Policy Evaluation System for Reduction of CO$_2$ Emissions in Transport Sector

Report from Japan

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• Sub-effects of Environment Policy in Transport
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MLIT has introduced “Management Cycle” for policy evaluation in which “policy assessment” and “policy check up” are implemented.

**Policy assessment**
Evaluate the importance, effectiveness and efficiency of adopted projects, while disclosing necessary information on project selection and implementation with clear targets. By applying policy assessment based on defined objectives and indicators, the results are reflected upon planning of new projects while controlling the quality of policies.

**Policy check up**
Processes of monitoring the plan-do-see-cycle of its policies and assessing their performance in light of policy goals whether it satisfies the expectations of the public. Based on such assessment, the ministry continues to implement necessary policies in an effective and efficient manner, while maintaining transparency of their implementation.
<table>
<thead>
<tr>
<th>Public Policy</th>
<th>Measures and Policies</th>
</tr>
</thead>
</table>
| **Ensuring the safety and improving the quality of life responding to falling birth rate and the aging population.** | - Secure stable housing supply while improving the quality of housing environment.  
- Ensure smooth transaction of housing services (purchase, leasing, renovation and management) in real estate market. |
| **To realize good living environment, conservation of natural environment, and barrier-free society.** | - Promotion of a comprehensive barrier-free environment.  
- Preservation, revitalization, development of coastal and marine areas and ports and harbors, promotion of marine waste management, prevention of marine pollution.  
- Planning and development of comfortable road transportation system.  
- Securing clean water supply, promoting reservoir area development.  
- Promoting comfortable urban areas with nature, while protecting cultural and historic features in rural areas.  
- Maintenance of clean water and water front environment, building a network of water and greenery, sewage facility, and circulation of sewerage system. |
| **Protection of global environment** | - Protection of environment against global warming, etc. |
| **Reducing the risk of damage by natural disasters such as water hazard.** | - Provide necessary information and forecast on weather while developing communication networks to reduce damage caused by natural disasters.  
- Improving disaster-prevention in urban, residential areas.  
- Reduce or prevent the damage by floods and landslides.  
- Reduce or prevent damage by natural disasters caused by seismic sea wave, erosion, etc. |
| **To provide reliable transportation system and to secure public safety.** | - Ensure safety an public transportation, prevention of hijack and airplane terrorism.  
- To improve and enhance road traffic safety.  
- Provide system of aid and support for victims of traffic accidents.  
- Improve safety of motor vehicles.  
- To ensure safety and security of ship transport. |
| **Reinforcement of global competitiveness, promotion of tourism exchange and inter-regional co-operation, etc.** | - To provide comprehensive distribution systems, such as the development of marine transport logistics and ports, to ensure and secure stability in international marine transportation.  
- To promote a “Tourism-Oriented Country”.  
- To plan and create attractive landscapes and tourist sports with good sceneries.  
- Facilitate construction of road transport network.  
- Facilitate construction of new lines for Shinkansen.  
- Reinforcement of air transportation network. |
| **To promote regeneration of urban & local areas.** | - Plan and promote the activities for regeneration of urban & local areas.  
- Promote implementation of comprehensive strategies on traffic system in urban and rural areas.  
- To facilitate smooth flow of traffic and transportation. |
| **Enhance comfort and convenience of urban & regional transport.** | - Reinforcement and utilization of railway transportation network.  
- To promote maintenance and activation of regional public transportation network.  
- To facilitate the development of market conditions for transportation industry.  
- Promote and survey on national land.  
- Facilitate the development of market conditions for transportation industry.  
- Create better business environment for shipping industries, including securing human resources, etc. |
| **Create favorable market environment, improve industrial productivity and promote consumer protection.** | - Effective management of infrastructure.  
- Facilitate infrastructure development in the real estate market, appropriate land utilization of land and implementation of required regulations  
- Facilitate infrastructure development in the construction industry.  
- Dissemination and utilization of statistic data on market and industry.  
- Promote and survey on national land.  
- Facilitate the development of market conditions for transportation industry.  
- Create better business environment for shipping industries, including securing human resources, etc. |
| **Promote comprehensive development, conservation, and maintenance of national land.** | - To promote and implement a comprehensive policies on national spatial plan.  
- Provide support for research and management of geospatial information used for defining locations and shapes of national land.  
- Promote regional development of isolated islands.  
- Promote Hokkaido Comprehensive Development Plan. |
| **To facilitate the utilization and R&D of ICT technologies.** | - To promote and facilitate R&D of new technologies.  
- To promote the shift towards an information-oriented society. |
| **Promotion of international cooperation and partnerships.** | - To promotion of international co-operation and coalitions. |
| **To enhance the convenience and security of government facilities.** | - To maintain, preserve safe and useful government facilities that are environmentally sound. |
## Public Policies for Global Environmental Protection and Their Performance Indicators in MLIT, Japan

