Smart mobility for sustainable development
- ITS measures in Japan -

Kinji Hasegawa
ITS Policy and Program Office
Road Bureau
Ministry of Land, Infrastructure and Transport
Government of Japan
Discussion Points

1. ITS measures for environment
   • Smooth traffic flow (ETC, VICS, Smart Interchange)
   • Traffic Demand Management
   • Promote use of public transportation

2. Platform supports a variety of measures
   • Common platform for sustainable society
1. ITS measures for environment

- 20% of CO₂ emissions is from vehicles
- CO₂ emissions is to be reduced by 6% during 2008-2012
- ITS is expected to be a strong weapon for environmental sustainability

Projected reduction of CO₂ emissions in Kyoto Protocol Target Achievement Plan
("Design CO₂-saving transportation systems")

<table>
<thead>
<tr>
<th>Measures</th>
<th>Projected emissions reduction (1000ton-CO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Smooth traffic flow</td>
<td>3600</td>
</tr>
<tr>
<td></td>
<td>(VICS : 2400)</td>
</tr>
<tr>
<td>2) Traffic demand management</td>
<td>300</td>
</tr>
<tr>
<td>3) Use of public transportation</td>
<td>3800</td>
</tr>
<tr>
<td>4) Others</td>
<td></td>
</tr>
<tr>
<td>Reduce road works</td>
<td>500</td>
</tr>
<tr>
<td>Develop traffic safety facilities</td>
<td>500</td>
</tr>
<tr>
<td>Tele-working, etc.</td>
<td>3400</td>
</tr>
<tr>
<td>Eco-driving</td>
<td>1300</td>
</tr>
<tr>
<td>Anti-idling automobiles</td>
<td>600</td>
</tr>
</tbody>
</table>

Carbon dioxide emissions in Japan

- Industry: 38%
- Other: 12%
- Consumer (commercial): 16%
- Consumer (household): 13%

Transport 21%! (Vehicle: 90% of transport)

20% of CO₂ emissions is from vehicles.
1. **ITS measures for environment**

**Various measures for each situation**

<table>
<thead>
<tr>
<th>Kind of measures</th>
<th>Concrete measures in Japan</th>
</tr>
</thead>
</table>
| 1) Smooth traffic flow                   | - Eliminate traffic jam at tollgate by increasing ETC (Electronic Toll Collection) usage rate to 50%.  
- Improve access and reduce traffic jam on the roadside by smart interchange. (Under trial)  
- Wide and detailed information providing by advanced VICS. (Under research)                  |
| 2) Traffic Demand Management            | - Environmental road pricing, fee measures, etc.                                           |
| 3) Promote use of public transportation | - Highway bus location system contribute to the greater convenience in public transportation, and is utilized as probe data. |
| 4) Other measures                       | - Evaluate economic loss due to traffic jams using probe data.                            
- Eco-driving by monitoring fuel consumption and driving condition.                           |
1. ITS measures for environment

1) Smooth traffic flow (ETC)

- ETC utilization rate raised to 50% and traffic congestion cleared

Causes of congestion on expressways

- Tollgates 36%!
- Merging lanes 21%
- Sags and tunnels 35%
- Other 8%

ETC utilization rates and tollgate congestion (on the main lines of Metropolitan Expressways)

<table>
<thead>
<tr>
<th>Year</th>
<th>ETC Utilization Rate (%)</th>
<th>Amount of Congestion (km²h/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr-02</td>
<td>2.5%</td>
<td>30.6</td>
</tr>
<tr>
<td>Apr-03</td>
<td>7.3%</td>
<td>26.6</td>
</tr>
<tr>
<td>Apr-04</td>
<td>21.1%</td>
<td>12.5</td>
</tr>
<tr>
<td>Apr-05</td>
<td>43.8%</td>
<td>2.6</td>
</tr>
</tbody>
</table>

Source: Conference on highway policy to prevent global warming (May 23, 2005)

CO2 emissions at Kawaguchi Toll Plaza

- 10% Reduced

Traffic volume

- 2003 (ETC utilization rate: 6%)
- 2003 (ETC utilization rate: 45%)

