

TRANSPORTATION PLAN FOR NEW TOWN DEVELOPMENT

- From Viewpoint of Energy Saving and
Environmental Preservation -

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1. Outline of Energy Policy

In Japan in 1978, 73% of the primary energy supply quantity was petroleum, 99.8% of the petroleum was imported and only 12.5% of the primary energy supply quantity was from domestic resources. This indicates that the energy supply and demand structure of Japan is very weak, therefore it has been greatly influenced by changes in the world energy circumstances and an increase in crude oil prices.

To overcome such a problem and conform to the international energy circumstances and, furthermore, to improve the steady economic growth and living standard, the energy policy is understood one of the most important present policies.

The following is important items to be included in the energy policy.

First, promoting and developing the use of alternative energy to oil, such as nuclear power, coal, hydro-power, geothermal power, etc.

Second, promoting energy-saving activities in various fields, such as industry, living, transportation, etc. on the basis of the Law for the Rationalization of Energy Consumption and expediting the nationwide movement to save and effectively use energy in the daily life of the people.

Third, promoting the international cooperation, accelerating the oil resources development and increasing oil stockpiles to secure the steady oil supply.

Fourth, reducing the oil dependency and, at the same time, promoting the electric power plant siting.

Fifth, expediting the development of new energy technology, such as utilization of solar energy.

In response to the economic growth after World War II, the primary energy supply quantity in Japan increased sharply. After the oil crisis in 1973, however, the supply quantity showed little change because of the fall in economic growth rate and effects of the above-mentioned energy policy. Therefore, a slight decrease in imported oil has continued since 1973 (Fig. 1).

Breakdown of the domestic energy demands is outlined as follows. The mining and manufacturing industries used about 50% of the total demand in 1970. Since then, the industries endeavored to improve the equipment into energy-saving type. This resulted in a yearly decrease in their demand quantity and reached 42.3% in 1978. In the transportation and living fields, an increase in the demand quantity continued after the oil crisis. Percentage of the demand quantity of both fields to the total demand quantity was 37.1% in 1978. Therefore, it is an important

problem to expedite the energy-saving measures in both fields (Fig. 3).

In the housing construction field, an active use of insulating materials and an improvement in energy utilization efficiency of various equipment and machines have been promoted and the hot water supply and heating by solar energy have been commercialized to some extent.

However, to attain the above, a large amount of personal expenses is necessary, therefore, such an improvement cannot be quickly promoted. So, it will be an idea that the energy-saving measures are incorporated when a new house is built. The governmental subsidy measures for energy-saving type housing have been already taken.

Research and investigation on the comprehensive energy measures in a city scale have started in various fields and several plans have been proposed. There are some examples that area heating and small scale electric generation have been experimentally carried out by utilizing heat from a waste incineration plant. (It is called the parallel heat supply system)

Next, energy-saving measures in the transportation field, a major subject of this paper, are discussed. A recent increase in number of automobiles and a relative increase

in volume of Automobiles have caused a serious problem. (Figs. 4 and 5).

Automobiles are a means of transportation having excellent maneuverability, comfortableness, door-to-door convenience, etc., on the other hand, they have many problems; the environmental problem such as noise, vibrations and air pollution by exhaust gas and problems on the safety and energy efficiency. Private cars, especially, transport 35% of the total passengers and consumers 66% of the total energy for transporting passengers.

The increase in number of automobiles has resulted in serious traffic jam in roads. Therefore, the surface car system has been eliminated in most large cities and the bus operation speed has been reduced to 11 to 13 km/h in average. Thus, unfavorable effects have been given to means of mass transportation.

For the construction of new roads to smoothen the automobile traffic, there are frequent cases that residents in the planned area protest against the construction by reason of possible destruction of environment. From the standpoint of rate of land utilization, the efficiency of roads is lower than that of railways or monorails. This is unfavorable because land is one of the precious resources.

Therefore, to solve problems in the transportation field, it can be considered to take the following measures; to enable automobiles to be efficiently used by emphasizing excellent points of automobile transportation and to transfer the adequate transportation demand to the public means of transportation.

In parrallel, policies to reduce traffic volume by improving the efficiency of transport systems should also be implemented.

The transportation for the New Town has been planned so as to meet the above-mentioned requirements.

2. Outline of New Town Traffic Plan in Japan from Viewpoint of Environmental Preservation and Energy

--- Environmental Aspects ---

As transportation means such as roads and railways were expanded, transportation by motor cars and railway services become indispensable for our daily activities. As a result, various effects of traffics have become evident in our country's highly congested daily living space and environmental problems caused by traffics are becoming increasingly important in cities and their vicinities. Air pollution caused by exhaust gas from automobiles, noise and vibration attributable to motor and railway traffic, broadcast reception trouble caused by high rise buildings, disruption of landscape caused by the construction of roads and railways, sunshine reduction problem caused by high rise structures are among main problems. Common features of these problems are:

- 1) extensiveness and diversity of their effects,
- 2) involvement of multiple interested parties and conflicts of their interests,
- 3) difficulty to measure their effects, their uncertainty and unpredictability and
- 4) multiple objectives of projects.

