



Mobility Revolution: ITS to Smart Mobility in Korea

Taehyung Kim, Ph.D.
Director, Center for Smart City & Transport

Contents

I. Introduction of ITS in Korea



II. Lessons for Future Transport Systems



III. Mobility Revolution: Smart Mobility in Korea



I. Introduction of ITS in Korea



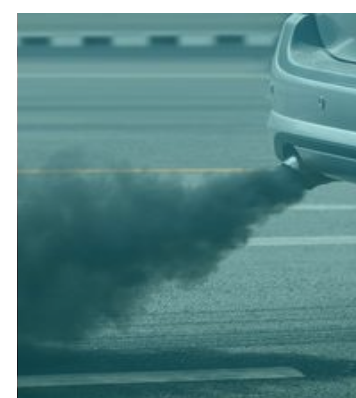
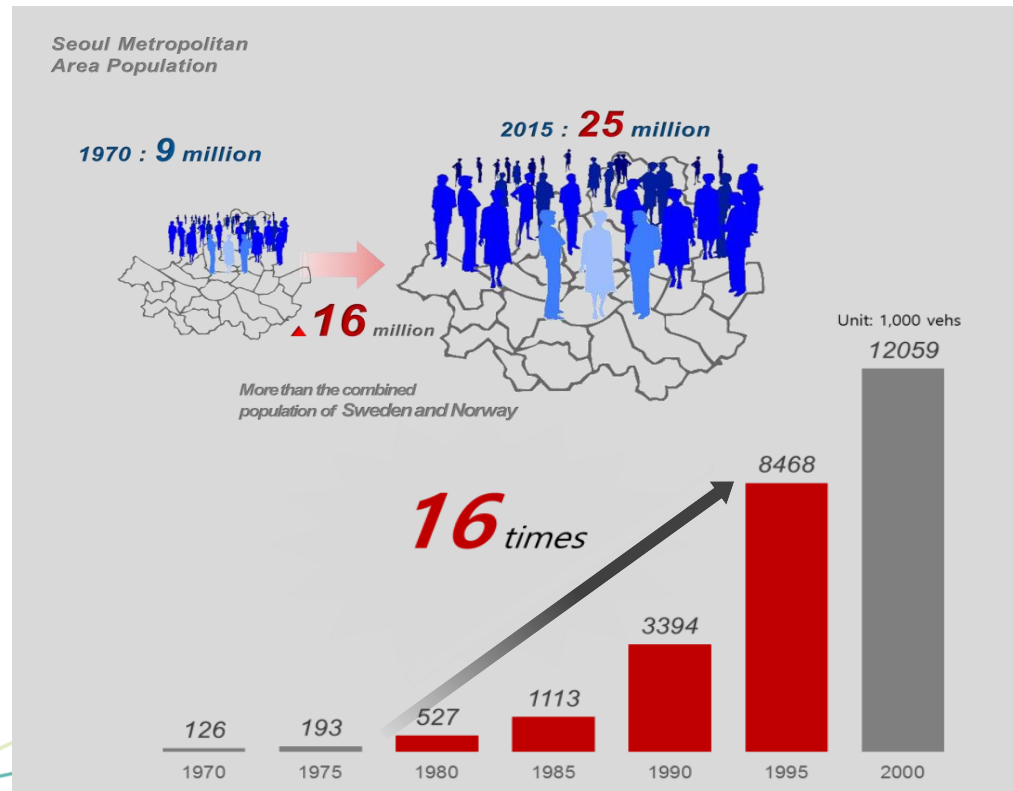
Rapid Urbanization & Motorization



Tremendous increase in the number of vehicles and rapid growth of urbanization



Traffic congestion, accident, pollution, and other problems



Various Policies & Strategies



Construct new roads

- Needs huge amounts of cost & time
- Derive more traffic demand



Reduce Traffic

- Travel demand management
- Alternative transport mode



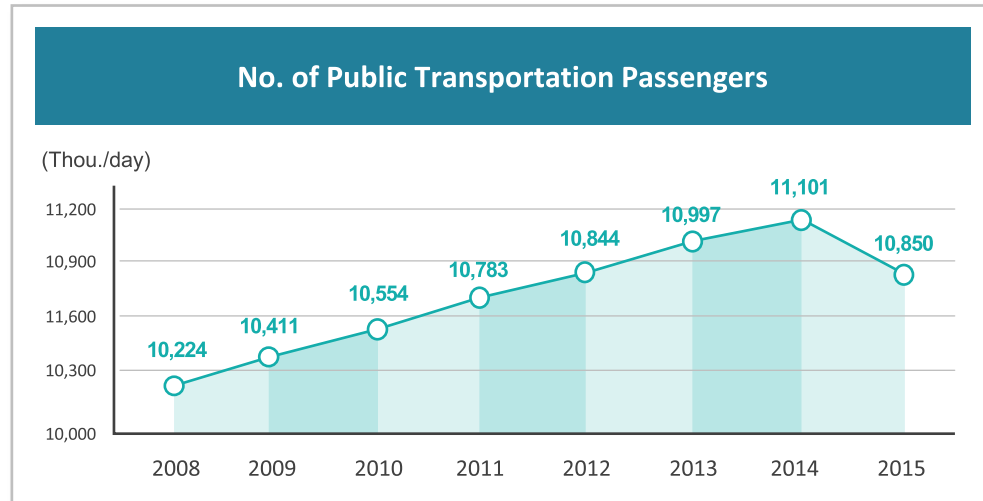
Increase existing infrastructure capacity

- Uses intelligent transportation systems (ITS)

