

THE REVOLUTION IN COMMUTER TRANSPORTATION

—A Proposal for Solving the Housing Shortage and
Commuter Congestion in the Metropolis by a New
Tōkaidō Line Type High Speed Railway—

RYŌHEI KAKUMOTO

I. THE METROPOLIS OF TOKYO

1. Revolution—Not of the Citizens but in Commuter Transportation “13th July, nothing special.”

The very day after the monarch had jotted this down, on 14th July 1789, the French Revolution broke out. The long amassed energy of discontent among the people at last exploded. In any age and in any country, if discontent accumulates it is bound to explode.

Let us now take a look at present-day Japan and see where discontent lies. The economy of the nation has shown spectacular growth and the living standard of the people has risen to a level unconceivable at the end of the War in 1945. Discontent in one aspect, however, has kept on growing—namely the housing shortage and the hardship of commuting felt most keenly in Tokyo.

Land is first required in building houses, and to secure cheap land people have dispersed further and further away from the city center, to the extent that the commutable limit has already been reached. Yet, even at places considered to be the limit for commuting in view of the physical strain and time consumed, the price of land is soaring, making land acquisition practically impossible. As a result, marriage and birth have to be restrained due to the lack of housing—a pitiful situation indeed. On the other side of the picture, landowners are relishing the rise in the land price with folded arms. Such a condition is surely a danger to social stability.

It is true that public bodies are supplying new houses, but this is not making much headway on account of the difficulty of procuring the necessary land. Private real estate dealers are scavenging every piece of purchasable land in anticipation of higher prices and are imposing upon the citizens poor quality houses at high prices. Due to the rise in land prices in sub-

urban areas, apartment houses of about eight storeys high have begun to appear in great numbers in the built-up areas. In Japanese they are called "mansions," but the quality of many of them are such that they will be slums in 10 years.

The citizens have already been driven into a mood of despair in regard to purchase of land, and if this is to continue, it may foster a revolutionary atmosphere. The landowners and real estate investors are interested only in rising land prices, and there is no sign of change in their attitude. Several consultative committees of the Government composed of representatives from academic and business circles have in the past few years insisted that land should not be looked upon in the same way as general merchandise, and that the Government should take positive measures accordingly. No steps have been taken, however, in this connection. If a "revolution" is to be avoided, a safety valve for the over-heated feelings of the citizens must be opened immediately.

Reform of the land system is also a prerequisite to the reform of commuter transportation by high speed railway which the author is advocating in this article. To be more explicit, the author's plan is to have recourse to the Land Expropriation Law for the purchase of land 50 km. or more away from the city center from where commuting would be inconvenient by currently available means of transport at the current price (approximately ¥2,000/3.3 sq. m. or US \$6,800/acre). The land so purchased is to be levelled, prepared as residential sites and sold in small parcels (at approximately ¥30,000/3.3 sq. m. or US \$102,000/acre). The difference in the purchase and selling price would become the main source of funds for the construction of high speed railways between such places and the city center.¹ A good living environment can also be secured by this method.

Aside from this proposal, there have been many others. Examples are: "The influx of the population into Tokyo should be suppressed"; "The functions of the metropolis should be dispersed"; "It is the age of the automobile, and transportation policies should be based on the use of motor vehicles"; and "Built-up areas should be made to absorb a greater number of people." The author shall expand on his proposal, while at the same time commenting on these other proposals.

2. Characteristics of Tokyo

As a mammoth metropolis, Tokyo has many features common with

¹ All prices quoted in this paper, including railway fares, are for 1965-1966 when this proposal was first made and current prices are somewhat higher. The rise in land prices at a rate higher than general commodity prices, however, does not stand in the way of realizing this proposal.

New York and London. On the other hand, it must first be borne in mind that the distressing situation to be found in present-day Tokyo stems from the following conditions:

Table 1. Area and Population of Three Great Metropolises

	Area (sq. km.)	Number of Population (1,000)
Tokyo 23 Wards		
1960	569	8,310
1965	569	8,892
Greater London		
1962	1,800	8,177
New York City		
1960	819	7,782

- (1) Greatest scale and density in the world

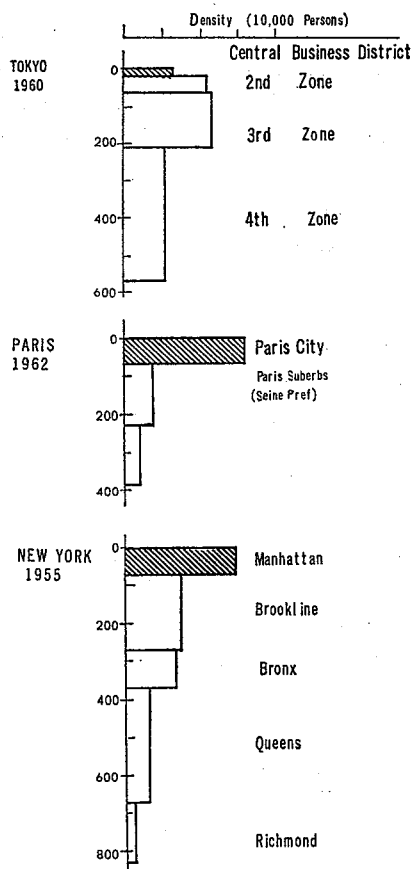
Tokyo, called "Edo" in the 18th century, had a population of 1.2 million, the largest in the world at that time. It is again the largest today, as may be understood from Table 1. In addition, the extremely high density of the population has made the urban problem all the more difficult to solve.

As shown in Figure 1, if only the central business district is taken, the density in Manhattan is greater, but Tokyo is characterized by high density in the other built-up areas. As a result, it is found that in an area of 572 sq. km., corresponding to 70% of the area of New York City, there is a million more people dwelling and working. This is an alarming concentration of population.

- (2) Rapid growth in the 10 years from 1965

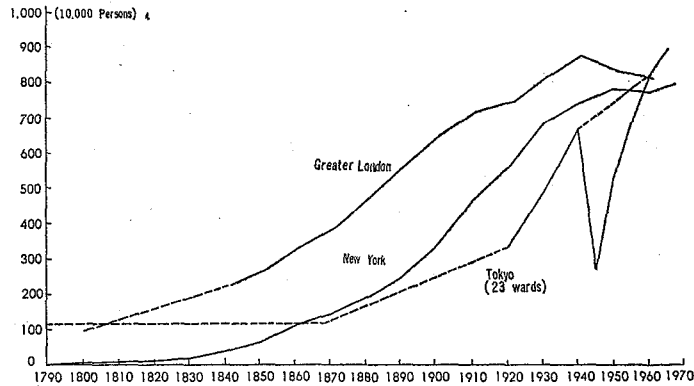
The history of population growth in the three metropolises is compared in Figure 2. After Japan was reformed into a modern state in 1868, Tokyo

Figure 1. Density of Inhabitants by District



kept on growing. While there was a break on account of World War II, the growth in the 10 years from 1955 was amazing. This is in line with the growth of the national economy, with the administrative function of Tokyo growing along with the increase in the nation's productive activities.