<table>
<thead>
<tr>
<th>Business Description</th>
<th>Performance Indicator</th>
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</thead>
<tbody>
<tr>
<td><em>In order to promote and facilitate energy efficiency policies and measures in transport sector, monitoring process on activities for research and analysis for energy-saving policies, including the level of enforcement of regulations, as well as the trainings for assigning responsible officials of business operators, provide advisory and support for business operators for their energy-saving efforts.</em></td>
<td>Energy conservation rates of specified freight carriers.</td>
</tr>
<tr>
<td><em>Holding seminars on transportation ecology.</em></td>
<td>Web traffic volume on environment portals.</td>
</tr>
<tr>
<td><em>Implementation of new systems and research and investment activities for building a social infrastructure for cross-sectional policies against global warming.</em></td>
<td>Protecting the environment by implementing construction machineries and devices.</td>
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<tr>
<td><em>Investment on promotion and protection of biodiversity.</em></td>
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<tr>
<td><em>Organize lending programs for the administration of the designated specified engines of certified off-road diesel construction equipments, and notification of the type of off-road diesel construction equipment, as well as for off-road construction equipments meeting standards.</em></td>
<td></td>
</tr>
<tr>
<td><em>Organize lending programs for the administration of the regulation on certification process for low-carbon building equipment, and for off-road construction equipments that are meeting the standard.</em></td>
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<tr>
<td><em>Consideration of issues regarding environmental policies and regulations within the context of Construction Material Recycling Law.</em></td>
<td>Recycling ratios of construction waste, utilization ratio of surplus construction soil.</td>
</tr>
<tr>
<td><em>Consideration of issues regarding policies and regulations on construction materials for the reduction of disposal of mixed construction waste.</em></td>
<td></td>
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<tr>
<td><em>Consideration of issues regarding dismantling on sight in the process of promoting recycling of plasterboard.</em></td>
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<tr>
<td><em>By evaluating levels of achievement on fuel-efficiency targets, it is possible to facilitate the dissemination of fuel-efficient heavy vehicles, for example, by setting new targets when necessary.</em></td>
<td>An average rate of fuel efficiency improvements for heavy vehicles.</td>
</tr>
<tr>
<td>1. Promoting the program by developing coalition between cargo owners and distributors.*</td>
<td></td>
</tr>
<tr>
<td>2. Promoting modal shift in or rail freight transportation.*</td>
<td></td>
</tr>
<tr>
<td>3. Strengthening the competitiveness of coastal shipping.*</td>
<td></td>
</tr>
<tr>
<td>1. Promoting formation of advanced metropolitan environment.*</td>
<td></td>
</tr>
<tr>
<td><em>Facilitation and development of energy-saving technologies for ships and vessels (high performance vessels).</em></td>
<td>The number of cities committed to the implementation of comprehensive policy on protection of urban environment at local level.</td>
</tr>
</tbody>
</table>
CO₂ Emissions Reduction Efforts in Transport Sector

Measures and policies against global warming implemented by MLIT

Transport sector

- Improvement in fuel efficiency of automobiles (the “top-runner standard”).
- Setting new fuel efficiency standards.
- Promotion of environmentally low emission vehicles. (clean & energy efficient automobiles, etc).
- Promotion of green driving.
- Biomass fuels, etc.

