Development of Model ITS Deployment for Asian Highway Networks

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Ⅱ. Review ITS Experiences of Target Countries

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I  Outline of AH ITS Research
1. Outline of AH ITS Research

❖ Background

- ITS has a great potential to enhance the efficient use of Highway networks
- provides the experience of selected member countries in implementing ITS
- promote the spread and use of ITS and related technologies

❖ Objectives

- Review status and experiences of ITS on AH countries
- Develop Model ITS deployment in AH
2. Target countries for the AH ITS

 Selected countries along AH1 and AH6

- Japan(AH1), Korea(AH1,6), China(AH1),
  Russian Federation(AH6) and Turkey(AH1)
3. Statistics of five countries

**Road density**

**GDP per capita**

**Passenger cars**

**Road traffic deaths**
## 4. Hierarchical classification for AH

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<thead>
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Review ITS Experiences of Target Countries
1. ITS Activities in Korea

- Transportation Systems Efficiency Act (1999)

- ITS on 13,456km (15.8%) of Roads (2013)
  - All Expressways (4,112km)
  - 2,633 km of National Highway (19.6% of 13,473km)
  - 6,711 km of Urban roads (9.9%)

- ITS Center/Facilities in 63 cities/Organizations (2013)
  - Travel Info., Traffic Control, BIS/BMS
  - Automated Enforcement, Road Safety Monitoring
Traffic Management Techniques in KEC

- **ETCS** (“Hipass”: nonstop ETCS)
- Ramp Metering
- Shoulder Lane Control
- HOV Lane
- Local-Express Lane
- Providing Traffic Information
2. Japan

- Expressways network and AH route in Japan

- History of ITS in Japan
  - 63 million navigations, 43 million VICS units and 47 million ETC terminals in 2014
3. China

Expressways network and AH routes in China

Expressways for north-south (5 corridors)
- Tongjiang – Sanya: 5,200 km
- Beijing - Fuzhou: 2500 km
- Beijing - Zhuhai: 2400 km
- Erlianhot - Hekou: 3600 km
- Chongqing - Zhanjiang: 1400 km

Expressways for west-east direction (7 corridors)
- Suifenghe - Manzhouli: 1300 km
- Dandong - Lhasa: 4600 km
- Qingdao - Yinchuan: 1600 km
- Lianyungang - Huorgos: 4400 km
- Shanghai - Chengdu: 2500 km
- Shanghai - Ruili: 4000 km
- Hengyang - Kunming: 2000 km

Traffic Management System

Various VMS  Weather Information  Toll Collection System  Traffic center
4. Russia

- Expressways network and AH routes in Russia
5. Turkey

- Expressways network and AH routes in Turkey

Expressways status & Plan in Turkey
http://www.snipview.com/q/Highways%20in%20Turkey

AH Network in Turkey
Ⅲ ITS on Europe
Objectives of EU’s transportation policy
- Mobility: that is efficient, safe, secure and environmentally-friendly

TEN-T (Trans-European Transport Network)
- formulated by the European Parliament and Council in 1996
- Planned networks of road, rail, air and water transport
  - Coordinated improvements in primary transport networks
  - Provide integrated and intermodal long-distance, high-speed routes
  - Ensure seamless transport networks for passengers and freight

Trans-European Road Network (TERN)
- One of several TEN-Ts
- A project to improve internal road infrastructure of the EU
2. EasyWay project

- Project for Europe-wide ITS deployment on main TERN corridors (2007~2013)
- Driven by national road authorities and operators with associated partners including automotive industry, telecom operators and public transport stakeholders
- Identifies the set of necessary ITS European services to deploy

![Diagram of EasyWay activities and core services]

The EasyWay 2 activities and Core Services
3. Primary ITS Projects supported by EU funds

**URSA MAJOR Project**
- ITS deployment on expressways in Germany and Italy etc.
  → improve **international freight & logistics**

**NEXT-ITS**
- Provide real-time traffic & road safety information for north Europe area

**CROCODILE Project**
- Infrastructure project to share ITS information between public & private

**MedTIS**
- Infrastructure construction for traffic information among Mediterranean area.

**Arc Atlantique**
- Connect economic area: traffic management & traffic information

**SCOOP@F (Part 1)**
- C-ITS for 3,000 vehicles and 2,000km roadways in France
IV Strategies for AH ITS Deployment
1. The objectives of AH ITS

