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SUSTAINABLE ROADS - PART OF THE TRANSPORT CHAIN IN A GLOBALISED WORLD

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SUSTAINABLE TRANSPORTATION IN JAPAN

ABSTRACT

In Japan, while dealing with various issues caused by the delay of a full-scale road development, we have made an effort to realize sustainable transportation. In practical terms, we are promoting to control traffic demand in coordination with the public transportation for enhancing smooth traffic in urban areas. In regional areas, we are promoting the development of road network to reduce infrastructure gap between urban and regional areas. In addition, to strengthen international competitiveness, we are building a distribution network in Japan and overseas that can link land, sea, and air transportation modes. Implementing these measures in an integrated manner, we are aiming at promotion of sustainable transportation.

1. INTRODUCTION

We have improved our living standards and furthered economic development through high-speed movement of people and goods. In response to social changes, roads were developed to their current form as the most accessible and fundamental social infrastructure supporting the transportation.

In 1956, a mission led by Watkins came from the United States to conduct a survey for the construction of Japan's first expressway, and in their report they summarized; "The roads of Japan are incredibly bad. No other industrial nation has so completely neglected its highway system." 50 years has passed ever since, and roads in Japan were dramatically improved through the eras of high economic growth and motorization.

For example, two-thirds of the total planned 14,000 km of arterial high-standard highways are in service nationwide, and are supporting the basis of Japan's economic activities. These roads became an essential infrastructure supporting our daily lives, making it possible to offer timely and diverse door-to-door delivery services.

On the other hand, we are facing a number of problems such as chronic traffic congestion in cities, many traffic accidents, pollution along roadways, and the global warming due to CO2 emissions from automobiles.

Furthermore, it is necessary to provide even more efficient road networks to support regional economies and lives of people to cope with the structural changes in the society such as the dwindling birthrate and aging population in regional areas and their diversifying needs.

In addition, the remarkable economic growth continues in the neighboring Asian countries. Across China, for example, high-standard highways are being built as ring roads surrounding cities at a remarkable pace; six ring roads around Beijing are almost completed and more than 30-km stretch in Shanghai is being completed as a part of the distribution facilities of the Yangkou Port off Shanghai. In Korea, Incheon International Airport is aiming to become a hub airport for Asia that can be used 24 hours a day. Progress in each of these countries is being made with the development of the basic infrastructure that is necessary for economic

development. As the total amount of international distribution is increasing, Japan should develop its infrastructure in response to it.

In this chapter, we will introduce the efforts being made toward sustainable transportation in order to deal with these issues and at the same time explain the direction of future road policies.

2. ENHANCING URBAN TRANSPORTATION

2.1. Traffic Congestion in Cities

While the development of our highway network system has focused on the radial road systems linking cities and region, the construction of ring roads around cities has lagged behind. For this reason, when heavy traffic from a wide area flows into cities, it causes tremendous congestion. Travel speed in central Tokyo during rush hour, for example, is 17.5 km/hr, that is slower than a marathon runner.

Consequently, the time loss due to congestion was about 3.81 billion man-hours in 2005, that is, when converted into a monetary value represents an economic loss of about 12 trillion yen. Most of that loss was incurred in the three largest urban areas of Tokyo, Osaka, and Nagoya that account for about 40%. Altogether, urban traffic congestion accounts for about 60% of total congestion nationwide.

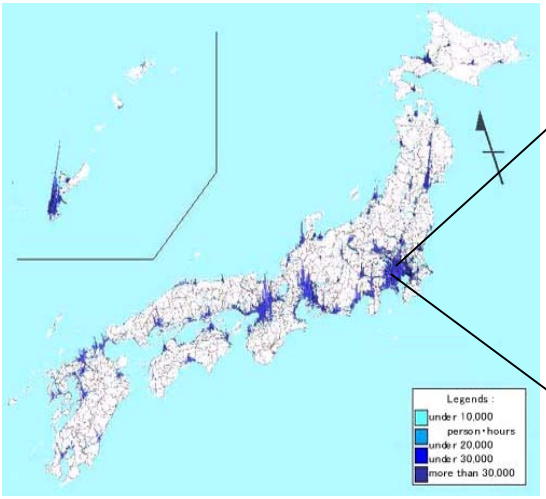


Figure1 - 3-D Map of Time Loss due to Traffic Congestion in Japan

Figure 2 - The major congestion points in the Tokyo Metro Area

In addition, there are still a large proportion of urban areas that have not yet achieved environmental standards for SPM and NOx along roadways, and these areas often create a controversy that further lead to a lawsuit over environmental damage.