Resolving transportation problems by introducing ITS

ITS Effects & Benefits in Korea

Improvement



Economic

High-benefit cost ratio

Use only 1% of road construction costs to reduce 20% of traffic jams B/C for ITS deployment by each city : 2.2~6.2

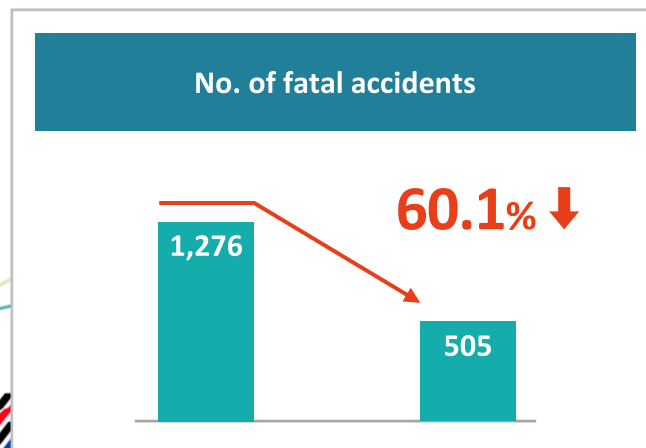
Seoul 2.27, Daejeon 5.2, Ulsan 4.64, Suwon 2.39, Jeonju 2.9, Jeju 6.2

\$11.8B worth of Social benefits per year

Increase travel Speed by 15~20%

Effect on Hipass
Tollgate passing time : 14sec to 2 sec. reduce (improvement of 85.7%)
Social benefit : USD 9.6M/year

Safe



Convenience



Eco-friendly

Reducing greenhouse gas & oil consumption

Reducing greenhouse gas and oil consumption based on decrement of traffic congestion and idling

Per 1,000km of road covered with ITS

- ▶ Annually 19,000 tons reduced
- ▶ Through Hipass(ETCS) service Annually 2.3 tons reduced

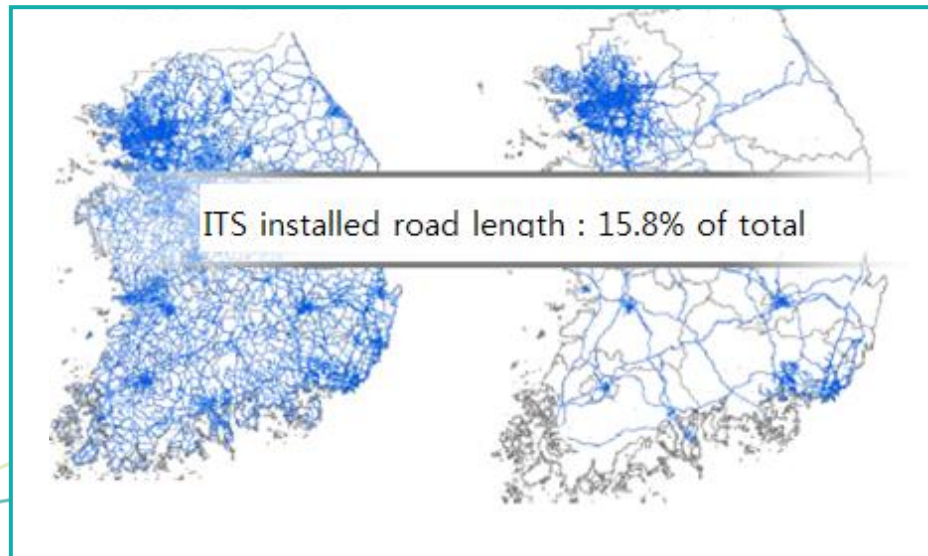
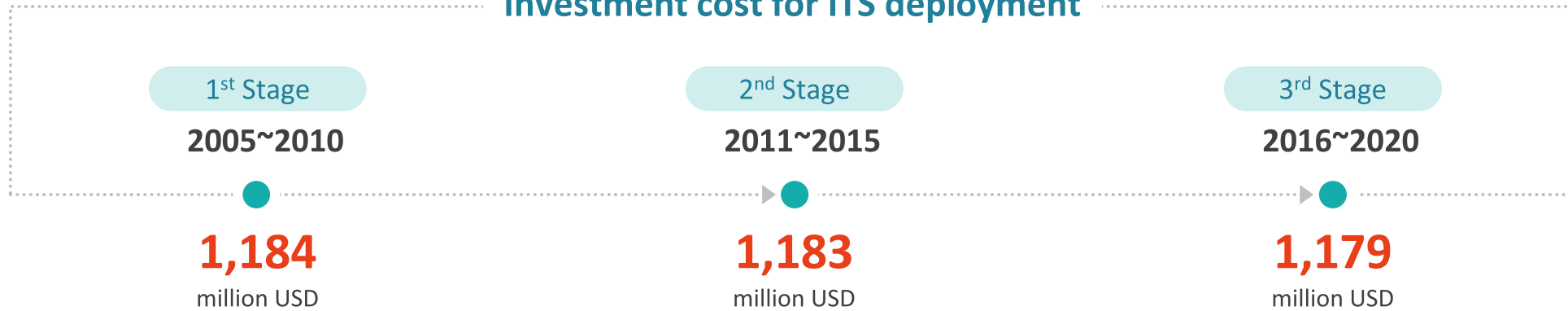
CO2 DOWN

II. Lessons for Future Transport Systems



ITS Investment in Korea

Investment cost for ITS deployment



Road Type	Road Length (km)	ITS Installed (km)	Percent (%)
Expressway	4,114	4,114	100
National Highway	13,587	2,633	19.6
City Road	67,788	6,711	9.9
Total	85,165	13,458	15.8

Transport Challenges



- **Increase of traffic congestion even though continuous ITS investment**

- Total cost of traffic congestion (2018): 59.8 billion USD (3.6% of GDP)



- **Inconvenient public transportation**

- Independent fare policy & payment system (ex. independent reservation/ticketing/payment)
- Insufficient investment for vulnerable people (ex. Demand responsive transit)



- **Higher traffic fatalities & injuries**

- Total fatalities (2019): 3,349 persons/year



- **Severe air pollution from vehicle emissions**

Public-Private Cooperation on Traffic Information

Public-private collaboration in ITS

Early expansion of ITS network

Secure 49,500km of ITS unequipped road by using private services.

