

Urban Development and Expressways in Tokyo

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●JAPAN consists mainly of four islands, Hokkaido, Honshu, Kyushu and Shikoku. Tokyo is situated near the middle of Honshu Island, bordering Tokyo Bay and occupying the major part of what planners call the Tokyo Metropolitan Region (Fig. 1).

In terms of local government units in Japan, Tokyo-to (Metropolis) is a top-tier authority, embracing as its second tier authorities 23 wards with a total area of 569.5 square kilometers and a population of 8,810,000 in 14 cities and 26 towns and villages. The total area of its jurisdiction is approximately 2,027 square kilometers and the total population is 10,660,000 as of January 1966.

The name Edo was changed to Tokyo in 1868 when the Meiji Restoration put an end to the Shogunate Regime and Tokyo became the capital of Japan, then emerging as a modern state.

Today, Tokyo is the center of policy, economy, education, and culture and occupies an important international position.

During the city's development, there were two great occasions for city planning. On September 1, 1923, an earthquake struck the entire Kanto Region, causing most of central and downtown Tokyo to be burnt to ashes. Land readjustment schemes were effected for those damaged districts, with the result that blocks and streets were improved on a grand scale. The major part of the urban structure in the central and downtown area of today was formed by the city planning scheme of that time.

During World War II, Tokyo was hit by a series of air raids and the war-damaged area totaled 160.7 square kilometers.

The postwar Japanese economy, which has grown at a fast pace through several chaotic years, has accompanied the concentration of population and industry in large cities. The population increase in Tokyo has been especially noteworthy, as is seen in Table 1. As the result of a 200,000 annual population increase repeated for several years, the population of Tokyo broke 10 million in 1965 and at present it has reached 11 million, the largest city in the world.

The number of vehicles in Japan is also increasing rapidly, corresponding to the economic growth of Japan. Vehicle type has changed though, with passenger cars enlarging their share. Table 2 shows the changes in the number of registered vehicles in Tokyo. Comparing the number of registered vehicles with the population, it is clear that whereas the population of Tokyo is 10 percent of the total population of Japan, on the other hand the number of registered vehicles amounts to 15 percent of the total number of registered vehicles in Japan. From this situation we realize the trend toward centralization of vehicles in large cities.

However, roads are not highly developed. The ratio of road area to total area in the Ward Area of Tokyo is 11 percent, and outside of the Ward Area the ratio is lower than that, such that the increase of traffic volume cannot be coped with. Therefore peak hour traffic congestion is gradually spreading out from the central part of Tokyo to the suburbs, and traffic accidents are also increasing.

PLANNING POLICY FOR THE RENEWAL OF TOKYO

In the Tokyo area, the location of housing, factories, transportation, and commuting, as well as the population increase, all indicate that the social and economic