To solve such problems and enhance urban mobility, in addition to introduce measures to expand transportation capacity, we are promoting to control traffic demand in coordination with the public transportation and further implementing policies in an integrated manner.

2.2. Measures to Expand Transportation Capacity

(1) Construction of Ring Roads

Urban roads in Japan are still inadequate in terms of both quantity and quality. The construction of ring roads, which are concentrated in cities and are intended to divert and disperse traffic, lags significantly behind compared to the US and Europe. Therefore, our top priority is to construct ring roads in major cities, as well as to widen roads and to construct bypasses.

The construction of three ring roads are promoted in the urban area around Tokyo, where 34 million people live, as part of the network of three ring roads and nine radial roads. Currently, however, the construction rate has stopped at about 35%. When a 7-km stretch of the innermost of Tokyo's three ring roads, the Central Circular Oji Route, opened in 2002, it reduced congestion on Tokyo's expressways by about 10% in one day, and as a result of traffic returning to main roads from surrounding neighborhood streets, fatal traffic accidents on those streets fell by about 30%, thus achieving a significant result. Currently, in addition to the Central Circular Route, construction is being promoted for the Tokyo Outer Ring Road that links central Tokyo and the Metropolitan Inter-City Expressway that connects core cities in the urban area. Over the next 10 years, we are aiming to complete about 90% of the overall planned ring roads.

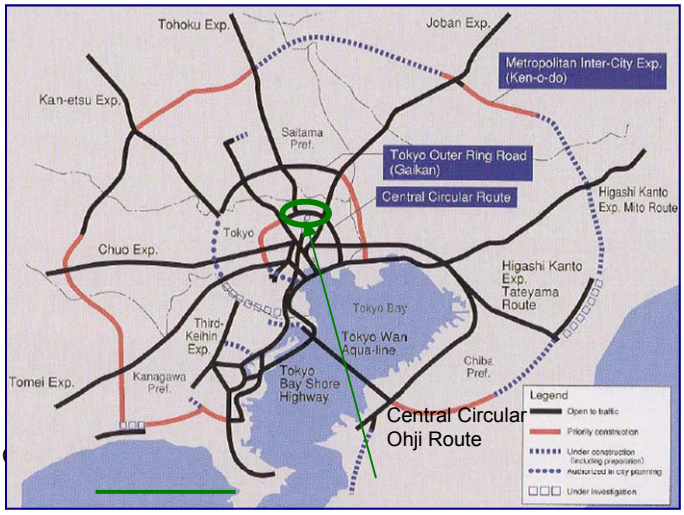


Figure 3 - Three Ring Roads of the Tokyo Metropolitan Area

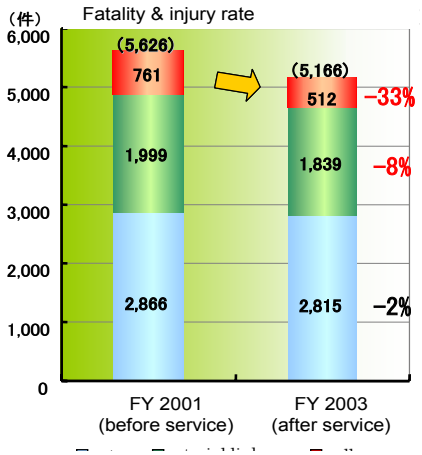


Figure 4 - Accident decreases in residential areas through operations of Central Circular Ohji Route

The construction of ring roads began after the urbanization had progressed, thus it is always difficult to obtain agreement on the projects. For example, city planning was decided for the urban sections of the Tokyo Outer Ring Road in 1966, but opposition from local residents prevented its progress for the past 30 years. Now the government and the city of Tokyo are taking the procedures to drastically revise the plans from elevated structure to subterranean structure, and are ensuring the transparency, objectivity, and fairness of procedures through public involvement (PI), and providing detailed explanations to local residents.

