# MEASURES FOR DEALING WITH URBAN LOGISTICS ISSUES IN JAPAN

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## ABSTRACT

In this paper, first we will examine the rather inefficient state of the physical flow of goods in urban areas, and then will systematically present a list of measures for the physical flow of goods in inner cities by focusing on freight transport and freight handling. From the list, we will highlight the measures that are being taken to develop facilities for loading and unloading goods and improve the existing distribution bases, as well as the way information technology is being used in freight transport. We will introduce efforts that are being made in these areas and cases to consider. Particularly, from the perspective of logistics measures for using existing facilities and spaces available at transport facilities, we will comment on providing parking facilities for loading and unloading goods using existing parking lots and other spaces available at transport facilities and will also comment on the idea of providing distribution bases by using spaces available at transport facilities and elsewhere, as well as on a system for supporting efforts to streamline freight transport.

## 1. INTRODUCTION

In Japan, in keeping with the expansion of economic activities, the quantity of goods distributed, that is, the volume of traffic involving freight vehicles, is on the rise. In addition, while the volume of goods distributed as a whole has tended to remain unchanged in recent years thanks to its door-to-door service, which is available whenever it is needed, the transport of goods by trucks has increased its share of freight transport. Moreover, as a result of the sophistication of logistics services such as just-in-time transport, frequently-delivered small-size shipments have been expanding, causing major social problems such as traffic congestion and environmental deterioration in urban areas. Consequently, the physical distribution of goods itself has become inefficient, pushing up distribution costs and reducing international competitiveness. However, given the extreme difficulty of securing spaces, including acquiring sites, there is little hope of roads being improved in metropolitan areas.

Thus, in this paper, as a means of resolving problems of increasing traffic congestion in urban areas and other problems related to the physical distribution of goods, we focus on parking areas for handling goods by using existing facilities and technologies and existing spaces or improving existing distribution bases, or building a new freight transport system, and describe how Japan is tackling these issues today and the challenges it faces. We also introduce the measures Japan is taking to deal with these logistics problems.

## 2. PRESENT STATE OF FREIGHT TRANSPORT IN URBAN AREAS

First, we look at the situation of freight transport in urban areas based on data in the Tokyo Urban Area Logistics Survey Data (1982, 1994) [1].

Figure 1 shows the share of freight transport borne by different modes of transport. In 1982, about 76 percent of freight on a weight basis was transported by trucks, but by 2004, this figure had jumped to 85 percent. In addition, on a freight basis (the number of times freight is moved), the share of freight transport relying on trucks increased dramatically, from 92 percent to 96 percent, proving that this heavy reliance on trucks for transporting intensified during the period under consideration.

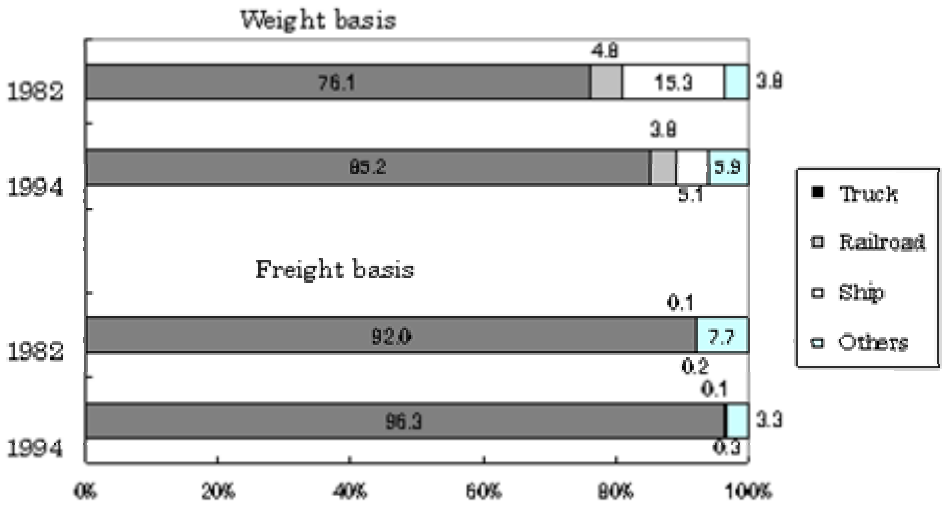



Figure 1 – Share of freight transport by mode of transport in the Tokyo Metropolitan area

Figure 2 shows the average loading ratio of trucks by potential load capacity. It reveals that the smaller the potential loading capacity, the smaller the loading ratio. For example, a truck weighing less than 1 ton operates at a loading rate of 19.8 percent, while a truck of between 1-2 tons, which is often used in cities, operates at a rate of 26 percent, or only at about one quarter of its potential loading capacity. The average for all truck types in the Tokyo Metropolitan area remains at below 50 percent (49.5%). This trend toward low loading ratio continues today.

One cause is the demand for highly sophisticated logistics services. As shown in Figure 3, freight with the hour of delivery specified accounts for nearly 60 percent of all shipped freight, suggesting that it is difficult to increase transport efficiency through systematic combined shipment.

