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PRESENT STATUS AND POLICIES ON MULTIMODAL TRANSPORT IN JAPAN

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In Japan, there is no single framework for the assessment of multimodal transport or the organization of the co-ordination in this area. However, from 1995, the Japanese Ministry of Transport and the Ministry of Construction have established a multimodal conference for the purpose of reviewing, assessing and co-ordinating their related policies and to begin with the tackling of the new policy.

In order to evaluate the present sectoral, single-mode approach and to consider the comprehensive multimodal approach, I would like to introduce the present status of multimodal transport and the outline of the Japanese multimodal related policies.

I. PRESENT STATUS OF MODAL SPLIT

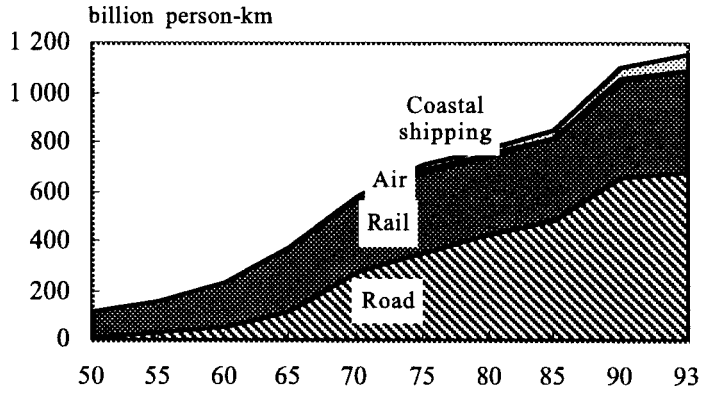
I.1. PASSENGER TRANSPORTATION

I.1.1 Domestic passenger transportation

Domestic passengers are transported mainly by two modes, that is, by road and by rail (see Figures I.1 and I.2.

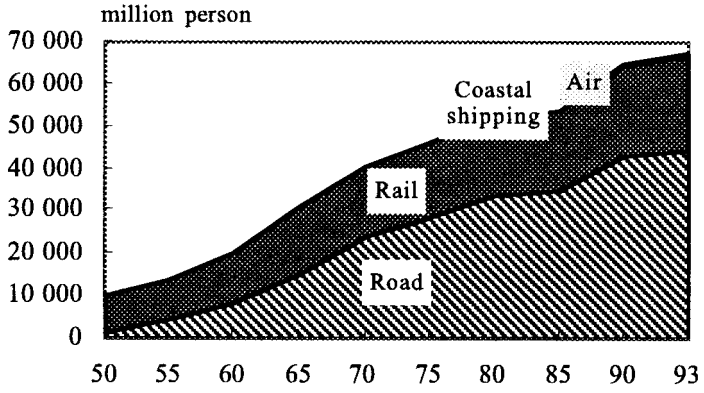
On the one hand, it seems that in Japan there is little need for a multimodal transport system for passengers especially in metropolitan areas, because the mass transport infrastructure is well developed and most commuters use one or two urban transport systems, such as the subway, suburban railway and bus networks from/to residential areas, although their capacities are limited and traffic jams in the inner city transport infrastructure are chronic, especially during peak hours.