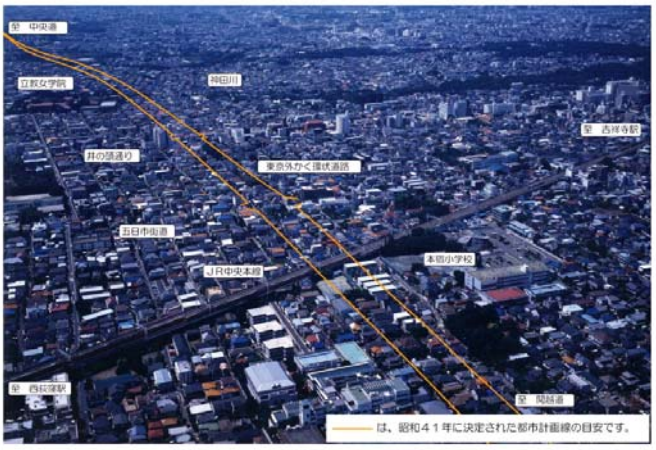


Figure 5 - Route in city planning of the Tokyo Outer Ring Road

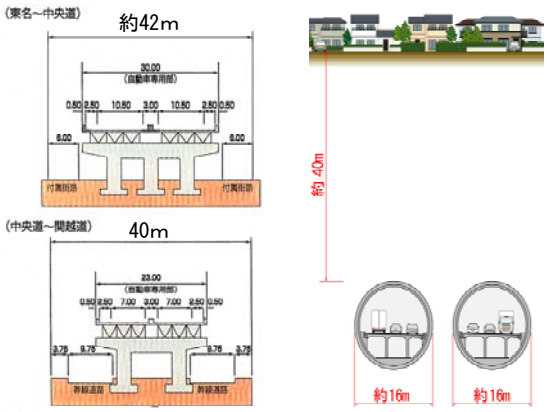


Figure 6 - Structural revise of Expressway

(2) Traffic Congestion Measures Program

In order to effectively mitigate congestion, the institutions as a whole have to implement comprehensive countermeasures by localizing the congested sections through assessing the data and set priorities. In this respect, a traffic congestion measures program was formulated in 1987.

In practical terms, based on data obtained through a variety of methods, severely congested sections are identified as “major congestion points” and concrete measures for each congestion point are proposed by the Congestion Measures Council made up of people from

related organizations. The information is released in the Traffic Congestion Measures Program.

In the past, local surveys were conducted at each major intersection to assess congestion points, but in recent years, by applying the ITS technology we can more effectively assess congested sections with probe vehicles equipped with GPS or with VICS data shared in cooperation with the police.

