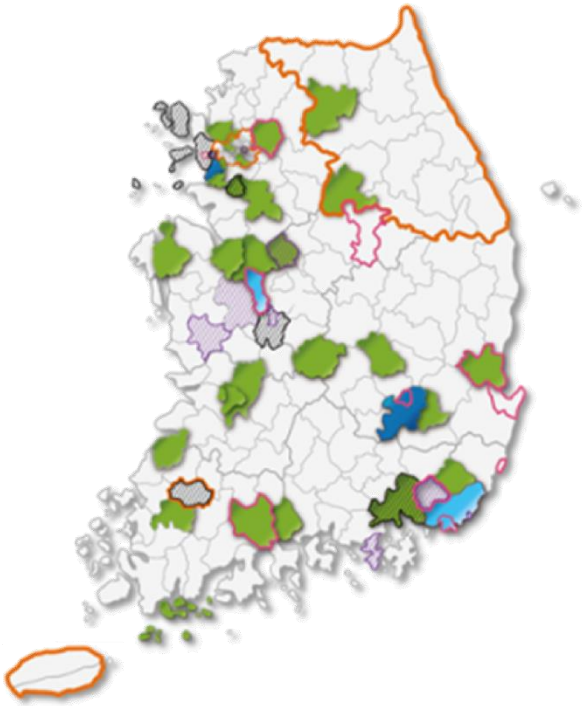
- Kochang,-gun Wanju-gun, Jeonju

Gwangju•Jeonnam(7)

- Gwangju
- Gwangju
- Gwangyang, Naju, Sunchun, Wando-gun
- Sunchjun

Jeju(1)

- Jeju-do



Gangwon(3)

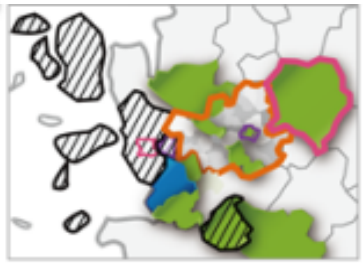
- Gangwon-do
- Wonju, Chunchun

Daegu•Kyungbuk(8)

- Gyungsan, Gumi, Pohang
- Daegu
- Daegu Buk-gu, Pohang(2)

Busan•Ulsan•Gyungnam(12)

- Busan Gangseo-gu, Gimhae, Yangsan, Changwon
- Gimhae, Busan Saha-gu, Ulsan Dong-gu
- Changwon
- Gimhae, Tongyoung, Busan Suyung-gu
- Busan (Eco-Delta)

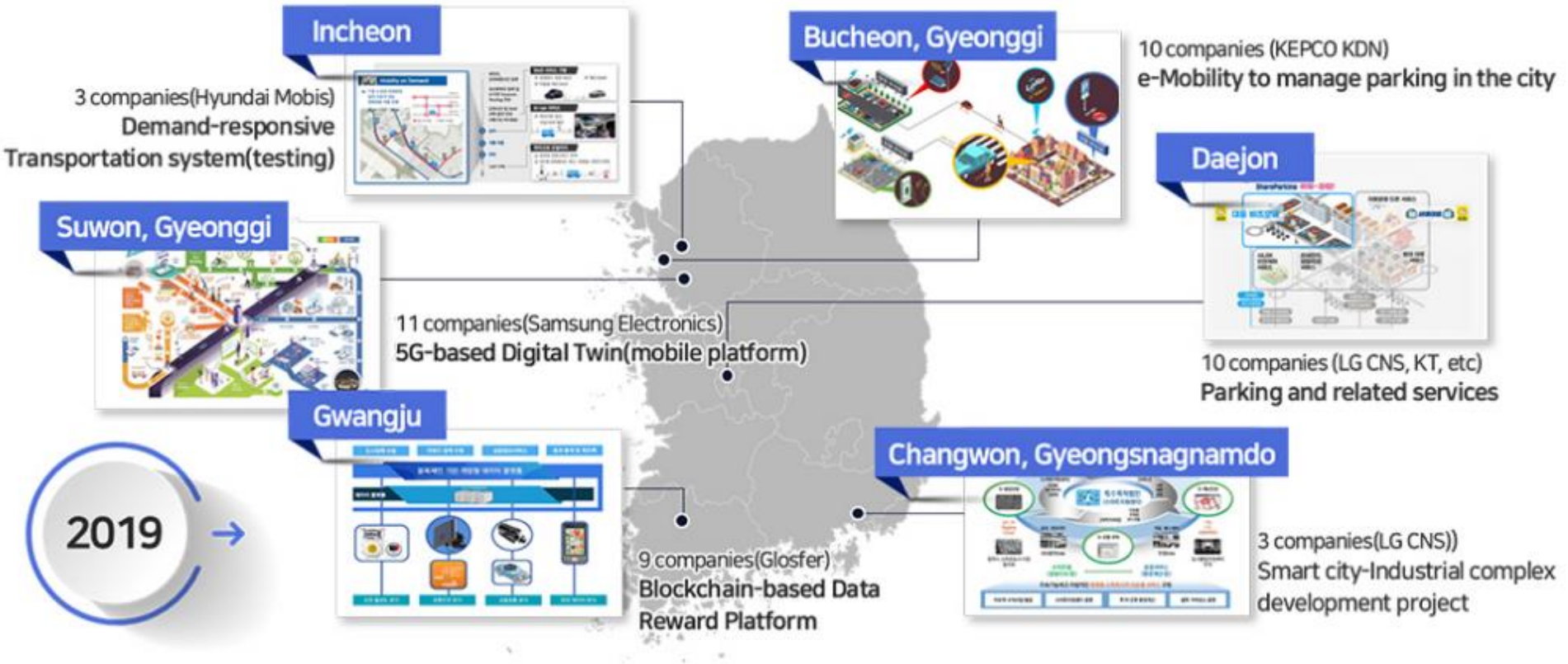


- Thematic Town
- Smart City Challenge
- Smart Urban Regeneration
- Smart City Platform(Metro)
- Smart City Platform(Medium)
- National Pilot City
- National Strategic Smart City R&D

3 Smart City Activities in Korea
Smart City Challenge Program – Overview

Smart City Challenge Program

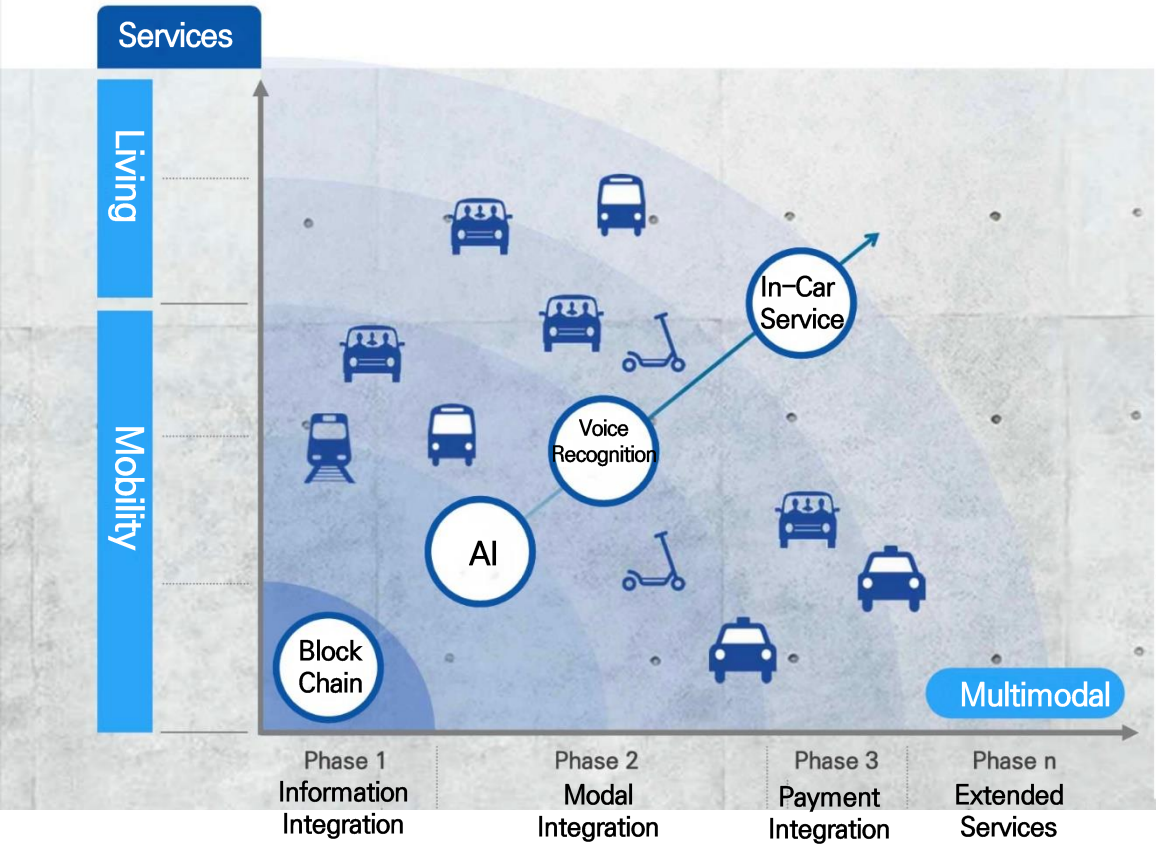
2021 : Daegu, Chuncheon, Choongbuk, Pohang
2020 : **Gangneung**, Kimhae, **Busan, Jeju Island**
2019 : **Incheon, Bucheon, Daejon**, Suwon, Gwangju, Changwon