Figure 4 shows the result of a survey on places where vehicles either stop or park to load or unload goods. Only about 4 percent of vehicles are parked off-road when they load or unload their cargo; most of them load and unload goods while parked on the road. Presumably most of these vehicles (including those that have run onto the sidewalk) are not only violating the law but are adversely affecting other traffic.

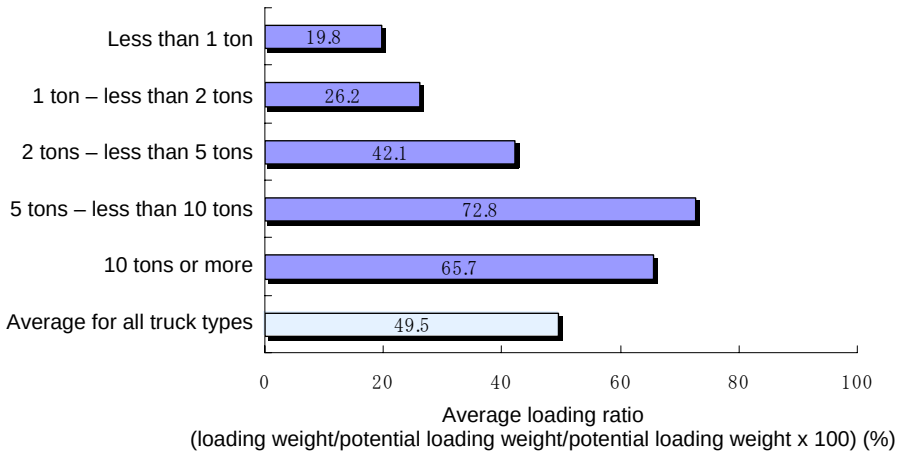



Figure 2 – Average loading ratio of trucks (1994)

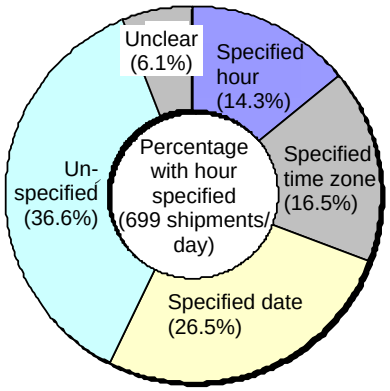



Figure 3 – Percentage of freight with hour of delivery specified (1994: shipment base)

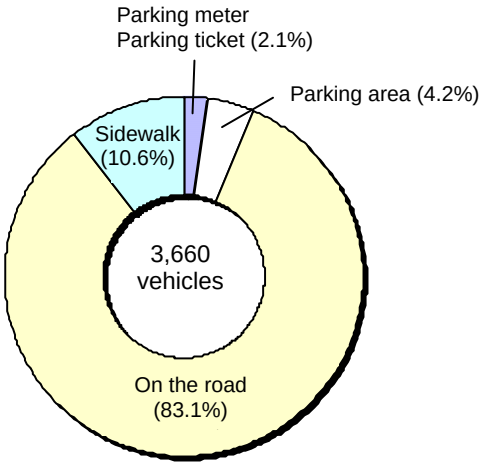
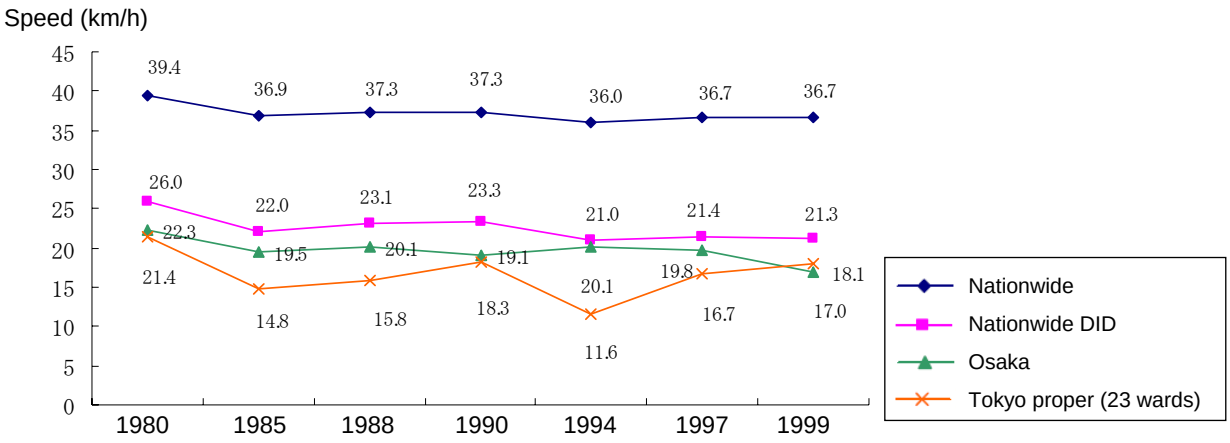



Figure 4 – Where vehicles loading and unloading goods are parked or have made a stop (1994)

Figure 5 shows the trend of average speed of travel at rush hour on general roads based on data from the Road Traffic Census [2]. The average speed on the road in metropolitan areas such as Tokyo proper (comprised of 23 wards) and Osaka is no faster than 20 km/h. Inner city roads are still heavily congested, causing freight transport to be extremely inefficient. The impact of traffic congestion is manifested not only in the longer time

required for transporting freight but also in the increased uncertainty of arrival time. Consequently, when transporting freight with hour of delivery specified such as in just-in-time transport, drivers of delivery trucks sometimes arrive near the destination and then wait for the time to make the delivery. Such behavior further aggravates the traffic conditions, thereby making the logistics operation even more inefficient.