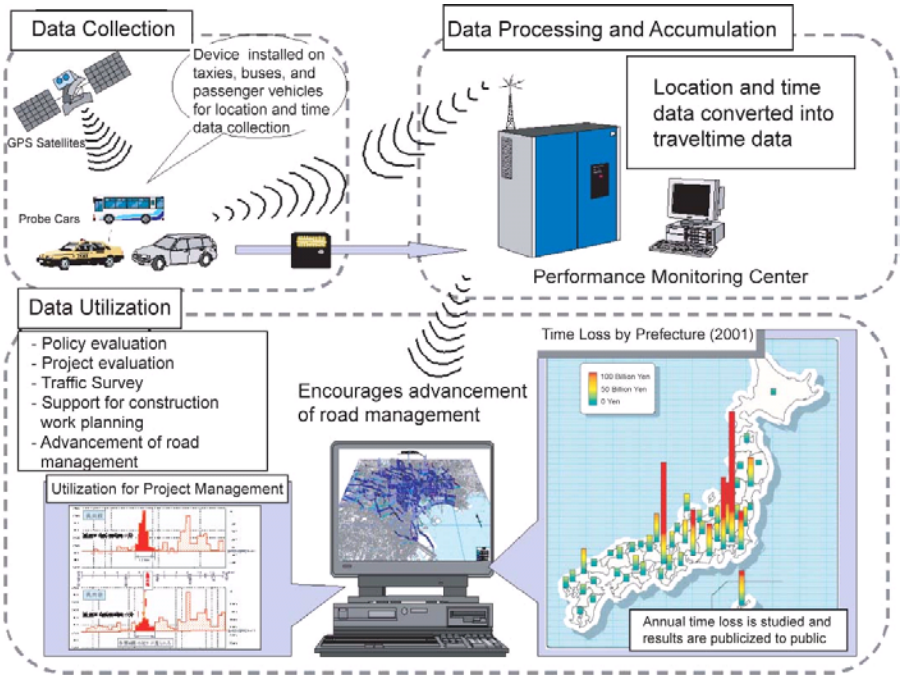


Figure 7 - Data collecting methods by using Probe Vehicles

In addition, the ITS technology proves effective in managing traffic congestion. Over 15 million car navigation systems equipped with VICS units are in use and the number of vehicle equipped with ETC on-board units exceeded 1.3million. ETC has almost entirely eliminated congestion at toll gates on the main line of the Metropolitan Expressway.

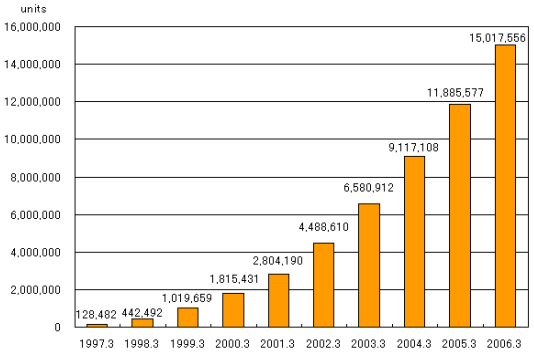


Figure 8 - Shipment of car navigation systems Equipped with VICS

Figure 9 - ETC gates on expressway

2.3. Measures for Transportation Demand Management

While we are trying to expand transportation capacity, we are also promoting efforts to control transportation demand. Since fiscal 1994, we have been striving to control transportation demand in cities, by introducing TDM measures to improve mobility in cities, and disperse peak traffic volume by introducing park and ride and flex time programs.

Since fiscal 1999 we have combined transportation capacity expansion and transportation demand control activities in major urban areas, and launched the “Urban Area Transportation Facilitation Comprehensive Measures” to facilitate mobility. At present, 23 cities have formulated their plans, and representatives of the central governments, cities, and prefectures and city and prefectural public safety commission members meet together to propose and implement transportation facilitation measures.

2.4. Coordination with the Public Transportation

It is extremely important for cities to promote coordination with the public transportation to share the tasks with the road transport in order to achieve sustainable transportation. To this end, we are promoting to use road budget for public transportation.

As the bus service is most closely related to roads amongst other modes of public transport, we are developing measures to improve its convenience by introducing bus priority lanes.

Furthermore, in fiscal 2005 a bus location system was fitted for expressway buses nationwide using road budget. This initiative will improve the convenience of inter-city bus service, and at the same time, travel time reliabilities on expressways can be measured by calculating time and location information obtained from the bus location system.

Currently, we are promoting measures to improve railway crossings. There are about 700 rail road crossings within 23wards of Tokyo, which is 80 times more than those of London. There are about 600 railway crossings in major cities, which were shut for 40 minutes/hour, causing many problems including traffic congestion. Therefore, we are using road budget to eliminate railway crossings by elevating them consecutively.

2.5. Efforts to Implement Comprehensive Transportation Strategies

Up until now, we have proposed countermeasures for traffic congestion in terms of capacity and demand in urban areas, but in the future it will be necessary to establish integrated plans in view of achieving sustainable transport. It is needed to conduct more comprehensive study of the urban transport system to formulate specific strategies for sustainable transportation. For instance, city scale, structure, and its characteristics should be taken into consideration, and basic policies for sharing tasks between public transportation and automobile traffic should be drawn. Also the areas to enhance the convenience of automobile traffic and areas where automobile traffic must be controlled should be marked off.