Figure 2. Trend of Population Growth in Three Great Metropolises



- 1800 In the beginning of the 19th century, the population of Tokyo and London had already exceeded 1 million and it was not possible to develop their built-up areas under a fixed plan, whereas this was possible in New York which was yet very small. Until the appearance of railways, horse-drawn carriages were the principal means of transportation.
- 1825 Appearance of steam railways.
- 1836 Appearance of horse-drawn railways.
- 1863 Appearance of underground railways.
- 1875 Appearance of electric railways.
- 1881 Appearance of streetcars.
- 1900 Beginning of the popular use of motor vehicles.

Population growth in the 23 wards which constitute the central part of Tokyo has recently ceased, while growth is continuing outside the wards. (See Table 2.) The growth in the rate of employment in the 23 wards is also falling.

Table 2. Increase of Population in Tokyo Metropolitan Area (5,938 sp. km.)

	Tokyo 23 Wards	Surrounding Area	Total
1955	6,969	5,904	12,873
1960	8,310	7,070	15,380
1965	8,892	9,582	18,474

On the other hand, housing and the provision of required public facilities has not been able to catch up with this population growth since 1955. There is a shortage of over 500,000 dwelling units in Tokyo, and the congestion of trains during commuting hours is very heavy. Since 1955

additional railway tracks have been built and additional electric cars put into service (the number of electric cars doubling in the 10 years), but this has only slightly relieved the congestion, and with the sprawling out of residential areas, the commuting time has become all the more longer.

(3) Extremely high land prices

It may not be surprising to find that the price of land in the world's most densely populated metropolis is also the highest. It is said that the price of land on the Ginza, one of the foremost shopping centers of Tokyo, is higher than that of Broadway in New York. Also, the price of ¥100,000/3.3 sq. m. (US \$340,000/acre) for residential land 10 miles away from the central business district is considered normal. This high price is caused by the high density of population and is an impediment to the provision of the necessary public facilities.

(4) Passive and suppressive policies in the past

It would not be strange to see over a million people employed in the central business district of the metropolis of an industrial country with a population of 100 million. Since the number employed in 1955 was around 500,000, the subsequent growth should have been supported. To the contrary, the Government looked upon this as a vice and tried to suppress the growth. The energy of economic growth is difficult to stop, and it was fortunate indeed for the progress of Japan that the Government was not able to arrest it; for, if it were otherwise, we would not have seen the present high level of prosperity in Japan.

The real reason for the Government's suppressive policy is not clear to this day. It can be surmised, however, that the planning authorities were afraid that the shortage of public facilities would become all the more acute if the population increased. This is like trying to stop the growth of a child's feet so that the child will be able to wear the same shoes.

It was considered that the Greater London scheme was a good model to follow and it was taken as a guide. The author does not know why the Greater London scheme was treated in this way, but he feels that if the American way of thinking, which admits urban growth, had taken foothold in our country, a different policy would have been taken.

The dominating idea for several years after 1955 was to encircle the built-up areas of the 23 wards and Yokohama with a green belt and limit housing construction to only the built-up areas. No matter how housing may be restricted, it is impossible to stop the growth of employment.

It is regrettable indeed that passive measures were taken at a time when positive measures should have been adopted, and that the Government had neglected to acquire the necessary land for future housing and public

facilities. For fast-expanding Tokyo to have copied stationary London (see Figure 2) was like giving an old man's medicine to a child.

3. *The Crisis of Tokyo*

The outcome of this passive policy is that Tokyo has now to face the following crises.

(1) Greater hazards to life

Man, as a living being, possesses two instincts: preservation of self, and preservation of the race. For the former, there should be protection against direct hazards to one's life. Crime and traffic accidents may be counted among these hazards, but what is imperiling the life of each citizen is air pollution.

Already in 1928 there appeared a poem "There is no sky in Tokyo." Now, the atmospheric content of sulphurous acid gas and carbon monoxide very often exceeds the danger limit in Tokyo.

Deaths from traffic accidents are increasing along with the increase in motor vehicles. In 1968 traffic accidents accounted for 532 deaths in a population of 9 million (23 wards), but this rate is not much different from that of New York or Greater London.

(2) Population reproduction imperiled

Preservation of the race cannot be satisfactory where preservation of the individual is unsatisfactory. Bringing up children in large cities is a hardship common throughout the world, and this is especially so in Tokyo. According to a survey, 58.5% of the children in the 23 wards do not have suitable playgrounds nearby. As the children are given nourishment but no playground to exercise, they are becoming too fat.

Of the 572 sq. km. of land in the 23 wards, less than 2% has a good living environment with satisfactory sewer system. Nearly 20% has a good living environment but is without a sewer system. Although there are no particular shortcomings, some inconvenience would be felt in nearly 29%. The remaining 40% is not fit for living.

(3) Conditions for creation of culture

Man creates culture and in his creativeness he has found his true worth. It may, moreover, be said that large cities have played a crucial role in the advance of present-day culture. Now, if we take the period from 1955 to 1965, can it be said that the large cities in Japan were suited to the creation of culture? It is still too early to give a conclusion, but the following losses may be mentioned.

(i) Man has lost contact with nature and there are less opportunities of being inspired by it.

(ii) The living space of the individual has narrowed, and in addition, he has come to live in a uniform environment.

(iii) The noise nuisance has become serious, and to avoid this, a composer has escaped to a solitary island.

(4) Poverty in plenty

Man is said to be a social being. While he shares responsibilities with his fellow men he compares his lot with that of others and this causes him pain. The larger the city, the more solitary becomes the individual, and the difference in his standing as compared with that of others makes him all the more unhappy.

Owing to the growth of the economy, personal income has risen. This, however, is the "flow" aspect. In the "stock" aspect, the gap between those who possess a house and land, and those who do not, is widening.

Even though income has more than doubled in the 10 years from 1955, the price of land has risen 10 times. Wage earners who, 10 years ago, thought that land could be purchased by saving money have now lost all hope of doing so.² Moreover, there is a great difference in the area of living space between those who already own a house and those who do not. Although earning the same income, there is a great difference in the standard of living, and those who do not own their own house are continually suffering from "poverty".

II. PROPOSALS IN THE PAST

Despite the previously mentioned crisis faced by only passive and suppressive measures were taken and it was not recognized that the further expansion of Tokyo was something inevitable. As a result, the hardships of the citizens kept on growing, and various proposals were made, both in public and private circles, to solve the problem. Among these, the one that became the basis of later policies is "Tokyo no sai-kaihatsu ni kansuru kihon kōsō" (Fundamental Concept of Re-development of Tokyo) (1963) drawn up by the Council on Metropolitan Re-development Problems.

