1. Diverse Means of Mobility and the Supporting Transport System

1-1 Quantitative and Qualitative Changes in Mobility

Fumihiko Nakamura

Annual number of trips by air and motor vehicle is on an upward trend, while annual trips by rail and passenger ship has been on a slight downward trend for 10 years. Trends for annual kilometers traveled are similar. Increased number of trip of air travel and kilometers traveled by air leads to the conclusion that overseas travel has become easier.

As for flow of goods, over the past 10 years, tonnes transported have decreased, but transport tonne-kilometers have increased slightly. Tonnes transported by motor vehicle were flat, while tones transported by rail and coastal shipping continued on a downward trend. The rate of decrease in coastal ship transport over the past 10 years has been remarkable. Air transport increased slightly. The same tendency is visible in transport tonne-kilometers, which are on an overall upward trend, with an upward trend for motor vehicles. As with the movement of people, air transport is probably becoming more convenient year by year.
The motor vehicle usage rate in major regional cities is high for each age group, with higher usage among males than females. For females, the percentage over age 65 that walks was remarkable.

Fig. 5 Modal share by male age/district group

Trips per person per day showed a slight declining trend for those under 65, with a slight increasing trend for those 65 and older. By purpose, the rate of increase and number of trips was higher for commuter trips to Utsunomiya than for other major local cities.

Fig. 7 Change in trips/person/day for each age group

Looking at usage rates by city, the usage rate for motor vehicles increased for each city, most notably in the areas around local cities. Among the three metropolitan areas, the number of bus passengers in the Chukyo (Nagoya) and Keihanshin (Kyoto/Osaka/Kobe) areas decreased slightly from 2001 to 2002. In addition, the number of rail passengers in the Chukyo and Keihanshin areas was on a year-by-year declining trend.

Fig. 9 Modal share of various cities

Fig. 10 Changes in passenger-kilometers and number of three metropolitan area passengers
For road traffic, there is a continuing trend in which the number of new roads being constructed is unable to keep up with the increase in demand. As a result, the average running speed on roads has been leveling off at a low figure.

**Fig.1 Changes in traffic volumes and extensions to the road network**
Road network extension and road traffic volume have been on an increasing trend since 1990, although road traffic volume has been up and down subsequent to 1990.

**Fig.2 Average travel speed on national roads**
Although annual changes are not large, at 10-20 km/h, average travel speed in the Tokyo and Osaka areas is about half the national average of 35-40 km/h.

**Fig.3 Changes in road length density for cities recognized by government ordinance**
Yokohama, Nagoya, Osaka, and Kyoto were on a downward trend from 1980 to 2000. Yokohama rapidly increased in 2003.

**Fig.4 Improvements and new construction by road type**
An upward trend since 1980 is apparent for national expressways, national roads, and principal local roads. Ordinary prefectural roads show no change since 1990.
Fig. 5 Metropolitan Expressway night discount experiment (FY2004)

New initiatives such as the effective use of unused road capacity, resolving bottlenecks by partially increasing the number of lanes, or techniques for developing smooth traffic flows by linear centralized management, have gradually started to increase.

The Metropolitan Expressway night discount experiment provides a discount on the Metropolitan Expressway at night, when traffic is relatively light. It is intended to shift traffic from ordinary roads to the Expressway, improving roadside environmental conditions and easing traffic for those roads. It was implemented from April 27, 2004, through March 31, 2005, and continues during FY 2005 with some changes.

Fig. 6 Redundancy of wide-area expressway networks

The Niigata-Chuetsu Earthquake closed part of the Kanetsu Highway. This led to traffic volume increases of 40 percent on the Banetsu Expressway and 60 percent on the Joshinetsu Expressway compared with the average. Because a wide-area expressway network between the Tokyo area and Niigata Prefecture was in place, the Banetsu and Joshinetsu Expressways could be utilized as alternative routes when part of the network was closed by the earthquake.

Fig. 7 Area traffic congestion mitigate project at Tomei Expressway

On March 20, 2003 the Japan Highway Public Corporation (JH) completed an acceleration lane (about 3 km) merging into the main lane from the Ebina Service Area (SA), to mitigate traffic congestion on the Tomei Expressway between the Atsugi Interchange and the Yokohama Machida Interchange (Up [toward Tokyo] line).