For this purpose, we will establish the Urban and Regional Comprehensive Transportation Strategy Conference in fiscal 2007, made up of representatives from road management, city planning and public safety commission members who have participated in the past, and

representatives from the public transportation organizations, to propose and implement radical countermeasures for urban mobility.

By implementing all these measures we hope to achieve the annual target of 8 million tons in CO2 reduction in 2010.

3. REGIONAL ROAD SYSTEMS

3.1. Increasing Gap between Urban and Regional Areas and the infrastructure development amid an aging populace with low birthrate

The construction ratio of National expressways in Japan is over 70%, achieving a certain level of success, but if we are to take a closer look at different regions, there is a large gap between cities and rural areas. In rural regions over 90% of the movement of people depends on automobiles, but despite this fact, in regions like Hokkaido and Shikoku that are far from major cities, there are still places that cannot be reached to expressways within 90 minutes, and the civil minimum infrastructure has not been constructed.

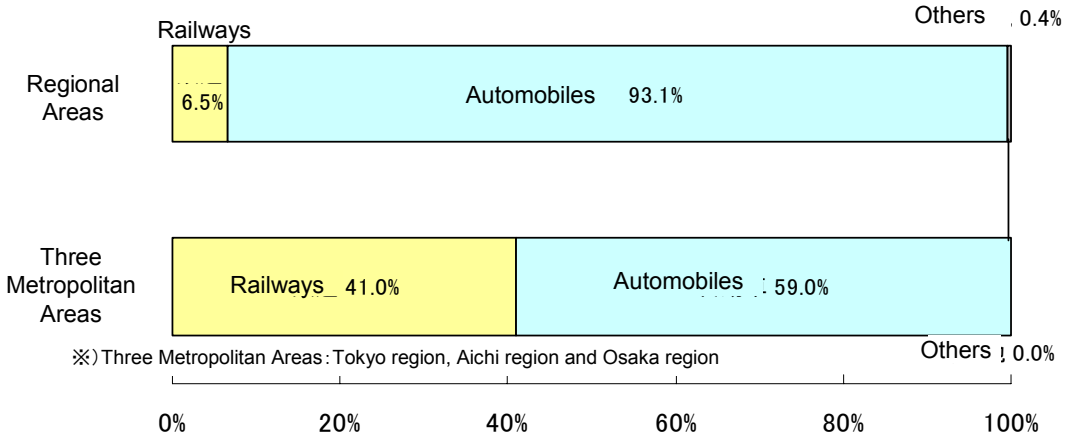


Figure 10 - Comparison of Passenger Transportation between Urban and Regional areas

A difference in the levels of service is generated among the people living in the same country, due to inadequate access to high-level health care, higher secondary education and recreational amenities. As a result, declining population, dwindling birthrates, and aging are severely progressing in remote areas with inconvenient access to cities. There are even some areas that are difficult to maintain local communities.

Meanwhile, there are also regions that are self-reliant, taking advantage of their characteristics and localities to attract tourists from overseas with their natural and historical heritages, and to induce corporations to build factories with their accessibility to Asia. It is extremely important to support these regions' efforts with transportation infrastructure.

Under these circumstances, we are promoting the development of a high service-level road network to improve the efficiency of distribution systems and the provision of road access to maintain living standards, and to protect and utilize national land and cultural resources.

3.2. Improvement of National Expressways by using new construction approach

Over 50 years has passed since the Japan Highway Public Corporation was established in 1956. National expressways have been constructed through borrowing money, and these funds have been repaid through tolls.

However, the Cabinet decided in December 2001 on the Restructuring and Rationalization Plan for Special Public Corporations to privatize the Japan Highway Public Corporation. One factor behind this change was that the future construction of roads would mainly be undertaken in regional areas with less traffic, and was considered impossible to maintain profitability.