² The monthly income of a city worker was ¥26,000 in 1955 and the price of land then was one-fifteenth of the price in 1968. With this income it was possible to purchase 15 sq. m. of residential land within commuting distance. Income in 1968 rose to ¥82,600, but this was not sufficient to pay for even 3.3 sq. m. of land. At least 80 sq. m. would be required to build a house with a garden. For this minimum requirement 2.5 years income would be required. Since 2.5 to 3 years income is said to be the most that wage earners are capable of spending for housing, the rise in land prices has made it impossible for wage earners to possess their own dwelling places. (*Asahi shimbun*, July 18, 1969.)

1. The Proposal of the Council on Metropolitan Re-development Problems

The framework of the proposal is shown in Figure 3. The basic idea behind the solution provided was as follows :

Local cities should be developed to prevent the disorderly concentration of various city functions in Tokyo and measures should be taken for balanced development of the land of Japan. As to the functions already found in Tokyo, those that do not necessarily have to be located there should be removed and dispersed to other areas, and the functions will have to be reorganized, leaving in Tokyo only such pivotal functions of government, economy and culture as are deemed necessary in the capital.

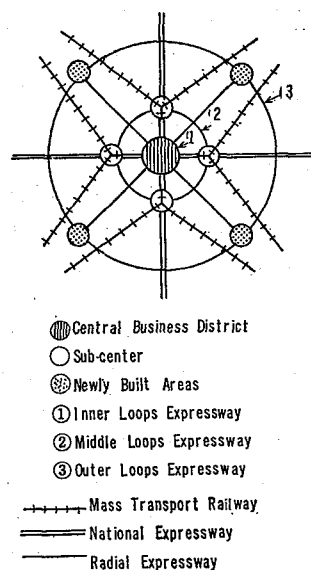
Moreover, in Tokyo such pivotal functions, together with those for distribution and consumption, are concentrated in the central business district forming a concentric type of city structure. From the viewpoint of urban transport, the limit has been reached in this type of structure. Consequently, in reorganizing the functions, those located in the city center should, in accordance with their present faculty, be removed to other areas of Tokyo or its periphery so that an eccentric and not a concentric type of city structure will be attained. To meet the needs of this reformation, a new system of transportation should be provided.

The viewpoint expounded here is that the crisis comes from an excessive concentration of city functions, or to be more specific, that factories, universities, research institutes and the like should be dispersed to satellite cities and that distribution facilities such as wholesale stores, markets and warehouses should be removed to the newly built-up areas on the periphery of the wards. The proposal continues as follows :

After these facilities have been dispersed as much as possible, the city center should comprise mainly office facilities, and consumption facilities should be properly placed among them. In doing so, care must be taken to prevent an excessive increase of office facilities and the disorderly expansion of the central business district.

The proposal goes on to say that by using the super-block system which combines several districts enough open space should be provided in the central business district to improve the environment; that office areas should be developed under modern plans in the sub-centers where mass

Figure 3. Proposal by the Council on Metropolitan Re-development Problems



transport facilities converge so that over-concentration of office facilities in the central business district can be avoided; and that small- and medium-scale plants connected with wholesale stores should be situated in the newly built-up areas into which distribution facilities are to be removed, and so reduce the number of plants in the existing built-up areas.

With the various facilities so placed, it was proposed to build inner, middle and outer loop expressways and several radial expressways.

As to housing, it was proposed to build many-storeyed apartment houses on a large scale around the central business district, sub-centers and newly built-up areas so as to shorten the commuting distance and mitigate the congestion. This would also serve to prevent the disorderly expansion of the metropolis. In residential areas where the environment was not good due to the existence of factories, office buildings and amusement facilities therein, it was proposed to reconsider the usage of these establishments so as to improve the environment.

This plan was none other than a collection of the various proposals made up to that time. In reality, however, the following basic problems had to be solved, and it has been these very problems that have been impeding the smooth implementation of the plan.

First is the problem of whether or not the planners can distinguish between functions that may or may not be allowed to be located in the metropolis. They may be able to reject certain establishment on account of the public nuisance they would create, but could there be a valid reason for approving office buildings and rejecting universities? It is true that new universities and factories are being located in the suburbs, but this is because of the difficulty of acquiring land and not because of their low estimation of the convenience from being located in the central area. Hence, it will not be possible to expel the universities already existing in the central area.

An attempt is being made to justify the dispersal of city functions on the ground that it would ease the congestion of urban traffic, but what is needed is augmentation of urban transport. Restricting demand by fixing supply is a one-sided argument.

The second problem is whether sub-centers can develop when there is room for further employment in the central business district. Generally speaking, sub-centers cannot provide substitute for the functions found in the central business district, except in such cases as EUR in Rome or La Défense in Paris where reconstruction of the built-up areas is difficult. No doubt, sub-centers will continue to serve as centers of the neighboring residential areas.

The third problem is that if sub-centers were to be built at places

where mass transport carriers converge, this will lead to a further increase in the volume of traffic at points already troubled by traffic congestion. The Tokyo Metropolitan Government is now making great efforts for the development of the Shinjuku Sub-center (located approximately 5 km. west of the central business district). In this sub-center is Shinjuku Station where the national railway, private railways and an underground railway converge, and the volume of traffic handled at this station is the largest in Japan. If additional railway lines were to be built here and the traffic volume increased, confusion would surely result.

The fourth problem concerns multi-storeyed apartment houses. It is true that they will accommodate a greater number of people in the same ground space, but it is problematical whether they can improve the living environment. The tendency at present is for the population in and near the central business district and sub-centers to decrease. The reason lies in the worsening living environment.

In our country there are many people who advocate multi-storeyed apartment houses without critically examining their merits. They simply believe that the population of Tokyo is less dense than that of the cities in foreign countries. If the 57 sq. km. area of Manhattan and the 87 sq. km. area of Paris City are compared with the same area in Tokyo's central business district, it is true the density is lower in Tokyo. On the other hand, the population density is extremely high in area outside the central district; in fact, 9 million people reside in an area of 572 sq. km. (23 wards of Tokyo). There is even a proposal to add another 10 million to what is already the highest population density in the world, but this takes into account only the physical capacity of dwelling quarters and has forgotten the human side of the dwellers.

World experience suggests that 10,000 inhabitants per square kilometer is the desirable limit. The construction of multi-storeyed apartment houses may be helpful in providing space for the building of roads, parks and playgrounds, but resorting to such housing to increase accommodation capacity is out of the question. Moreover, the air becomes polluted in the city center, sub-centers and adjacent areas. Actually, some high buildings have been built for dwelling purposes in these areas, but no doubt the residential population there will keep on decreasing.