Average speed of the congested section

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>after</th>
</tr>
</thead>
<tbody>
<tr>
<td>after</td>
<td>50 km/h</td>
<td>60 km/h</td>
</tr>
</tbody>
</table>
| Delay time

<table>
<thead>
<tr>
<th></th>
<th>Before</th>
<th>after</th>
</tr>
</thead>
<tbody>
<tr>
<td>after</td>
<td>10 min</td>
<td>5 min</td>
</tr>
</tbody>
</table>

Table. 1 Area traffic congestion mitigate project

<table>
<thead>
<tr>
<th>Changes in carriageway markings</th>
<th>Signal adjustment</th>
<th>Establishment of bus bay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parking control video system</td>
<td>Establishment of left-turn lane</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Red color (glittery) pavement and guidance and education from crossing guards</td>
</tr>
<tr>
<td>Extension of right-turn lane</td>
<td>Securing of loading space</td>
<td>Establishing of left-turn lane</td>
</tr>
</tbody>
</table>

The five-year “Smooth Tokyo 21: Expanded Strategy” began in 2003. It aims to smooth traffic in Tokyo by reediting lane composition, adjusting signal lengths, establishing bus bays and loading zones, providing audio warnings via a parking control video system to those who park illegally, and guiding drivers to parking lots.

Fig. 8 “Smooth Tokyo 21” initiative

Table. 1 Area traffic congestion mitigate project
Demand for the Shinkansen lines (new trunk railway lines) and for air travel, has been increasing, while the use of conventional railways and buses is leveling off.

**Fig.1** Operating kilometers and train-kilometers for conventional lines in three metropolitan areas

**Fig.2** Trends in passengers of railways and buses(nationwide)

**Fig.3** Transition in operating kilometers and number of passengers

**Fig.4** Extensions to bus routes

**Fig.5** Railway transport passenger-kilometers and passenger train-kilometers

**Fig.6** Domestic air transportation passenger-kilometers and domestic airline airport landing frequency

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**1. Diverse Means of Mobility and the Supporting Transport System**

Public Transport Today

Fumihiko Nakamura
As for major urban areas, the railway congestion rate is easing in each of the three major metropolitan areas. In the Tokyo area, the number of track sections with through-operation between multiple railway companies is increasing, as are through-operation services. In the Keihanshin and Chukyo areas, however, through operation has changed little since the late 1980s.

Fig. 7 Trends in railway congestion rate in three metropolitan areas

Fig. 8 Change in the number of track sections with through-operation

Fig. 9 Examples of monorails, new transport systems, and subways in Japan

Many examples of new transport systems such as monorails can be found in the three metropolitan areas of Tokyo, Keihanshin, and Chukyo. In Naha, a monorail has been adopted as a core transport system. New subway projects are being implemented in Yokohama and other cities, and the Nippori-Toneri Line, a new transport system, is under construction. Subways and new transport systems are expected to increase, especially in the three metropolitan areas.
1. Diverse Means of Mobility and the Supporting Transport System

Developments in New Urban Transport Systems

Fumihiko Nakamura

Table 1 New urban transport system trends
Proliferation of various new urban transport systems has started all over Japan.

Table 2 Innovative measures of public transport
Innovative measures are being used in cities to solve a variety of public transport problems.

Fig.1 Slope transportation system in Saruhashi
The slope transport support system "menu" is being diversified.

Fig.2 Low-floor LRV in Okayama City
The spread of low-floor streetcars has been outstanding, but mass introduction has not yet taken place because the cars are expensive and the subsidy system is restricted.

Fig.3 Community bus in Yokohama City
Many communities have started to introduce low-floor vehicles, and their introduction in Japan is on the increase.

Experimental urban transportation systems were adopted for the Aichi World Expo held in 2005.