Nationwide DID: National average for national highways in heavily populated regions (DID)

Figure 5 – Changing speed of traveling at rush hour

## 3. LOGISTCS MEASURES FOR URBAN AREAS

### 3.1. System of logistics measures for urban areas

Japan's system of logistics measures is set forth in three broad outlines: the "Outline of Comprehensive Logistics Measures" adopted in 1997; the "New Outline of Comprehensive Logistics Measures" 2001; and the "Outline Comprehensive of Logistics Measures" (2005-2009). The logistics measures adopted separately by different ministries and agencies of the central government were systematized based on these outlines. In the Outline of Comprehensive Logistics Measures (2005-2009), on the strength of progress made so far in implementing these measures, in changing the socioeconomic system, in carrying out structural reforms, and in dealing with new logistics issues, the following four goals have been set as the basic direction of future logistics measures:

(1) Realize speedy, seamless and low-priced logistics integrating international and domestic routes.
(2) Realize efficient and environment-friendly logistics such as "green logistics."
(3) Realize an efficient logistics system that stresses the supply side.
(4) Realize a logistics system that supports a safe and secure national life.

Efforts will be made to implement logistics measures in a comprehensive and integral manner toward 2009 as the target year. In regard to the provision of logistics related to social infrastructure, considering the financial difficulties currently facing the government, such logistics measures will be implemented intensively and strategically by rigorously evaluating the relevant projects, reducing costs, and promptly implementing them. In addition, a policy that stresses the effective use of existing social infrastructure will be advocated.

Meanwhile, the following measures have been put forward as concrete steps to realize the measure (2) above: (i) improvement of urban logistics including the establishment and effective use of road networks and measures for joint collection, delivery and loading and unloading of goods; (ii) freight traffic management measures including efforts to make international marine container flows more efficient; and (iii) computerization of logistics along with development of human resources and improvement of business practices.

Logistics measures differ in scale ranging from international and inter-regional (inter-cities) logistics to city and district logistics. Also, they deal with various activities ranging from transporting, handling, and storing of freight, as well as various functions including processing of distribution and other functions or business transactions and practices. A systematic analysis of measures adopted for city logistics focusing on the handling of freight and transport functions and information yielded the items shown in Table 1. In the following sections, we look at facilities for loading and unloading goods and distribution bases, transport systems and the like, as well as examples of current efforts including surveys and researches in this field.

Table 1 – List of city logistics measures

| | Facilities (hardware measures) | | | Control and Guidance | | |
|---|---|---|---|---|---|---|
| | Facilities | Traffic routes | Modes of transport | Operations | Control | Market |
| Handling freight | Parking areas for loading and unloading goods<br>Indoor areas for loading and unloading goods | Pay parking meters installed on the street | Trucks equipped with equipment for loading and unloading goods | Joint regional handling of goods | Controlling parking and stopping hours<br>Requiring parking area | Charge for parking or stopping |
| Transport | Distribution bases<br>City collection and delivery base | Ring road construction<br>Intersection improvement<br>Special roads for logistics vehicles<br>Truck lanes | Low-emission vehicles<br>New transport system | Joint collection and distribution<br>Lane where trucks have the right of way | Controlling truck traffic<br>Yielding the right of way to trucks | Pricing |
| Information | Information centers | Road information system<br>Parking area information | Driving control system<br>Freight tracing system | Plan for vehicle allocation route<br>Information-seeking vehicles and freight | Guiding vehicles to most suitable routes<br>Guiding vehicles for parking or stopping | Information user fee |

Note: Prepared by referring to document 4.

## 3.2. Providing facilities for loading and unloading goods

Traffic congestion is often caused by vehicles loading and unloading goods while parked on the street in an unruly manner. Also, since 2006, the year the Road Trucking Vehicle Law was revised, efforts have been made to tighten controls on illegally parked vehicles. These include securing spaces for loading and unloading goods by requiring carrying companies to provide facilities or using parts of existing areas for loading and unloading goods, or, when road conditions permit, allowing drivers to use some of the parking and stopping zones on the road to load and unload goods.

### 3.2.1. *An example of a large-scale underground driveway and an example of a facility for loading and unloading goods*

Shinagawa Intercity was built as part of the redevelopment of the East exit of JR Shinagawa Station. In order to reduce the traffic load on the roads outside the city block, build an axis to lead vehicles toward an underground parking area, and make the over-

ground space available to pedestrians, we constructed an underground passage (driveway) of 1.6 km total length connected to a general underground parking area with a capacity for 2,700 vehicles and another underground parking area for loading and unloading goods comprised of an entire building (Photo 1). As a result, vehicles that collect and deliver cargo can now load and unload goods for a number of buildings without driving up to ground level. Vehicles loading and unloading goods are given preferential treatment, that is, no fee is charged for using the parking area for the first 1 hour for office use and for the first 2 hours for shop use. However, during some time zones, some vehicles are forced, because there is not enough space, to load and unload goods on the underground driveway or drive up to ground level to load and unload goods. The situation is serious enough to warrant new measures including reducing the length of time vehicles are given to load and unload goods by spreading out the time permitted for delivering goods or expanding the joint collection and delivery of goods in the buildings concerned.

