Perspective of Future Transport with Digital Infrastructure in Korea

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2022 CHENGDU
18TH ITS ASIA PACIFIC FORUM

I. Current Status of ITS in Korea

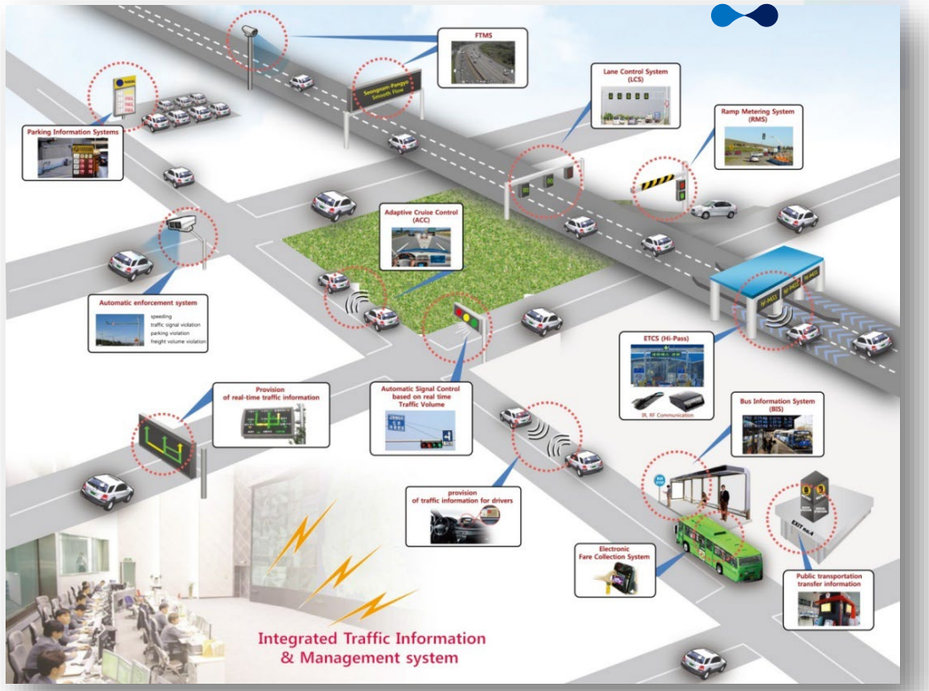
Introduction of Korean ITS Service

Korean ITS Service

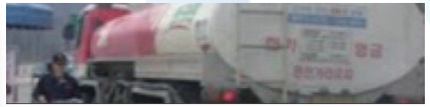
Traffic Management
- Traffic control & providing traffic information
- Manage traffic incidents
- Real-time adaptive control
- Automatic enforcement

Traffic Information Center
- Integrated management ITS
- Monitoring real-time traffic condition and Providing traffic information (VMS, Internet, App)
- Exchange traffic information with related centers

Intelligent Vehicle & Road
- C-ITS
- Autonomous driving & road
- Adaptive Cruise Control(ACC)



Commercial Vehicle Operations
- Manage freight vehicle
- Manage hazardous materials



Public Transportation Provide Bus Information
- Manage bus operation
- BRT system
- Bus priority signal

Traveler Information
- Car navigation
- Provision of traffic information for drivers

Electronic Payment
- Electronic Toll Collection System
- Automatic Fare Collection System for public transportation

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ITS Driving for a Better Life

Current ITS in Korea

01 **ETCS**

- **Expressway Hipass***
  - ('07) 262 → ('20) **386 Toll plazas**
- **Multilane Hipass :** ('20) **34 Toll plazas**
- **Usage rate :** ('12) 56.9% → ('20) **81.4%**
- **OBU distribution rate**
  - ('12) 41.1% → ('19.3) **81.9%**

* Hipass : Korea ITS System

02 **BIMS**

- **Bus Information System(BIS)**
  ('11) 59 cities → **('20) 147 cities**
  → ('26) 162(expected) cities
- **Bus Information Terminal(BIT)**
  ('11) 13,163 devices → **('19) 34,797 cities**

03 **ATIS**

- **ITS Information Centers**
  - ('10) 33 cities → **('20) 53 cities**
    (* Most cities with more than 0.2 million citizens operates)
- **ITS Information Provision**
  - Private companies use public open data to provide additional traffic info.