It is considered inevitable that these phenomena or problems will emerge in building traffic facilities for the new town. In fact,

there were some examples whereby new town development projects were delayed or project modifications were forced because of protest campaigns launched by residents of new towns or around them against construction of roads in some new town projects. Developers of new towns must of course cope with these problems as they happen. Further it is important to study transportation programs from the stage of planning to preclude such problems. At the same time, transportation means must be such as to satisfy both the need for convenience and residents' wish to lead healthy life. The following is the means to be taken for the environmental protection in the transportation field.

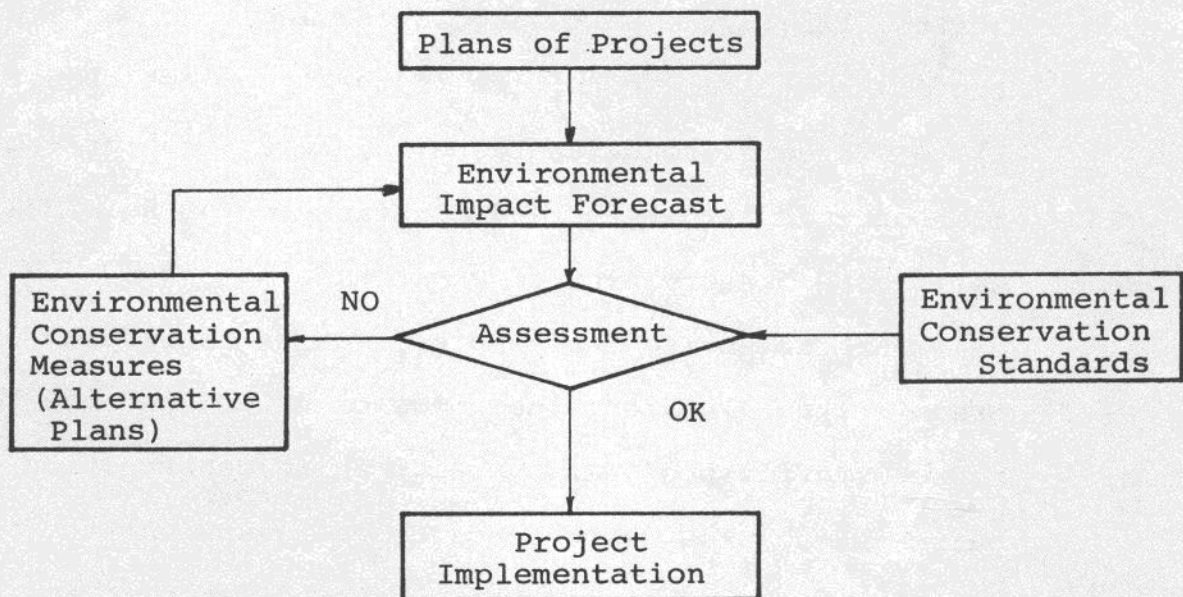
- 1) Division of road functions,
- 2) elevation or excavation of road structures and construction of noise buffer walls,
- 3) preservation of environmental space such as by constructing environmental preservation facilities or green belts,
- 4) alongside-roads-oriented land use to reduce traffic problems by encouraging construction of buffer structures along roads or railways.

At the same time, comprehensive measures are being taken to improve the performance of automobiles or railway cars and to tighten traffic controls.

Further when a public organization is to undertake a new town development project of a certain scale, it is required to carry out the so-called environmental impact assessment prior to the implementation of the projects.

This is a system for assessing various impacts which large scale development projects are expected to bring about on the environment such as: 1) air pollution, water pollution, noise trouble and others that will affect human health or living environment 2) impacts on ground configuration, plants and trees, and other natural environments, 3) impacts on scenic beauty of the environment.

"Concept of Environmental Impact Assessment"



--- Energy Aspects ---

In 1978, the transport sector (automobiles, railway services, shipping and aircraft services, etc.) accounted for about 14 percent of the country's energy consumption. Since this is the figure to all Japan, the rate should be higher in urban areas where traffic services are more intensive.

A report analyzes energy consumption patterns of several big cities in Japan. According to this report, the transportation sector accounts for 20 to 30 percent of the cities' total energy consumption. Since no study has been made on the transportation sector's energy consumption in a community of a new town scale, it is impossible to make a definite estimate at this moment. However, because New Towns in Japan are planned to develop residential district, it is estimated that the transport action sector's energy consumption in the new town is slightly smaller than the figure for the large cities. It is obvious that energy conservation measures will be most efficient when such measures are taken in all areas of New Town Projects. Thus those involved in the new town development are required to grasp an accurate picture of the energy consumption structure not only of the transportation sector but of all the activities concerned adequate energy conservation measures.