Figure I.1
DOMESTIC PASSENGER TRAFFIC VOLUME (PERSON-km) BY MODE



Source : Ministry of Transportation

Figure I.2
DOMESTIC PASSENGER TRAFFIC VOLUME (PERSONS) BY MODE



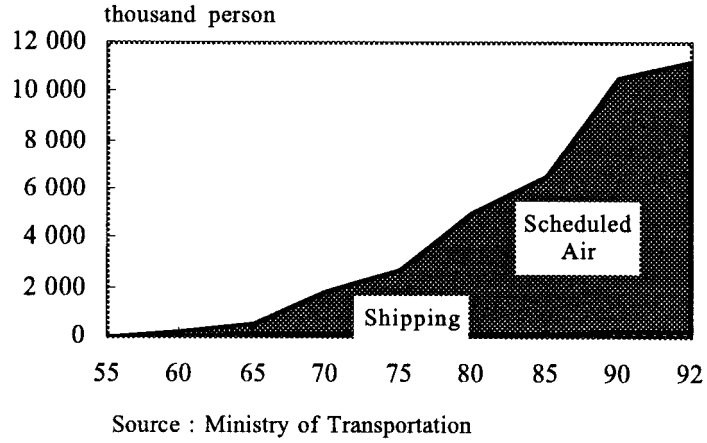
Source : Ministry of Transportation

On the other hand, in local small and medium sized cities, mass transport systems are poor and most commuters use passenger cars. However, traffic congestion emerges only during a peak of 15 to 30 minutes in central business districts and commuters do not feel such congestions to be a severe problem. Therefore, I feel that in local cities, there is little demand to transfer from cars to railway or bus systems. And, in scarcely populated areas, the distance from homes to bus stops or stations is relatively long. As a result, commuters prefer passenger cars although the problems of availability to all, especially for disabled or older people, remain.

I.1.2 International Passenger Transport

Most international passengers are transported by air because Japan is an island (see Figure I.3).

Figure I.3
INTERNATIONAL PASSENGER TRAFFIC VOLUME (PERSONS) BY MODE



Source : Ministry of Transportation

Previously, in 1955, most of the 32 thousand international passengers (0.3% of 11 million passengers in 1992) were transported by ship. However, as income levels are growing and the time saving element becomes more important, air transport systems is becoming the main mode for international transport.

Because change has occurred drastically during a short period of time, development of related infrastructures has lagged behind the increase in demand. Most passengers use mass transportation and do not rely on only road transport. Therefore, it seems that there is little demand for transferring from road to mass transportation. However, main problems remain regarding the connectivity between air and motorway or rail transport and, in urban areas, between bus stops and subway stations.

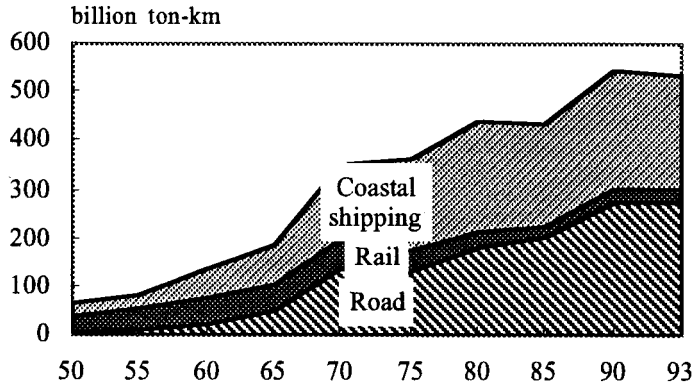
I.2 FREIGHT TRANSPORT

I.2.1 Domestic freight transport

Domestic freight is transported mainly by two modes, that is, by road and by coastal shipping (see Figures I.4 and I.5).

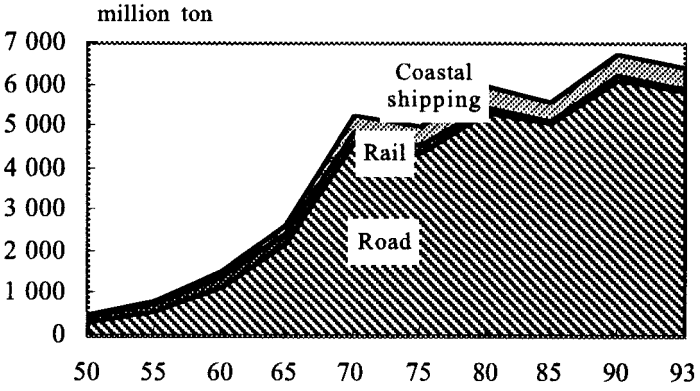
Until the 1960's, rail transport was the main land transport system. It was even used for freight transport. However, as road conditions improved, motorway networks grew and the need for door-to-door transport became popular; old rail transport systems could not support the freight traffic demands.