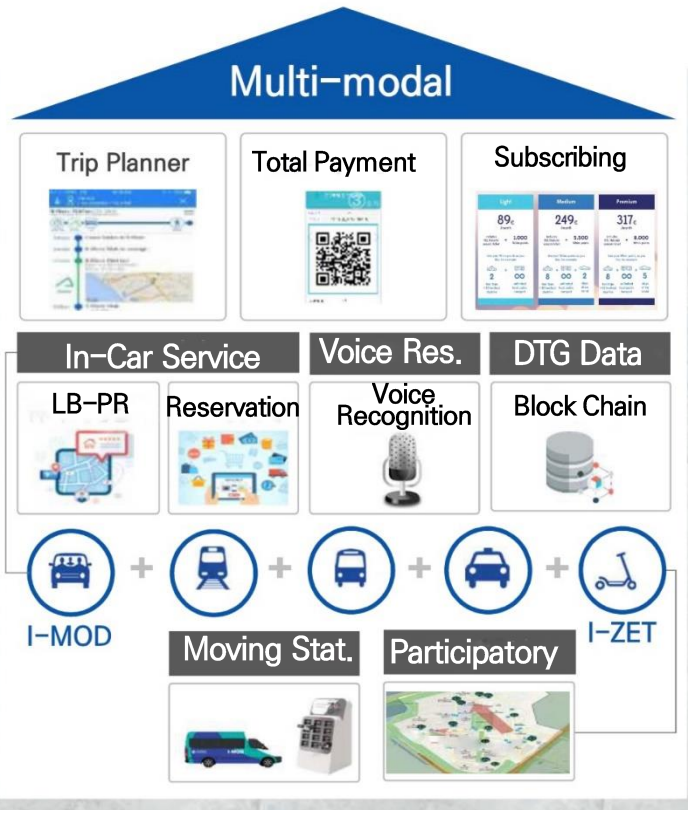


3 Smart City Activities in Korea
Smart City Challenge Program – Incheon(2020)

Smart City Challenge : Incheon (2020~2023)
Demand Responsive Mobility Solution – Multimodal Service

Mission : Improvement of Mobility Service and Establishment of Multi-modal Standard for connectivity to existing public transportation system





3 Smart City Activities in Korea
Smart City Challenge Program – Incheon(2020)

JBNEWS 22.08.03

Cheongju City launches the first Demand Responsive Bus pilot project in Chungbuk province

In September of this year, Cheongju City will launch a demand-responsive bus (DRT), also known as Cheongju Call Bus," in the Osong-eup area as a pilot project. This marks the first DRT pilot Introduction by a basic local government in Chungbuk province.

Pilot Project Design Overview

- Operating period : 2022. 10. 05 ~ 2023. 03. 31 (6 months)
- Operating area : 30㎢ (Residential population 24,500)
- Number of operating DRT vehicles : Operating 3 vehicles (with 1 fixed-route bus)

Suggestion for Cheongju City

92% reduction in waiting time
The previous 84.5 minutes → Less than 7 minutes for DRT

44% reduction in bus mileage
The previous 1,158 km → 654km for DRT

21% reduction in transportation costs
The previous 870 Million Won → 690 Million Won for DRT

	Average Daily Waiting Time	Daily Average Mileage	Cost per day of operation
Before DRT Service	84.5 min	1,158 km	870 Million Won
	92% reduction forecast	44% reduction forecast	13% reduction forecast
Forecast TAMOS-P Simulation	7 min	654 km	690 Million Won
	The pre-operation simulation was based on the introduction of 4 DRT vehicles In actual operation, only 3 DRT vehicles were deployed, resulting in differences in the data		
After DRT Service	19.3 min	693.7 km	Analyzing

3 Smart City Activities in Korea
Overview – Korea Smart City Strategy

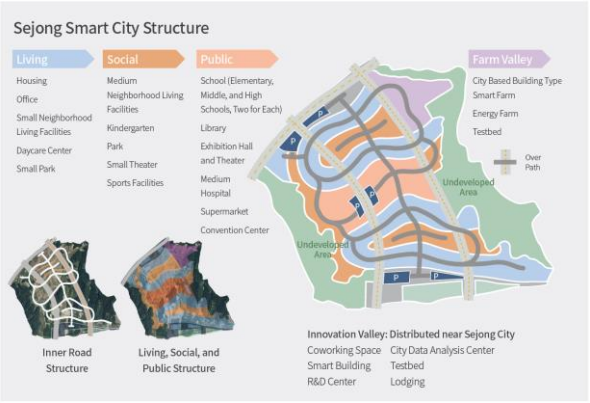
Sejong 5-1 District

Location : Sejong Hapganri
Area : 2.7 km2
Duration : 2020~2025
Developer : Sejong City, LH
Innovative Solution(7) : Mobility, Healthcare, Education, Energy/Environment, Governance, Culture/Shopping, Job Creation

Busan Ecodelta City

Location : Busan Gangseoku
Area : 2.8 km2
Duration : 2021~2026
Developer : Busan, K-water
Strategic Program : Robot, LWP, Administration, Smart Water, Zero Energy, Education & Living, Healthcare, Mobility, Safety, Park

3 Smart City Activities in Korea
National Pilot Program – Sejong 5-1



Sejong National Pilot Smart City Land Utilization Plan Development Status

Appointment of Prof. Jeong Jae-seung as MP

Announcement of the Basic Conception Plan Provide a humane and natural environment from the city instead of parading technology

Resolution of the National Smart City Council Apply new values of mixed use to urban planning

The 1st Plan Adjusting Working-Level Consultation Planning in consideration of the integrated development of elementary, middle, and high schools and the commuting distance to schools

The 2nd Plan Adjusting Working-Level Consultation Development of road alignment, including the Circulation Ring and program redeployment

Reexamination of the Land Utilization Plan Review of the land utilization plan from square one by reflecting the philosophy of MP


past

18.04.


18.07.


18.12.


19.01.


19. 01.


19.01.-19.02.

Multifunctional Administrative City 5-1 Living Zone Master Plan Innovative Sejong National Pilot Smart City, Connecting People and Technology

Approval of execution plan scheduled

19.03.


The 3rd Plan Adjusting Working-Level Consultation Value in Preserving the Original State Green Axis Connecting the Mountains and Hapgang River

19.04.


The 1st Ministry of Land, Infrastructure, and Transport Spatial Plan Advisory Committee Meeting Block-sized Segmentation and Greenness Adjustment to Activate Walking

19.05.


The 2nd Ministry of Land, Infrastructure, and Transport Spatial Plan Advisory Committee Meeting Subdivision of the master plan, two elementary schools, and roads

19.06.


The 3rd Ministry of Land, Infrastructure, and Transport Spatial Plan Advisory Committee Meeting Development of mountains preserved in their original state as artificial parks Placement of One elementary school

19.07.


The 50th Revision of the Development Plan Currently the final land utilization plan approved

19.09.


The 4th Ministry of Land, Infrastructure, and Transport Spatial Plan Advisory Committee Meeting Supplementation of the land utilization plan after the approval of the development plan

3 Smart City Activities in Korea
National Pilot Program – Busan EDC

The Busan pilot city with the concept of data and augmented reality, is creating of cutting-edge waterfront city through 10 innovative factors such as robots, water, and energy. In particular, it is a city specialized in water by applying smart water management technology in the entire urban water cycle (rainwater-river-sewage-reuse) and will also build zero energy system that achieves 100% energy self-sufficiency by utilizing renewable energy source from nature such as hydro and solar energy.

Busan Pilot City - Core Innovative Factors

Energy A city that secures energy self-sufficiency by meeting its energy need from new sources like fuel cell plant, hydrothermal energy

60MW Fuel Cell Plant

Produce electricity and energy from fuel cell plants

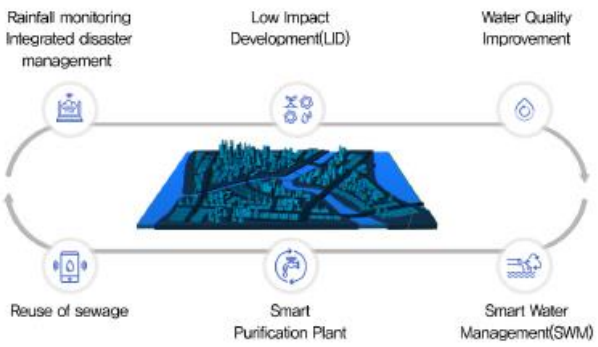
Hydrothermal Energy (10% of total energy need)

Obtain energy for heating and cooling by extracting heat from surface water

Robot A global robot city with emerging robotic industry and robot-friendly infrastructure that integrates robots to daily life

Water Develop a Korean Water-Specialized City by implementing all the cutting-edge technologies related to water throughout the entire water cycle(rainwater-river-sewage-reuse)

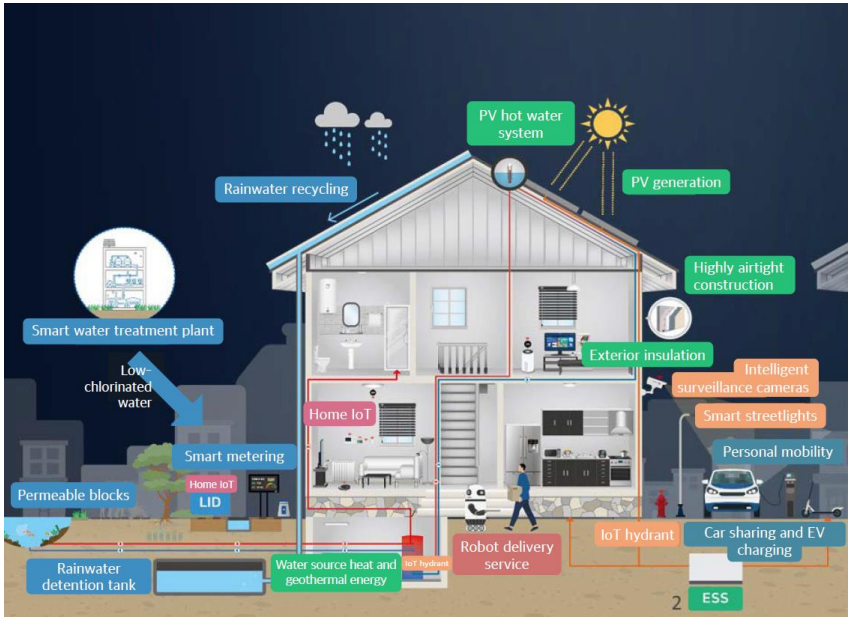
100% Water recycling with smart water technologies