- Providing safe and comfortable driving environment.
- Promotion of ITS technologies, green-driving.
- Elimination of bottleneck railroad crossing, etc.

Independent policy on automobile emissions
Differentiation of environmental standards by mode of transportation

Traffic flow control

Measures and policies for automobiles, road freight transport.

Improved energy efficiency in rail, ship, and air transport

Improved logistics efficiency

Promoting public transportation system

Developing environmentally-friendly transportation network

- Improve efficiency in truck freight transportation.
- Modal shift to rail, sea freight.
- Reduction in use of in-land transport for international marine containers.
- Supporting the growth and activities by the “Green Partnership”, etc.

- Develop new railways, etc.
- Promoting the use of existing transportation system.
- Promotion of eco-friendly commuting, etc.

Source: WHITE PAPER ON LAND, INFRASTRUCTURE, TRANSPORT AND TOURISM IN JAPAN 2012
Example of CO₂ Emissions Reduction in Transport Sector

Promotion of environmentally-friendly vehicles

- Future development targets are set through the introduction of ambitious fuel efficiency standards.
- Tax incentives and subsidies are given based on their environmental performance.

### Development of fuel efficiency standards

**Setting future development targets, which will be reviewed as necessary.**
- Fuel efficiency standard for heavy vehicles established for the first time in the world in 2006.
- Fuel efficiency standard for passenger cars, considered to be the highest level in the world, is to be established for the year 2020

**Trend of improvement in average fuel efficiency in new passenger cars and fuel efficiency in retained cars**

<table>
<thead>
<tr>
<th>Year (FY)</th>
<th>Fuel Economy Value (km/L)</th>
</tr>
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<tbody>
<tr>
<td>1990</td>
<td>12</td>
</tr>
<tr>
<td>1995</td>
<td>13.6</td>
</tr>
<tr>
<td>2000</td>
<td>16.8</td>
</tr>
<tr>
<td>2005</td>
<td>20.3</td>
</tr>
<tr>
<td>2010</td>
<td>24.1%</td>
</tr>
<tr>
<td>2015</td>
<td>24.1%</td>
</tr>
<tr>
<td>2020</td>
<td>24.1%</td>
</tr>
</tbody>
</table>

**Promote automobile manufacturers to achieve the highest level of technical innovation by introducing the fuel efficiency standard in 2020.**

### Tax incentives and installation support

**Tax incentives (tax breaks for eco-cars)**
- Reduction and exemption of vehicle taxes for electric vehicles and other next-generation vehicles
- Induction of technical innovation by, based on the level of fuel efficiency, reducing and exempting tax for gasoline vehicles

**Installation support of environmentally friendly vehicles**
- A certain amount of financial support will be given when purchasing vehicles with superior environmental performance

- Gasoline vehicle having fuel efficiency equivalent to that of hybrid vehicle
- Electric vehicle
- Compressed natural gas (CNG) vehicles

Source: MLIT
Example of CO₂ Emissions Reduction in Transport Sector

Smarter use of vehicles

- Energy-saving driving of vehicles such as green driving are promoted.
- Urban spaces are developed for environmentally-friendly vehicles.
- Future lifestyle using electric vehicles has been proposed.

Promoting green driving

The way of using vehicles with less impact on the environment (green driving, etc.) has penetrated widely into the society, making it possible to reduce CO₂ of not only new vehicles, but also retained vehicles. Awareness raising and promotion of green driving by means of “10 recommendations for green driving” and EMS (green driving support equipment).