In the fifth place, the newly built-up areas are to be connected with the central business district and sub-centers by expressways, according to the plan. However, as will be mentioned later, the existing roads are already saturated, and even if new expressways are built, it is doubtful whether that will be sufficient. There is bound to be people commuting to the central

business district from residences in the newly built-up areas.

2. Proposal for Relocation of the Metropolis

The dispersal of city functions was dealt with in the plan mentioned in the previous section. While in this plan the central administrative functions were to remain in Tokyo, the proposal for relocating the metropolis aims at dispersing government functions which are the mainspring of metropolitan expansion. This proposal was heard from the 1950's and reached the climax around 1964 when a draft plan was announced by the Ministry of Construction, but interest in the plan has recently waned.

According to the Construction Ministry plan, it was proposed to construct a new metropolis with a population of one million in an area of 75.9 sq. km. In the first stage of six years, 28 sq. km. of land was to be developed for 300,000 inhabitants; in the second stage of 20 years, 42.8 sq. km. for 500,000 inhabitants; and later to be further developed for 1 million inhabitants. Announcement of this plan brought to the fore the various problems involved and it seems that there are many who are against hasty action in implementing the plan.

In the first place, there is the problem of whether the people are really in favor of relocating the seat of Government functions. The people of the new location might welcome this, but it is doubtful whether there can be a place more convenient than Tokyo to the people as a whole. This is because the transportation network of Japan was molded from the 17th century with Tokyo as the core.

In the second place, there is the problem of whether the separation of economic and government functions would be desirable or not. The case of Washington and New York is often referred to, but in a single nation the form taken by London or Paris would be more efficient and convenient. The U.S. case just happened to turn out the way it did because of unavoidable political circumstances in the past.

In the third place, the question arises as to why the Government, even though it may be to prevent the overgrowth of Tokyo, has to be the first to evacuate. Government organizations are housed in modern buildings located in a well-kept area. Evacuation would not only be a waste of facilities, but the land so evacuated would most likely be used by establishments causing nuisance to the public. Hence, what should be done is to evacuate those establishments which cause a great deal of public nuisance. If the Government were to be the first to evacuate because it is unable to relocate the other functions, this would be tantamount to renunciation of Government responsibilities.

In the fourth place, it is doubtful whether the expansion of Tokyo is due to the existence of Government organizations therein. Employment in the heart of Osaka grew in the years from 1955 to 1965 in the same manner as Tokyo, and this is because of the growth in economic activities and not because of the location of the Government.

In the fifth place, what is most dangerous is for the Government to draw the attention of the people in the wrong direction and neglect what should really be done. Even if 300,000 civil servants were to be evacuated from Tokyo in 6 years, that would not provide a basic solution to the urgent problems of water supply shortage, traffic congestion and housing shortage.

3. "*Tokyo 1960*," a Proposal by Professor Kenzō Tange

Even if the functions of the metropolis were to be dispersed on the lines already mentioned, it is most likely that subsequent concentration cannot be stopped so long as there is an advantage in concentration. If there should be a demand to concentrate, despite the expenses that would have to be borne (such as transportation and water supply facilities) then it may, in fact, be to the benefit of the nation to allow such concentration. Instead of suppressing the growth of the metropolis, is there not some other policy which would facilitate further development?

This brings to mind a proposal made in this direction by Prof. Kenzō Tange and known as "Tokyo 1960." His line of thought on the 10 million population metropolis is as follows :

The progress in civilization and the economic growth in the 20th century led to the development of mammoth 10 million population metropolises in all parts of the world. It behooves us to recognize the inevitability of this development and the importance of its existence. We should further consider what the essential functions are of this newly born metropolis of 10 million inhabitants. Such a metropolis is already qualitatively different from cities of a hundred thousand or a million inhabitants.

What promotes the formation of such mammoth cities is, indeed, the tertiary productive function.

Concerning Tokyo, Prof. Tange reiterates,

Before saying that it has overgrown, we must properly understand the inevitability of its development, its *raison d'être* and the true nature of its functions.

The essence of Tokyo does not merely lie in the conglomeration of tertiary functions involved in the distribution process of the economy, but in the fact that it is the local organ of the nation enabling the fulfilment of the over-all functions of our country.

Concerning transportation, Prof. Tange says,

With regard to the mobility much needed in this key organ, it is already clear that this cannot be secured by the hitherto centripetal, radial transport system. However, to suppress the growth of Tokyo so that transportation will not become paralysed is none other than mistaking the means for the end. Proper measures should be taken to promote development.

Even if factories and government and educational functions are dispersed, Prof. Tange says,

What has remained of Tokyo will continue to face confusion and contradiction, and this is the problem. Remaining Tokyo... will inevitably continue growing.

Unless we focus our attention on Tokyo itself, there will be no salvation for Tokyo. We cannot support those who purposely distract our attention away from Tokyo and take an escapist stand.

From this viewpoint, Prof. Tange proposed that a city be constructed across Tokyo Bay in a ladder shaped form. In other words, areas of 1 kilometer square are to be enclosed by expressways and three of these units are to be connected in a row. This larger unit is to be enclosed by another expressway and nine of these are to be projected into Tokyo Bay from the central part of Tokyo. For mass transport the monorail is to be used. Furthermore, in a direction at right angles to this city axis, residential areas are to be established. Along the route linking Tokyo-Ikebukuro sub-center, the central business district and the marine city, working places are to be created for 2.5 million people, and housing for 5 million people is to be provided in the marine city.

At first glance this proposal seems to be very unrealistic, but in reality, it is the policy of suppressing the growth of Tokyo that is isolated from reality and not in keeping with the aspirations of the people.

What we have to consider here are the comparative merits on the one hand of developing a new central business district on this proposed city axis making maximum use of private automobiles, and on the other hand of endorsing the trend so far in the development of the existing central business district and strengthening public carriers for business men and commuters without depending much on private automobiles.

In making this comparison, it will become necessary to calculate the relative cost of city center construction, housing projects and commuter railway construction. In this connection, what is of importance is the land policy. If measures for restricting land prices are taken, and land for public use and housing can be made available easily, then the ground plan would become advantageous. But if the land problem cannot be solved, creating artificial land in Tokyo Bay would become promising.

III. THE LOGIC OF TRANSPORTATION AND URBAN COMMUNITIES

1. The Principle of Urban Community Formation

All cities have endeavored to realize their respective ideal plans based on the transport techniques of the time. The history of Tokyo goes back more than 500 years and the central business district of today was formed in the 17th century. At that time the movement of cargo depended mostly on water transport. As a result, the down-town section of the city grew up at a place most convenient for water transport, as was the case with London and New York, and that is the business section of today.