3 Smart City Activities in Korea
Overview – Korea Smart City Strategy

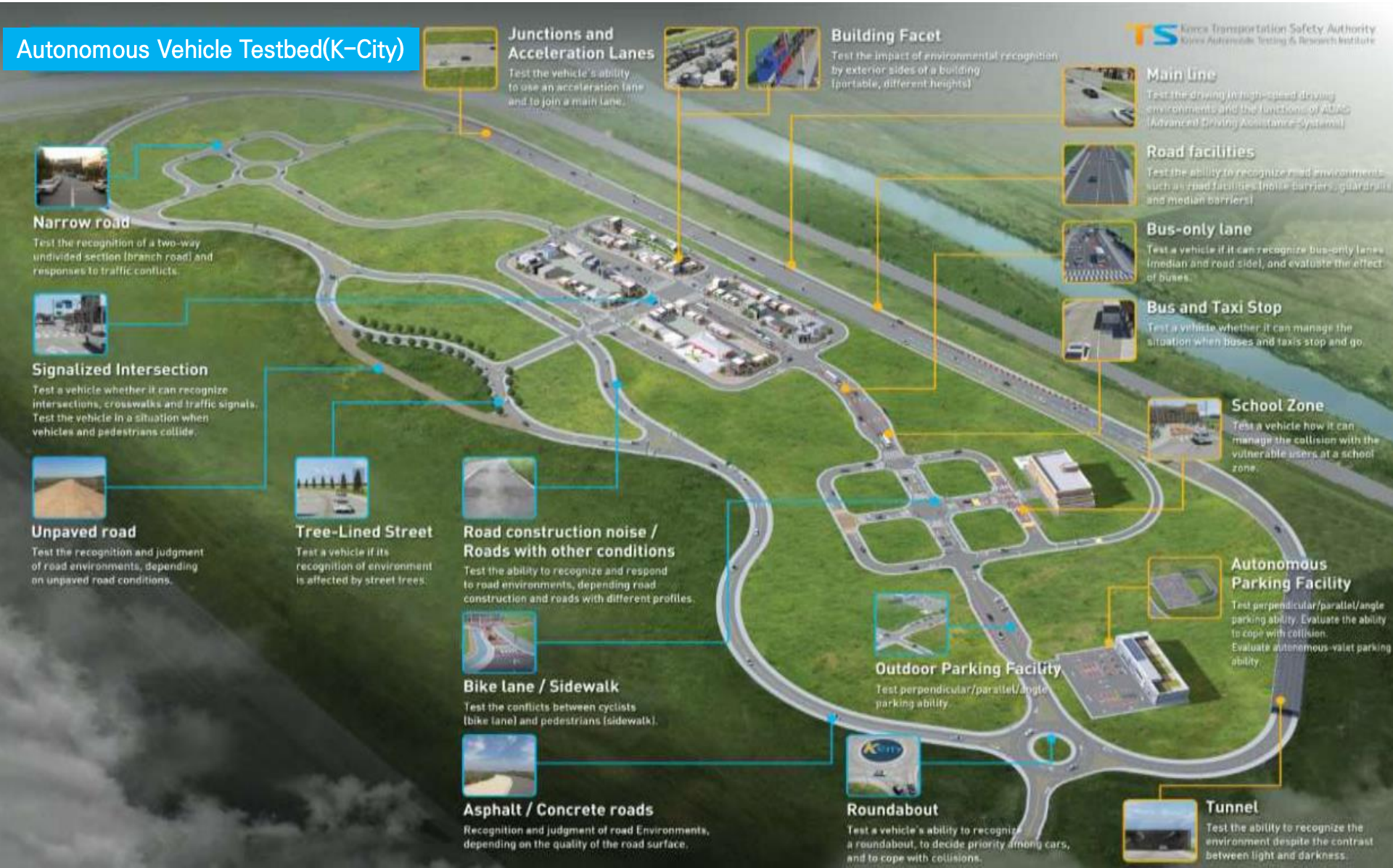
Smart Village(56 Houses)

Smart Village Green Technology



Urban Tech House

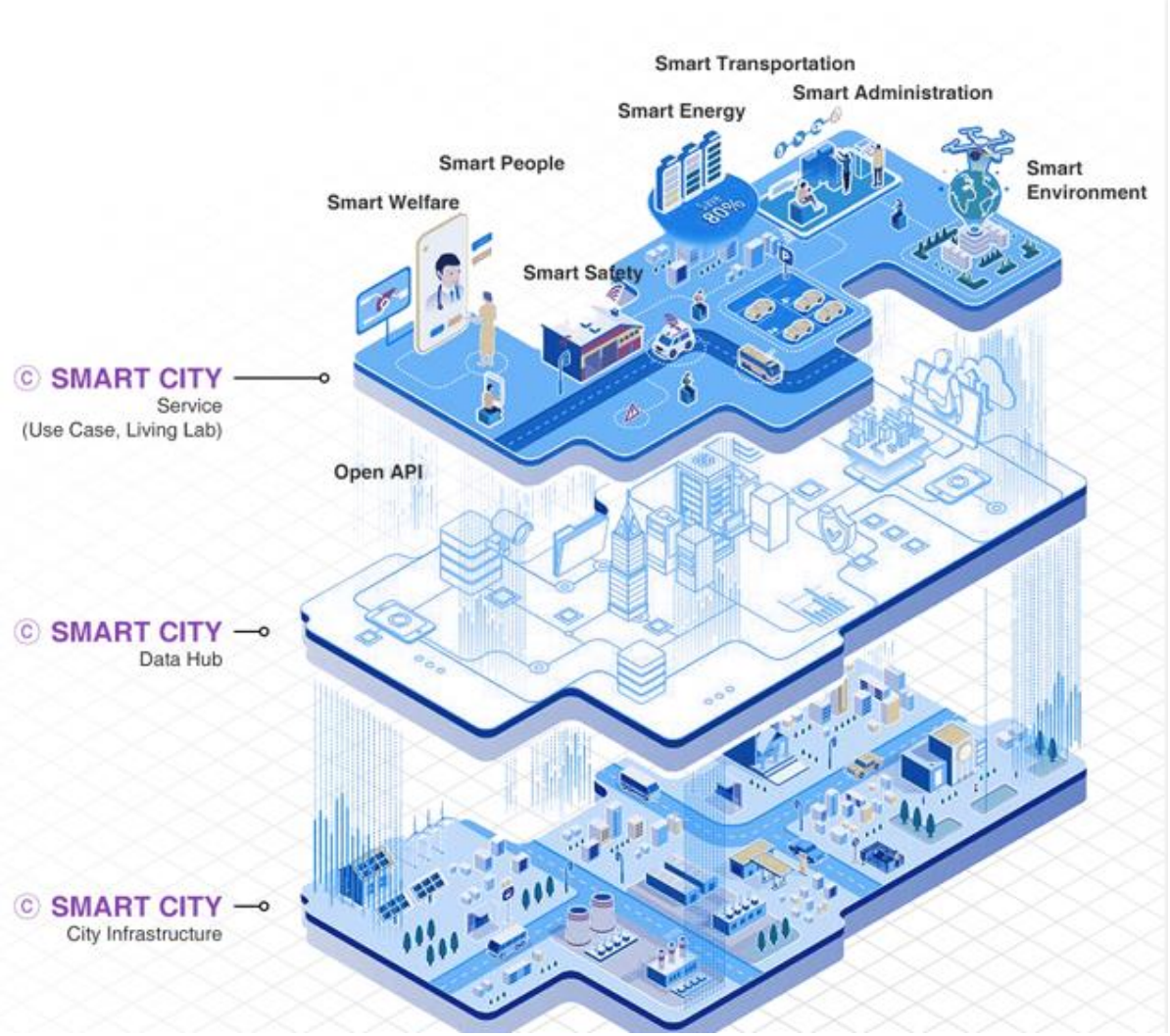
3 Smart City Activities in Korea
Test Bed for Autonomous Vehicle(Hwasung)



4. National Strategic Smart City Program

National Strategic Smart City Program – Overview

Initiating National Strategic Smart City Program based on data and AI for building Open Data Smart City Frameworks



☑ National Strategic Project

130 million dollars investment(18-22)

* Government (84.3billion)
+ Private sector(23.5billion)
+ Municipal governments (20.9billion)

- **Phase 1** Data hub technology development(18-19)
- **Phase 2** Demonstration to Daegu and Siheung (19-21)
- **Phase 3** Spread and expansion (22-)

☑ Joined Organizations : 90

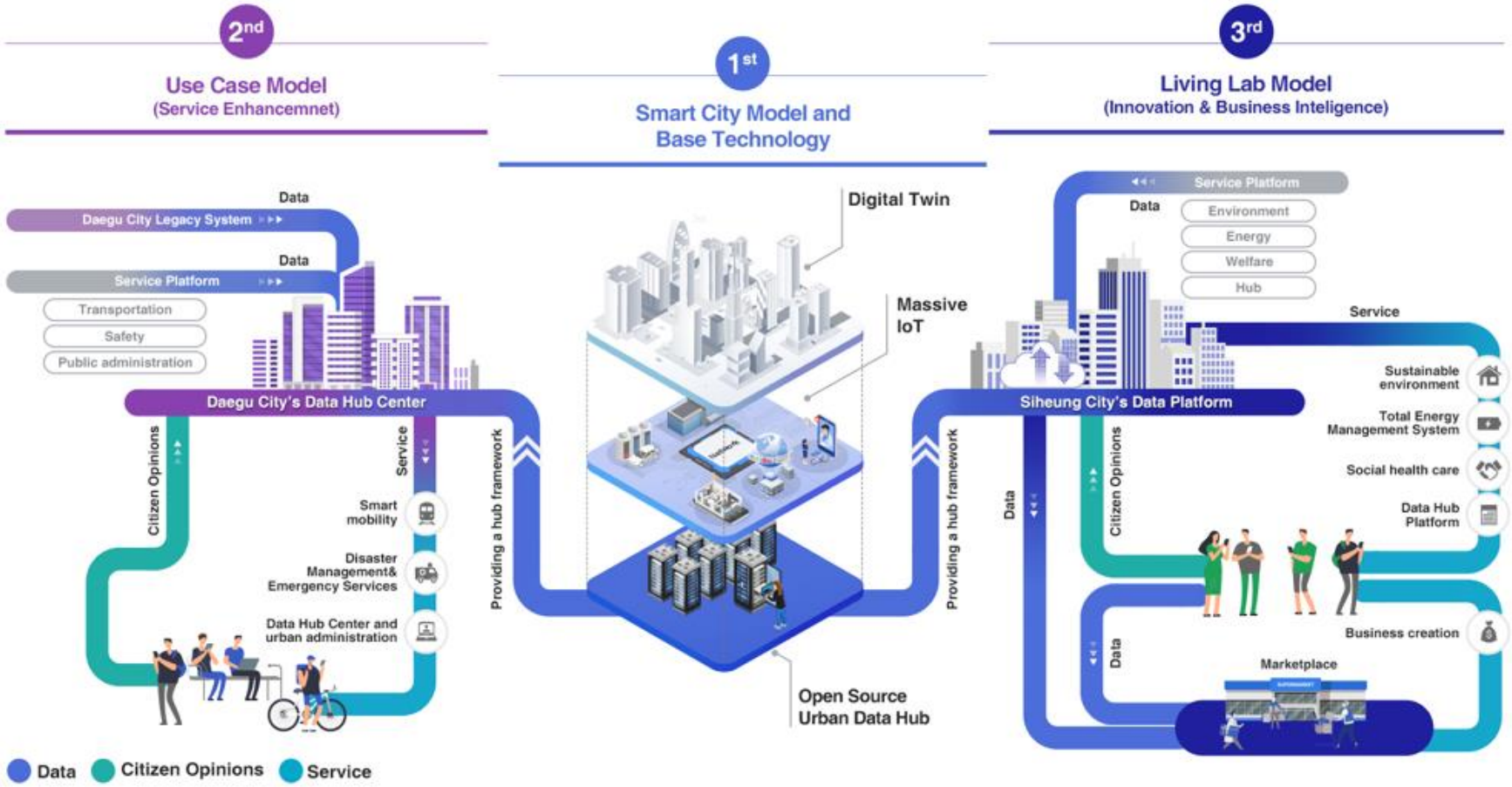
* companies, universities, research institutes

☑ Participants : more than 1,300

* professors, researchers, engineers, etc.