Urban development using environmentally-friendly vehicles

Promotion of development and dissemination of extra-small mobility through inter-sector cooperation between urban development and vehicles. Extra small mobility highly convenient and low in environmental impact is appropriate for traveling within regions that are difficult to be covered by public transportations and bicycles. Also promote dissemination of zero-emission EV with low noise and vibration by encouraging the introduction or development of electric charge system and linking it with urban development.

Integrated energy management of vehicles and households

Integrated implementation of the vehicle energy management and household/business energy management will induce energy conservation activities, leading to further energy conservation.

- Benefits from introducing and disseminating extra-small mobility
  - CO₂ reduction
  - New transport means in the city and region (supplementary to public transportation)
  - Tourism and regional development
  - Support movements of the aged and families with small children

- Dissemination of EV by linking it with Power supply to the houses: Charging EV households
  - Easy energy conservation management at the household (green driving), improvement of convenience
  - Integrated management of vehicles types and numbers
  - Mutual utilization among manufacturers

- Effective utilization of batteries
  - Effective utilization of unused power of car-mounted batteries in the households
  - Minimization of power loss and securing of durability of batteries

Source: MLIT
Example of CO₂ Emissions Reduction in Transport Sector

Improvement of traffic flow

• Smooth traffic flow improves fuel efficiency and reduces CO₂ emission from vehicles.
• Ring roads and other trunk road network have been invested for reducing traffic congestion.
• Bicycle-friendly infrastructure and ITS have been introduced
• Bottleneck railroad crossings have been eliminated in urban area.

Principal countermeasures

<table>
<thead>
<tr>
<th>Development of a bicycle-friendly environment</th>
<th>Promotion of the Intelligent Transport System (ITS)</th>
<th>Elimination of bottleneck crossings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitaka City, Tokyo (bicycle road)</td>
<td>Continuous grade separation project of the Keihin Kyuko Line and Keihin Kyuko Airport Line (Tokyo)</td>
<td></td>
</tr>
<tr>
<td>Amagasaki City, Hyogo (bicycle lane)</td>
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</tbody>
</table>

■ Development of bicycle roads by reorganizing the road space
■ Promotion and dissemination of VICS, which offers information on congestion to the drivers, allowing them to take optimum routes
■ Reduction of CO₂ emission brought by higher traveling speed

Source: MLIT
Example of CO₂ Emissions Reduction in Transport Sector

Improvement of efficiency in logistics and freight distribution system

Distribution
- Rail & shipping
  - Fuel efficiency
    - High efficient trams
    - "Super Eco Ship"
- Increasing capacity
  - Railway infrastructure
  - Roll-on/roll-off ships
- Improving loading ratio
- Facilitate utilization

Trucks
- Private
- Commercial
- Improvement in energy efficiency
  - Develop and promote fuel-efficient, low-emission vehicles.
  - Promotion of Green Driving.
- Use of larger trucks

Logistic facility
- Implementation of comprehensive distribution system
- Improve efficiency in distribution system

Orders management
- Coalition and Cooperation
- Cargo owners

Modal shift (mainly for long-distance freight)

Specific Transportation Companies: target is to improve annually energy intensity 1% or more on average.

Energy Saving Act
- **CO₂ emissions (g-CO₂/ton km) from commercial truck is 1/7 of emissions from non-commercial truck.
- **CO₂ emissions (g-CO₂/ton km) from ship is 1/3, and from train is 1/6 of emissions from truck.

Source: MLIT
Businesses are structured and managed with expectations for achieving their initial targets. While there are influences of sub-effect generated by the implementation of policies, the evaluation have been done only by measuring the level of achievement in meeting the specific targets.

The effect of “Business C” on “Policy 2” is not evaluated in Policy 1.
Sub-effects of Environment Policy in Transport

Policies implemented for reduction of CO₂ emissions in transport sector could have many sub-effects through the impact on the supply and demand of their services.