Photo 1 – Large-scale underground driveway and underground facility for loading and unloading goods (Shinagawa Intercity)

### 3.2.2. *An example of a joint parking area for loading and unloading goods*

While efforts to persuade operators of large-scale facilities to provide spaces for loading and unloading goods are yielding results, in urban areas which are filled with small shops and business establishments, it is still practically impossible to secure such spaces. This forces vehicles to continue loading and unloading goods while parked on the road, thereby causing traffic congestion and damaging the environment.

Consequently, in Kanazawa City, Ishikawa Prefecture, for example, the local government has taken the initiative to provide parking areas exclusively for loading and unloading goods (Photo 2). The local government is also taking the lead to secure an area for loading and unloading goods by building a truck bay designed to ease the controls on vehicles moving through back alleys, while taking steps to strengthen the ban on parking on arterial roads to encourage the orderly use of urban spaces and smoother road transport. Although the joint use of a parking area for loading and unloading goods has extended the distance of the side trips drivers have to make and has increased the time they have to spend waiting in the parking area, the new system is generally well received. More than 100 vehicles a day now use the truck bay for loading and unloading goods, and on-street parking has reduced since the advent of the truck bay.

In addition, in Tokyo, where there is a severe shortage of parking space, the so-called loading system is being implemented on a trial basis. Under this system, small parking spaces for one or two vehicles each have been secured in several locations by leasing parts of small open spaces or existing parking lots and forming a network of parking lots.

Photo 3 shows a pocket loading space made available in an area near the South exit of Shakuji-koen Station in Nerima Ward, Tokyo. Collection and delivery of vehicles owned by business proprietors who are registered members of the pocket loading system are given preferential treatment such as being able to reserve on the Internet a space to park for loading and unloading goods, pay parking charges with a special IC card, and receive user fee discounts. Thanks to these preferential treatments, the pocket loading system has been well received. Drivers agree that, despite the longer side trips, they can now deliver goods to several locations safely and without worrying about getting a parking ticket. Moreover, under the pocket loading system, it is possible not only to reduce the frequency with which drivers of delivery trucks are forced to hunt for a parking space but also to enable them to collect and deliver goods according to plan, thereby promoting the efficiency of physical distribution. Furthermore, considering the fact that sidewalks are used for freight side trips, it is also important to consider widening sidewalks and other measures to eliminate differences in levels between streets and sidewalks and help drivers avoid entanglement with pedestrians.

Photo 2 – Off-the-road joint parking areas for loading and unloading goods (Kanazawa City)

Photo 3 – A trial run of a pocket loading system (Nerima Ward, Tokyo)

### 3.2.3. *An example of provision of a facility for loading and unloading on the road*

In the city of Hiroshima, as part of measures to clamp down on illegal parking such as when a truck stops or parks on the road to load and unload goods or when a taxi stops or parks on the road illegally to wait for a customer, and to bring order to the way truck drivers do business, the length of existing bus stops on the main streets of the city has been extended and trucks have been allowed to load and unload goods and taxis to park in the spaces thus created.

In addition, as conventional efforts to establish order in road use, arterial roads are being avoided in favor of back alleys, or parking restrictions are relaxed in some sections of roads within certain boundaries, or exclusive spaces in the street for loading and unloading goods are being provided by limiting traffic to one way (Photo 4). When these facilities are

provided by a road administrator, no fees are charged for their use; if they are provided by a watch committee, in most cases, a constant sum is levied by installing parking meters and the like.

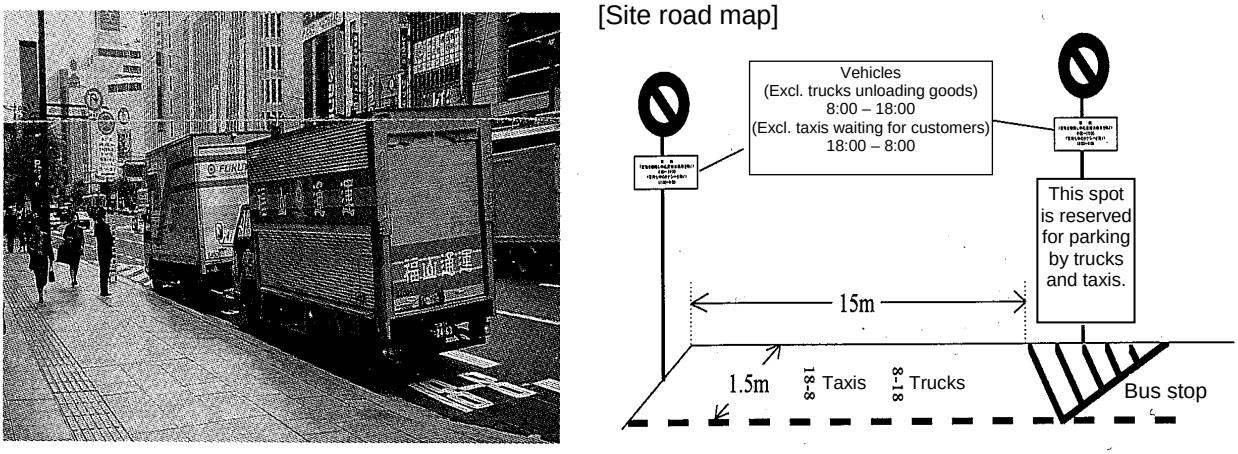



Figure 6 – Time sharing parts of the bus bay with taxis as space for loading and unloading goods (Hiroshima City)