04 **ATES**

- **Automatic Traffic Enforcement System**
  - Speeding : **3,401 sites**
  - Signal violation : **3,339 sites**
  - Illegal parking : **4,605 sites**
  - Dedicated line violation : **33 sites**
  - Multi Enforcement : **1,731 sites**
  - Others : **124 sites**

* Until January 2020

05 **Express way**

- **ITS on Expressway** : **4,788km(100%)**
- **FTMS(Freeway)**
  : VDS(2,999), CCTV(3,163), VMS(1,261), AVC(304), DSRC(1,100), LSWIM(483)
- **TTMS(Tunnel)**
  : VDS(1,041), CCTV(5,632), VMS(447)

* Until end of 2020

06 **National Highway**

- **ITS on National Highway**
  - 4,188km(47%)
- VDS(1,667), AVI(241), CCTV(2,044), VMS(1,015), WEB CAM(7), DSRC(320), RSS(RWIS)(37), VSL(1,732)

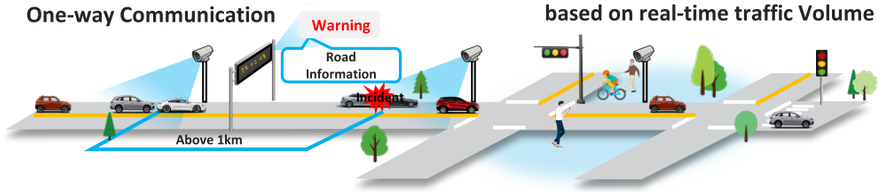
* Until end of 2020

Current Status and Future Vision of ITS

National Level Preemptive Investment to Realize Future Digital Road Accommodating CAV

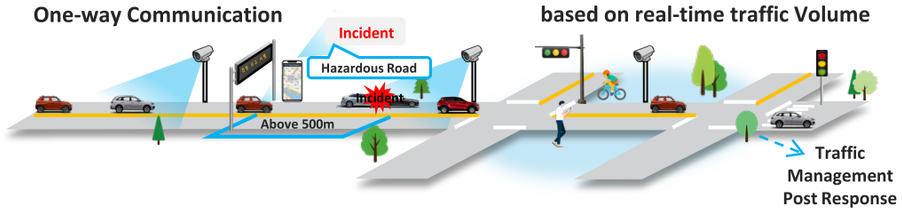
- Full-scale implementation of 3rd generation ITS (C-ITS) for commercialization of 4th generation ITS (Automated Driving)

1st Generation ITS ('90~'10)



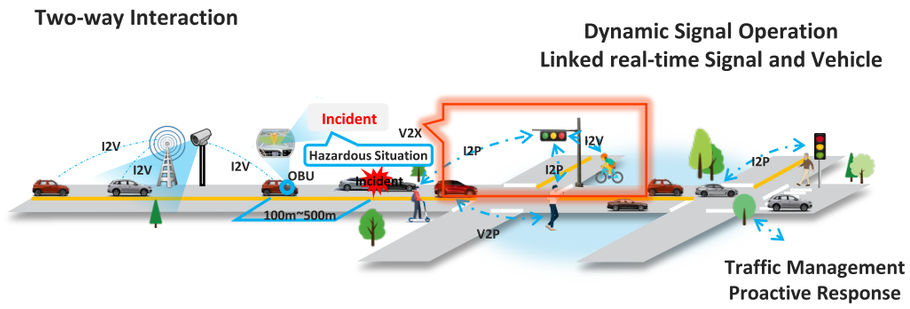
One-way collection and provision of information on traffic information center and RSE

2nd Generation ITS ('10~'20)