National Strategic Smart City Program – Concept of Implementation

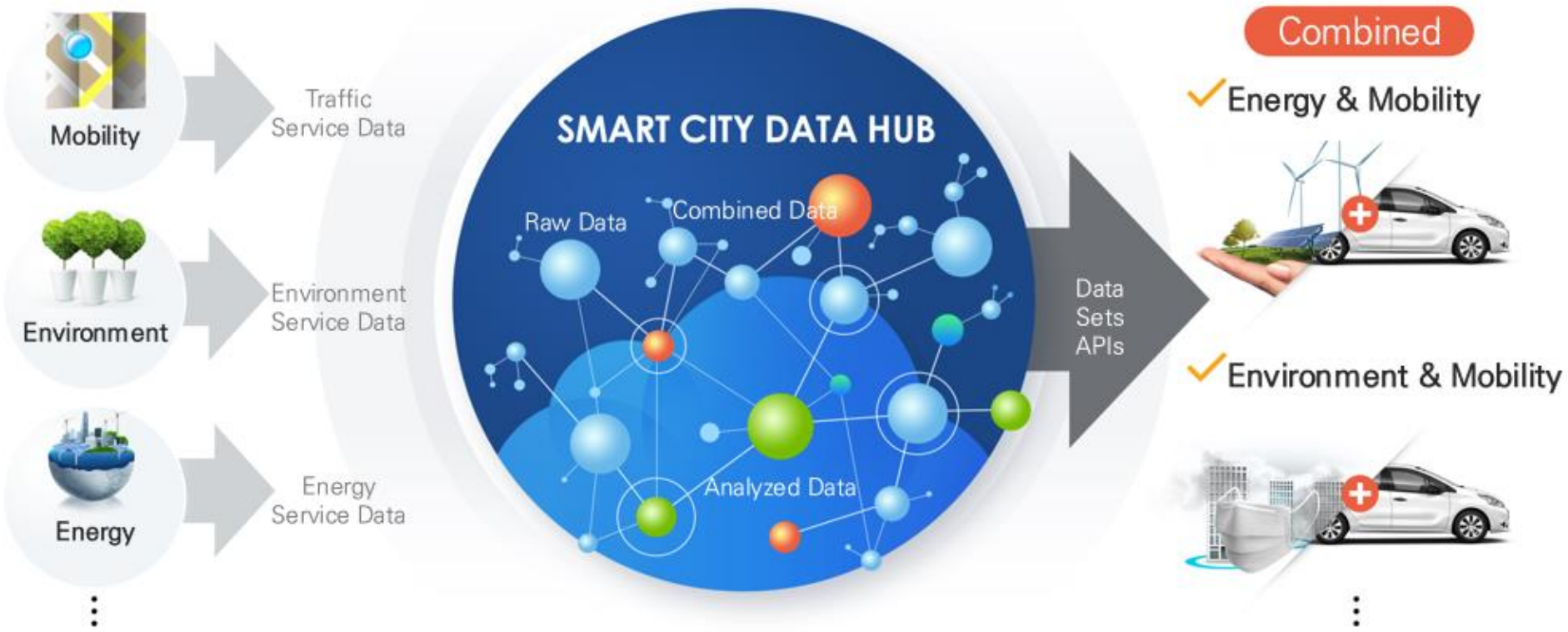
Conceptualizing the Data-driven smart city model and implement the several usecases in Daegu and Siheung by use of Datahub model with advanced technologies such as digital twin, massive IoT.



Source : KAIA

National Strategic Smart City Program – Smart City Data Flow

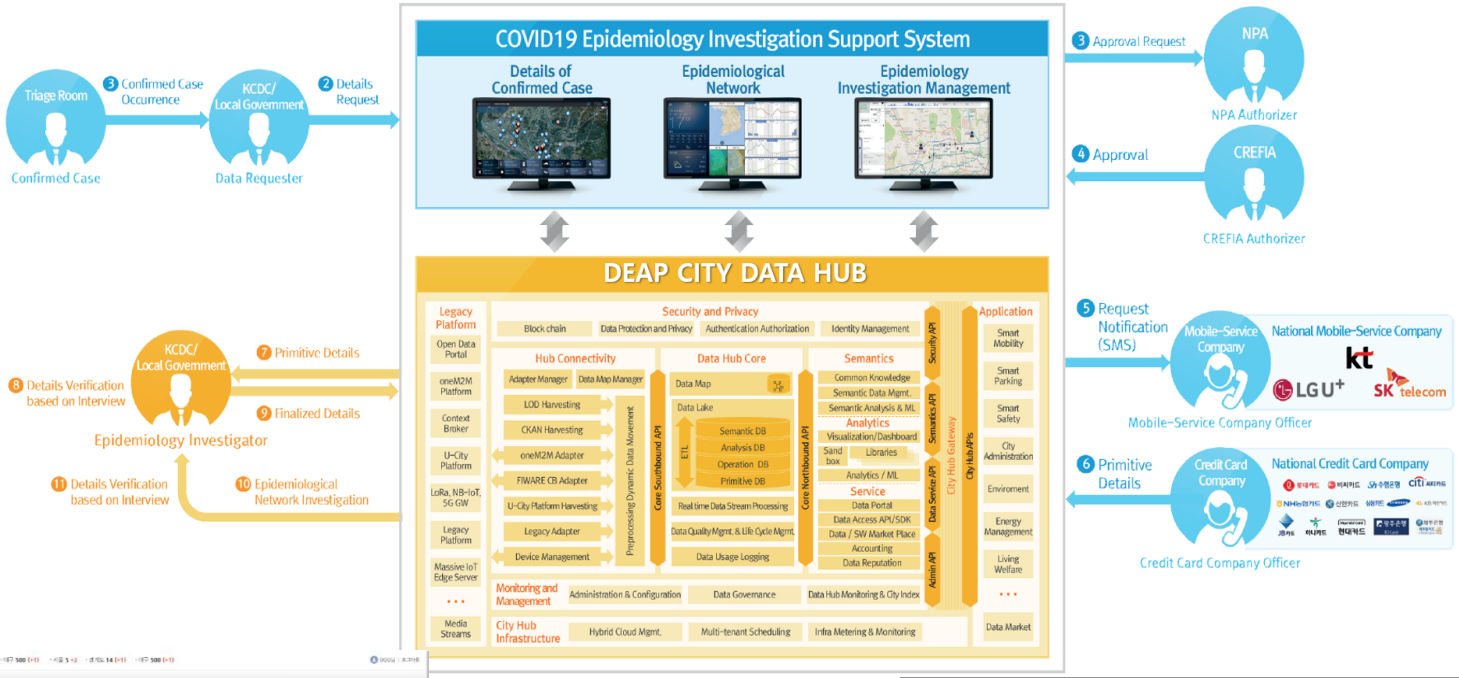
Smart City DataHub is the fundamental infrastructure for data-driven smart city where the raw data and calculated data are stored and analysed for the public/private services

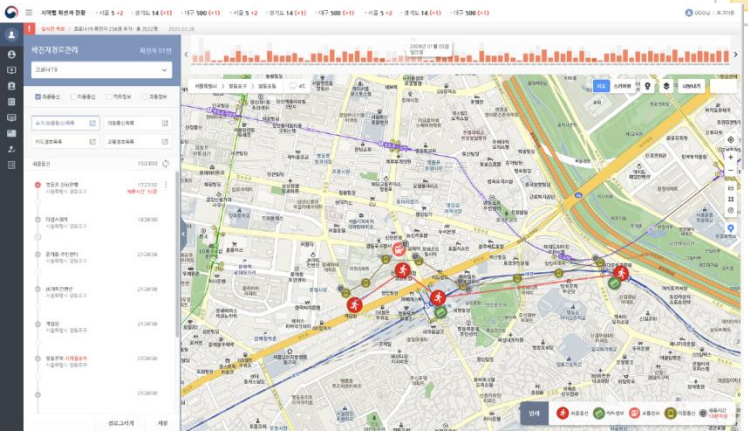


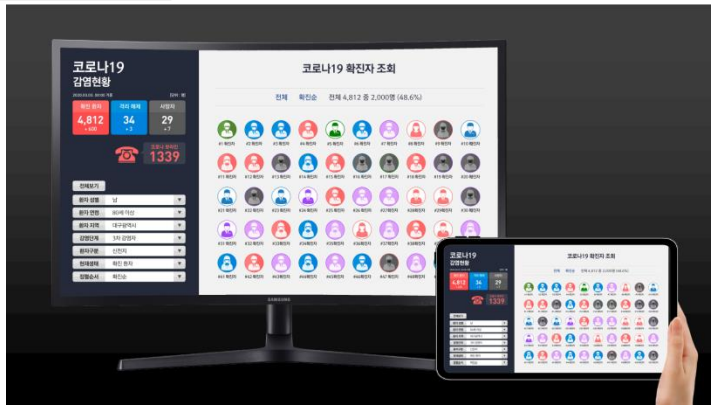
4 National Strategic Smart City Program

National Strategic Smart City Program – COVID19 “EISS”

EISS was developed through the application of Smart City Data Hub to collect, process and analyze relative data to enable the automation of the epidemiological investigation process.