Meanwhile, in December 2002, it was decided to "introduce a new project directly controlled and funded by the national and local governments to construct necessary roads, as a complementary measure to the new company's service."

Accordingly, two schemes will be applied for the construction of national highways in the future: the toll road system as the Japan Highway Public Corporation had been utilizing in the past and direct control system by the national and local governments utilizing fund made available from taxes for furthering construction.

The introduction of the direct control system enables to promote the development of regional roads that are ill fitted for toll-based national highways in view of profitability, but are highly beneficial to the society through using national and regional taxes. In the future, construction of national highways will be carried out efficiently and quickly by combining the toll road system continued to be operated by privatized companies and the new direct construction system controlled by the government to reduce a burden of the citizen.

4. GLOBAL LOGISTICS STRATEGIES

4.1. Japan's International Distribution

In recent years the economic links between Japan and East Asia have deepened along with their booming economy, as symbolized in particular by the Chinese economy. In the past, the US was our most important trading partner for both imports and exports, but in 2004 total trade with China surpassed the US and China became Japan's largest trading partner. Total trade with China in 2005 amounted to 25 trillion yen, while trade with the US was 21.9 trillion yen, and trade with the countries of the Association of Southeast Asian Nations (ASEAN) was 16.4 trillion yen. Trade relations between Asia and Japan will continue to grow in the future, and it is expected that mutual dependency will further deepen.

Varied manufacturing styles are promoted such as an international horizontal distribution of work. For example, a corporation may export major parts to a subsidiary in China for assembly and thereafter import the final products, or semiconductors may be manufactured in Japan while other parts are manufactured in China and assembly works may be concentrated in China. We are promoting thorough supply chain management on a global scale, regarding the Asian market including Japan as a single entity, and aiming for manufacturing and sales

to be conducted in the most appropriate location, thereby eliminating excess inventory as much as possible.

Under these circumstances, reinforcing international competitiveness is considered as one of the most important measures, especially as the Asian distribution becomes quasi domestic distribution. Thus it is all the more important to make Japanese distribution system more efficient, speedier, seamless, and cheaper.

The Japanese government made a cabinet decision in November 2005 for a comprehensive distribution network (2005 to 2009). Among various measures proposed, to strengthen international competitiveness, it called for building a distribution network in Japan and overseas that can link land, sea, and air transportation modes.

4.2. Building an International Distribution Backbone Network

In recent years, Japanese exports and imports in international standard containers have greatly increased, which can also be seen as a worldwide trend, and the role of semi-trailers to haul ocean containers (44.1 tons and 4.1m high when fully loaded) has become extremely important. However, there are sections of important distribution routes where passage is restricted because of bridge strength or tunnel heights, and lead times and costs increase by detours or trans-loading. This is a major problem in terms of strengthening international competitiveness.

In order to respond to these circumstances, the Road Bureau of the Ministry of Land, Infrastructure and Transportation announced an international distribution backbone network in June 2006. To ensure a trunk road network (international distribution backbone network) where vehicles carrying international standard containers can pass without trans-loading, it will review the sections of roads currently in service for any obstacles and will concentrate on eliminating them.