Fig.4 LINIMO
Fig.5 IMTS
Fig.6 Global Tram
Fig.7 Velo Taxi
Table 3 Summary of deregulation of buses

In the two years since bus deregulation, the gradual entry of new bus companies has been seen, although the relationships between the running of these new corporate buses and road administration and operations as well as the relationships between the running of the new buses and overall urban transportation plans have become important problems to be resolved.

Table 4 Expansion of 100 fares, and diversified fare systems

Diversified fare system was introduced just before deregulation started.

Table

<table>
<thead>
<tr>
<th>Fares</th>
<th>Fare System</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Diversified</td>
</tr>
</tbody>
</table>

Practical application of BRT (a high-speed trunk bus system) has begun.

Fig.8 "Eco-Park-and-Ride"
Some joint utilization systems for motor vehicles have developed from the social experiment stage and are now in practical use. Ways of putting suburban residential area type "Eco-park-and-ride" systems into practical use are now being sought through long-term trials.

Fig.14 Model diagram of Transit Oriented Development in Curitiba City, Brazil
The concept of linking urban planning with urban public transportation planning is coming to fruition overseas.

Fig.15 Development axis in Curitiba City
The Curitiba City development axis is reaching completion after 30 years.
Transportation Accessibility Improvement for People with Disabilities

Fig. 1 Basic concepts for Transportation Accessibility Improvement submitted
Setting forth of basic concepts for transportation accessibility environment is progressing in various local government.

Fig. 2 Pedestrian environment considering a pedestrian network

Fig. 3 Number of non-step buses in use
In 2003, 9.3 percent of all buses used are non-step.

Fig. 4 Call for train station volunteers
Volunteers are sought at train stations as part of the "support by people" initiative.

Fig. 5 Example of barrier-free route search on the Internet
Enhancement of information is implemented for realization of barrier-free. (Easy Outing information service).
The number of elderly persons requiring care is climbing, so improved transportation services and transportation for those needing care is necessary.

**Fig.6 Dissemination of scooter-type power wheelchairs**
The number of scooter-type power wheelchairs is rapidly increasing mainly among the elderly.

**Fig.7 Increase in elderly persons certified as In Need of Assistance or In Need of Grade 1**
The number of elderly persons requiring care is climbing, so improved transportation services and transportation for those needing care is necessary.

**Fig.9 The "Noritaku" (shared ride taxi) system**
A new community bus transportation initiative is making progress.

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### Table 1 Outline of universal design policy concepts

<table>
<thead>
<tr>
<th>Building a participatory society</th>
<th>Integration of barrier-free policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town planning that enables anyone to live safely and at ease</td>
<td>Response to diverse activities through technology and methods</td>
</tr>
</tbody>
</table>

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### Fig.8 Flow chart for councils on the operation of volunteer based transportation

**Guideline for the creation of operation councils:**
From determining a contact to establishment (model case)

**Process for establishing operation councils**

1. **Advance preparation** (about 3–4 months)
   - Determination of group in change
2. **(about 1 week)**
   - Ascertaining need for paid welfare transportation
3. **(about 1 month)**
   - Examination, adjustment, and determination of unit to be established
4. **(about 1 week to 1 month)**
   - Selection and requesting of council members
5. **(about 1–2 months)**
   - Notification and application guidance to transportation providers
6. **(about 1 month)**
   - Meeting of operation council
7. **(about 1 week)**
   - Holding of deliberations
8. **(about 1–2 months)**
   - License applications (from transportation providers)
9. **(about 1 month)**
   - Approval

**Concrete action**

**Operation of council**

1. **Priority guidance period**
   - (1–2 months)
2. **(1–2 months)**
   - Meeting of operation council
3. **(about 1 week)**
   - Holding of deliberations
4. **(from transportation providers)**
   - License applications
5. **(about 1 month)**
   - Approval

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*Reservations can also be made for the return trip from Tama Center.*

Source: Tama Center information site
Future Transport Infrastructure Development

Table 1 Outlines of the Comprehensive National Development plans

Under Comprehensive National Development Plans, Japan’s transportation infrastructure was improved to form the backbone of national land development.