4 National Strategic Smart City Program

National Strategic Smart City Program – Siheung Innovation Districts

2-1 Transportation

- Integrated platforms for smart mobility (MaaS)
- Services for parking space sharing
- Demandresponsivetransport/transitservice(DRT)

2-2 Safety

- Flood prediction and warning services (Daegu dyeing industrial complex)
- Slopecollapsepredictionandwarningservices (22 branches)
- Heatwavereductionandvulnerabilityanalysis
- Emergency rescue service (Indong)

2-3 Establishment of city administrative services and the Data Hub Center

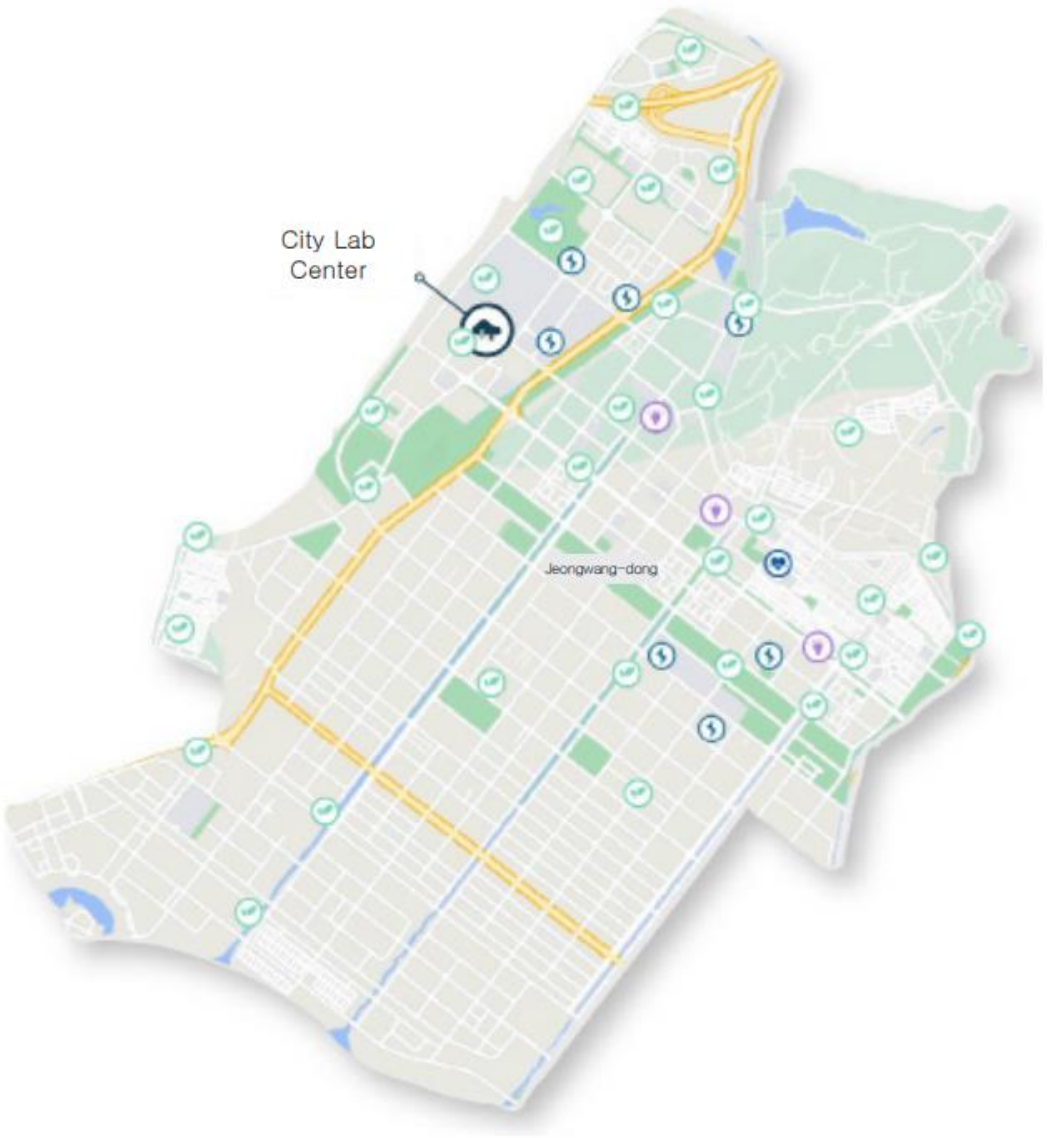
- Developingintegrated5D-basedurbanfacility management technology
- DevelopingSmartCitysocialcrowdsourcingand portal technology
- EstablishingtheDataHubCenterintheDaegu Smart City Center

2-4 Problem solving services with the participation of citizens

- Intelligent traffic safety and control (Shincheon-daero, Yongji intersection)
- ECODashboard(15productionsites,400con sumption sites, 20 in Alpha City)
- Fine dust solutions using walls (Dongil elementary school)
- Solutions for illegally disposed waste (Ayang Arts Center, Ansim Creation Valley)
- Safety solutions for streets for the youth (Gosan 1, 2, and 3-dong)
- AI resource circulation robots
- Crowded detection model for subway using AI crowd counting
- In-wheel type e-wheelchair-based ADAS

4 National Strategic Smart City Program

National Strategic Smart City Program – Siheung Innovation Districts



3-1 The Environment Living Lab

- Fine particle measuring and monitoring
- Analysis of fine particle pollution sources and air quality prediction
- Provision of fine particle information and testbeds

3-2 Energy Living Lab

- Five types of integrated smart metering reading (HEMS) (186 households)
- Building Energy Management System (BEMS) (4 locations)
- FactoryEnergyManagementSystem(FEMS) (2 locations)

3-3 Welfare Living Lab

- Siheung Care Zone for the elderly living alone (12 locations)
- Mobility assurance system for people with disability (across Jeongwang-dong)
- AR-based mobility simulation (1 location)

3-4 Siheung Data Hub Platform

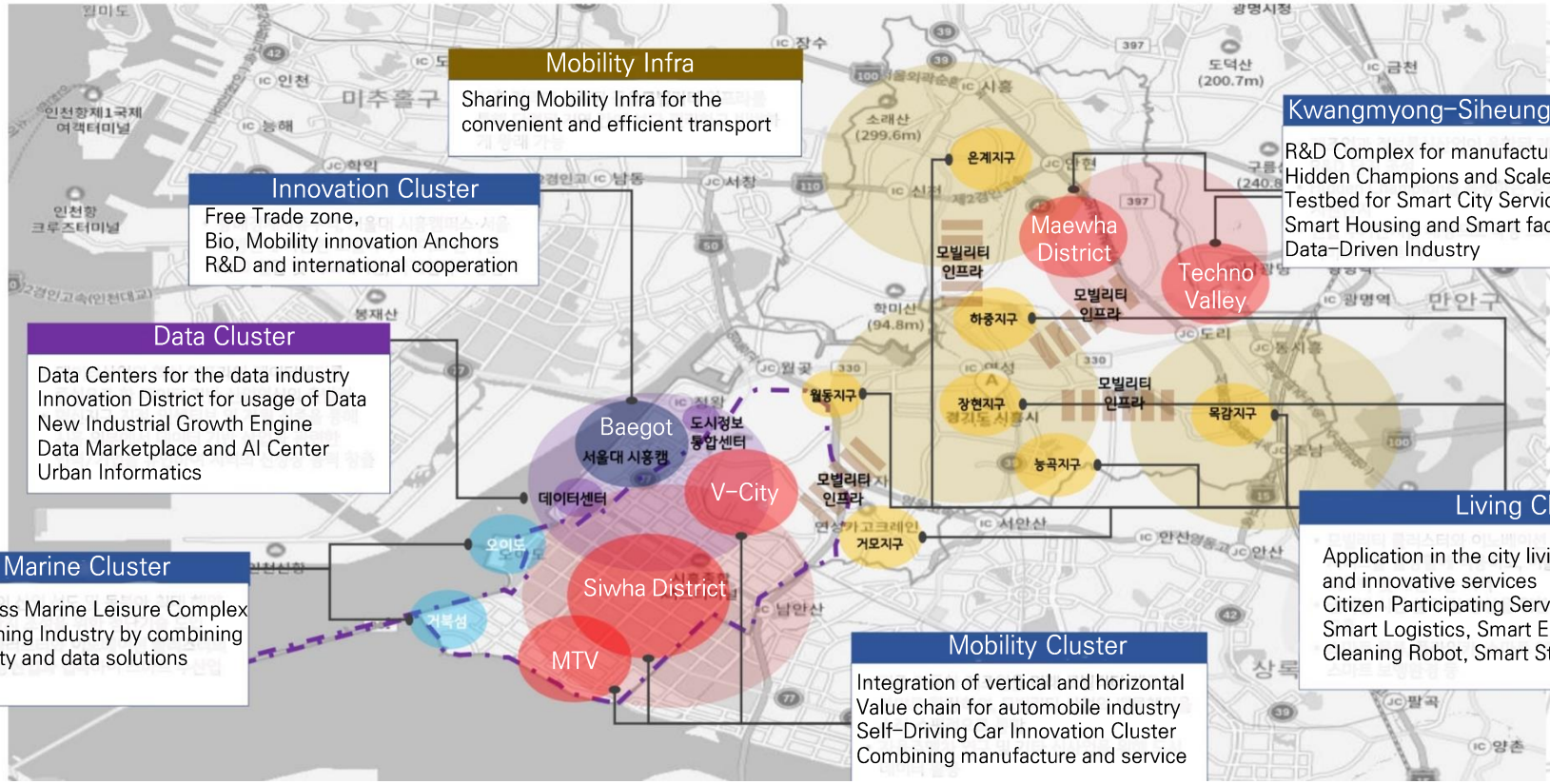
- Establishment of the Data Hub Platform in the City Lab Center
- Realization of digital twins in the data marketplace

3-5 Local Demand-based Business

- Top-down projects for smart city service models based on local demand (4 projects)
- Bottom-up projects for fostering new industries using smart city data (8 projects)