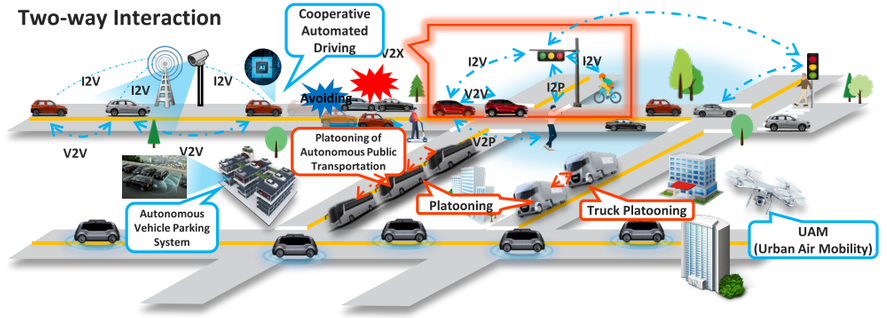
One-way collection and provision of information via communication device and Traffic Information Center

3rd Generation ITS ('20~'25) : C-ITS, AI, Smart Infrastructure



Two-way interaction between RSE and OBU

4th Generation ITS ('26~) : CAV



Two-way interaction between RSE and Autonomous Vehicle

II. The Future with Digital Infrastructure

Implementation of C-ITS in Korea

Current Status of C- ITS Implementation Project

- Developing 15 common services with customized service and verifying message standards based on pilot, testbed, demonstration

2014~2017 C-ITS pilot project (88km)

- 3,000 units of OBU, 15 safety services , USD 12 M

2018~2019 C-ITS pre deployment on expressway (85km)

- 700 units of OBU, services for truck and express bus , USD 8M

2018~2020 C-ITS pre deployment in Seoul (121km)

- 1,700 units of OBU, services for public transport (bus, taxi), USD 22M

2018~2020 C-ITS pre deployment in Jeju (300km)

- 3,000 units of OBU, services for tourism(rent cars), USD 19M

★★ Effects : Service satisfaction improved by 8%(3.55→3.83),
Safety Observance 96.5% (stop, reducing speed)

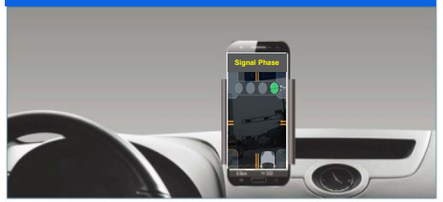
2019~2021 C-ITS pre deployment in Ulsan (103km)

- 2,700 units of OBU, services for truck safety, USD 22M

2019~2021 C-ITS pre deployment in Kwangju (144km)

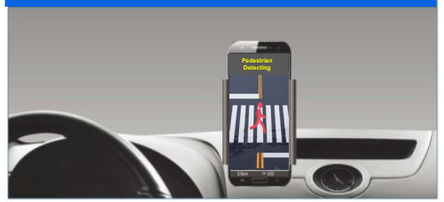
- 2,000 units of OBU, services for the old and the vulnerable, USD 22M

Signal Violation Warning



Emergency Vehicle Approaching

Pedestrian Collision Warning



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ITS Driving for a Better Life

Current Status of C-ITS Preparation & Future Plan

“Preparations for C-ITS Implementation”

according to **Korean New Deal Policy**(’20.7), **Action Plan of 2021 Digital New Deal**(’21.1), **Revised C-ITS Action Plan**(‘21.8)

Institutional Preparation

- Distributing dedicated **frequency** (’16)
- Establishing **de facto standards** for C-ITS(~’20)

Technical Preparation

- Implementation of C-ITS on **major expressway**(’21~’22)
- Providing 26 **C-ITS services**
- Establishing a **product certification system**(’20)
- **Security authentication** for Hacking Prevention and Anonymity

2021 — C-ITS Implementation of Major Expressway (800km) (‘21~’22)

2022 — Demonstration of LTE-V2X (~’22)

2023 — Implementation of Hybrid Communication (WAVE+LTE-V2X) (~’23, 2,400km)

2024 — Nationwide implementation of C-ITS (‘24~)

2025 — Commercializing AV (~’25)

2026

2027 — Realizing Automated Driving (Lv. 4) (~’27)