Photo 4 – A case where spaces for loading and unloading were secured by restricting traffic to one-way (Takamatsu City)

### 3.2.4. *Thinking behind providing parking space for loading and unloading goods*

Most terminal logistics do not have special parking spaces at their destination facilities, with the result that goods are usually loaded and unloaded on the street, causing traffic congestion and traffic accidents. The situation has become a social problem. Parking spaces used for loading and unloading goods should, properly speaking, be provided by the operators of the destination facilities. However, especially among small businesses in large metropolitan areas, it is difficult for them to provide their own parking facilities, so it is hoped that parking facilities would be provided publicly. In particular, since unruly loading and unloading of goods in the road degrades the traffic function of roads, so road administrators need to tackle this problem proactively.

Measures to deal with vehicles unlawfully loading and unloading goods can be divided into many categories including those for loading and unloading goods inside privately owned buildings, those for off the road, and those for on the road. Which measures are effective depends on the road conditions. If a street is narrow and there is no sidewalk, it will be difficult to implement any measures for the street. In such a case, measures should be implemented off the street or in a privately owned building that the street services. In

addition, in case of arterial roads, even if a stop zone is provided, in consideration of traffic safety and smooth flow of traffic, loading and unloading of goods may be restricted. In this way, possible measures are affected by factors endemic to the region concerned, but generally speaking, they can be categorized by road condition as shown in Table 2. Figure 7 shows a newly built parking facility for on-the-road loading and unloading. This facility is designed to meet the demand for securing space on the road for loading and unloading goods without affecting the cruising lane and loading and unloading goods quickly. If there is a parking area nearby for loading and unloading goods off road, in addition to deciding where to install this facility in view of the circumstances under which the facility is being provided, it is important to operate the facility by incorporating a toll policy that encourages short-time use.

Table 2 – Measures for loading and unloading goods by road condition

| Road condition | | | Effective measures |
|---|---|---|---|
| Stop zone | Vehicular road and sidewalk are divided | Width of sidewalk | |
| Exists | | | Establish rules for using stop zones |
| None | None | | Build an off-road parking area<br>Establish rules for using the off-road parking area |
| None | Exists | Wide | Build an on-the-road parking facility in unused spaces<br>Build an on-the-road parking area<br>Establish rules for using on-the-road and off-road parking areas |
| None | Exists | Narrow | Widen the sidewalk<br>Build an on-the-road parking facility in unused spaces<br>Build an off-road parking area<br>Establish rules for using on-the-road and off-road parking areas |
| Where the local shopping area is well organized | | | Build a joint transport-delivery system |