Figure 1.4
DOMESTIC FREIGHT TRAFFIC VOLUME (TON-km) BY MODE



Source : Ministry of Transportation

Figure I.5
DOMESTIC FREIGHT TRAFFIC VOLUME (TON) BY MODE



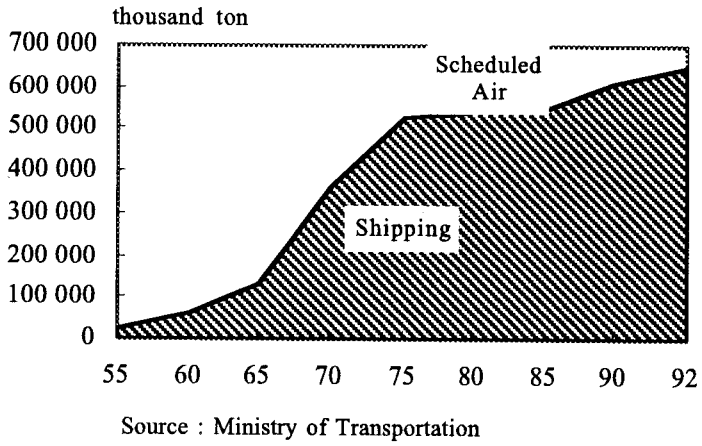
Source : Ministry of Transportation

I.2.2 International freight transport

Most international freight is transported by ship (see Figure I.6).

Recently, most international shipping companies use container cargo. Therefore, the combination of road transport, especially motorways, and sea cargo is becoming more attractive. The demand to transport containers (without stuffing or stripping) to inland factories directly has increased.

Figure I.6
INTERNATIONAL FREIGHT TRAFFIC VOLUME (TON) BY MODE

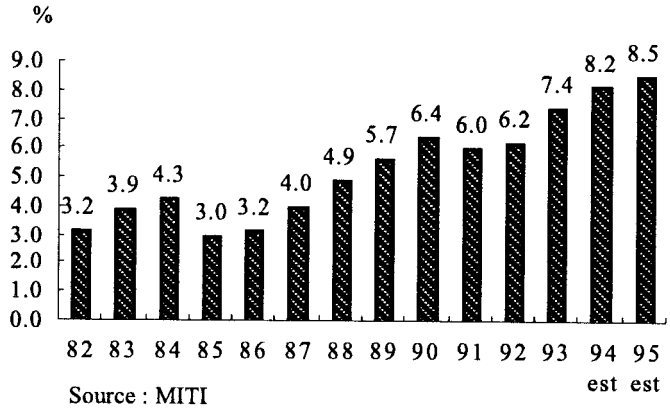


Source : Ministry of Transportation

Recently, Japanese local harbours are being developed for containers and the Asian big hub harbours have already been constructed. Therefore, in the near future, the position of the Japanese harbours such as Kobe and Yokohama as main Asian harbours will disappear. As a result, the link between local harbours and motorway networks will be necessary. The same situation is apparent for international air transport. The link between Japanese local airports and main Asian airports will be significant for both freight and passenger transport.

Traffic volume of international air cargo forms a small percentage of international freight transport. However, the economy has become globalized and foreign production by Japanese manufacturers is growing (see Figure I.7).

Figure I.7
RATIO OF FOREIGN / DOMESTIC OUTPUT IN MANUFACTURING

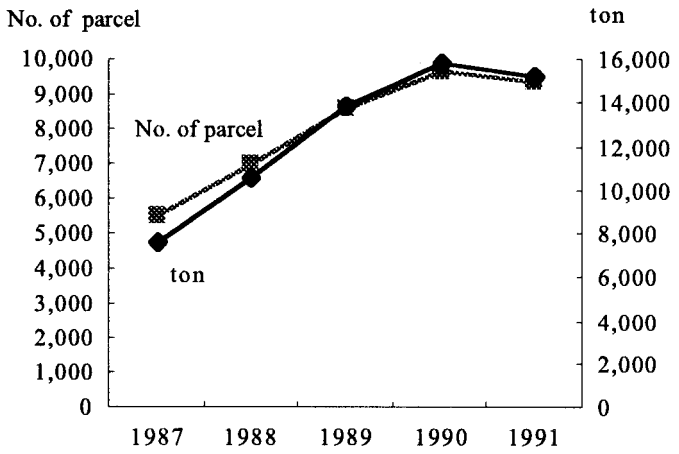


Source : MITI

Demands for advanced logistics such as "Just-in-time" transport are increasing even for international freight transport. The significance of international air freight transport is also increasing, especially in the area of high valued goods, such as integrated circuits or electronics and fresh foodstuffs.

