JAPANESE APPROACH FOR SUSTAINABLE ROAD TRANSPORT SYSTEM

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1. INTRODUCTION

World GHG emissions
Developed countries: Large per capita. Efforts toward reduction under the Kyoto Protocol.
Emerging and Developing countries: Anticipated to rise every year with economic growth.

- It is important to reduce CO$_2$ emissions with economic growth.
- Japan is the few countries to success it.
- To success it, Japan has promoted various countermeasures under the Kyoto Protocol.
2. JAPAN’S CO₂ EMISSIONS AND ECONOMIC GROWTH

Japan’s CO₂ emissions by sector (FY 2009)
Compiled based on figures by the Greenhouse Gas Inventory Office of Japan
2. JAPAN’S CO₂ EMISSIONS AND ECONOMIC GROWTH

Changes in CO₂ emissions in Japan’s transport sector (1990 - 2009)

Source: MLIT website

Other modes: Bus, Taxi, Railway, Ship, Aviation

FY 2010 target *, the best-case figure under the Kyoto Protocol Target Achievement Plan (March 28, 2008 by cabinet resolution).

* FY 2010 target, the best-case figure under the Kyoto Protocol Target Achievement Plan (March 28, 2008 by cabinet resolution).
2. JAPAN’S CO₂ EMISSIONS AND ECONOMIC GROWTH

There are countries with both economic growth and decreasing CO₂ emissions in transportation sector.

Relationship between GDP growth and CO₂ emission in various countries (1990–2005)

Sources: Created from IEA, "CO₂ Emissions from Fuel Combustion 2007" and OECD, "OECD Environmental Data 2006-2007."

Relationship between per capita GDP and CO₂ emission (transport sector) in various countries (2004)

Sources: Created from IEA, "CO₂ Emissions from Fuel Combustion" and WORLD BANK, "World Development Indicators Database."
3. FRAMEWORK FOR CO₂ EMISSIONS-REDUCTION

1998: Enacted the Law Concerning the Promotion of Measures to Cope with Global Warming.

2005: Set Kyoto Protocol Goal Achievement Plan by Cabinet resolution. It sets reduction targets for FY 2010 emissions for each sector.

Targets for greenhouse gas emission suppression and absorption under the Kyoto Protocol Target Achievement Plan

<table>
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<tr>
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<th>Base Year</th>
<th>FY 2010 emission yardstick</th>
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<tbody>
<tr>
<td></td>
<td>Million t- CO₂</td>
<td>Million t- CO₂</td>
</tr>
<tr>
<td>Energy CO₂ emissions</td>
<td>1,059</td>
<td>1,076~1,089</td>
</tr>
<tr>
<td>Transport</td>
<td>217</td>
<td>240~243</td>
</tr>
<tr>
<td>Total greenhouse gas emissions</td>
<td>1,261</td>
<td>1,239~1,252</td>
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</table>
4. SPECIFIC MEASURES IN INTEGRATED APPROACH

**Reduction of CO₂ emissions**
- Improved traffic flow
  - Bottleneck removal, Construction of ring roads, ITS technology
- Driving behavior
  - Eco-driving, Idling stop
- Improved fuel economy of individual car
  - Higher fuel efficiency standards, Next-generation car

**Diverting car traffic**
- Modal shift
  - Promote transit, Improved environment for cycling
- Efficient logistics
  - Combined transport & delivery, Modal shifts
- Travel Demand Management (TDM)
  - Park and ride, Road pricing, Compact cities

System of measures to reduce automobile-source CO₂ emissions
4.1. Traffic Flow Improvement
- Less CO₂ Emissions from optimal travel speed-

The relationship between travel speed and CO₂ emissions

Smother traffic leads to optimal travel speed, contributing to reducing CO₂ emissions.
4.1. Traffic Flow Improvement - Bottlenecks Elimination -

Status of major traffic congestion points in Tokyo Metropolitan area

High Priority sections due to time loss by traffic congestion

Road sections for priority action

Road sections where measures to smooth traffic have been taken

Japan’s thinking on major traffic congestion points

Grade separation project of intersection

Measures for bottleneck railroad crossings
4.1. Traffic Flow Improvement
- Construction of Ring Roads in Urban Areas -