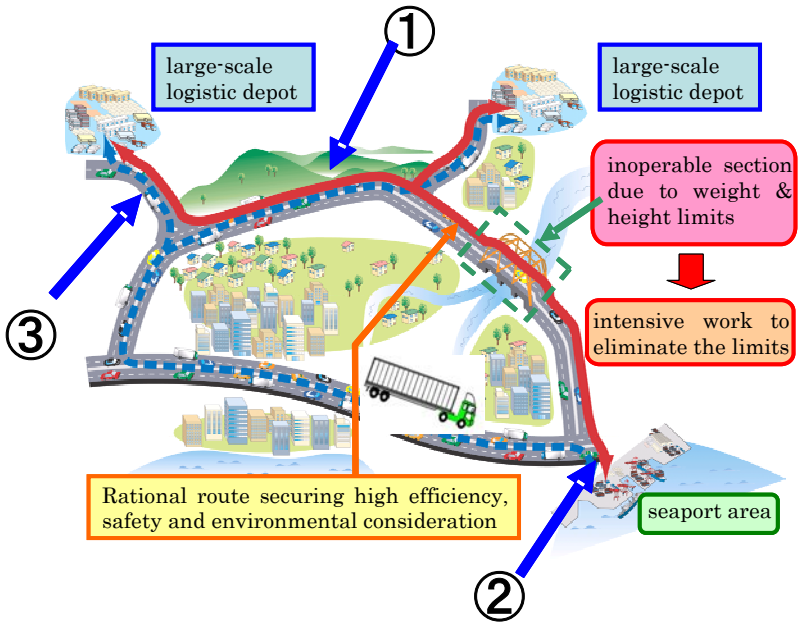


Figure 11 - Conceptual Image of an International Distribution Backbone Network

The selection of the international distribution backbone network started with identifying approximately 29,000 km of the trunk road network currently in service, including high-standard highways, that should allow the passage of vehicles carrying international standard containers in view of establishing an efficient distribution network. In practical terms, the network comprises of three elements: (1) trunk roads including high-standard highways, national roads, and ring roads, (2) access routes from (1) to ports, etc., and (3) access routes from (1) to distribution centers.

There are approximately 560 km (47 sections) of impassable sections where bridges need to be reinforced for vehicles carrying international standard containers. We are planning to implement upgrading works immediately (bridge reinforcement or bypass construction) for these sections to speedily resolve the problems.

Table 1- Length of International Distribution Backbone Network

Classification		Total Length	Sections where there are obstacles to the passage of international containers	
			Sections	Length
Length in Service	National and Urban Expressway	approx. 8,200km	-	-
	National Highways	approx. 19,000km	33	approx. 510km
	Local Roads	approx. 1,500km	14	approx. 50km
Planned Improvement Section Leng		approx. 5,200km	-	approx. 560km
Total		approx. 34,000km	-	

Furthermore, in order to concentrate on the improvement of impassable section for international containers, super core ports (Tokyo Port, Yokohama Port, Nagoya Port, Yokkaichi Port, Osaka Port, and Kobe Port) related sections will be tackled within five years.

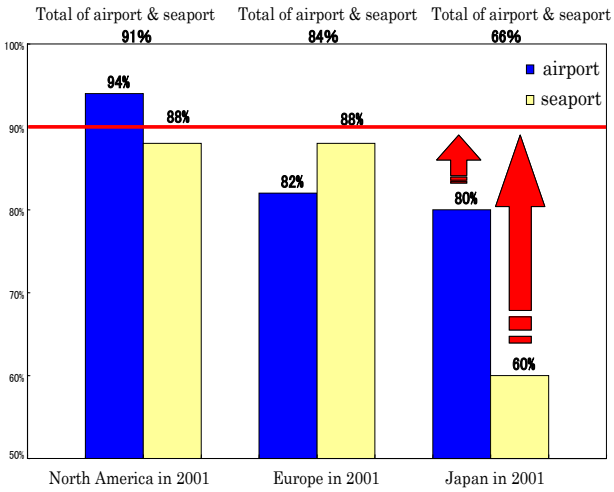
Furthermore, taking into account continuing distribution needs, we are cooperating with related organizations to increase roads where vehicles carrying international standard containers can pass speedily and safely under given conditions. We plan to complete a total of about 34,000 km of international distribution backbone network in the future, that includes high-standard highways encompassing the already planned ring roads in the three major urban areas and national roads, as well as the existing network of about 29,000 km.

4.3. Improvement of Road Access to Airports and Ports

In addition to the previously mentioned measures to increase distribution efficiency and strengthen international competitiveness, we continue to promote improvement in the rate of 10-minute access from highway interchanges (ICs) to main airports and ports.