4 National Strategic Smart City Program
Innovation District– Siheung

Siheung has pursued the innovation district as smart city solutions and systems are critical for the 4th industrial revolution and digital transformation



5. Urban Trasnformation

5 Urban transformation
5th National S&D MasterPlan

The 5th Masterplan of Science & Technology, Innovation in Korea('23~'27)

• Strategies for not only resolving current national issues and preparing for the future, but also for enhancing the S&T system and creating an ecosystem for industry with emphasizing the importance of establishing a foundation in S&T

비 전
VISION

A Bold Future Led by Science, Technology and Innovation

3 Strategies, 17 Pillars 50 Tasks

Science, Technology & Innovation

Strategy 1
Advance S&T System for Qualitative Growth

- Mission-oriented
- Research Environment
- R&D Achievement
- Key Talent
- Science as Culture

Strategy 2
Improve Innovation Capabilities and Foster an Open Ecosystem

- Private Sector -Led
- University & Government-funded Research Institutes
- Starting Businesses
- Regional Innovation
- S&T Diplomacy

Challenging Issues

Strategy 3
Resolving National Pending Issues through S&T and Preparing for Future

- Carbon Neutrality
- Digital Transformation
- Health & Welfare
- Disaster & Crisis Mangt.
- Supply Chain & Resources
- National Defense & Security
- Space & Ocean

Key Technologies to Nurture National Strategic Technologies

- Semiconductor Display
- Secondary battery
- Advanced Mobility
- Next-Gen Nuclear Power
- Advanced Biotechnology
- Aerospace And marine Technology
- Hydrogen
- AI
- Advanced Mobility
- Next-Gen Communications
- Cyber Security
- Quantum Technology

5 Urban transformation
Government & S&T Policies

Considering the role of the MOLIT as prescribed in the law, the current government and MOLIT's direction of promotion, and national sustainable development goals, four S&T focus areas are derived

Laws

- (Art. 42 of Government Organizaiton Act(MOLIT)

① The Minister of Land, Infrastructure and Transport is in charge of the establishment and adjustment of the Comprehensive National Territorial Plan, conservation, utilization and development of land, construction of cities, roads, and houses, coastal and reclamation projects, and affairs related to land, railroad, and aviation transport

Yoon Suk-yeol Administration(Tasks)

윤석열 정부, "강소형 스마트시티 추가조성·완전자율차·도심항공교통 최초 상용화" 국정과제로

대통령직인수위원회, 국정과제 110개 발표..."예산 209조 추가 필요"

MOLIT(inaugural address, '22)

... We will prepare for the future through innovation in space and transportation. ...(omitted) ... We need to shift the paradigm to consumer-centered 'mobility' ...

Sustainable Development Goals(SDGs)

Focus Area

Land/Urban Space | **Mobility** | **Infrastructure** | **Living Places**

5 Urban transformation
MOLIT 10 year Plan's Vision and Goals

2nd Comprehensive R&D Plan for 2023-2032 in the field of Land, Infrastructure and Transport

Vision, Strategy and Tasks

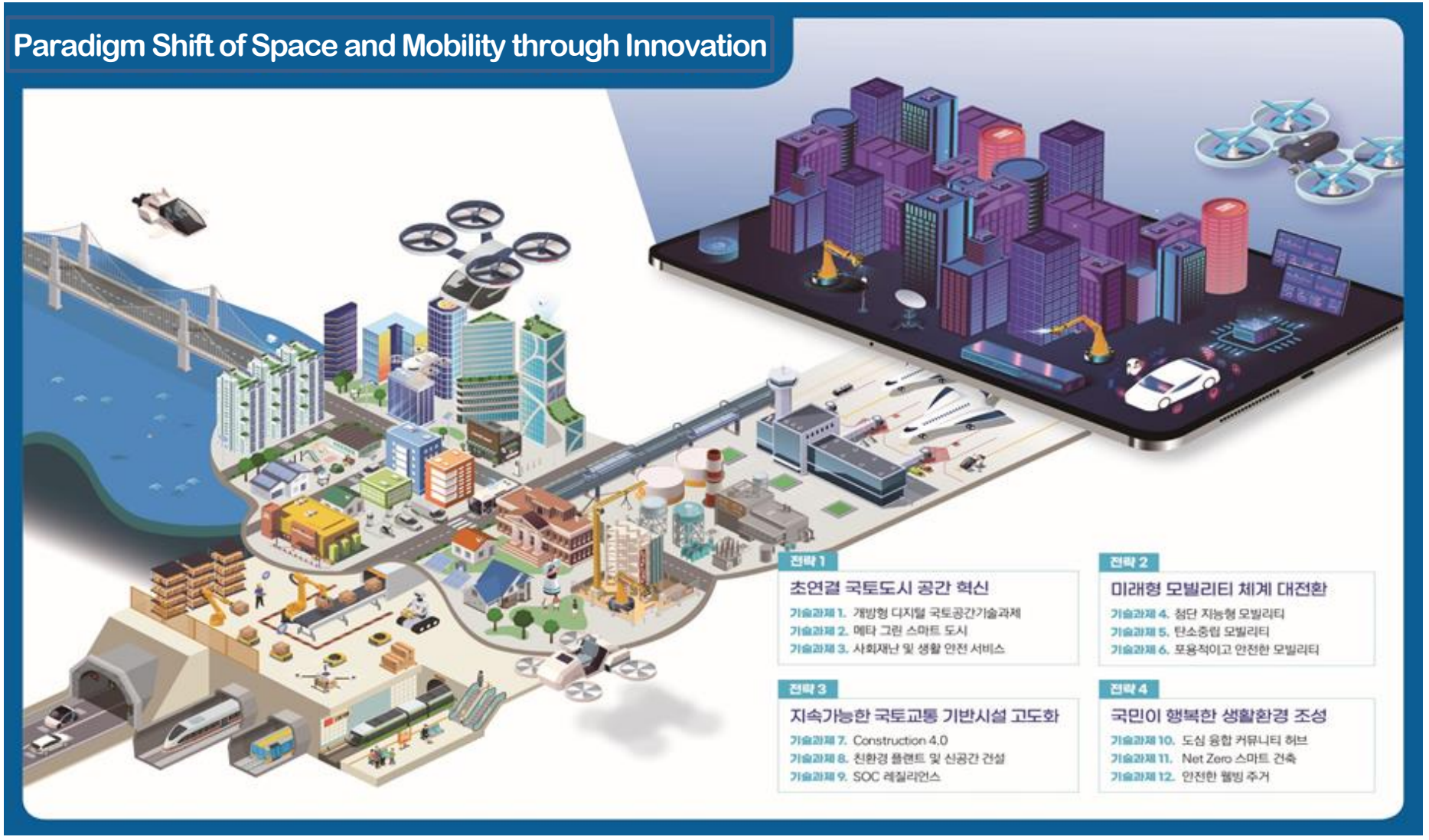
Vision — **Big Shift in the Paradigm of Land and Transportation through Technological Innovation**

5 strategies and 17 tasks for future response and pending issues in the field of land and transportation

Main Area / Issues	Digital Transformation	Climate Change & Net Zero	Quality of Life
Strategy 1. Land / Urban Space Innovation	Open Digital Space	Meta Green Smart City	Social Crisis and Safety Service
Strategy 2. Future Mobility	Innovative & Intelligent Mobility	Net Zero Mobility	Inclusive and Safe Mobility
Strategy 3. Sustainable Infrastructure	Construction 4.0	Eco-Plant and Hydrogen City	SOC Resilience
Strategy 4. Innovative Living Place	Industrial Cluster and Community-hub	Net Zero Smart Building	Safe and Well-being Housing

Strategy 5. Policy Support for Industry Innovation	Mission-oriented & Innovative R&D System	Private-led Innovation & Dissemination of R&D outcomes	Data Ecosystem & Knowledge-sharing Library	Manpower Training & Advanced R&D Infrastructure	R&D-based Regional Development & International Cooperation