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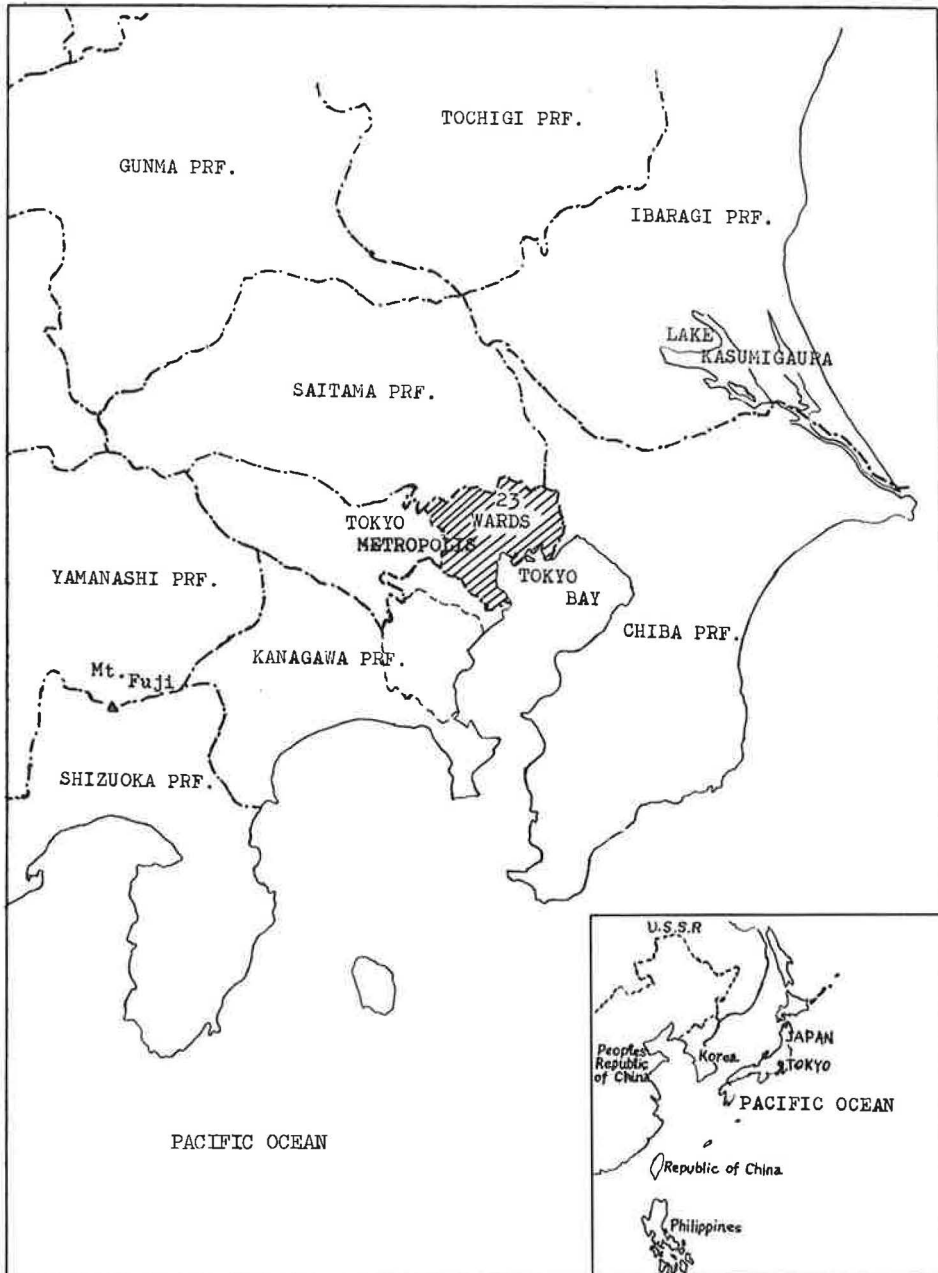


Figure 1. Tokyo Metropolitan Region.

development of the Tokyo Metropolitan Region, where urban activities are performed as a unit city, extends to a 50-kilometer distance from the center.

The Tokyo Metropolitan Region consists of major parts of Metropolis of Tokyo, Prefecture of Kanagawa, Prefecture of Saitama, and Prefecture of Chiba. This region occupies only 2 percent of the total national area but has 20 percent of the nation's population. The population of the Tokyo Metropolitan Region is approximately 19 million and is increasing by 500, 000 to 600, 000 annually, half of the nation's population increase.

TABLE 1
GROWTH OF POPULATION
OF TOKYO

Year	Population
1930	5, 402, 936
1935	6, 363, 190
1940	7, 347, 610
1945	3, 488, 284
1950	6, 277, 500
1955	8, 037, 084
1960	9, 683, 802
1965	10, 869, 244

The population of Japan will reach its peak between 1985 and 2000 at an estimated 120, 000, 000. The population in the capital region will level out between 28, 000, 000 and 30, 000, 000.

To cope with this situation, it is necessary that the nationwide land development plan, regional plan and city plan be coordinated effectively and executed strongly.