Budget reduction

Save about 1.2 billion USD to be spent for additional ITS deployment.

Focus on safety

Public concentrate on ITS service for safety issues.

Building a Safe Traffic Environment through Public-Private Collaboration

Building Safety Infrastructure



Ministry of Land,
Infrastructure and Transport

Public

New Service Development

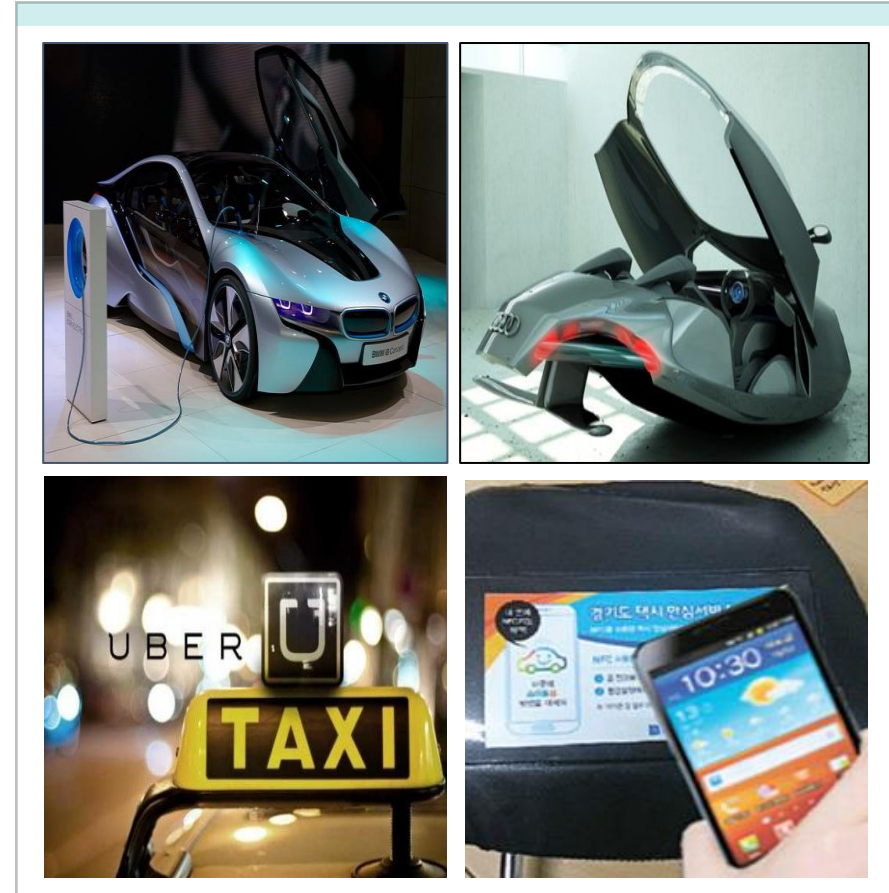


NAVER
THINKWARE

Private

ICT Changes Transport

 Provide various transport services integrated with ICT



Direction for Future Transport Systems

- Integration of transport & ICT-based infrastructure
- Systems to be deployed as **Cheaper, Simpler & Easier**
- Services to be provided for **Greener, Smarter, Safer & more Inclusive**