Status of construction of the three ring roads in Tokyo metropolitan area:
- Blue Lines: Opened by April 2010
- Red Lines: not yet completed

Effects of constructing the part of Central Circular Route

Sources: Metropolitan Expressway Co., Ltd., Website

CO₂ approx. 34,000 tons/year Reduction
Estimate for expressways and ordinary roads in Tokyo Capital Region (4 prefectures)

Before opening
After opening

Approx. 30% decrease

Congestion length (km)

37km
26km

*congestion length: length of section 20km/h and under in interurban expressway & entire Tokyo line.
(peak-hour: 11:00~11:59AM weekdays)
4.1. Traffic Flow Improvement
- USE of ITS technology -

Traffic congestion guidance using VICS
(Vehicle Information and Communication System)

ETC mechanism
(Electronic Toll Collection system)
4.2. Eco-driving and other driving behaviour

Level of eco-driving is analyzed by accelerator and brake operation. Speedometer’s background color changes to feed back fuel consumption status in real-time.

-% Momentary fuel economy
Fuel economy in this time
Fuel economy in last time

5 min. ago
10 min. ago
15 min. ago
20 min. ago
25 min. ago

<Display for the Eco Assist>

Reduced fuel consumption through eco-driving

<Average fuel economy improvement for all drivers>

Sources: Honda Motor Co., Ltd., Website
4.3. Fuel Efficiency improvement of Individual Vehicles

Average fuel economy is improving for cars registered since 2000.

Lately, Hybrid vehicles have spread rapidly.

Average fuel economy of Japanese automobiles (1990-2006)

Dissemination of low-emission vehicles in Japan

Created based on "Environmental Statistical Summary", Ministry of the Environment
4.4. Modal Shift
- Promotion of Public Transportation Use -

Buses and railways emit less CO₂ per person-km than passenger cars.

As share of public transport increases, CO₂ emissions tend to decrease.

**CO₂ emissions per person by transport mode**

Source: MLIT website

**Relationship between the share of public transportation and CO₂ emission in transportation sector (1990, 2000, 2005)**

Sources: Created from IEA, "CO₂ Emissions from Fuel Combustion 2007" and OECD, "OECD Environmental Data 2006-2007."
### 4.4.Modal Shift
- Improvement of Cycling Environment-

<table>
<thead>
<tr>
<th>Bicycle lane</th>
<th>Sidewalk for pedestrians and cyclists</th>
<th>Underground parking lot for cyclists</th>
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<tr>
<td><img src="image1.png" alt="Bicycle lane image" /></td>
<td><img src="image2.png" alt="Sidewalk for pedestrians and cyclists image" /></td>
<td><img src="image3.png" alt="Underground parking lot for cyclists image" /></td>
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- **Roadway**
- **Private property**
- **Curb line**
- **Pedestrian way**
- **Traffic marking** (bicycle sidewalk traveling section)
- **Bicycle lane**
- **Sidewalk for pedestrians & cyclists**
- **Street utilities** (as necessary)
4.5. Streamlining Logistics

Commercial trucks emit fewer CO₂ per ton-km than personal truck; ship and railway emit even less.

\[ \text{Commercial CO}_2/\text{ton-km (FY 2009)} \]

Changes in independent conversion of trucks (1990-2006)

Source: MLIT, "Statistical Survey of Motor Vehicle Transport"

CO₂ emissions per cargo volume by transport mode

Source: MLIT website

4.6. Traffic Demand Management (TDM) - Traffic Conversion Measures to Eliminate Congestion -

Traffic congestion reduction effect by adoption of “Park & Ride” in Kanazawa City

Image of “Environmental Road Pricing”
Source: Hanshin Expressway Company Limited website
5. CONCLUSION

• Balancing economic growth with reducing CO$_2$ emissions from the transportation sector is possible.
• Road development to smooth traffic flow is effective in reducing CO$_2$ emissions from transportation sector.
• It is important to take integrated approach that promoted the countermeasures to contribute to CO$_2$ emissions reduction in various fields, such as roads, automobiles, transport planning, logistics etc.
• Emerging and developing nations may use experiences of successful countries in reducing CO$_2$ emissions from transport sector.