Access roads from highway ICs to airports and ports are extremely important for distribution strategy, but 10-minute access rates are stalled at 66% in Japan, compared to 80 to 90% in the US and Europe (as of the end of fiscal 2005). That is still a remarkable improvement over fiscal 1997 when the 10-minute access rate was stalled at about 30%, thus a certain degree of success was achieved. The target of the Social Capital Facilities Emphasis Plan is to improve the rate to 68% by fiscal 2007, and we will continue to implement necessary

measures to widen roads and improve intersections, aiming to achieve the 90% range like the US and Europe in the medium term.



Note
Subject airport: Japan/ class 1 and class 2 airport where an international regular flight is available
Europe & North America/ airport where an international regular flight is available
Subject seaport: Japan/ the primary seaport or a specific primary seaport where the annual handling freight amount exceeds 10 million tons or the annual amount of international freight which is handled exceeds 5 million tons
(excluding any specifications as an international container sea line, international ferry line and domestic sea line available for international freights)
Europe/seaport where annual handing freight amount exceeds 10 million tons
North America/ where annual handing freight amount exceeds 10 million tons or the annual amount of international freight which is handled exceeds 5 million tons

Figure 12 - Expressway Network Accessibility to a Hub Airport/Seaport

However, there are some places where improvement of hard facilities is difficult because of conditions around airports and ports. By taking necessary measures including soft measures such as adjusting signal controls, access to airports and ports can be steadily improved even in these places.

4.4. Establishing a Flexible Toll System with Smart IC Facilities

Along with construction of the international distribution backbone network and access roads for airports and ports, we are also taking steps to encourage cargo vehicles to make more use of arterial high-standard highways and other high quality roads.

ICs are about 10 km apart on average national expressways, which is about twice the distance compared to the US and Europe, making it more difficult to use expressways. The reason for the long distance between ICs on Japanese highways is to reduce labor costs involved with collecting tolls. Also, ICs were built in a “trumpet” shape to concentrate toll booths in one location, which results in elevating the structure and is more costly to build and maintain the facility.

In order to respond to this problem, ETC only ICs (Smart IC) are being built at SA and PA to reduce construction and management costs, and we are working to improve access to expressways by efficiently constructing additional ICs. As of August 2006, there are Smart ICs connecting SA and PA in 31 locations across the nation, conducting social tests. Based on their results we will introduce Smart IC in full-scale this fiscal year. Through such efforts, we are expecting to improve access to expressways and achieve faster transportation.

In addition, in October 2005, the four public corporations that built and managed expressways were privatized. Prior to that, since November 2004, toll discounts were gradually introduced

based on the time or amount of use in order to return the profit gained through cost reduction on toll roads to users.

We are implementing pilot programs for flexible toll measures aiming at converting some general roads to toll roads. We think these efforts will promote the use of high-standard highways by cargo vehicles, and contribute to reduce a burden on the environment.

5. CONCLUSION

Japan has aimed for balanced development of national lands, and in order to achieve land policies for decentralized development of national lands and a multi-axial national land structure, we have proactively promoted road development as the most fundamental element of infrastructure. These are considered extremely important efforts, from the perspective of both Japan's economic growth and social protection for vulnerable national lands.

However, in recent years our society is facing problems such as rapidly dwindling birthrate and aging population, as well as global warming that have not been experienced before. Thus it is necessary to engage in a variety of efforts combined with the road development as a national land policy, taking into account regional needs and conditions.

Japan's land area is long and narrow, extending south and north, and mountain ranges run through the central areas, resulting in still very large regional differences in transportation convenience.

Under these circumstances, comprehensive transportation measures are necessary to sufficiently utilize the strengths of all modes of transportation, not only road transportation, in order to resolve chronic traffic congestion in cities.

Meanwhile, basic road networks are still incomplete in local regions, and differences can be seen as increasing, so that in the future it will be important to promote a variety of approaches to construct necessary roads as soon as possible and to resolve regional problems related to the invigoration of society and the economy.

Furthermore, in order to sustain Japan's economic development in the future, we need to swiftly complete an international standard distribution network. To this end, we have to further road development, which will play an important role, with strategies and setting priorities, taking into account the needs of industry.

As Japan is facing a period of major social changes we aim to establish a sustainable transportation system by promoting these policies while fully taking into consideration regional characteristics and transportation characteristics.