ICT-enabled Transport Systems

Smart Mobility



Autonomous Mobility

Electric Mobility

Shared & Flexible Mobility

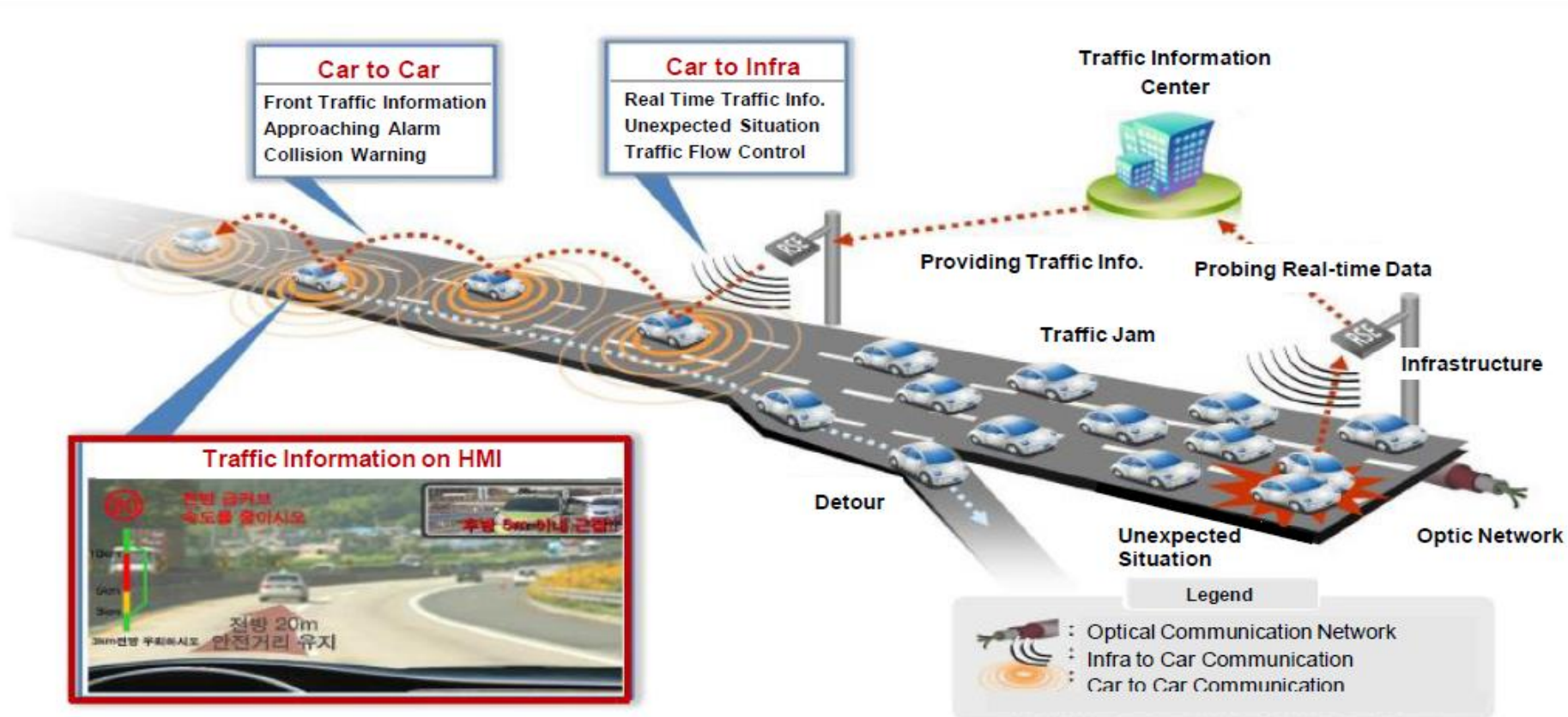
Connected & Integrated Mobility

III. Mobility Revolution: Smart Mobility in Korea



Cooperative ITS (C-ITS)

- New Paradigm for next-generation ITS focusing on Safety, Mobility, Sustainability.
- Improving Road Safety by V2V, V2I and V2P communication



Cooperative ITS (C-ITS) – Pilot Project

Purpose

- Verification of C-ITS Technologies and Services
- Preparation of Full-scale Deployment

Objectives

- Safety Applications and Security Systems Development
- Safety Benefit Evaluation and Economic Analysis
- Technical standards, Device Certification System, Legal System Improvement

Period

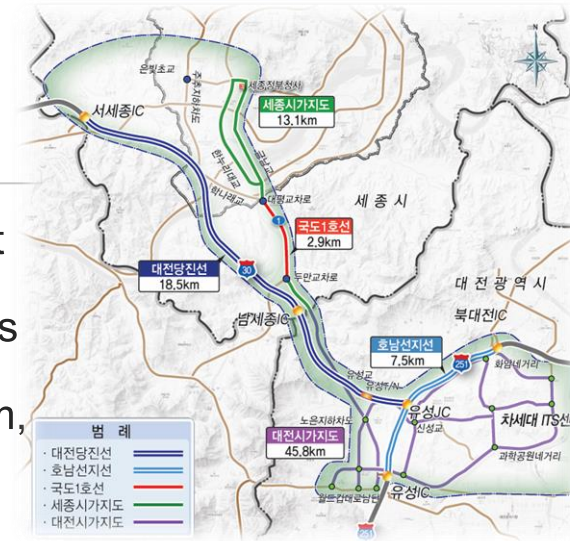
- 2014. 7 ~ 2017. 12

Budget

- 20 million U.S. dollars

Location

- Expressway, National Road, Urban Road in Daejeon City and Sejong City (total 87.8km)



Automated Shuttle Service

Easymile



2getthere



WEpods



Robosoft



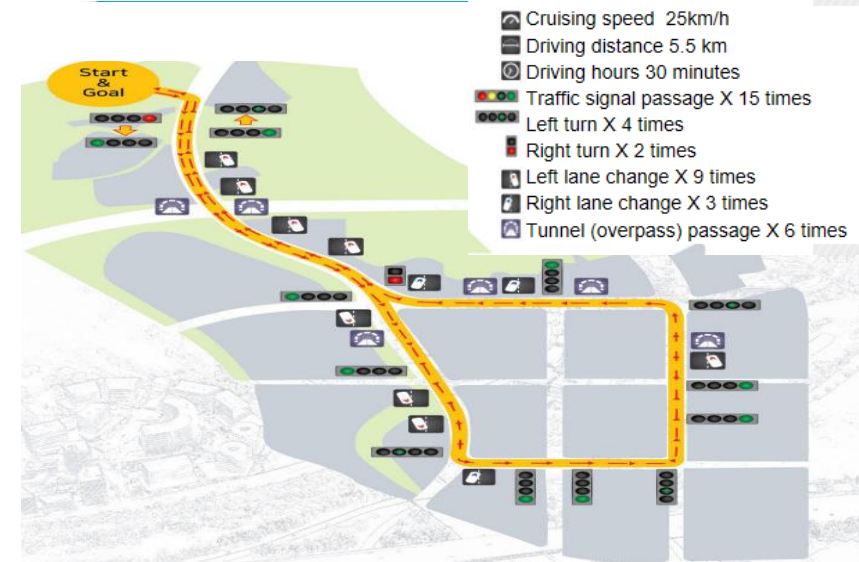
Navya



IBM-Watson IoT Alliance



Zero Shuttle (Korea)