5 Urban transformation
MOLIT 10 year Plan's Conceptual Map



5 Urban transformation
Future Smart City Program _ Autonomous Driving

R&I Program

For Autonomous Driving Technology

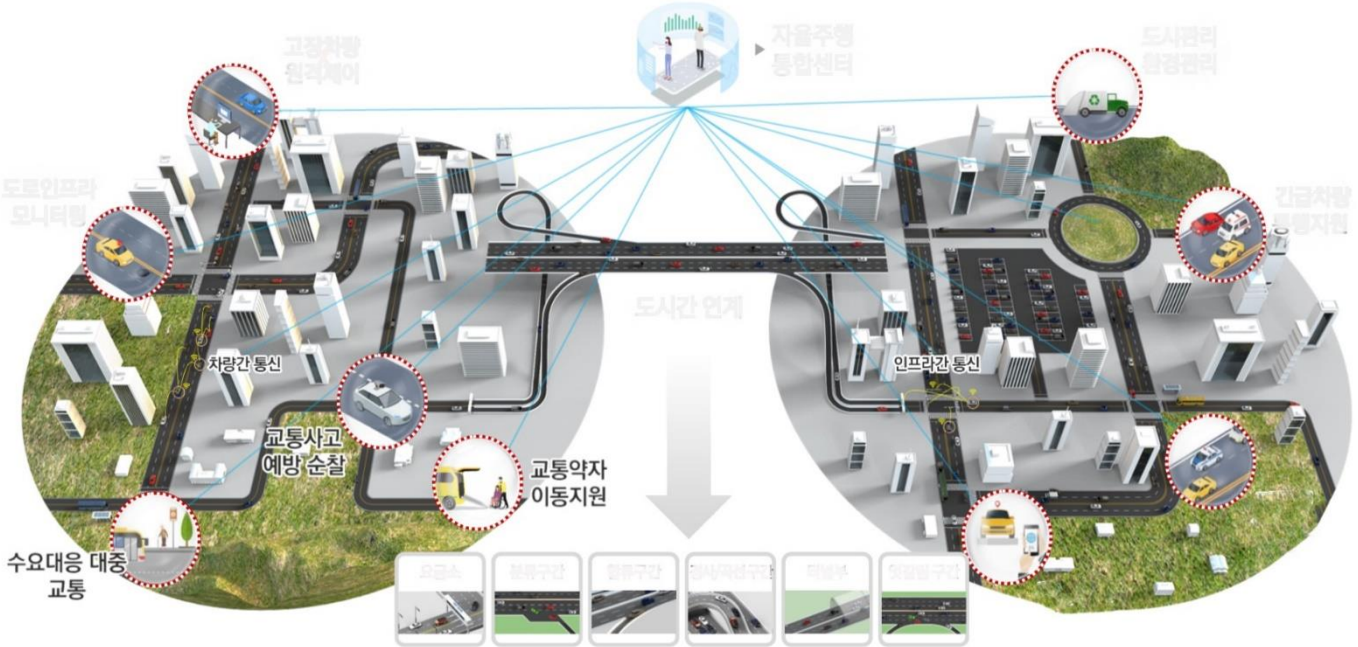
Duration : 2021~2027

Budget : US$ 1bn

01 VR TEST(Virtual Simulation)

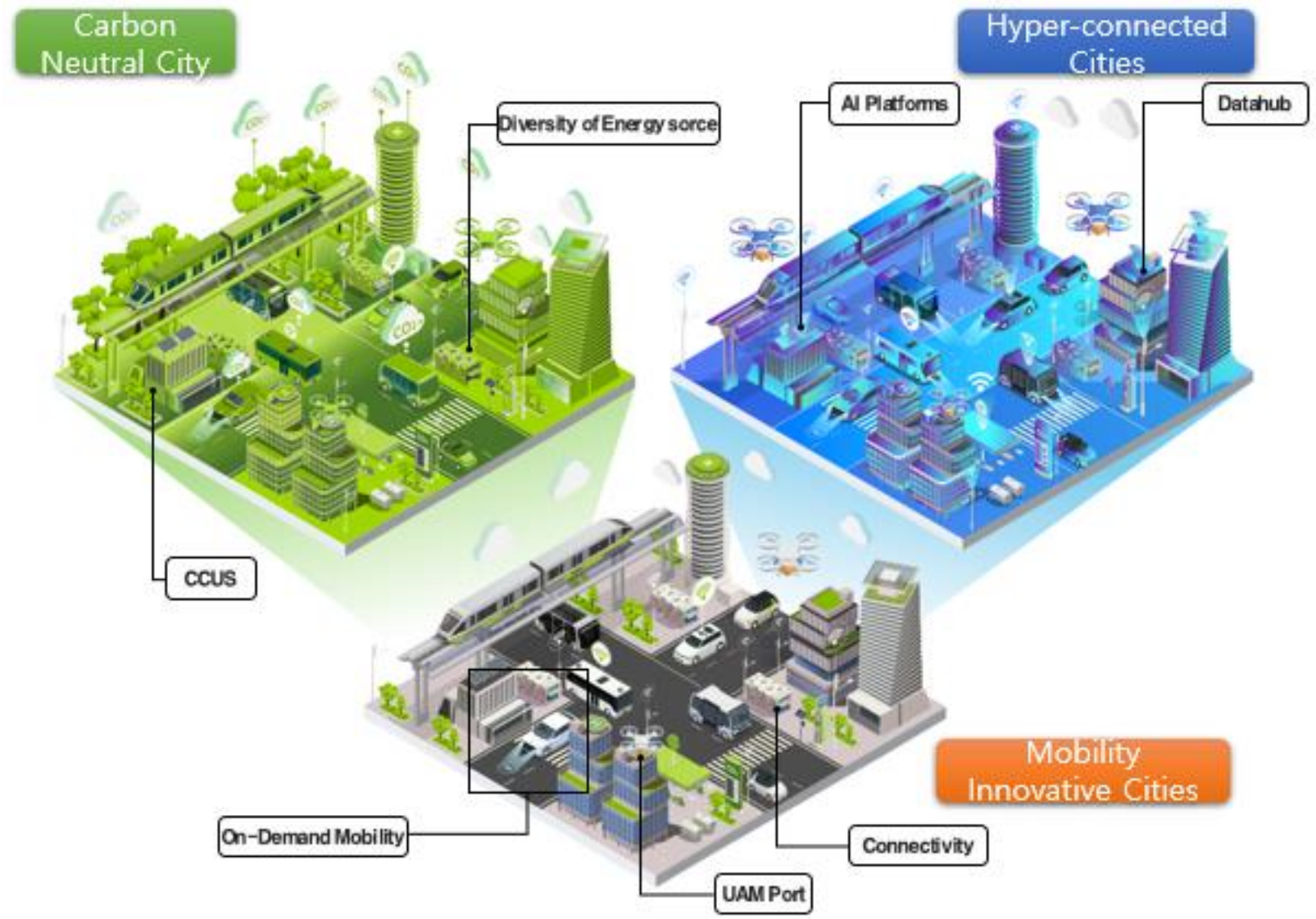
02 Level 4/4+ Testbed

03 Self-Driving Car Living Lab(City Scale)



5 Urban transformation
Future Smart City Program _ Virtual Space

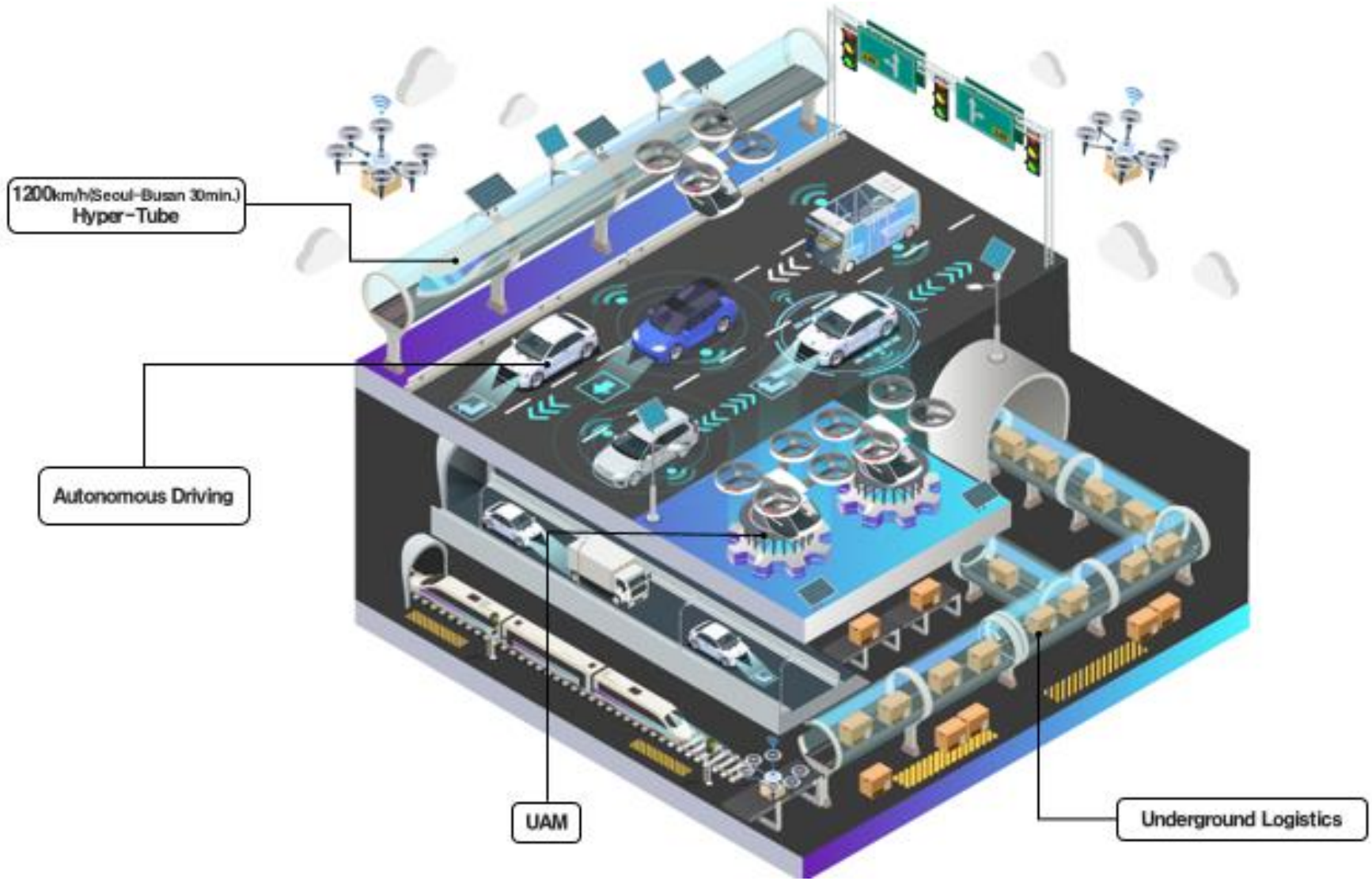
5 Urban transformation
Future Smart City Program _ Meta Smart City