With the arrival of the 20th century and the spread of electric railways, the community of water transport and pedestrians began to develop outwards along the suburban railways. In 1932 the old Tokyo City of 81 sq. km. was enlarged to the present 23 wards of 572 sq. km. and it may be said that the formation of this metropolis was due to the railway. After World War II, people sought residential land outside the 23 wards and railways were expanded accordingly. At present the population has ceased to grow in the 23 wards, and the front line of population growth has shifted to the areas 30 km. to 50 km. away from the city center.

In the process of this urban expansion, employment and housing were governed by their own logic. The place where the maximum economic profit can be achieved will be the place selected for employment. For the management function covering the whole country, it is but natural that a place which is the center of the transport network and where it is convenient to keep in touch with other enterprises and government agencies would be selected. Once the central business district is formed, transport terminals will be located therein, and unless there should be any great defect in the existing place, the central business district will keep on thriving. This is the case with the City of London and the down-town area of New York. However, the area of the land being too small relative to present-day demand, development takes place in adjacent areas, and the direction of development is guided by transport facilities.

Retail business and entertainment facilities which serve residences are induced by residential areas, and it is natural that department stores in the central business district should open branches in sub-centers and in the suburbs. As road congestion becomes worse, factories and warehouses which handle large volumes of cargo will leave the central business district and go to the suburbs as this is economically rational. As to residences, they were close to working places in the days when people walked and this is why Tokyo City in the olden days and the City of London were densely

inhabited. If, on the other hand, the means for commuting is provided, human nature would call for a better living environment and people would move to the suburbs to free themselves from the unpleasantness of the dense residential area. It is the railway which fulfilled this role as mentioned before. Whilst there were 2.25 million inhabitants in the 81 sq. km. area of old Tokyo City in 1935, there were merely 1.55 million in 1965.

Greater ownership of private automobiles has led to more houses in the sparsely-housed areas being located between the railway lines radiating out towards the suburbs. Nevertheless, the structure of the metropolis as formed by the railway has not changed much as yet. This is because automobiles essentially do not harmonize with large cities, as will be mentioned next.

2. Selection of Future Means of Transportation

Since the 19th century, many forms of urban transport have appeared but it is considered today that railways (rapid transit, suburban railway) and motor vehicles (automobiles, buses) will survive in the future. Whether new forms of transport will soon appear is hard to say, but considering the present state of technical development, it seems that much cannot be expected before the end of the 20th century. Moving sidewalks and minicars may be mentioned, but they can at best serve only to supplement the existing transportation network. The monorail may be considered as a form of a railway, technically.

Now, we must try to see how railways and motor vehicles will be selected in the transportation network of the future. In the proposals made in our country so far, there has been a tendency to attach great importance to motor vehicles. These proposals were made around 1960, and at that time road transport had begun to reach the limit in New York and London while Tokyo had not yet experienced the popular use of automobiles. This may have led to an optimistic outlook on the use of motor vehicles. In fact there are many people in Japan who still believe that the automobile can be used very easily in the heart of European and American large cities.

There is of course no need to explain to readers in Europe and America the difficulties of using automobiles in the center of large cities. There is a physical, physiological and economic limit to the use of automobiles in large cities. The ratio of roads in the 572 sq. km. area of the 23 wards of Tokyo is approximately 12% and in the 21 sq. km. area of the city center, 23%. Efforts have been made to increase the ratio, and expressways with two lanes on each side have been constructed into the central business district, but it is physically impossible to raise the capacity of roads here. Moreover,

the exhaust gas problem is getting serious and traffic policemen directing traffic at street corners have to use oxygen masks after work.

Therefore, if people were to depend on motor vehicles to a greater extent in the future, there will be no alternative. But to relocate the various functions of the metropolis. Mention has already been made of the dispersal of factories and other establishments which are closely connected with the transportation of cargo. Whether other institutions will place importance on the use of motor vehicles and disperse, or whether they will strive to maintain the other advantages of being located in the central business district is the key point. Since World War II, there have been cases of large enterprises in America moving their head offices away from the city center to the suburbs, but this has not yet happened in our country. An insurance company moved part of its head office to the suburbs but this was only its "factory" department. In our country there is no likelihood of head offices also evacuating the city center in the future.

Hence, as far as going to and from the central business district is concerned, the use of automobiles will be governed by the present capacity of roads. Furthermore, the density of noxious gases such as carbon monoxide is rising and the use of motor vehicles is being more and more severely criticized. The Administrative White Paper of 1969 of the Tokyo Metropolitan Government states:

In city planning so far, motor vehicles were treated as a given condition, that is, as a pre-fixed condition just like natural conditions. However, in the future, motor vehicles will have to be examined within the framework of the plan. In other words, unless some form of restriction is imposed on motor vehicle production or on increase in motor vehicle ownership, it is feared that there will be no basic solution to the road traffic problem.

Today, when the Japanese people are experiencing the flood of motor vehicles, the optimistic expectations that they had previously are vanishing as far as built-up areas are concerned. In the future, motor vehicles will no doubt be used extensively in the suburbs or further beyond, and factories and research and educational functions will develop in accordance with the ease of road transport. However, the built-up areas will most likely continue to prosper as before, depending on the railway. In this case, railways that can be operated at a much higher speed than those currently in use will come to be used. The reasons why great hopes should be placed on this will be taken up in Section IV.

3. Future Urban Measures

The measures to be taken with regard to or in reorganizing the metro-

polis in the future should proceed in the following direction without being bound by past policies and proposals.

(i) It is necessary to acknowledge the fact that the management function is the main function of the metropolis and that this function should be concentrated in the central business district. Since 1959, restrictions have been placed on industries, but even without restrictions they will probably continue to disperse.

(ii) In these days when rapid development is taking place in the suburbs, the plan should cover the whole metropolitan area, and enough margin should be provided when deciding upon the scope of the metropolitan area with future growth taken into consideration.

(iii) With regard to the shape of the central business district, it is necessary to acknowledge the fact that a single center as we see today is something inevitable. A continuous long axis as proposed by Prof. Tange is possible, but for the present, the plan should be based on the present shape of Tokyo, and Tokyo Bay should be kept intact for use in case of future need. Not much is to be expected of sub-centers.

(iv) As for the additional expenditures to be incurred for improvement of public facilities made necessary by location of new establishments in the central business district, there should be assessed against the newcomers so that only those that may bring over-all economic benefit to society would come in. In other words, if the newcomers are made to bear the additional expenditures, they will be paying for the social cost incurred by themselves and only those enterprises that would find it advantageous even after paying for the social cost would come in. This is considered to be a more rational way than by requiring newcomers to obtain permission for new offices in advance.

(v) As to housing, any future population increase should be accommodated in the outer area of the suburbs. Furthermore, positive action should be taken to reduce the population in the low and damp Kōtō district, as well as other areas considered as unhealthful. In carrying out this plan, the keypoint is the commuter transport system for linking residences with working places.