International express parcel services are also growing due to increased demands for the transport of documents or sample goods (see Figure I.8).

Figure I.8
HANDLING VOLUME OF INTERNATIONAL PARCEL SERVICE



Source : Ministry of Transportation

II. THE OUTLINE OF 'MULTIMODAL' RELATED POLICIES

II.1. RAIL AND ROAD

Past main discussions were related to resource allocations to rail and road transport and called "comprehensive transport policy controversy". It was popular to use imperfect cost - benefit analyses during the 70's in academic papers. For example, the infrastructure of road transport, that is the road network itself, is supported by public investment. However, railway authorities pay both railway construction cost, vehicle and other running costs. This is not neutral to market conditions. In other words, it does not occur on an equal footing.

The controversy surrounding this issue was seen as a good chance for applying cost - benefit analyses to public policy in Japan. However, since it was not impartial and it was influenced by politics, I feel the results were ambiguous. Real policy has been directed to the demands made by the market, which is preferable for road transport. The liabilities for the Japanese Railway organization accumulated to the maximum. Privatization and regional subdivision were introduced in order to offer the Japanese Railway system some compensations. It was said that the main cause for the deficit originated in the Japanese Railway Cargo division.

After the privatization and the regional subdivision of the Japanese railway system in 1987, Japanese Railway Cargo became an independent company. Many local cargo handling terminals were abolished and the number of terminals decreased from 848 to 368. The number of scheduled trains decreased from 3208 to 846, the daily number of train-kilometres decreased from 372 thousand km to 209 thousand km, the number of vehicles used for cargo decreased from 103 thousand vehicles to 32 thousand vehicles, the number of employees decreased from 54 thousand to 13 thousand. Accumulated liabilities were shifted to another ad hoc authority and only those necessary were compressed into the new JR cargo company.

The cargo transport system changed from a linking system in which the cargo had to wait until the pulling capacity of the locomotive was optimal at the station to a system between main cargo terminals, that is, it changed from the cheapest way to the fastest way. Time schedules were also adjusted to the requirements of the shipping companies. The Japanese Railway Cargo company does not own the rail infrastructure and pay only a rental fee (being the avoidable cost in the case of no cargo transport) to the owners of the rail infrastructure. The owners are 6 regionally subdivided passenger train companies.

As a result, Japanese Railway Cargo recently restructured management and now enjoys good management conditions. However, new problems have arisen: low revenue (increasing rates), low labour productivity due to the age of workers and high investment ratios in relation to facilities. Another problem arises from the relationship with passenger railway companies. Japanese Railway Cargo cannot control the way in which the railway is used. They are required to negotiate with passenger companies since they are the owners. However, railway capacity is strictly limited, especially in urban areas, due to heavy use of the passenger transport infrastructure. Japanese Railway Cargo does not have the ability to invest in new railway lines on its own. Therefore, it is difficult to co-ordinate time schedules. Also, in the case of the new Shinkansen route, the width of the rail (1435 mm) will be different from that of ordinary lines (1067 mm) that use cargo transport. Therefore, Japanese Railway Cargo will need to construct double tracks.

II.2. GROWING CONCERN ON 'MULTIMODAL' ASPECTS

During the economic growth period of 1950 to the 1970's, the volume of Japanese freight transport increased sharply. In order to remove barriers to economic growth, transport policies aimed at increasing traffic capacity by developing a transport infrastructure. And during the so-called stable growth period of the mid '70's (after the first oil crisis) to around 1985, freight transport volume stagnated, thus reflecting the industrial structural change from heavy industry, such as iron and oil, to assembly industry such as motor vehicle manufacturing and electronics. On the other hand, during the same period, "Just-in-time" transport become widespread; consumer related transport services, such as next-day parcel delivery services emerged. In short, logistic services became advanced and sophisticated.

After 1986 the Japanese economy enjoyed continuous growth for several years mainly due to the expansion of domestic demand. During this period, freight transport increased by approximately 6 to 7% annually in parallel to economic growth, and at the same time, the logistic requirements of shipping companies become more advanced and sophisticated. On the other hand, during this period, external and internal limitations concerning logistics such as environment, labour shortage and road traffic congestion were revealed. These limitations were hard to overcome by individual companies themselves. And again it was said that logistic activities would become the bottlenecks for the Japanese economic growth. From this point of view, present major goals are to promote more efficient and comprehensive logistic activities.