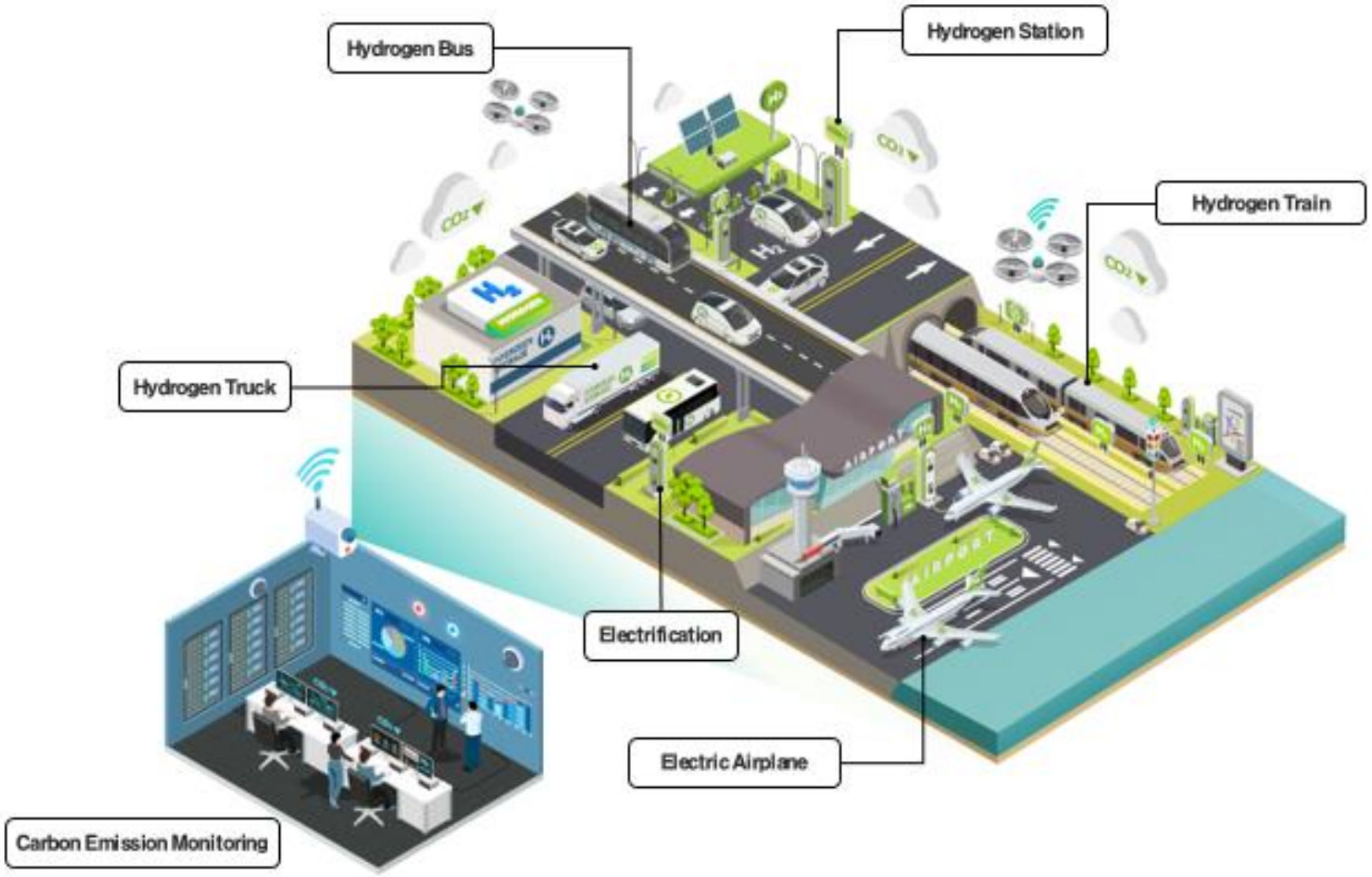
5 Urban transformation

Future Smart City Program _ Social Crisis and Safety Services

5 Urban transformation
Future Smart City Program _ Innovative & Intelligent Mobility

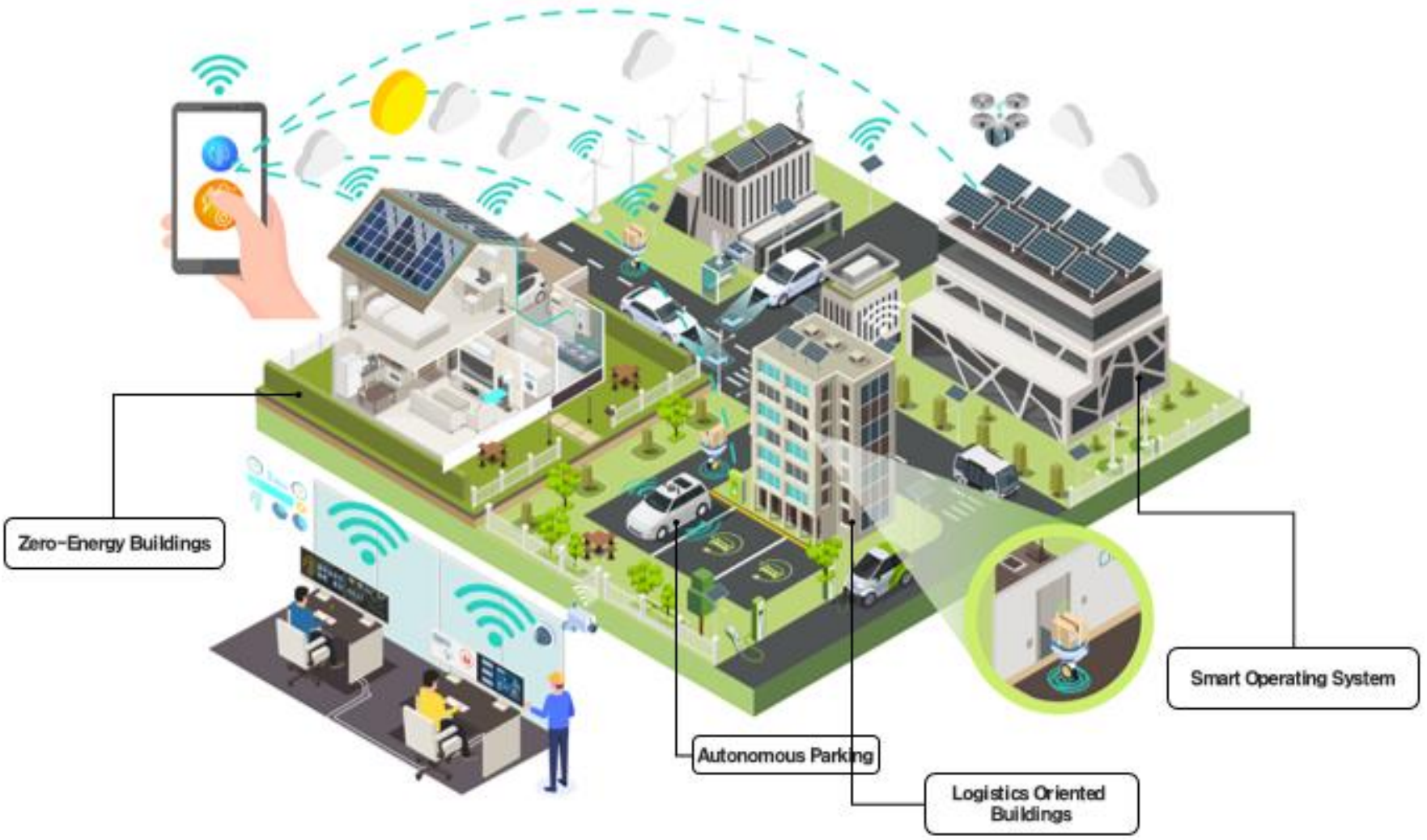


5 Urban transformation
Future Smart City Program _ Net Zero Mobility



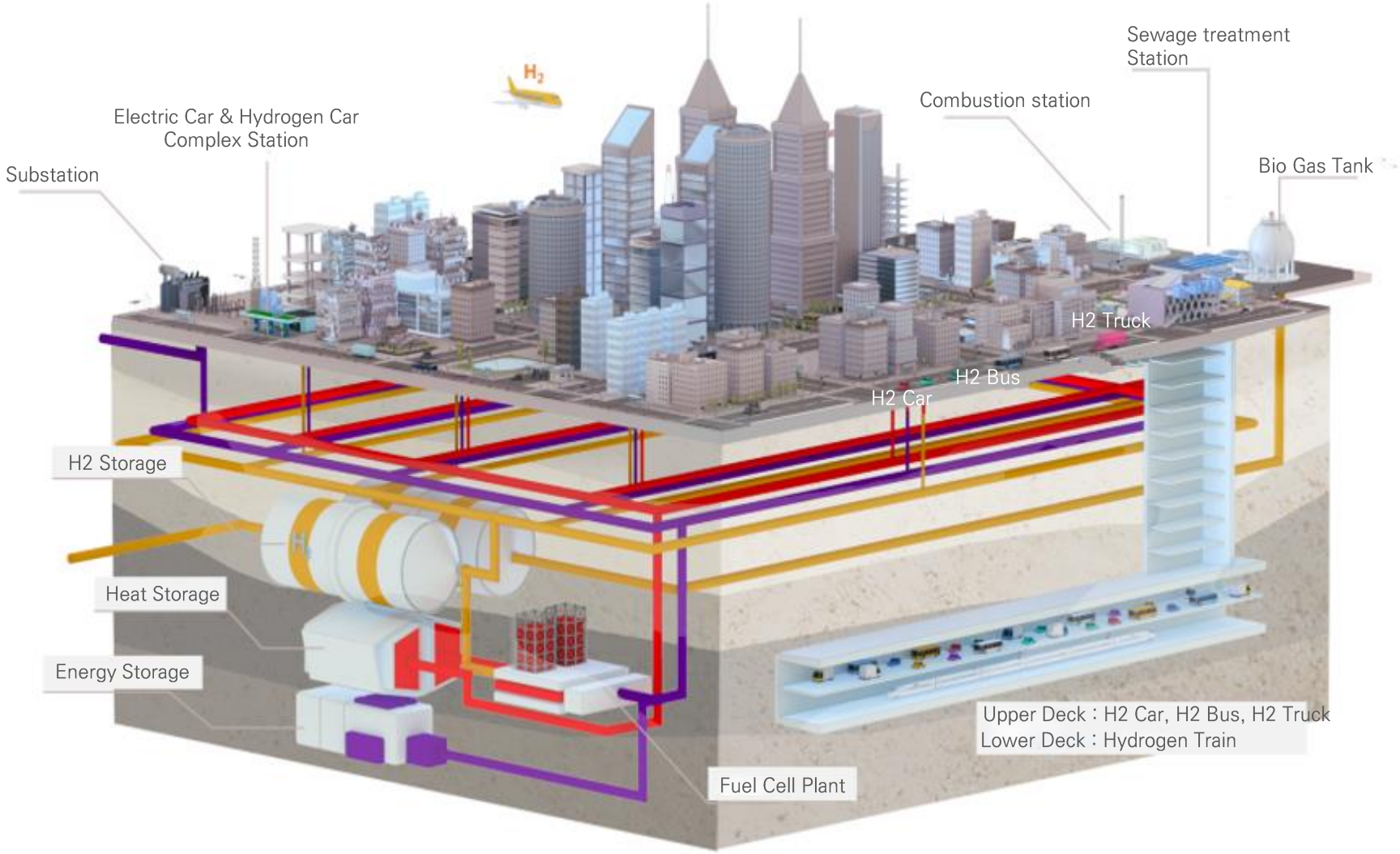
5 Urban transformation
Future Smart City Program _ Resilience of SOC

5 Urban transformation
Future Smart City Program _ Net Zero Smart Building



5 Urban transformation
Future Smart City Program _ Hydrogen City

Hydrogen City Model will be developed for next 10 years in Ulsan, Ansan, Jeonju and other cities, of which purpose is to accomplish the carbon neutral city



THANK YOU

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