Necessarily much attention was paid to the development of the capital region. The Capital City Construction Law was enacted in 1950, by which the national government would extend financial assistance to develop Tokyo. However, this legislation could not bring about a basic solution to the population problems and Tokyo's other needs,

which required a regional planning approach. The planning area was confined to the administrative area of the Tokyo Metropolitan Government, and financial resources of both the national government and Tokyo Metropolitan Government were insufficient to meet the financial requirements of the plan's execution in war-devastated Tokyo.

The Capital City Construction Law was replaced by the Capital Region Development Law in 1956. The basic idea of the latter was to meet the increasing problems of excessive urban growth and the resultant inadequacy of public service by a regional planning approach. A broadly defined "Capital Region" with a radius of approximately 100 kilometers from Tokyo Central Station was established for planning purposes. The region is divided into three concentric rings: Inner Urban Area, Greenbelt Area and Peripheral Area. A number of industrial satellite cities have been planned in the peripheral area to absorb industry and population which would otherwise be attached to Tokyo or move into Tokyo or which might be decentralized from the central city. The Greenbelt Area was envisioned at the outskirts of the built-up area to prevent the further sprawl of the Inner Urban Area. This plan was worked out after study of a regional planning pattern which was adopted for London on the basis of the Greater London Plan.

Nearly ten years have passed since the Capital Region Development Law was put into force. However, in view of its limited effectiveness in controlling the overgrowth of Tokyo, it was not powerful enough to encourage the development of industrial satellite cities. The greenbelt proposal has been frustrated because the difference

TABLE 2
GROWTH OF NUMBER OF REGISTERED
VEHICLES IN TOKYO

Year	Number of Registered Vehicles	Population per Registered Vehicle
1958	403, 023	22
1959	490, 306	19
1960	608, 392	16
1961	726, 420	14
1962	814, 841	13
1963	924, 816	11
1964	1, 063, 199	10
1965	1, 181, 010	9

in actual situation of land ownership and land use between the greenbelt area around London and the proposed greenbelt area surrounding Tokyo was not recognized. In addition, the proposal in Tokyo is denounced as lacking an understanding of the growth potential of a giant city like Tokyo. Consequently much land in the area scheduled to be designated as the greenbelt area has been occupied by unplanned industrial plants and housing, resulting in continued urban sprawl and commuter congestion during the morning and evening rush hours. This area should have been developed with positive planning suited for its growth potential.

In June 1965, in order to establish comprehensive planning for the metropolitan region, the Capital Region Development Law was amended to revise greenbelt control and to plan the Tokyo Metropolitan Region consisting of the Built-Up Area and Suburban Development Area. At present, studies are being conducted to revise the regional development plan according to the amendment of the law. The Capital Region Development plan will officially start again within a year, drastically converting its negative enforcement into positive implementation, from control to induction, to adapt the Tokyo Metropolitan Region to the economic growth of Japan.

What must be the nature of the future metropolitan region?

Satellite cities, larger in size and more attractive, to absorb industry and population, should be fostered in the 50- to 100-kilometer area in smaller number, instead of the existing small-sized cities in large number. In the 50-kilometer area, it is necessary to reorganize the urban structure through a rational introduction of industrial plants, business offices and housing in an orderly fashion. This area should be called the Tokyo Metropolitan Region.

The fundamental items required for putting forward a rational plan for the 50-kilometer area of the Tokyo Metropolitan Region are as follows.

First, the proposed greenbelt in the shape of a concentric ring should be abolished. Instead a comprehensive planning pattern should be established for the 50-kilometer area as a whole with the existing proposed greenbelt, industrial satellite cities and Inner Urban Area (Built-Up Area) combined together. A planned development within the 15-kilometer area and planned development in the 15- to 50-kilometer area should be promoted in their organic relationships with each other.

Second, to reorganize the 50-kilometer area into a more efficient urban structure, it is necessary to reorganize the urban structure from the existing single-focus structure into a multi-focus structure. A number of measures which would be effective for bringing about a multi-focus urban structure are listed below.