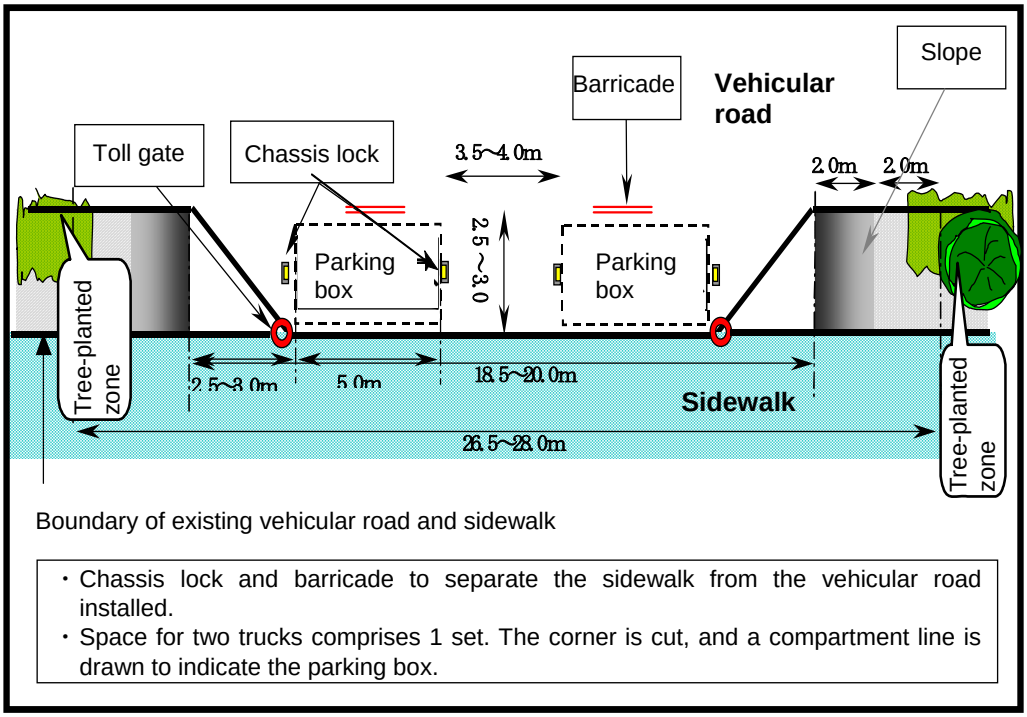



Figure 7 – Structure of on-the-road parking facility

## 3.3. Provision of distribution bases

### 3.3.1. *A case where a distribution base is provided*

In Japan, as a typical distribution base, a distribution estate is basically a rebuilding project in which the public sector improves the land while the private sector is encouraged to locate its logistics facilities in the distribution estate. Improvements have been made on these distribution estates under the provisions of the “Law concerning the Improvement of Distribution Systems in Urban Areas” (established in 1966). As of the end of FY2005, the basic policy was adopted in 22 cities and 42 districts throughout Japan, and distribution estates commenced operating at 26 locations. Photo 5 shows the Keihin 2nd Distribution Estate in Tokyo (Heiwajima), which was improved soon after the law was established. In the early days, industries that moved in to the distribution estate were mostly transport, warehouse and retailing industries, and the owners were truck terminals, warehouses, and wholesale trade parks.

However, in recent years, the difference in the contents of physical distribution facilities between different industries has become less pronounced and emphasis on their distribution function has grown. But there is a problem with the distribution estate that was improved in accordance with the aforementioned law: it is still not permitted to build distribution processing facilities on the distribution estate. Additionally, under the law, the improved land must be sold in lots, but in recent years, to cut costs, many companies prefer to lease lots. Here again we have a mismatch. Consequently, in addition to manufacturers, more and more logistics related business categories are now actively encouraged to locate their business even in industrial and manufacturing complexes and at land adjustment sites.

Photo 5 – The Keihin distribution estate

Next, as an example of an improvement project, we look at a plan to build a JR freight terminal station in Maihara City, Shiga Prefecture(Figure 8). The plan calls for the development of a freight terminal and an access road connecting the proposed station to a nearby national highway as well as a loading and unloading facility. Road and rail businesses will cooperate for the first time to implement this plan. Efforts are now being made to switch to a transport system that will effectively combine truck transport with rail transport.

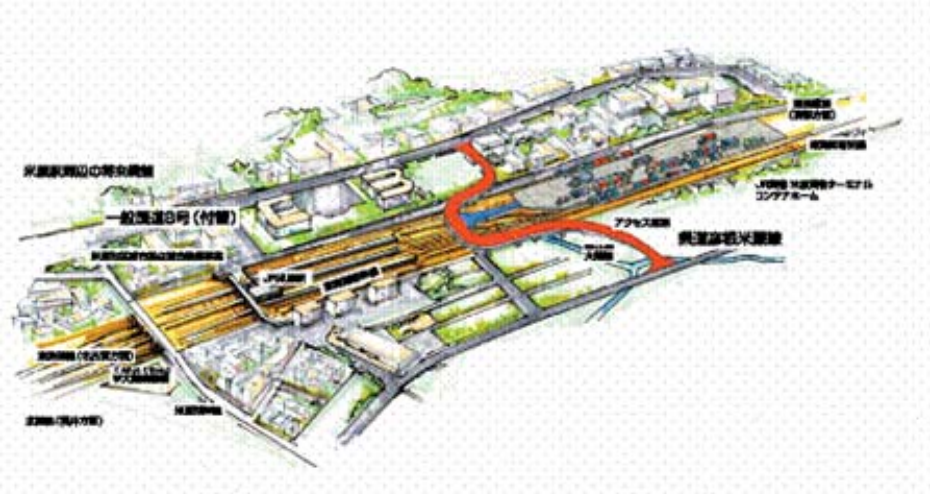


Figure 8 – The development of JR Maihara Freight Terminal Station

### 3.3.2. *Thinking behind the development of distribution bases*

Given the difficulty of procuring sites in urban areas and suburbs, many have pointed out the problem caused by the indiscriminate selection of sites for logistics facilities and the resultant deterioration of the surrounding environment caused by large trucks transporting freight through residential areas. Moreover, the following problems have been cited in the process of considering plans for developing distribution bases:

(1) Development of distribution bases with government involvement runs the risk of requiring too much time for completion, failing to meet the needs of the user, and costing too much.
(2) Development of distribution bases with government involvement does not adequately meet the functions that companies with distribution centers in the distribution complex demand.
(3) There is no land available that will satisfy the required scale of distribution bases.
(4) The situation discourages small and medium-sized companies from making economic progress.

Based on these problems, we describe below our approach for effectively developing distribution bases by introducing a package of regulations and inducements.