**Examples of sub-effects from environment policy in transport**

Transport policy to the supply side
- Maintenance of arterial highways  → Reduction of traffic congestion
- Provide infrastructure for bicycle  → Increase of health benefits from cycling
- Promotion of green vehicles  → Technological innovation

Transport policy to the demand side
- Promote use of public transport  → Neighborhood revitalization by increasing visitors to urban areas
- Facilitating modal shift  → Improvement of management efficiency through cost reduction
Flexible Policy Evaluation System: Proposal

By structuring the expected impacts of a given program for CO$_2$ reduction, it would be possible for us to recognize its sub-effects on other policies.

The effect of “Program C” on Policy 2 is also recognized on Policy 1.
Case Study: Freight Transport

In Japan, shipping and rail are more dominant in long-distance freight transport whereas trucks are dominant in short-distance freight transport.

Volume of freight transport by country (billion ton-km)

Source: MLIT * There is a discontinuity in data from FY2010.
UK: Transport Statistics Great Britain 2012
Germany, France: Eurostat
US: U.S. Department of Transportation Statistics 2012
Example of Modal Shift in Freight Transport, Japan

**Outline:**
Implemented a centralized pick-up and delivery system based on milk run logistics in Kansai area, and modal shift from arterial transit to rail freight containers in Saitama. The deliveries were done between the cargo owners and the four suppliers (A ~ D) in order to improve efficiency in delivery system and to reduce CO$_2$ emissions.

**Impacts:**
By reducing fleet mileage of diesels trucks, reduction was achieved not only in CO$_2$, but also in NOX, PM emissions, as well as in the number of traffic accidents. The operating company (Duskin) was also able to cut back on their transportation costs.

**Observed improvement:**
CO$_2$ reduction: 64 tons per year
Reduction rate: 86%
Modal shift from trucks to rail and coastal shipping may have positive impacts on several aspects of our society such as reduction of CO$_2$ and other greenhouse gas emissions, decline of traffic accidents, and improvement of efficiency in transport system.
The sub-effects of Modal Shift on Multiple Policy Goals

- Reduction in NOx•PM emissions
- Decline of traffic accidents
- Increase in time benefit
- Improvement in business condition of railroad companies
- Improvement in business condition of costal shipping companies

Impact

- Ensuring the safety and improving the quality of life responding to falling birth rate and the aging population.
- To maintain and improve living environment, to protect natural environment, and promote barrier-free society.
- Protection of global environment
  - Reducing the risk of damage by natural disasters, such as water hazard.
  - To provide reliable transportation system and to secure public safety.
  - Reinforcing global competitiveness, promotion of tourism exchange, inter-regional co-operation, etc.
  - Promoting regeneration of urban & local areas.
- To provide reliable transportation system and to secure public safety.
- Reinforcing global competitiveness, tourism exchange, inter-regional co-operation, etc.
- Enhancing comfort and convenience of urban & regional transport.
- Create favorable market environment, improve industrial productivity and promote consumer protection.
- Promote comprehensive development, conservation, and maintenance of national land.
- To facilitate the utilization and R&D of ICT technologies.
- Promotion of international cooperation and partnerships.
- To enhance the convenience and security of government facilities.

Sub-effects of Modal Shift on Multiple Policy Goals

Modal shift could contribute to "protection of global environment"; "improvement and protection of the living, natural environment"; "barrier-free society"; "reliable transportation system that ensure public safety"; and "regeneration of urban & local areas".
Conclusions

• Policy evaluation of CO$_2$ emission reduction have typically highlighted to what extent the given targets have been met.

• However, the environment policy in transport sector usually has the “sub-effects.”

• By examining the “sub-effects”, the correlation between different policies could be identified.

• This may enable us to enhance the feasibility of the policy evaluation system for CO2 emissions in a more systematic and holistic manner.
Acknowledgement

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