1. An efficient network of transportation, especially a rational relocation of road transportation facilities, should be established. Urban expressways will be extended and an outer-ring expressway will be constructed on the outer fringe of the Ward Area of Tokyo to connect inter-city freeways organically. Bus terminals and parking facilities will be located at suitable points, which will be accompanied by redevelopments.

2. It is necessary to push forward urban redevelopment schemes around the city center and subcenter district, to attract business firms to the subcenter so that central functions may be distributed and to induce planned development of industry and housing in the surrounding areas, and to develop a number of auxiliary centers like the synthetic center for distribution and others along the arterial routes of transportation. Actually large redevelopment projects are under way; one is at Shinjuku utilizing the vacated land of the Yodobashi Water Purification Plant and another is at Ikebukuro utilizing the vacated land of Sugamo Prison. Also, synthetic centers for distribution which include truck terminals, wholesale markets and warehouses will be constructed along the outer-ring expressway.

3. Construction and expansion of factories in the Built-Up Area is limited by the Law for Controlling Industry and Other Activity Within the Inner Urban Area, whereby vacated lands of factories are acquired and redeveloped to promote the decentralization of industry.

4. Designation of bulk control will maintain the equilibrium between bulk of buildings and transportation facilities. Besides that, bulk control will protect living and working conditions in the city.

PROPOSED ARTERIAL ROADS OF TOKYO

The present highway system for Tokyo has an 80-year history. However, current traffic problems make the former two-dimensional highway plan inadequate. Construction of new roads or widening of existing roads can no longer be a countermeasure against the increasing traffic demand, from the point of economy as well as time. Therefore an economic and effective highway system has been designed to cope with present and future traffic problems, on the basis of a ten-year study.

According to this plan traffic demand in 1985, which is estimated through analysis of an origin-and-destination traffic survey conducted in 1962, will be met by arterial roads and urban expressways (Fig. 2).

The arterial road network has a combined ring and radial pattern. The intention to reorganize the present urban structure of Tokyo into a multi-focus pattern is included. The physical structure of the urban area of Tokyo is featured by fragmented blocks and numerous traffic intersections. For this reason, from the standpoint of traffic engineering, the most important point in road improvement in Tokyo is how to bring about continuous grade separations at the intersections rather than mere widening of roads. The problem is how to obtain the maximum traffic capacity at a minimum cost.

Total length of the proposed roads in the Ward Area of Tokyo is more than 1,500 kilometers, consisting of trunk roads totaling approximately 600 kilometers and auxiliary roads.

Grade separations are proposed at about 330 existing intersections. Some have already been completed. On Showa-dori Street in the central city, grade separations were made at five major intersections for a continuous distance of 2.8 kilometers. On Ring Road No. 7, continuous grade separation at 67 traffic intersections was proposed and grade separation is finished at 25 intersections. A lane of the grade separation on Showa-dori Street allowed more than 1,500 vehicles to pass in an hour. The number of vehicles proves the effectiveness of the continuous grade separation.

Because it is expected that the present increasing demand for traffic facilities will reach its summit sometime in the next 20 or 30 years, it is hoped that all of the proposals will have been finished by that time. A total of 5.56 billion dollars (2,000 billion yen) is required for the completion of all the proposed arterial roads.

THE BIRTH OF URBAN EXPRESSWAYS

Generally speaking, the following are considered as the means of resolving the traffic congestion in a city: the improvement of ordinary roads, the construction of grade-separated intersections, traffic regulations such as one-way control, etc. But none of these is a decisive solution. For the highly agglomerated areas in Tokyo the difficulties of expropriation and continuously rising land prices require a number of years of construction and tremendous investments.

Thus, to make the traffic flow smooth in a city, roads exclusively for cars, separated from ordinary roads and intersections, were proposed. From this proposal developed the theory of successive grade-separated intersections—the Urban Expressways in Tokyo.