Source: Conference on highway policy to prevent global warming (May 23, 2005)

Picture: Kawaguchi Toll Plaza
1. ITS measures for environment

1) Smooth traffic flow (Smart Interchange)
   - Smart interchanges, dedicated for ETC, will contribute to less congestion

Average distance between interchanges

- Japan: About 10 km
- Europe and North America: 4-5 km

Field trial on 29 locations nationwide

Introduce smart interchanges
1. ITS measures for environment

1) Smooth traffic flow (VICS)
   - Started in April 1996
   - Provide real-time road traffic information on car-navigation system

Schematic depiction of VICS
Providing information using three communications and broadcasting media

Text display (level 1)
2 kilometers of congestion ahead due to an accident between Gotemba and Susono.

Simple diagrams (level 2)

Map display (level 3)
1. ITS measures for environment

1) Smooth traffic flow (VICS)

- Wide and detailed information by VICS using 5.8GHz-DSRC

[Wide range of information]

[Information by voice]

Urayasu to Makuhari: 2 km congestion due to an accident

Congestion 2km ahead
1. ITS measures for environment

1) Smooth traffic flow (VICS)

- Wide and detailed information by VICS using 5.8GHz-DSRC

[Information by static image]

[Icy road surface ahead.]

[Information on greater numbers of routes]

[Icy road surface ahead.]
1. **ITS measures for environment**

2) **Traffic Demand Management**

- **ITS as a policy tool, multi-modal measures and fee measures for traffic guidance**

**Environmental road pricing in Hanshin Expressway**

- Number of vehicles with ETC setup nationwide

- Further discount during field trial ($7.00 to $5.00)

- About a 60% increase

**Image of TDM**

- Toll A > Toll B

- City area (Residential area)

- Suburban area (Industrial area)
1. ITS measures for environment

2) Traffic Demand Management

- ITS as a policy tool, multi-modal measures and fee measures for traffic guidance

Discounts rate for ETC users on the Metropolitan Expressway (Trial on 2004)

Fee measures using ETC on Metropolitan Expressway 4

Travel time reduction in on ordinary roads

*Travel time on National Highway 20 from Miyakezaka to Kamitakaido (away from Tokyo)

Source: Data from the Metropolitan Expressway Public Corporation
1. ITS measures for environment

2) Traffic Demand Management

- Raise highway usage rate by offering discounts for long distance driving

Low highway usage rate in Japan

![Bar chart showing low highway usage rate in Japan with travel distances and discount rates.]

Discount rate for travel distances:
- 300km-400km: 5%
- 400km-600km: 10%
- 600km-900km: 20%
- 900km+: 30%

Midnight discount for long distance driving (Japan Highway) (Trial on 04.2004-10.2004)

<table>
<thead>
<tr>
<th>Travel distance</th>
<th>200km-300km</th>
<th>300km-500km</th>
<th>500km-800km</th>
<th>800km-1,000km</th>
<th>1,000km+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discount rate</td>
<td>0% - 10%</td>
<td>10% - 20%</td>
<td>20% - 30%</td>
<td>30% - 33%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Modest speed for less CO₂ emission

![Graph showing CO₂ emission vs. average speed with different vehicle categories.]

CO₂ emission g-CO₂/km vs. Average speed km/h

- Passenger car
- Small truck
- Bus
- Truck
1. ITS measures for environment

3) Promote use of public transportation
   - Bus location information provided through internet
   - Park and Ride system trial in many cities using IT

Bus location systems

- Approaching bus indicator at a bus stop
- Bus stop information accessed by cell phones

Park and ride system
2. Platform supports a variety of measures

- An environment that supports multiple applications from a single on-board unit
- Promote the establishment of an open platform

If a different device is needed for each application.....

Multiple applications with a single ITS on-board unit
2. Platform supports a variety of measures

- From separate platforms to a common platform
- This platform will support a wide variety of applications
2. Platform supports a variety of measures

Common platform for sustainable society

- Awakening various measures and services toward environmental sustainability using a common platform
- ITS enter the second stage and common platform and new ITS service in 2007FY