- **Objectives of AH**
  - Promote social, economic development in Asia area

- **Properties of ITS**
  - Optimizes efficiency and increases effectiveness of existing transport infra.
  - Ensure the transportation system securely
  - Enhance traffic safety → Lower the number and severity of accidents
  - Less congestions → Cut energy consumption and emissions
  - Achieve “managed” transport networks and better sustainability in mobility

- **Role of ITS in AH (AH ITS model deployment)**
  - Achieve objectives of AH Fast and efficiently
  - Motivates AH countries to accomplish objectives of AH
2. Target Section of AH ITS Deployment

- **Properties of ITS**
  - Highway infrastructure should be installed before ITS adoption
  - Time & cost of ITS is smaller than highway Infra. (Secondary tool)
  - **Highway Infra. can trigger demand, but ITS can’t**
  - Optimize efficiency and enhance the effectiveness of existing infrastructure

- **Target section for AH ITS**
  - consider demand(traffic volume, accident etc.) and level of highway Infra.
3. Target Area

Alternative 1: Specific Countries

- Five countries
  - High and Upper-Middle income Countries
  - Lead the implementation of ITS projects
- Selection of these countries will allow to identify and to study on successful ITS projects in the region

Alternative 2: Regional blocks for neighboring nations

- As like in Europe (example) Northeast Asian economic region, GMR etc.
  - Focus on support to passengers and freights transport in neighboring area
- Lack of the connectivity between 5 target countries
  - Islands (Japan, Korea), connect only some section in AH6 (China-Russia)
4. Roadmap for AH ITS

History of ITS in Korea
- government, Expressways lead ITS deployment
- Pilot project kicked off in urban area
- Related regulations were established

UNECE ITS Road Map
- Harmonization based on existing infra.
- Build and reinforce Highway infrastructure
- Link Highway to ITS: related Agreements
- ITS Deployment
- Monitoring

Deployment program over time in EU
- Support of individual projects (before 2001)
- Cross-border deployment (2001-2006)
- Europe-wide services (2007-2013)
- European corridors (2013)

Source: UNECE(2012), Intelligent Transport Systems (ITS) for sustainable mobility
# 5. Define Services for All ITS

## ITS services on ISO

- International Standard 14813-1:2007(E)
- **12 ITS services**
  - TIS, TM&O, VS, FT

<table>
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<tr>
<th>ITS Service Domains</th>
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<tbody>
<tr>
<td><strong>Traveller information</strong></td>
</tr>
<tr>
<td>Provision of both static and dynamic information about the transport network to users</td>
</tr>
<tr>
<td><strong>Traffic management and operations</strong></td>
</tr>
<tr>
<td>The management of the movement of vehicles, travellers and pedestrians throughout the road transport network</td>
</tr>
<tr>
<td><strong>Vehicle services</strong></td>
</tr>
<tr>
<td>Enhancement of safety, security and efficiency in vehicle operations, by warnings and assistance to users or control vehicle operations</td>
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<tr>
<td><strong>Freight transport</strong></td>
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<tr>
<td>The management of commercial vehicle operations, freight and fleet management, and activities that expedite the authorisation process for cargo at national and jurisdictional boundaries and expedite cross-modal transfers for authorised cargo</td>
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<tr>
<td><strong>Public transport</strong></td>
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<tr>
<td>Operation of public transport services and the provision of operational information to the operator and user, including multi-modal aspects</td>
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<tr>
<td><strong>Emergency</strong></td>
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<tr>
<td>Services delivered in response to incidents that are categorised as emergencies</td>
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<tr>
<td><strong>Transport-related electronic payment</strong></td>
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<td>Transactions and reservations for transport-related services</td>
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<tr>
<td><strong>Road transport-related personal safety</strong></td>
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<tr>
<td>Protection of transport users including pedestrians and vulnerable users</td>
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<td><strong>Weather and environmental conditions monitoring</strong></td>
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<tr>
<td>Activities that monitor and notify weather and environmental conditions</td>
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<td><strong>Disaster response management and coordination</strong></td>
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<tr>
<td>Road transport-based activities in response to natural disasters, civil disturbances or terror attacks</td>
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<tr>
<td><strong>National security</strong></td>
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<tr>
<td>Activities that directly protect or mitigate physical or operational harm to persons and facilities due to natural disasters, civil disturbances or terror attacks</td>
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<td><strong>ITS data management</strong></td>
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<td>Registration, storage and exchange of traffic related data</td>
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Considerations for Selection of AH ITS Services