Under New Towns in Japan Project, efforts are made to

- (1) limit the movement of people and goods to the most possible extent by making a rational road plan, constructing comprehensive a town center, or by encouraging residents to work in the area,
- (2) to encourage people to walk by providing pedestrians, cyclistlanes and automobile-free zones, and by making adequate plans of facilities location and environmental design,
- (3) to develop a mass transportation to ensure the efficient communication with the mother city,
- (4) to promote the development of energy saving transport systems (new transport system, etc.),
- (5) to improve road structures as well as traffic control systems,
- (6) to adopt delicate operation patterns that react to peak hour traffic or late-night traffic accordingly.

In general, automobiles consume twice to four times as much energy as other transportation means (buses or trains) (Fig. 2). Thus it is not efficient to use cars as main transportation means for a new town project. Under the planning of New Town Project in Japan emphasis has been placed on the employment of mass transportation.

In this respect, it is proper to conclude that sufficient consideration has been given to the need of energy saving. At any rate, it has become an urgent and important problem in Japan to make a transportation plan that is compatible

with local conditions under the comprehensive evaluation that includes consideration of speed, certainty, safety, comfort, convenience, and costs of various transportation means.

3. Transportation Plan for New Town in Japan

The main objective of new town developments in Japan has so far been designed to quickly supply a large quantity of housing lands which are well equipped with roads, parks, sewer system, schools and other urban facilities of satisfactory condition in a short period to meet strong housing demand in big cities. Thus most of the new town projects were located on the outskirts of big cities within a distance commutable from cities (30 to 50 km from city centers).

Plans were made on an assumption that most of the workers who immigrated into new towns would commute to the "mother cities." Thus it was an important requirement for success to secure transportation means connecting new towns and city centers -- in most cases such transportation means was a railway service.

One of the reasons for adopting railway services was that new towns were planned on the assumption of utilizing railway networks already developed in and around cities. Another reason was the need to restrict the commuting by automobiles to the most possible extent through the employment of mass transportation which offer high grade services. In this respect, railway services were considered as the most appropriate mass transportation.

Until today twenty large scale new town or housing complex projects involving areas of more than 300 hectares have either been completed or under planning in the areas of the country's three biggest metropolitan areas -- Tokyo, Osaka and Nagoya. Twelve of them, new railway lines were constructed for serving the project areas and in three others, new stations were constructed on the already existing railway lines.

It is recognized today that it is efficient to employ public transportation systems as transportation means for new town projects and to restrict motor car traffic from the viewpoint of energy saving and environmental conservation needs which have emerged recently. Efforts were made and measures were taken along this line in Japan. The following account outlines such efforts and measures as well as their outcomes.

--- Efforts made in construction of railway lines ---

Railway lines connecting new towns and city centers are not only for transporting commuters but for carrying residents of new towns to busy quarters of cities for shopping and entertainment. Further they give residents mental security that they are closely linked to "mother cities." (It has been found out in polls that residents

have increasingly lessening feeling of separation from mother cities as they live for longer period of time in new towns.)

In Japan, there was no case in which a completely new railway line was constructed for a new town. In many cases, existing railway lines were extended to new towns or branch lines were constructed to be connected with new towns.

The construction of railway lines is important for the development of a new town but it has the following managerial problems.

- i) Passengers center around peak hours, and the traveling direction is one way toward a city center the morning rush hour and the opposite in the evening.
- ii) Construction costs are high.
- iii) It is necessary to start services before the number of passengers reaches a level to bring sufficient revenues for the operator.
- iv) Fares are controlled for other administrative purposes.
- v) The capacity of existing railway lines in cities is not sufficiently large as to take on trains from new town.

In most cases, railway lines serving new towns are operated by private railway companies. Because of this, there arose some cases in which construction of a railway was not started at the right moment which is synchronized with development of a new town. Under such circumstances, a new policy was introduced in 1972 whereby developers of new towns put up a substantial portion of railway construction costs (including land purchase costs) and at the same time national and local governments offer subsidies to railway companies.

Further the Housing Land Development Corporation, founded in 1974, is authorized to construct and operate railway services which is necessary to function new towns.

In other cases, new town developers and railway companies launched new companies for constructing and operating new town railway services. (national and local government subsidies are offered in such cases as well).

Railway companies are also making management efforts by introducing unmanned wickets or computerized train operations. However, new town railway operations are still running deficits.

To speak of railway services, train operation intervals during rush hours are relative short between 5 minutes to 10 minutes but still congestion during rush hours is rather serious.

Figure 7 and 8 show the example of Tama New Town Railways.

--- Efforts to Improve Bus Service ---

In the case of small housing development projects (of less than 30,000 residents), bus services are inaugurated to link new towns with stations on existing railway lines. Even if a new town railway line is to be built, bus is to be temporary transportation means until the completion of the new railway line. Bus services are efficient transportation means for new towns because their operation routes and intervals can be operated flexibly.

However, a managerial problem of passenger concentration on rush hours and one way travels during rush hours are also inevitable in bus services as in railway services. As a result, there were many cases in which bus services were not operated in accordance with the demand. Because of this a new policy was instituted in 1973 whereby new town developers are required to provide buses and bus yards to bus operating companies and the national and local governments extend subsidies for a certain period after the service in auguration.