There are two ways to provide distribution bases. First, both public and private enterprises provide them based on the assumption that the roads will be occupied. Second, the private sector provides distribution bases by procuring the sites themselves without occupying them,

1) Provision of roads based on the premise that the roads will be occupied

a) Public provision of physical distributions bases

Sites are secured in the vicinity of national highway exits (in Japan, interchange or IC for short), service areas (SA), or parking areas (PA) based on the premise that the roads will be occupied. A road will be built on the site. A public organization to act on behalf of the road administrator will be the occupant of the road. Enterprises wishing to use the physical distribution base move in after concluding a contract with the public organization.

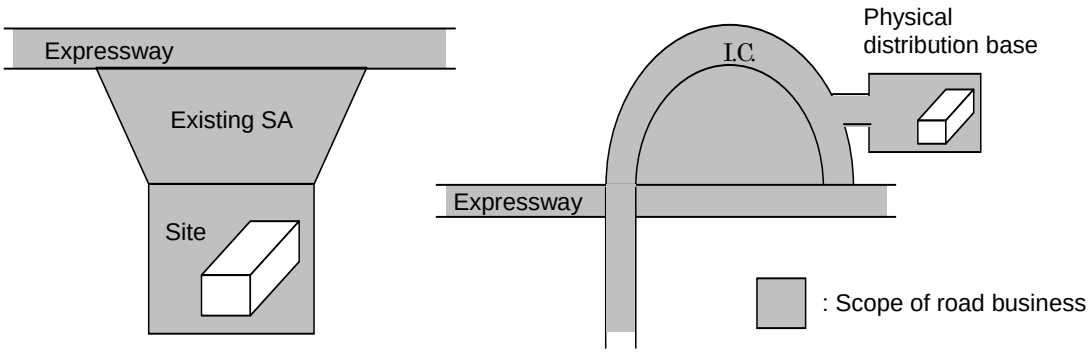



Figure 9 – Provision of a physical distribution base through additional occupation of a road space

b) Provision of private business proprietor (Figure 10)

Occupation of roads for use as logistic facilities will be allowed on unused lands, at highway exits and in spaces located between the top and bottom of existing roads. These sites will be regarded as facilities “for use by the general public.” As a result, all companies will be allowed to move in irrespective of their industrial category and other criteria. Companies will be selected among those that apply to use these facilities.

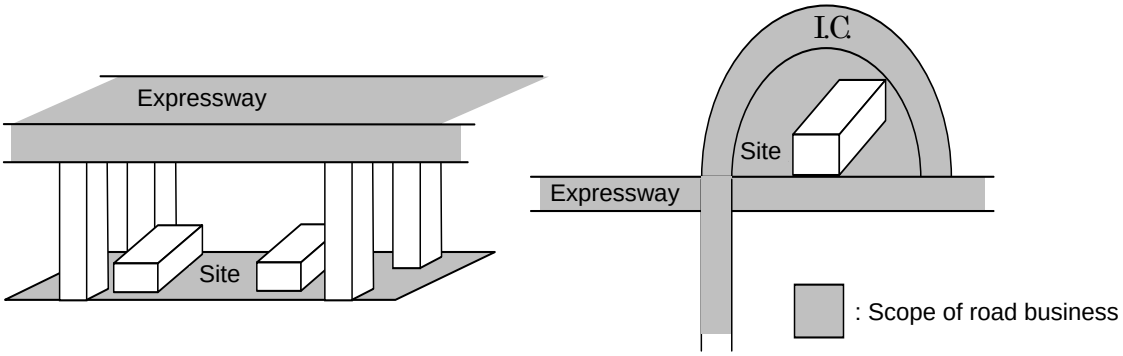



Figure 10 – Provision of a physical distribution base through existing occupation of a road space

2) Provision of a physical distribution base without road occupation

We will induce the selection of a physical distribution base by adopting a plan for its provision based on a long-term perspective (provision of physical distribution base promotion zone]).

In other places, we will induce integrated selection of locations for logistics facilities by restricting the selection of locations or logistics activities (inflow restriction, loading ratio restriction, etc.).

Figure 11 shows a case where, with government involvement, a business proprietor provides a physical distribution base.