National Policies and Plan related to Future ITS in Korea

National ITS Master Plan 2030

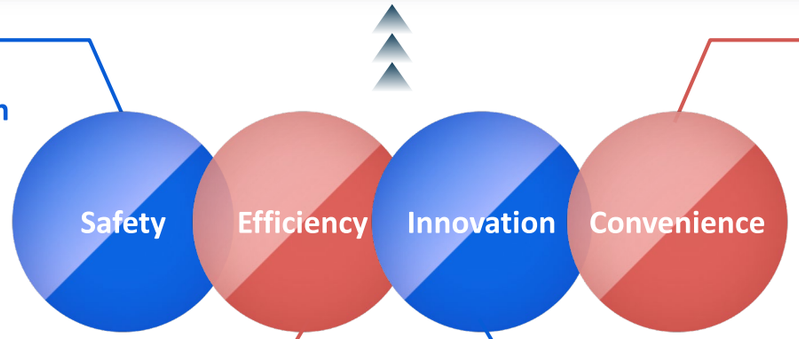
“ DREAMS on ITS ”

Digital Road for Eco-friendly and Advanced, Mobility Service

Innovative Road & Competitive International Technologies
By Implementing a Digital Road Network for Autonomous Vehicles and MaaS

Zero Safety Blind Spot,
Real time Accidents Prevention
and Responds

Anytime, anywhere,
convenient for anyone
Inclusive Mobility



Customized Service
based on AI Convergence
Smarter Traffic Management

Self Diagnosis and Controls
Innovative Digital Infrastructure

Safe Road without Blind spot / **Better Life Quality** based on New Values - Openness, Convergence, and Innovation

National R&Ds and Projects related to Future ITS in Korea

Service Roadmap Based on National ITS Architecture Revision

Background and purpose

1. Transition of transportation paradigm (autonomous driving, C-ITS, etc.)
2. Coordination with national plans
3. Diagnosis of current ITS architecture service level
4. National ITS Architecture Revision

Issue

- Issue 01 National ITS enacted in ’99, insufficient reflection of technology after the ’09 revision
- Issue 02 Consistency with plans such as the "National ITS Master Plan 2030" is required
- Issue 03 Continuously renewing ITS architecture globally
- Issue 04 Need to prepare digital infrastructure introduction and service expansion and dissemination (draft)

Solution

- Solution 01 National ITS service level and status diagnosis
- Solution 02 Preparation of mid- to long-term development plans and roadmaps for national ITS services
- Solution 03 Understanding the current status of overseas ITS architecture and deriving directions for improvement
- Solution 04 Preparation of national ITS architecture revision based on service roadmap

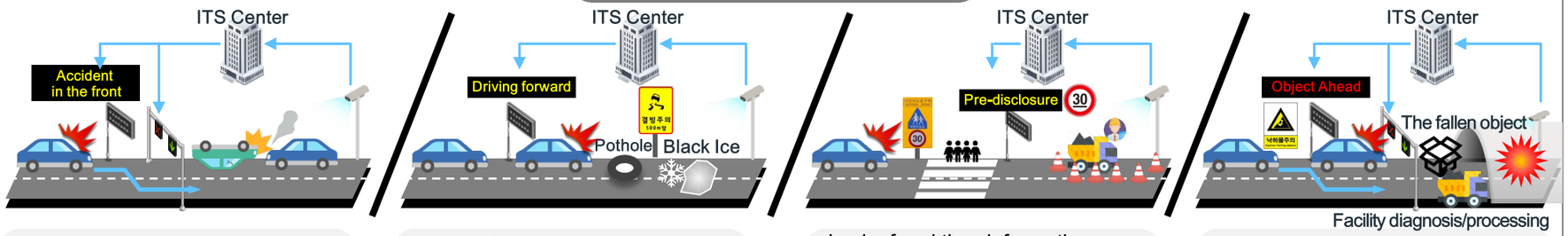
Promoting national ITS architecture revision based on the national ITS service roadmap

National R&Ds and Projects related to Future ITS in Korea

Future Service Roadmap

AS-IS

CCTV Monitoring, One-way, Service section disconnection



- CCTV based monitoring
- **One-way** Information Provision (VMS)