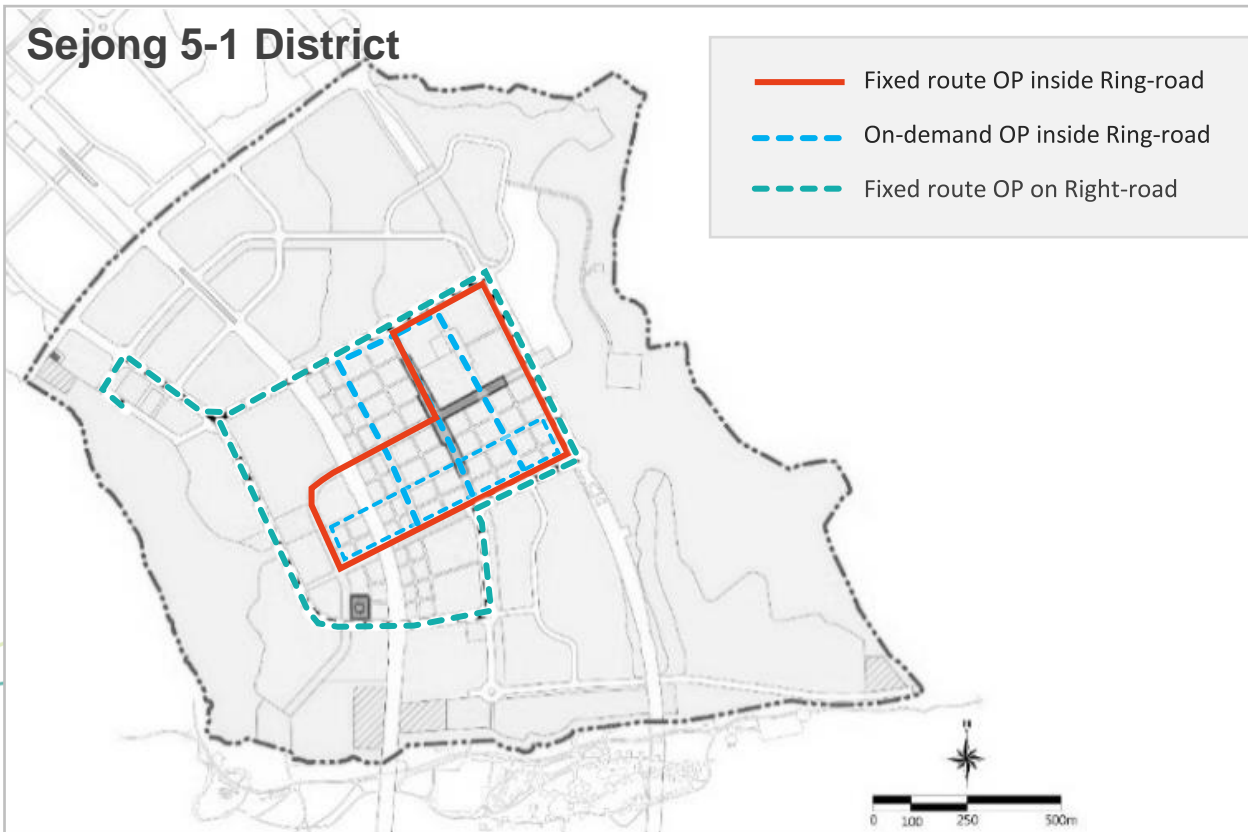
Source : Pangyo Automated Vehicles Exhibition 2017

Automated Shuttle Service (cont'd)



Mobility for 6~12 passengers

Circular operation (fixed route) & on-demand operation



Source: <https://www.zdnet.co.kr/view/?no=20190403130327>



Source: <http://www.jeonpa.co.kr/news/articleView.html?idxno=68277>

PM & Car Sharing Service

Personal Mobility Sharing



Source

<https://www.dhgate.com/product/new-15-inch-big-tire-electric-skateboard/410325967.html>