The above is the conclusion for Sections I, II and III, and based on this conclusion, mention will be made in Section IV of how the housing shortage and deficiency of commuter transport in Tokyo should be solved.

IV. AUTHOR'S PROPOSAL

1. Inexpensive Land Is Available

The following conditions, among others, are required of residential land:

- (1) No public nuisance, that is, no air pollution and no noise;
- (2) Sufficient open space fit for daily living and enough sunshine and vegetation; and
- (3) Convenience of commuting to working places.

Seeking these conditions, people moved to the suburbs. They thought the environment was good, but again public nuisances appeared, and moreover, they boosted the price of land.

This rise in land prices is due to the heavy demand relative to the land available, together with the fact that land is inherently different from merchandise in general, as is pointed out in the following.

- (1) Land cannot be produced or imported. Land may be reclaimed, but this is only to a small extent.
- (2) Hence, to procure land, it must be purchased from the landowner.
- (3) Land proper does not have any production cost. There is a cost of production for general merchandise and it is said that the selling price is ultimately founded on the cost of production. This is not the case with land; there is no value on which the price may be founded. The more the buyer is willing to pay, the higher becomes the price. In this respect, land is similar to objects of art.
- (4) As can be understood from the above, landowners need not hurry to sell their land so long as there is a strong demand for it. Besides, land will not decay like other merchandise and there is no shortage problem.
- (5) There is little scope for choice in selecting land for public facilities. The site of such facilities must be located at specific places. The same applies to formation of large tracts of land into residential areas.

Although these characteristics of land are well known, land policy was practically absent. Individuals, enterprises and public housing agencies (Japan Housing Corporation, housing corporations of local bodies, etc.) have all feverishly hunted for good land purchases and large private enterprises hastened to make money from land. The result is the sharp rise in the price of land.

In Stockholm and Rotterdam, well known for the success attained in city planning, efforts were made to increase public holdings of land, and it

is on account of these public holdings that these cities were able to realize an adequate plan. In Japan, however, the Government progressively sold the land it possessed. Not only did the Government neglect to adopt forward-looking land policies, it even parted with the land the Government itself could directly use. Under such a Government, no housing or transportation policy can be successful.

The proposal that the author will make in the following is based on the premise that the Government will rectify its attitude to the land problem. This does require the Government to take unprecedented measures. All that is necessary is for the Government to resort to the Land Expropriation Law and purchase the required amount of land at the present price. Expropriation of land at the present price is not unusual in France and America.

In Japan, however, the prefectural governors who are elected by the people try to avoid making recourse to the Land Expropriation Law, and even when resorting to it, the land has to be purchased at a price to which it has risen with the announcement of the public project. Such malpractices are the first to be corrected.

At the same time, it must be made clear that purchase of land at a price lower than the present price is impossible, even under pressure of government authority. Hence, even if the land is vacant, it cannot be used for the purposes of this plan should the price be high. Such being the case, there is hardly any land left that can be used for this purpose within the commuting range under the present railway network, even when resort is made to government authority.

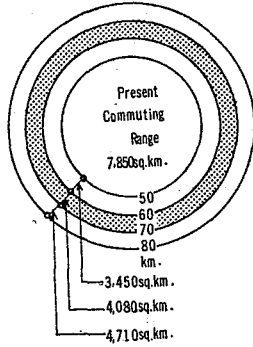
Table 3 shows the change that took place in population density from 1950 to 1965. It can be seen from this table that the area within the 15 km. radius zone became saturated gradually, and around 1965 the front line of growth moved beyond this zone. Further, growth began to take place in the 31 km. to 50 km. zone. As a result the price of land adjacent to railway lines in this zone showed a sudden rise. In contrast, the population density in the area beyond the 50 km. radius circle is stationary. This is because it is difficult to commute from this area due to the time required at existing

Table 3. Trend of Population Density in Tokyo Metropolitan Area

Distance (radius)	1950	1955	1960	1965
Within 15 km.	9,306	12,045	14,591	15,615
16-30 km.	1,384	1,800	2,338	3,302
31-50 km.	681	684	757	955
Over 50 km. (Tokyo and 3 Prefectures)	350	351	341	341

railway speeds. Hence, the price of land in this area is still low.

Figure 4. Possible Residential Area



Moreover, as may be understood from Figure 4, it would be possible to secure large areas of land by merely extending the radius 10 km. The history of metropolitan development all over the world is none other than the process of utilizing larger areas of land through the development of higher speed means of transport. Today, we consider the ordinary commuting range to be from 15 km. to 30 km., but a hundred years ago

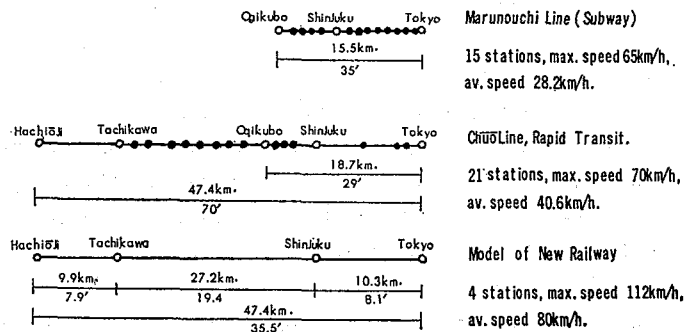
when people went on foot, this was a one-day trip. The future path to be followed is nothing but an extension of the past.

2. Linking Inexpensive Land by High Speed Railway

The speed of the present-day rapid transit has not gone up very much compared with the speed half a century ago. Since the speed of 120 km./h can be attained in inter-city service even on the narrow gauge railway, the distance of 70 minutes can be reduced to 35.5 minutes if new lines were to be built with the intention of making use of high speed at the outset, without intermediate stops, as shown in Figure 5. In other words, the utility of a place 47 km. away from the center becomes the same as that of place 15 km. away, as measured by time-distance. This is the same as saying that the 5 km. radius range in the usage of streetcars is equivalent to the 15 km. radius range of rapid transits.

This could be of one of the ways of developing unused land. However, it should be possible to have access to much cheaper land by using railways

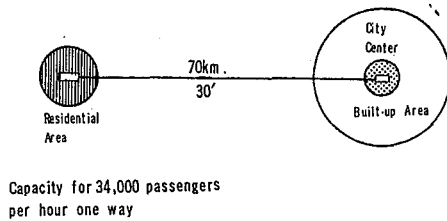
Figure 5. Model on Speed-up between Tokyo and Hachiōji



of still higher speed. We have available the techniques of the New Tōkaidō Line or *Shin-kansen* as we call this kind of line in Japanese. On the New Tōkaidō Line, the distance of 76.7 km. between Tokyo and Odawara can be

Figure 6. Commuter Transport Capacity of High Speed Railway

1,700 persons per train.
20 round trip per hour.