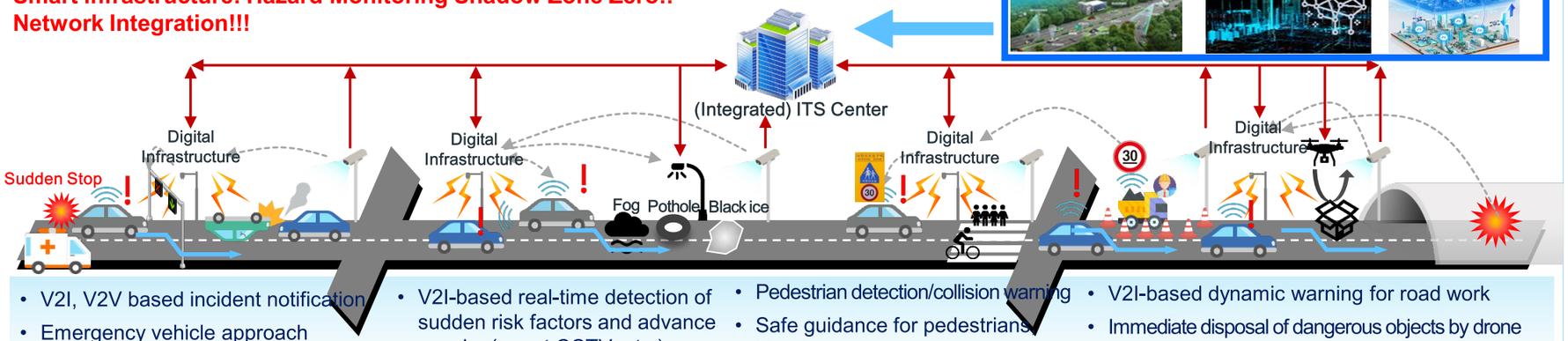
- Lack of collecting invisible risk data like pothole or black ice
- Fixed Signage according to statistical analysis

- Lack of real time information provision for the road work, school/ sudden event
- Lack of collecting, analysis, provision

- Labor-based facility management
- One way info. provision
- Lack of collecting real time risk data

TO-BE

Smart infrastructure! Hazard Monitoring Shadow Zone Zero!!
Network Integration!!!



- V2I, V2V based incident notification
- Emergency vehicle approach notification, network-based lane control **(two-way)**

- V2I-based real-time detection of sudden risk factors and advance warning(smart CCTV, etc.)
- Safe driving support, light control

- Pedestrian detection/collision warning
- Safe guidance for pedestrians, bicycles etc.
- Real-time warning for driving areas such as school zones

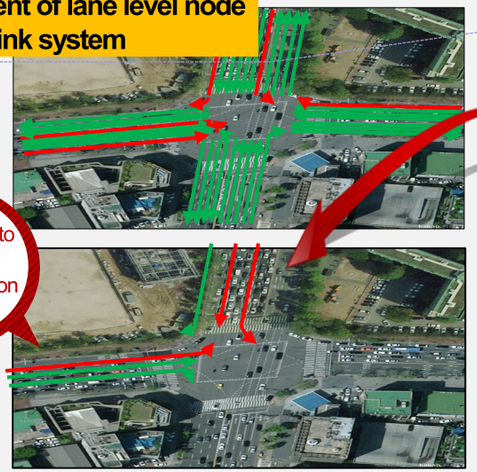
- V2I-based dynamic warning for road work
- Immediate disposal of dangerous objects by drone
- Data-based integrated management and response for traffic-vulnerable facilities

National R&Ds and Projects related to Future ITS in Korea

Revision of National ITS Node-Link Standards and Management Guidelines

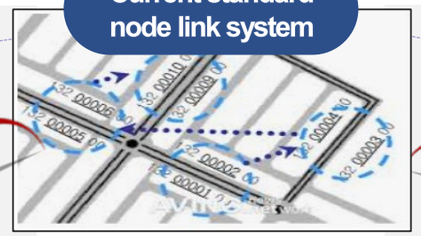
Dual functions to continue the current ITS service and respond to the future transportation system