In order to alleviate serious environmental problems caused by the excessive reliance on road freight transport and road traffic congestion, the links among various transport systems such as motor vehicles, railways and coastal shipping should be strengthened. The links can be constructed taking the characteristics of the transport system and the region they serve into consideration. And in response to the demands for high speed transport such as container transport, terminal functions of airports, harbours and railways should be strengthened, so that a smooth link among the different modes of transport may be constructed.

Especially for the purpose of developing import related facilities, systems for tax exemption or reduction and financial support have been established under ad hoc authorization. This system is called FAZ (Foreign Access Zone) which is based on the Law which promotes import (April 1992).

In order to improve the efficiency of road transport, motorways and related networks should be improved, thus facilitating their use for heavy vehicles. In 1993, an ordinance for the limitation of vehicles was amended. This amendment includes deregulation on general limitations with reference to the total weight from 20 tons to 25 tons and, for motorways, to the total weight for semi-trailers from 34 tons to 36 tons.

Currently, the Motorway Improvement Programme is at the stage of completing the major motorways that run through Japan in a longitudinal direction. In the next stages, emphasis will be put on motorways that run in a transversal direction in Japan and ring road networks for large cities. The total length of the motorways in service reached 5,929 km at the end of the 1992 fiscal year, which is around 42% of the total planned length of 14,000 km. As for urban motorways, only 470 km are in use (1992), which is around 47% of the total planned length of 1,000 km. However, the rise in the price of land is having a big influence on road improvement in metropolitan areas. In order to ensure an enhanced flow of road traffic, not only expansion of traffic capacity but also effective use of traffic facilities and effective transportation demand management, such as measures to increase loading rates of delivery vehicles, are required.

III. CURRENT METHODS FOR APPRAISING

III.1. EFFECTS ON THE ENVIRONMENT

Although transport policy is changing with regard to capacity increase from a mainly developmental bias to a management bias, there is no clear change in the tools for analysing effects. The Tables below show recent estimates for the effects on the environment that were included in reports of the Ministry of Transport and the Ministry of Construction. The basic data for both are almost the same. According to a comparison of modes of transport, truck transport came out as the worst system (see Table III.1).

Table III.1
COMPARISON OF TRANSPORT EFFICIENCY

	CO_2 emission g/ton-km (estimated)	Freight volume per worker thousand ton-km	Transport time dorr-to-door for containers between Tokyo and Osaka	
		1988	1975	1989
Trucks	370	25	9.5	10.0
Rail	24	193	12.5	10.5
Coastal shipping	35	313	-	-

Source: Ministry of Transportation, 1991

These comparisons by mode are meaningful for interurban transport. In the case of truck transport, the majority of small vehicles are used in urban areas and, in interurban transport, heavy vehicles, with a maximum loading weight of 10 tons, is the most popular. For heavy vehicles, energy efficiency is relatively better (see Tables III.2 and III.3).

Table III.2
ENERGY CONSUMPTION BY TYPE OF TRUCK

Type of truck	CO_2 emission	Energy consumption		Condition
	g/ton-km	cc/ton-km	cc/vehicle-km	Fuel, Loading weight, Speed
Ordinary size[1]	28	10	73	Diesel, 7 ton, 40 km/h
Ordinary size[1]	260	96	287	Diesel, 3 ton, 20 km/h
Small[2]	347	146	146	Gasoline, 1 ton, 20 km/h
Small[2]	416	153	153	Diesel, 1 ton, 20 km/h

[1] Maximum loading weight >4 ton, usually 10 ton for inter-urban transport
[2] Maximum loading weight <4 ton, usually 1 to 2 ton
Source: Ministry of Construction, 1991

Table III.3
ENERGY CONSUMPTION BY TRUCKS

Area	kcal/ton-km
Urban	2280
Suburban	1725
Regional	1081
Interregional	130

Source: Ministry of Construction, 1991

Other Tables show that public investment for each mode of transport has remained unchanged recently (see Table III.4).