Source

<https://www.walmart.com/cp/bikes/1081404>



Source

<https://electricmotorcycles.news/bio-hybrid-a-new-form-of-personal-mobility/>



Source

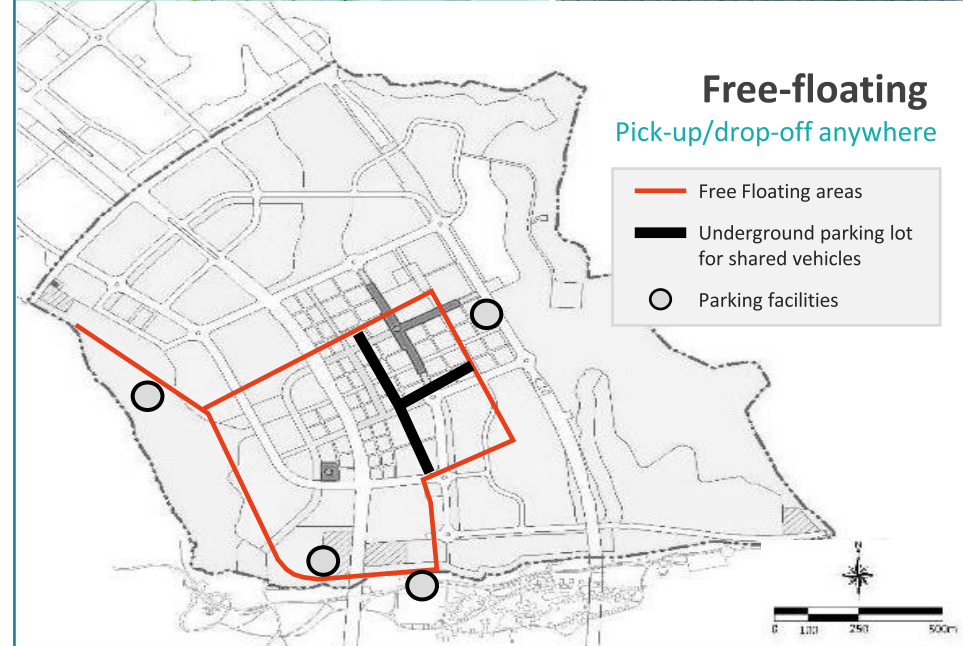
<https://www.toyota.com.bh/about/innovation/personal-mobility/>



Source

<https://www.motor1.com/photo/1180227/honda-wander-concepts-preview-a-bright-future-for-personal-mobility/>

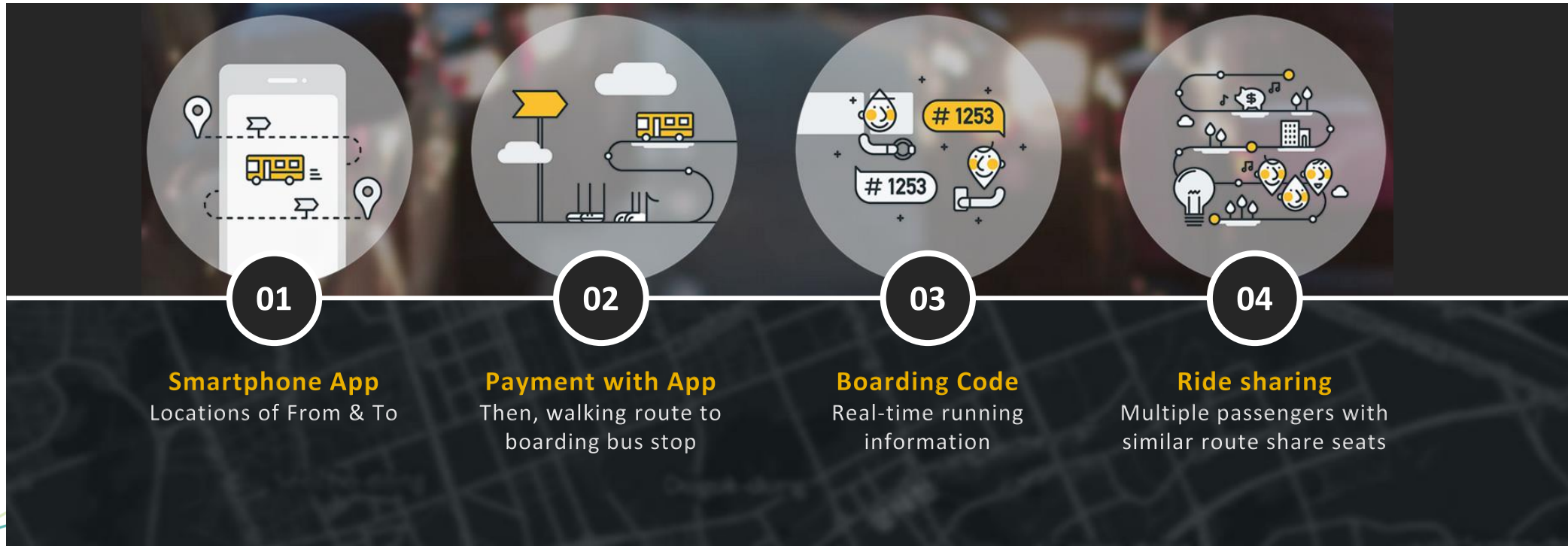
Car Sharing



Demand Responsive Transit (DRT) Service



- **Demand responsive transit service** by real-time or pre-reservation via internet or smartphone
- Optimal bus routes & stops for passengers who have same departure times, origins & destinations (e.g., commuting, shopping, etc.)



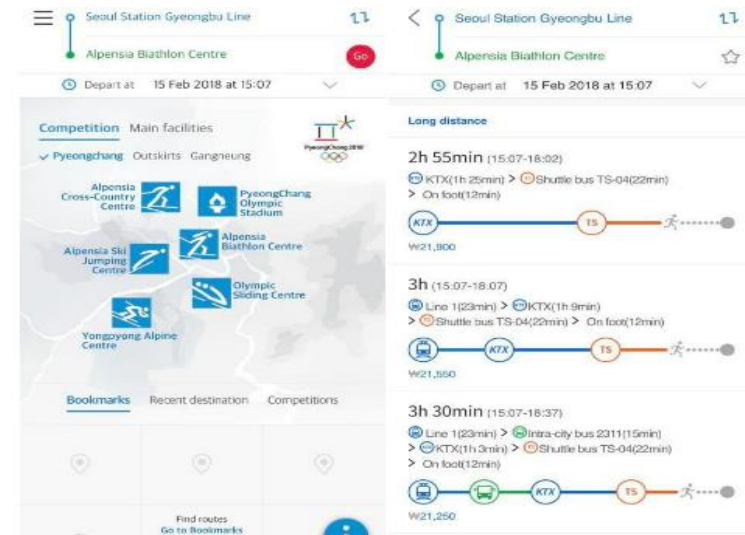
Integrated Mobility Service

- Search, reservation and payment services for transportation through a single smartphone application
- Improved convenience of using public transportation and improved mobility by connecting to first-mile and last-mile