Development of lane level node link system

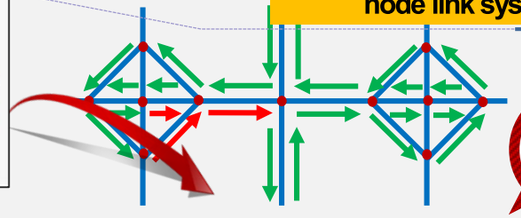


Response to the future transportation system

Current standard node link system



Improvement of the current node link system



Issues

Service area

Automated driving safety

C-ITS service

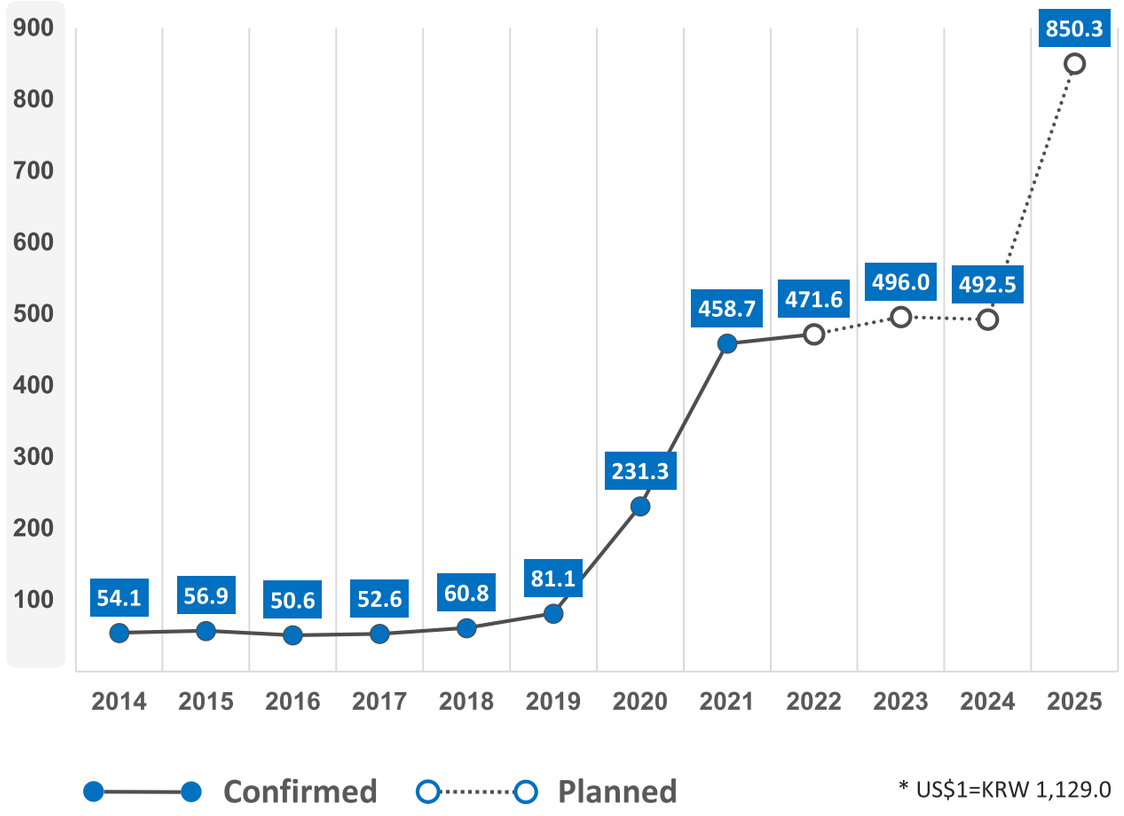
School Zone

Construction

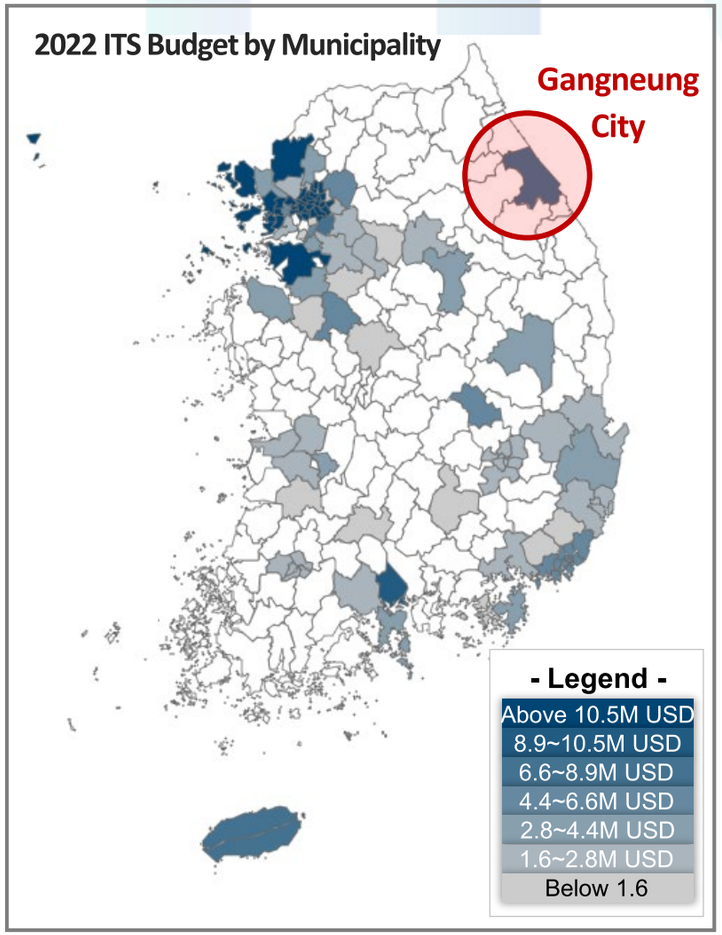
MOLIT Budget for ITS&C-ITS

Total Budget (’14 - ’25)

(Unit : million USD)