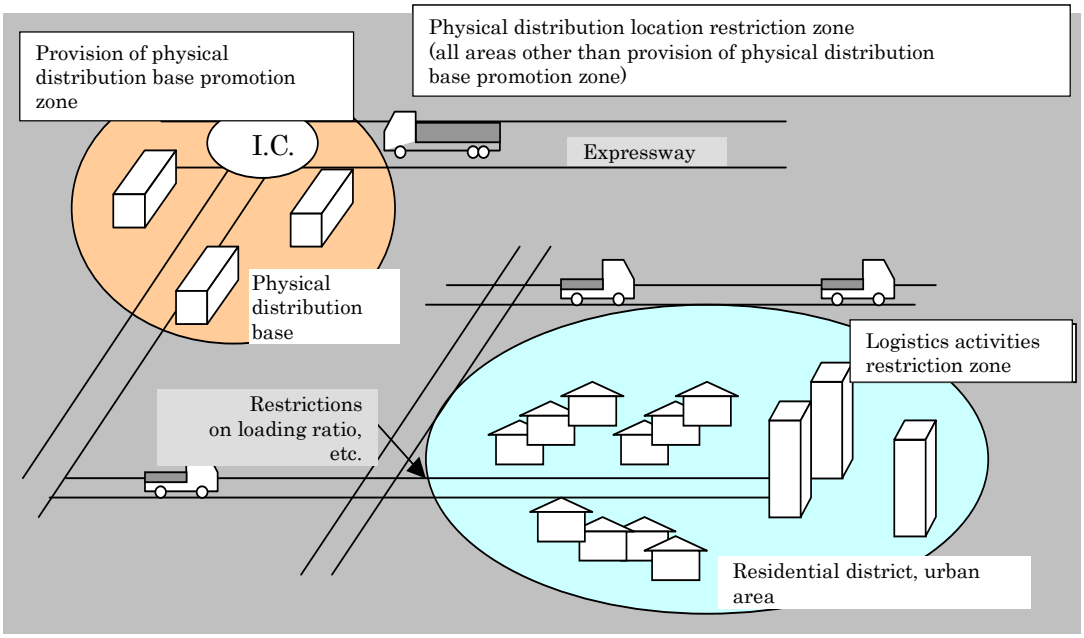



Figure 11 – Provision of a physical distribution base by a business proprietor without road occupation

Most companies perceive the need for new distribution bases, relocation of existing bases, or integration thereof. Among the merits of cooperating with the government in providing distribution bases mentioned by companies are (1) “Accessibility to arterial roads,” “Easy procedure,” “No need to look for a site,” “Tax incentives,” “No need to negotiate with local residents,” and “Easier to negotiate with banking institutions.” One effective approach would be to draw up a plan that guarantees these conditions.

## 3.4. Freight transport system

This section introduces examples of efforts being made in Japan to develop a freight transport system for urban areas that uses the existing transport facilities and spaces available.

### 3.4.1. *Joint transport system*

Transporting small-lot cargo frequently reduces the loading ratio and increases the number of freight vehicles, thus causing traffic congestion. Additionally, the advent of high-rise office buildings has increased the time vehicles need to make deliveries, thus reducing the utilization rates of loading and unloading facilities. Consequently, cases of joint freight transfer have increased in urban areas in recent years.

Photo 6 shows a truck used exclusively in the Tenjin shopping district in Fukuoka City. Freight carried into a terminal 5 km from the heart of the city by 35 transport companies is delivered to the Tenjin district four times a day by vehicles used exclusively by a joint-stock transport company. In addition, the goods collected from the Tenjin district are sorted by the joint company and are turned over to each of the district’s transport firms. Incidentally, parking meters especially for truck delivery are installed in various parts of the Tenjin district, and are designed such that vehicles collecting and delivering goods are given priority.

It has been reported that, as a result of introducing this joint delivery system, the number of vehicles loading and unloading freight in the Tenjin district has decreased by 65 percent, the distance traveled within the district by 87 percent, and the total number of vehicles parked by 72 percent, thus easing traffic congestion on roads in the vicinity of the district.


Photo 6 – Vehicle used exclusively by a joint-stock transport company in Tenjin

### 3.4.2. *A system for controlling freight traffic*

Thanks to advances in information technology in recent years, various systems for controlling freight traffic are being introduced. The three most typical ones are presented below.

(1) Truck/load matching system

The “KIT” system operated by Japan Truck Association Co., Ltd. is an example of matching empty trucks with urgent loads. KIT is a computer-base transport information network system for small and medium-sized shipping companies, that allows the latest information to be accessed at any time. It serves as an intermediary between cargo owners and shipping companies. Being most effective in load matching operations such as matching loads with empty trucks and allocating accommodating trucks, the KIT system is expected to greatly expand business opportunities. In addition, because of its potential for effective utilization of vehicles, the KIT system will significantly help preserve the environment.

(2) Vehicle allocation and delivery plan support system / optimum delivery route system

The vehicle allocation and delivery plan support system formulates effective vehicle allocation and delivery plans by using artificial intelligence so that even an inexperienced person can carry out vehicle allocation and delivery plans. This system is expected to have the following effects: (1) Allow visual judgments on the appropriateness of vehicle allocations and delivery in accordance with map displays; (2) Reduce the time required for formulating vehicle allocation and delivery plans: and (3) Allow the arrival time of delivery to be accurately set, thus improving customer service. As a result, the system is expected to reduce the number of vehicles and increase the loading ratio, as well as improve the actual vehicle ratio and reduce the distance traveled.

(3) System for recording the usage history of trucks

By collecting the travel history of each truck by equipping it with a digital tachograph and safety recorder connected to a GPS, we can give better instructions to drivers on driving safely and in ways that will save energy while improving transport efficiency. Furthermore, by equipping trucks with information and communication equipment, we will be able to monitor the traveling position of each truck, and thus improve the actual vehicle ratio and turnover ratio.

## 4. SUMMARY

This paper focused on the physical flow of goods as a cure for urban traffic problems and looked at examples of logistics measures related principally to freight handling and freight transport. At present, under a new comprehensive logistics measures, efforts are being made to develop social infrastructure related to logistics including a network that will link parking areas where goods are loaded and unloaded to distribution bases. In addition, we must tackle software measures such as effective utilization of existing infrastructure in order to increase the efficiency of freight flows as well as manage freight traffic by, among other things, installing truck routes and truck lanes and regulating loading ratios.

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