(Frost & Sullivan, 2016)

GO PyeongChang Service, 2018 Winter Olympic Games

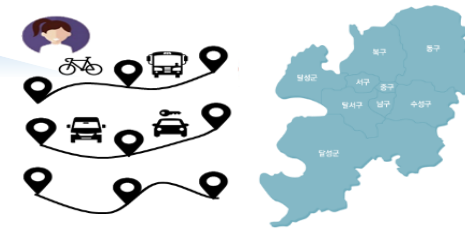


Integrated Mobility Service – Smart Mobility R&D

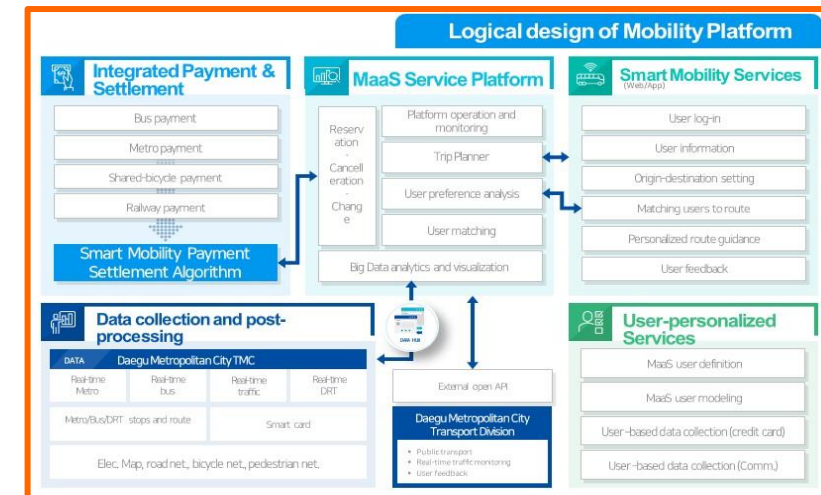
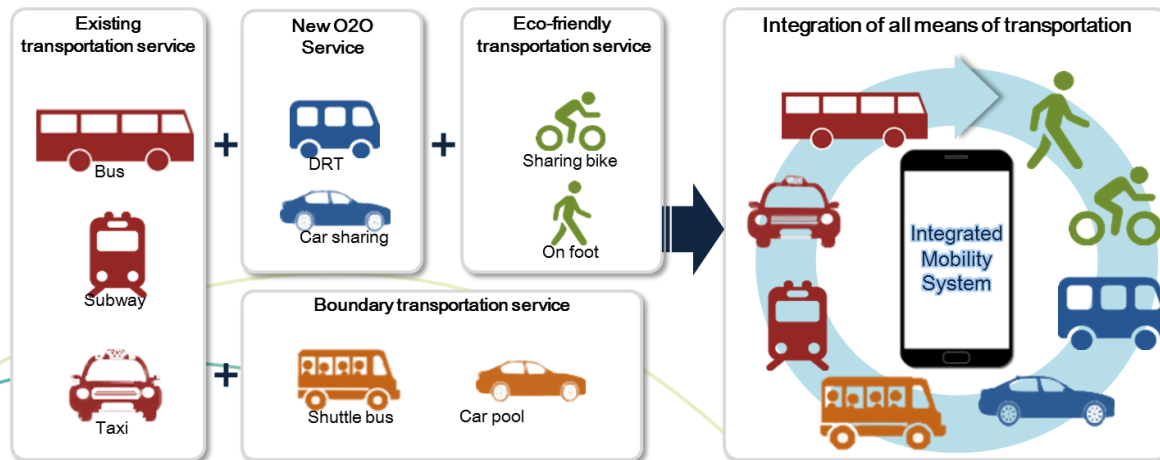
Development of various technologies for providing integrated smart mobility service

- Develop smart mobility service scenarios
- Develop data collection technologies for real-time traffic situation and transportation information
- Develop user-tailored transport data analysis technologies and optimal path algorithm
- Develop personalized smart mobility service provision technologies including Mobility Platform

Demonstration of smart mobility service to Daegu Metropolitan City



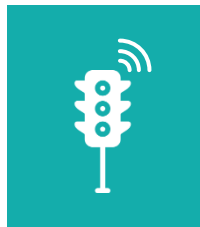
- Operate service demonstration and system in Daegu Metropolitan City
- Verification and evaluation of demonstration scenario



Smart Signal & Pedestrian Crossing



Source : <http://www.onnyx.in/vehicle-actuated-signal.html>



SMART SIGNAL CONTROL (AI-based)

AI-based image processing using high-definition CCTVs & actuated controls (phase extension, skips, etc.) for all approaches



SMART PEDESTRIAN CROSSING system

Sensing pedestrians, guiding pedestrians (vocal warning and guidance), warning to vehicles, indicating signals and information on surface.