- focus on international connection, exchange, standard
- focus on Freight trip / not personal service
  - Freight transport can motivates the economic development, needs international trip
### Selection of AH ITS Services

- **AH ITS target services (temporally):** TI, FT, EM, EP

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<th>Service</th>
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<th>Selection</th>
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<td>Traveler Information</td>
<td>Provide basic information for traffic situation</td>
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<td>Traffic Management</td>
<td>service for safety &amp; relief congestion in domestic</td>
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<tr>
<td>Vehicle services</td>
<td>Suitable for each vehicle, driver (personal)</td>
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<td>Freight Transport</td>
<td>necessary to cross-border long travel freight vehicle</td>
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<tr>
<td>Public Transport</td>
<td>sufficient only for domestic urban area</td>
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<tr>
<td>Emergency Management</td>
<td>necessary to safety and rapid rescue in accident</td>
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<tr>
<td>Electronic payment</td>
<td>necessary for unification of vehicle classification, system in tollroad</td>
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<td>Personal safety</td>
<td>Not suitable for mainline highway</td>
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<td>Weather monitoring</td>
<td>Needs a lot of various road sensor</td>
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<td>Disaster response</td>
<td>Needs connection with a lot of system, infrastructure(high cost)</td>
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<td>National security</td>
<td>efficient to install by each nation</td>
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<tr>
<td>ITS data management</td>
<td>Share for only cross-border, disaster information</td>
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TIS

- Static message standardization is the first task to undertake
  - Static information (sign, etc.) → dynamic information (Variable Messages, etc.)
  - Many countries not enough sign systems

Other issues

- Role about traffic information
  : Traffic data should be collected and processed by each country
  ; but information display type needs unification
- Display type: diagrams may be better than characters
- Car Navigation needs to mobile communication(high cost): Private
- Common language for display: English?
EMS (Emergency Management System)

- Related organizations, standards, other services (medical etc.) of each country
  - related with disaster response
  - Not high level response (insurance etc) → basic response
Freight Transport, Cross-Border Transport (CBT)

- Priority in international trip: border-crossing truck → tour bus → passenger car
- Example of Cross-Border Transport (CBT) between Canada and USA
- Border Crossing Guide for Commercial Truck Drivers (USDOT)
  - Canada → USA border CBT Case
  - Move to inspection after crossing border

Smart Commercial Vehicle Operation case
GPS, emergency button,
Freight monitoring sensor, interior CCTV, lock system

- Needs agreement among nations about invoice integration, RFID install etc.
6. Survey & Evaluation for AH ITS Deployment

**Survey items**

- **Status of highway and ITS for National level**
  - status and planning for national highway, ITS
    - Highway facilities: The number of lanes, toll roads, intersections
    - ITS services: information provision, incident management etc.
    - ITS system: VDS, CCTV, VMS, AVC, ETC, WIS etc.
  - government organization of national highway ITS

- **Status and plan for AH1, AH6**
  - Highway facilities, ITS services, system
  - traffic volume, traffic accident etc.

- **Experience of ITS deployments → Sharing the knowledge**
  - the process, problem of national ITS and main highway for target countries
  - sharing the knowledge with developing countries
**Evaluation of AH countries**

- Evaluate the ITS-related environment for each countries

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**Evaluate ITS level of AH countries**

- low/middle/high or level 1~5
- evaluation ITS services level for each countries
- set the future ITS level
  - 예) level 1 \(\rightarrow\) level 3 after 10 years
Set the service and section considering Level of ITS

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<th>Services</th>
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<td>Basic ITS services</td>
<td>Urban area</td>
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<td>Middle</td>
<td>Enhancement of ITS services</td>
<td>Inter-Urban Expressways, Tunnel, Border Crossings</td>
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<tr>
<td>High</td>
<td>New ITS services for special section</td>
<td>Network-wide</td>
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Suggest the Service architecture for ITS deployment

- ISO service
  - Not means implement of standardization
  -的目的 of sharing recognition for ITS service, suggest the possible services by ITS
- service is dependant on physical, logical architecture
- service is dependant on organization(different with each countries)

→ Service architecture can be different with each countries
More gaps and blocks in AH countries than in EU

- socio-economic: income(safety, two-wheel), language(VMS, emergency), culture(drive direction)
- technology: level of Infra., industry, equipment, criteria(vehicle type), special education

Policies—not technologies—can hamper international ITS connection

- License plate(e.g. E-plate in EU), Insurance, repairs of cars
THANK YOU