Capacity for 34,000 passengers
per hour one way

covered in 41 minutes, including stopping time at Shin-Yokohama Station, and the distance of 107.2 km. between Shin-Osaka and Maibara in 44 minutes, including stopping time at Kyoto Station. By using this technique to link the residential area with the central business district, as shown in Figure 6, the distance of 70 km. can be covered in 30 minutes, taking the maximum speed at 200 km./h and the

average speed at 140 km./h.

Now, let us consider the economic aspect of such a railway. From the point of view of the railway, a short line would be preferable, but when housing and transportation policies are also to be taken into account, a reduction can be effected in the total cost by extending the railway over the outer areas where construction cost is low, making use of low-priced land.

Although the construction cost varies considerably according to the conditions that apply, assuming that a 70 km. line is to be constructed, the cost would normally be ¥2 billion per kilometer for the underground portion of 10 km. to 15 km. in the built-up area, ¥1 billion per kilometer for the elevated track portion of 15 km. to 20 km., ¥800 million per kilometer for the remaining portion of 40 km. If the cost of electrical facilities and rolling stock is added, the total cost would amount to approximately ¥100 billion.

Further, assuming that a city of 300,000 inhabitants will be built in the 60 km. to 70 km. radius area and that the construction cost of the line is to be allocated to and retrieved from the residential land of the city, the amount to be levied per 3.3 sq. m. would be ¥20,000 (\$68,000/acre). If the population of 300,000 were to inhabit the land at the rate of 10,000 per square kilometer, the size of the city would be 30 sq. km. It will be assumed that half of this land is for public use and the other half for residential purposes. This means that simply by adding a sum of ¥20,000 per 3.3 sq. m. the value of the low-priced agricultural land and land of hillside villages would become equivalent to the value of the land 15 km. away from the city center (¥100,000/3.3 sq. m.).

As for the fare to be applied, assuming that the annual operating ex-

Table 4. Annual Operating Expenses of High Speed Railway
(100 million yen)

Personnel Expense	10
Track Maintenance Expense	10
Rolling Stock Maintenance Expense	10
Motive Power Expense	15
Sundry Expense	10
Depreciation	20
Total	75

penses will amount to ¥7.5 billion as shown in Table 4, and that the line will carry 40 million passengers a year, the operating expenses per passenger will be ¥190. In our railway this corresponds to the ordinary passenger fare for the distance of 50 km. Assuming that the commuter will use the train 20 days a month, the total fare for a month will become ¥7,600. This is not too high, but still it will be twice as high as the existing commuter fare for a distance of 64 km.

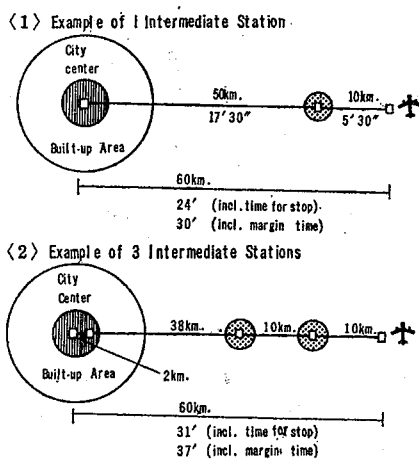
Therefore, as a more realistic plan, let us assume that the line will connect two new cities, each with a population of 300,000. This time the construction cost can be allocated at the rate of ¥10,000/3.3 sq. m. The fare for one trip in this case will be ¥95. For the non-commuting passenger this will be extremely low, and even for the commuter, the sum of ¥3,800 per month will be within the limit of what the commuters can bear. (Strictly speaking, the actual amount to be charged in the second case will become slightly higher than one-half of the amount of the first case.)

In making the above computation, the following question will most likely occur to the reader who compares this line with the New Tōkaidō Line. This railway is for commuting purposes and people will use it only in the morning and evening. On the New Tōkaidō Line there is a surcharge for the fast service, even though it has business throughout the day. For instance, the total that the passenger has to pay, including the surcharge, for the 76.7 km. trip between Tokyo and Odawara by unreserved second class accommodation would be ¥710. How can it be possible for the fare of this 70 km. new line to be only ¥95, which is below one-seventh of what the passenger has to pay for the Tokyo-Odawara trip on the New Tōkaidō Line, when the new line costs twice as much to construct and is used mainly in the morning and evening?

In response, two reasons may be given for the low fare. The first is the fact that the entire construction cost was levied on land, and hence, there is no interest to bear. The second is the difference in the number of passengers to be carried. Whereas the break-even point on the New

Tōkaidō Line requires that the average for the entire line of the number of passengers passing over it be 65,000 per day, on the new line, however, assuming that the annual number is 80 million, there will be 220,000 passengers per day which is 3.4 times the number of the New Tōkaidō Line. For these reasons, the operation of the new line can be adequately maintained even though the price to be paid by the passenger may be below one-seventh of that of the New Tōkaidō Line.

Figure 7. Examples of Intermediate Stops on Airport Railway Line



As mentioned above, the line can effectively serve as a commuter railway between the residential city and the central business district. In reality, however, such a line will fulfil other purposes. For instance, transportation between the airport and the city center is a problem all over the world, and the line could be used to link the airport 60 km. away as shown in Figure 7. Even if two residential cities are built along the route, the transit time will only be a little over 30 minutes.

It is also possible to extend this railway to the 100 km. radius area. In this 100 km. zone will be such local

urban centers as Utsunomiya, Maebashi and Takasaki. If such lines are extended to these cities, Tokyo can be reached from them in an hour, as shown in Table 5. There was much talk about dispersion of metropolitan functions to local areas, but there was no transport axis which would make this possible. Some people thought that an expressway network would serve the purpose. Already from the autumn of 1968, however, traffic congestion in the built-up areas of Tokyo has become apparent and no doubt the areas affected will continue to grow. Moreover, as it is not easy to find parking space in Tokyo, it may not necessarily be convenient to use automobiles in coming to Tokyo.

This railway can also play a major role in reorganizing the metropolitan area. Up to now, housing policy has been decided with the commuting sphere fixed and within the existing framework. It lacks very much in flexibility. In areas where population is increasing, the energy thereof has to be released; otherwise, reorganization will become very difficult. Instead of trying to build more houses at places where the price of land has already gone up, if such houses would be built elsewhere outside the existing frame-

Table 5. Comparison of Traveling Time on Old Railway and High Speed Railway

	Ueno—Takasaki	Ueno—Utsunomiya	Ueno—Mito
Distance (km.)	101.4	105.9	117.5
Number of Intermediate Stations	4	3	4
Time Required by Express on Old Line (min.)	101.0	95.30	102.30
Time Required by High Speed Line (min.)	60 (approx.)	60 (approx.)	60 (approx.)
(Excluding Slow-down Margin en Route)	47.30	46.00	51.45

work, it would also serve to cool down land prices.