The primary object of urban expressways, therefore, is to attain efficient traffic flow; the increase of running speed is merely a secondary aim. In this sense they have quite different characteristics from the long-distance expressways, whose object is to connect cities in a shorter time.

The concept of urban expressways in Tokyo was born in about 1950. After extensive research and examination, such as O-D surveys, traffic volume counts, projection of vehicle numbers in the future, etc., the network of urban expressways with a total length of about 70 kilometers was decided upon in 1959. Several routes having been added afterward, the total length amounts to 103 kilometers at the present time. Construction is being carried out by the Tokyo Expressway Corporation. The completion of the important routes on the eve of the XVIIIth Tokyo Olympiad was especially remarkable. As the result, a 32-kilometer section of the expressway from Haneda



Legend

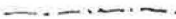







-  Administrative Boundary of Ward Area
-  Arterial Roads: Ra = Radial Roads; Ri = Ring Roads
-  Planned Urban Expressway (Authorized)
-  Extension of Planned Urban Expressway (In Study)
-  Inter-City Freeway
-  Center of City
-  Subcenter
-  Synthetic Center for Distribution

Figure 2.

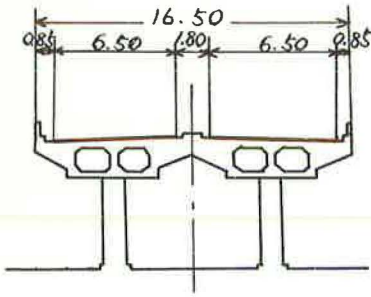


Figure 3. Cross section (units are meters).

Airport to Shinjuku via the central district has been put to use. The fee is 80 cents for trucks and buses, 40 cents for ordinary cars.

Permitting automobiles to travel at high speed is not their primary aim, so the standard speed of automobiles has been set at 60 kilometers per hour and the structure is also designed with a fairly low average.

Figure 3 shows the standard cross section. The width of 16.5 meters with four lanes may be considered narrow for an expressway. On the other hand, as the land cost is extraordinarily high in Tokyo, it has the advantage of lower cost of construction and easier choice of routes. The

structure is mainly viaduct form, and in part takes the form of open-cut or underground.

URBAN EXPRESSWAY PLANNING FOR TOKYO

As mentioned before, one aim of the development of the Tokyo Metropolitan Region is to achieve the multi-focus urban structure, and now is the time when we have to make every effort to realize this plan. To induce relocation of urban functions, it is indispensable to develop the traffic facilities, including urban expressways, which will be the framework of the highway network of Tokyo.

In the built-up area, some urban expressways which connect the city center and sub-center districts have already been constructed. Tokyo also has other planned urban expressways, but those urban expressways, both completed and planned, will not be enough to cope with the future traffic demand. On the other hand, in the outer districts of the Ward Area, a number of inter-city freeways which run through the country have been proposed and are partly under construction. However, inter-city freeways run merely in radial directions out into the outer fringe of the Ward Area. To distribute long-distance traffic on the inter-city freeways into the Ward Area smoothly and to realize the multi-focus urban structure, existing urban expressway planning must be improved, so that the urban expressway network may connect each district organically.

Figure 2 shows the future plan. First, the Outer Ring Expressway is planned on the outer fringe of the Ward Area, nearly 15 kilometers from the center, to connect the inter-city freeways. An Inner Ring Expressway will be planned on a circle of approximately 8 kilometers as a coupler of subcenters. All radial expressways which end at the subcenters will be extended to the Outer Ring Expressway. Thus, the urban expressway network including the Outer Ring Expressway will total 340 kilometers, and most of the proposed expressways are expected to be finished in 10 years.

The nature of traffic in Tokyo is more intensely centralized than that of New York and Chicago because of its urban structure. Although the economic value of the Outer Ring Expressway would be low, it should be utilized for bringing about a reorganization of the urban structure of Tokyo by locating subcenters, auxiliary subcenters and synthetic centers for distribution along its route.