Table III.4
PUBLIC INVESTMENTS IN TRANSPORTATION

Fiscal year	1990	1991	1992	
	10^9 yen	10^9 yen	10^9 yen	%
Total	11,929	13,313	15,076	100.0
Road	10,308	11,464	12,898	85.6
Railway	387	463	630	4.2
Harbour	855	919	1,095	7.3
Airport	379	467	453	3.0

Source: Ministry of Construction and Ministry of Transportation

And they imply that the percentage of road infrastructure is very high and should be amended based on multimodal aspects. Investment per unit traffic volume is high in road infrastructure compared to railway infrastructure (see Table III.5).

Table III.5
RATIO OF COST / TRAFFIC VOLUME

	Public investment	Traffic volume		Ratio cost/traffic volume	
		Freight ton-km	Passengers person-km	Freight	Passengers
	10^9 yen	10^9	10^9	yen/ton	yen/person
Total	15,076	555	1,152	27.2	13.1
Road	12,898	279	687	46.2	18.8
Railway	630	27	402	23.3	1.6
Harbour	1,095	248	6	4.4	182.5
Airport	453	1	57	453.0	7.9

Source: Ministry of Transportation
Fiscal year 1992

However, road infrastructure has many functions, from inner urban roads to motorways. Therefore, we should compare using a functional classification of road infrastructure although some difficulties arise from such a comparison due to the multifunctions a road may have.

III.2. NEW RESEARCH PROJECT

The Ministry of Construction has begun a new research project into multimodal aspects, especially into the physical links between different modes. Since the research is in its initial stage, evaluation has not yet been possible. However, we can see the issues being looked into and their current status in the Table below (see Table III.6).

Table III.6
ITEMS OF INSPECTION

Passengers	Transport conditions				
	From railway station, airport, harbour				From bus stop
	to another terminal	to parking space	to taxi stop	to bus stop	to parking space
No. of facilities	*	*	*	*	*
Distance from terminal	*	*	*	*	*
Sheltered waiting place	*	*	*	*	*
Sheltered access route	*	*	*	*	*
Parking accommodation					
for cars	*	*	*	*	*
for bicycles					*
Signposting	*	*	*	*	*

Passengers	Accessibility from/to inner city		
	Railway	Airport	Harbour
Travel time	*	*	*
Traffic conditions (reliability)	*	*	*
Railway	*	*	*
Expressay	*	*	*
Bus route	*	*	*

Freight	Conditions for freight terminals		
	Railway station	Airport	Harbour
Space for loading/unloading	*	*	*
Parking space for waiting	*	*	*
Parking space for loading/unloading	*	*	*
Traffic accidents	*	*	*

Freight	Accessibility from/to inner city		
	Railway station	Airport	Harbour
Transport time	*	*	*
Traffic conditions (reliability)	*	*	*
Expressway	*	*	*

This is a significant first step from the point of view of the multimodal user which is entirely different from former ones. A second step should be the evaluation of soft infrastructures such as: waiting time in terminals or the time and cost involved in loading/unloading etc.. Finally, comprehensive evaluation methods should be devised which take into account the socio-economic effects including the origin-destination of users.

When rail transport or shipping transport increase as is happening in certain locations at present, heavy truck access to stations or harbours located in inner urban areas will also increase and urban traffic conditions will worsen. The evaluation should encompass a variety of viewpoints: interurban as well as urban, logistic chains which include production, consumption and recycling, etc..

LITERATURE

1. Ministry of Transportation, National transportation statistics handbook (Japanese title: Unyu Keizai Toukei Youran), Japan transport economic research centre, Tokyo, 1994

2. Ministry of Transportation, Japanese Logistics Yearbook (Japanese title: Nihon Butsuryu Nenkan), Gyosei, Tokyo, 1992

3. Ministry of Transportation," Movement of Asian hub airport ",Transport, Tokyo, Feb. 1996

4. NAKAJIMA, H. Present Rail Cargo Transport (Japanese title: Gendai no Tetsudou Kamotsu Yusou), Seizando shoten, Tokyo, 1995

5. SAKAKIBARA, Y. "Intermodalism and transport efficiency", Transportation and economy (Japanese title: Unyu to Keizai), Unyu-Keizai-Chousa-Kyoku, Vol. 55, No. 12, Tokyo, September 1995.