Further, if more houses can be provided by means of this railway and the housing situation is eased in the existing built-up areas, it will become easier for people to exchange houses. It is because of the lack of this margin in the housing situation that people have to cling to their present dwelling-houses like a lump of sticky candy. If houses can be secured at any place desired, the exchange of houses will automatically take place.

What the percentage of this margin should be cannot be determined in specific terms, but in Chicago the rate of vacancy is 3%, and it is on account of this margin that one is able to freely select a suitable house there in accordance with the size of the family and place of work.

City re-development in our country will become feasible only after this margin is attained. Under the present situation where people cling to the houses in which they are living and where land prices are rising continuously, people become unwilling to cooperate in a plan which will bring about a change in the *status quo*, no matter how much they may be persuaded. When a margin emerges and land prices become stable, people will come to favor a plan which will raise the utility value of land. Instead of taking up city re-development at this moment when there is a housing shortage, it would be wiser strategy to create the margin first in the outer areas and then commence re-development.

3. Actual Development

The foregoing proposal was made in 1966, and in the following year in August, 1967 the Japanese National Railways announced a plan for construction of the following six lines :

(1) Route (from Tokyo)

1. To North Chiba New Town and New International Airport, 50 km., 30 minutes.
2. To Tsukuba University City and neighborhood of Mito, 100 km., 50

minutes.

3. To the Utsunomiya area, 100 km., 50 minutes.
4. To the Maebashi and Takasaki area, 100 km., 50 minutes.
5. To the Kōfu area, 100 km., 50 minutes.
6. To the Shōnan area, 70 km., 40 minutes.

Total route length 520 km.

(2) Route and terminals in the central business district

The terminals in the central business district are to be located underground and the routes are to be so determined as to enable transport to the central business district and sub-centers, with the routes mutually connected for through operation from one to the other.

(3) Relation to the New High Speed Trunk Line Network

The six lines are to be built, for the present, for the new residential cities within the 50 km. range. However, with a view to future extension to local urban centers in the 100 km. range in conjunction with the dispersion of metropolitan functions, and to further extension for long-distance transport toward the Jō-Shin'etsu, Tōhoku and Tōkaidō regions, the lines are to be of the New Tōkaido Line type.

(4) Construction funds required

¥870 billion

This proposal was adopted in the New National Comprehensive Development Plan of May, 1969. In Figure 8, another route traversing Tokyo Bay has been added.

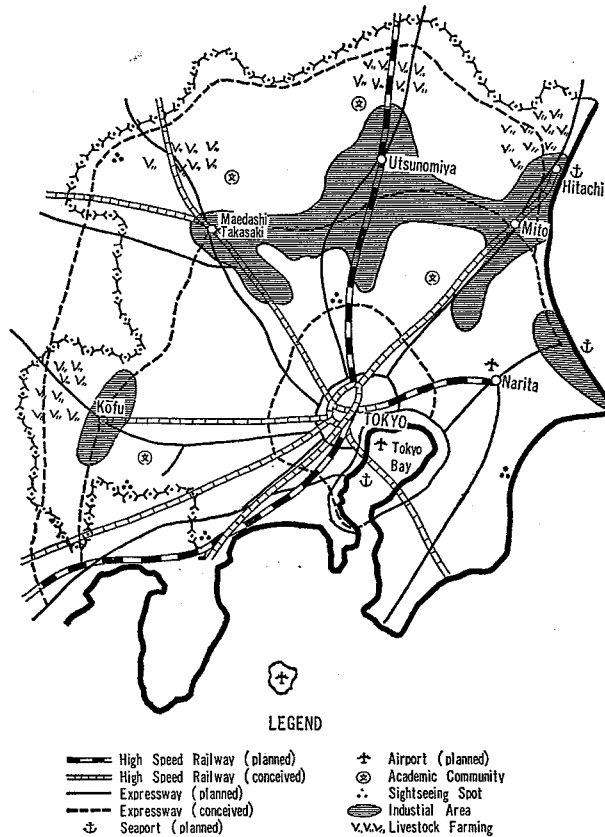
To realize this plan, the necessary funds have to be obtained. According to the author's proposal, they should have been sought from land values. If, however, such a railway is also to have other objectives besides commuter service, it will not be practicable to secure the funds only from the residential city. It may supply some of the funds but other source will also have to be sought.

That part of my proposal concerning curtailment of time-distance by using New Tōkaidō Line techniques and the extension of usable land has been taken up by the Government. At the present stage, however, measures for procurement of funds have yet to be determined. It is hoped that this will soon be done and the proposal realized as early as possible.

Finally, the author would like to point out the following in concluding this paper.

It seems to be the fashion to picture the future image with such fancy words as "The vision 20 years ahead" or "The world in 2000 A. D." The world depicted being too bright and the path leading to it being too vague, one is apt to consider it something remote and feel that there is nothing to

Figure 8. Proposal for Development of Metropolitan Area by Economic Planning Agency (Target Year 1985)



Source: Tokyo Metropolitan Region Comprehensive Plan Association, *Shuto ken no chūki tembō* (Medium-Term Prospects of Tokyo Metropolitan Region), Tokyo, 1969.

be done for the coming several years. To bring to reality the hoped for world of 20 years ahead, however, step-by-step action has to be taken beginning from this very moment. The new world will not come all of a sudden 20 years from now by just waiting for it. It is up to us to create the future.

The changes that took place in typical metropolises have already been reviewed. Some of the changes were good, but many were bad. The following three reasons may be given for the latter :

- (1) Underappraisal of city development ;
- (2) Forgetting the “human being” in the thinking process ; and
- (3) Defective distribution of income—land policy bringing about exorbitant profits to the landowner.

These causes are very deeply rooted, and unless strong countermeasures are taken, the same mistakes are liable to be repeated in the next 10 years ; in which case there is every probability that "the vision 20 years ahead" will not come at all. Experience through the ages has shown that it is not only material production growth which is conducive to better living of the society as a whole, and most familiar to us is the experience of the years from 1955 to 1965. Whilst remarkable growth was seen in the national economy, discontent of the people in their way of living grew. Then, what should be done to solve "poverty in plenty"? At this juncture we should dissect our old way of thinking and establish new reasoning.

Postscript

The use of New Tōkaidō Line techniques for commuter transport is not an idea of the author alone. If the author's proposal has any value, it is not because he has pioneered an idea, but because he proved through some calculations he made that it is possible to realize his proposal, and because of the critical comments he made with respect to land policies and aspects of social institutions.

The author's proposal was printed in May, 1965 for submission to the Science and Technology Agency of the Japanese Government. It was made public through the magazine *Chō kōron*, January 1966 issue (and later published in book form as one of the San'ichi shinsho books). In the present paper the author has given a synopsis of his original paper, supplementing it with some more up-to-date information.