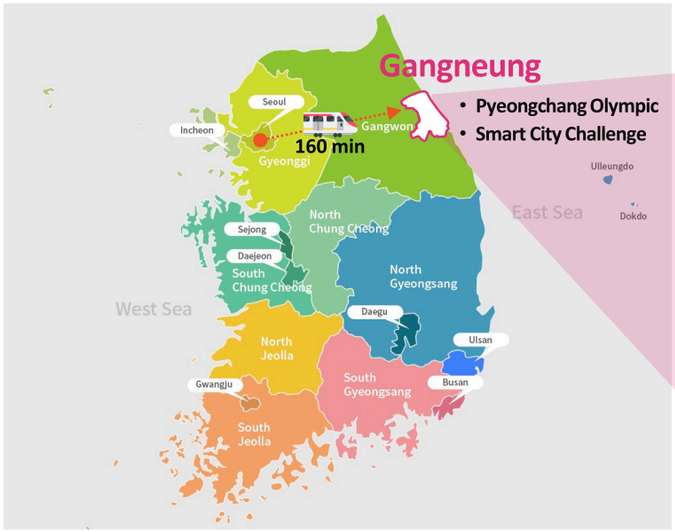
* US$1=KRW 1,129.0



Smart City with Digital Infrastructure

Gangneung city, Integrated smart city realizing Automated Driving

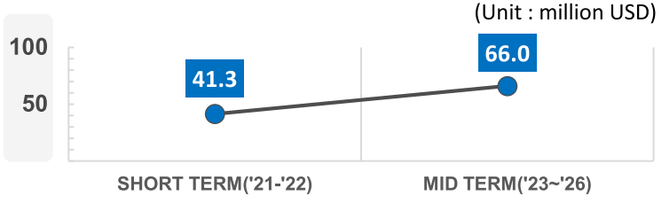
2026 ITS World Congress Candidate City



ITS Budget for Gangneung

✓ The largest ITS budget is invested in Gangneung among small medium cities in Korea

(Unit : million USD)



* US$1=KRW 1,129.0

"BEYOND THE CITY, EVERYWHERE SMART MOBILITY"

THANKS