<table>
<thead>
<tr>
<th>Plan Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed travel</td>
<td>The new rail systems were built to reduce travel time and improve ease of transportation.</td>
</tr>
<tr>
<td>Public transport</td>
<td>Bus and subway networks were expanded to accommodate growing urban populations.</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Roads were upgraded to handle increased traffic volumes.</td>
</tr>
</tbody>
</table>

Fig.1 Outline of previous and future infrastructure improvement plans

Under infrastructure improvement plans, improvements have been implemented by taking into account not only quantitative aspects of the plans but the qualitative aspects. How to secure financial sources should be considered when formulating these plans.
Table 2: Priority items for road improvement under the Social Infrastructure Improvement Priority Plan and examples of Assessment Indexes

Road improvement projects focus on the efficient construction of roads and their effective use based on a set of policy themes. As a result, high-quality, reasonably-priced road services are provided while the participation of citizens in road planning and management is made possible.

The government revised the five-year Comprehensive National Development Plans that started in 1962, and the Cabinet approved the new Social Infrastructure Improvement Priority Plan (implementation period runs from 2003 through 2007) based on the Social Infrastructure Improvement Priority Law. As a result, improvement programs in 13 areas, including long-term plans in nine sectors such as roads, ports, and airports undertaken under the previous Comprehensive National Development Plans, were placed under the Social Infrastructure Improvement Priority Plan.
Table 1: Vehicle taxes and revenues earmarked for road construction

<table>
<thead>
<tr>
<th>Country</th>
<th>Total Revenue</th>
<th>Share of Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$20,000</td>
<td>0.20</td>
</tr>
<tr>
<td>B</td>
<td>$40,000</td>
<td>0.40</td>
</tr>
<tr>
<td>C</td>
<td>$80,000</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Table 2: Revenue sources for road construction in major countries

<table>
<thead>
<tr>
<th>Source</th>
<th>Country A</th>
<th>Country B</th>
<th>Country C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline taxes</td>
<td>$10,000</td>
<td>$20,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>Vehicle registration</td>
<td>$5,000</td>
<td>$10,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Road use fees</td>
<td>$5,000</td>
<td>$10,000</td>
<td>$20,000</td>
</tr>
</tbody>
</table>

Use for Road Facilities: Revenue Sources and the Supporting Transport System

1. Diverse Means of Mobility and the Supporting Transport System

Fumihiko Nakamura
Table 3 Revenue sources for road investment (FY 2006 initial budget)

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subscription fees</td>
<td>30%</td>
<td>User fees</td>
</tr>
<tr>
<td>Toll collection</td>
<td>20%</td>
<td>Toll roads</td>
</tr>
<tr>
<td>Sales of road-related goods</td>
<td>10%</td>
<td>Goods sales</td>
</tr>
<tr>
<td>Refund of construction costs</td>
<td>15%</td>
<td>Cost recovery</td>
</tr>
<tr>
<td>Miscellaneous income</td>
<td>5%</td>
<td>Other income</td>
</tr>
</tbody>
</table>

Table 4 Road-related budget

<table>
<thead>
<tr>
<th>Category</th>
<th>Budget Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road construction</td>
<td>50%</td>
</tr>
<tr>
<td>Maintenance</td>
<td>30%</td>
</tr>
<tr>
<td>Safety improvements</td>
<td>20%</td>
</tr>
<tr>
<td>Research and development</td>
<td>1%</td>
</tr>
</tbody>
</table>

Table 5 Composition of road investment by implementing body

<table>
<thead>
<tr>
<th>Implementing Body</th>
<th>Road Construction</th>
<th>Maintenance</th>
<th>Safety Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of ...</td>
<td>70%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Local government</td>
<td>30%</td>
<td>50%</td>
<td>20%</td>
</tr>
<tr>
<td>Private sector</td>
<td>10%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Table 6 Breakdown of general road project funds

<table>
<thead>
<tr>
<th>Fund Source</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>National budget</td>
<td>70%</td>
</tr>
<tr>
<td>Local government</td>
<td>25%</td>
</tr>
<tr>
<td>Private sector</td>
<td>5%</td>
</tr>
</tbody>
</table>

Note: The tables and figures are placeholders for visual representation and do not contain actual data or text.