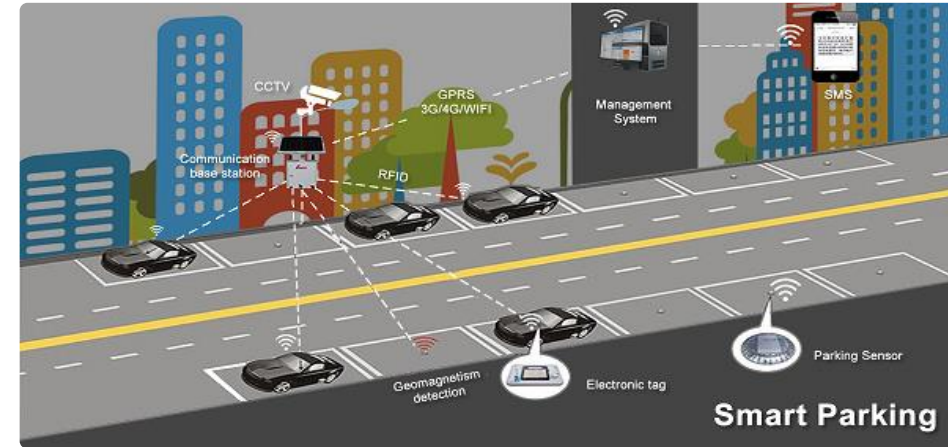
Smart Parking Service



Route guidance based on a reserved parking space



Real-time parking space sensing



Automated parking payment



National Smart City Pilot Project



Sejong 5-1 District

Goal

Livable, workable and sustainable city for human well-being

Key Elements

7 elements

- **Smart Mobility**
- Smart Health Care
- Smart Education
- Smart Energy & Environment
- Smart Culture & Shopping, and so on



Busan Eco Delta District

Goal

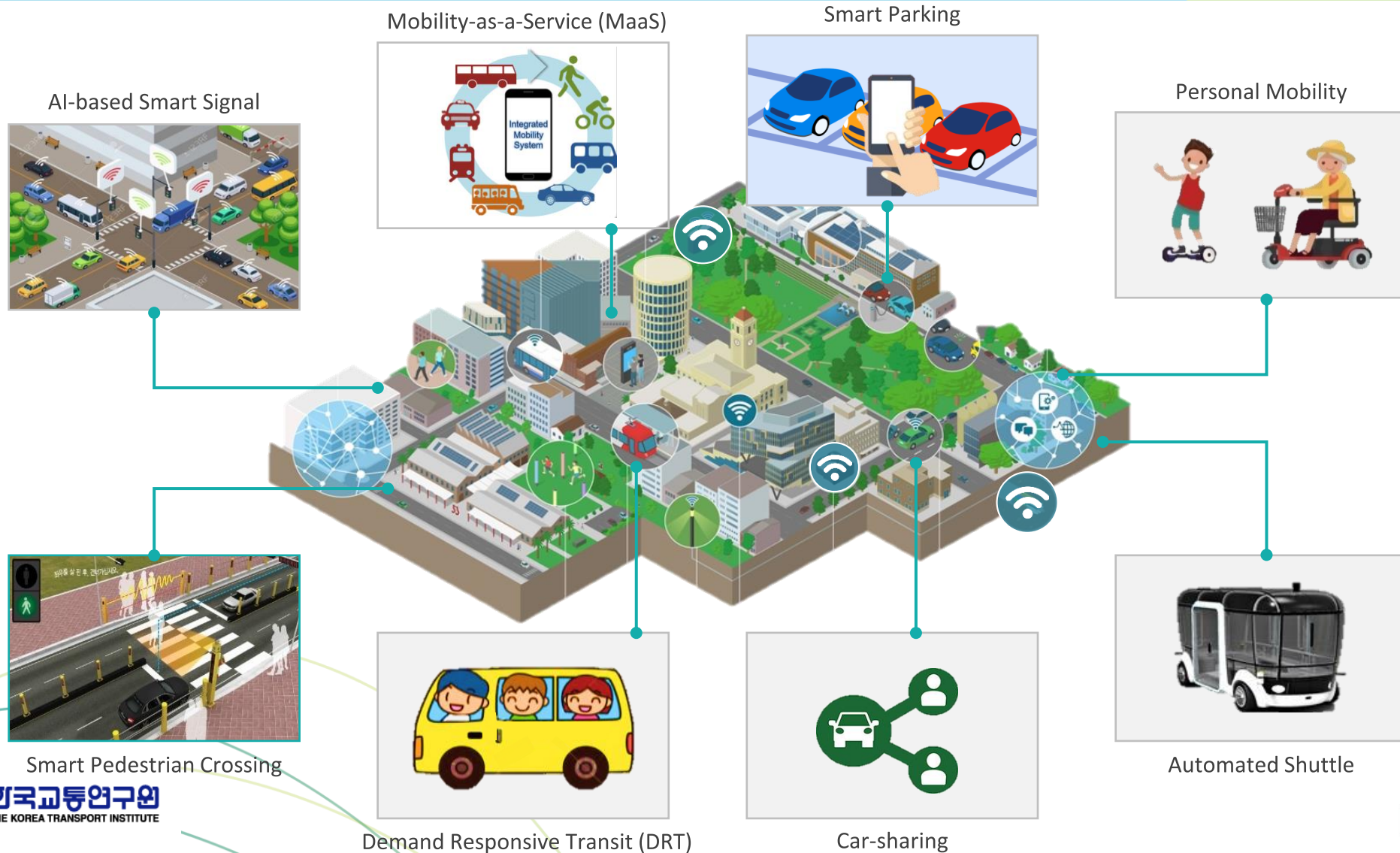
Sustainable city model based upon water circulation and renewable energy

Key Elements

10 elements

- Smart Water
- Smart Energy
- **Smart Mobility**
- Smart Safety
- Smart Education & Living, and so on

National Smart City Pilot Project - Smart Mobility



**KOTI enriches the future by securing harmony
among humans, the environment and transport.**