

# Policy Making Process of Water Resource Development in Tokyo Metropolitan Region

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## Contents

- I. Introduction
- II. Historical Background of Water Resource Development in Tokyo Metropolitan Region—The Water Resource Development Corporation—
- III. Decision Making Process for Construction of Yagisawa Dam, Tone Waterway, and Numata Dam Planning
- IV. Future Program of Water Demand and Supply in Tokyo Metropolitan Region

## I. Introduction

Tokyo Metropolitan Region, which includes Tokyo, Yokohama, Kawasaki of the Japanese first rank industrial areas and suburban regions of Chiba, Saitama, Ibaragi, Gumma, Yamanashi, shall be expected to promise the redevelopment of excessive crowded cities as well as the integrated development of the Metropolitan Region. In the redevelopment of the Metropolitan Region, there are economic, social, political problems such as population, highway, housing, industrial location, water, land use, transportation, port harbor, air and water pollution etc.

In April, 1956 (The Tokyo Metropolitan Region Development Act No. 83, April 26, 1956), the Committee of Tokyo Metropolitan Region Redevelopment was set up for the purpose of formulation and encouragement of integrated programs of the Metropolitan Region which was modified from the Tokyo Metropolitan Construction Committee under the Tokyo Metropolitan Construction Act of 1950.<sup>(1)</sup>

According to the Tokyo Metropolitan Region Development Act, the Committee should make an arrangement for the formulation and performance of the integrated programs, which are divided into fundamental program, equipment program and execution program. Fundamental program is decided by items of population, land use and other basic factors within the Metropolitan Region. Equipment program includes adjustment of key equipment connected with building land, road, railway, tramway, airport, port harbor, park, green tract of land, water supply, sewage, disposal plant, water way, housing, school and others, which are to be prepared for urban, suburban, and new town development. And execution program is an annual program of equipments above-mentioned.

These programs shall be made a decision by hearing the opinions of affiliated administrative agencies, related prefectures and the Council for Metropolitan Region Development. Already several equipment programs were prepared for various public works of Metropolitan Region, but all integrated programs have not yet been accomplished.

## **II. Historical Background of Water Resource Development in Tokyo Metropolitan Region.**

The largest demander for water in Tokyo Metropolitan Region is Tokyo city. In 1940, Tokyo city had felt a need of water resource development of Tone River Upper Basin as well as Edo River, Arakawa and Tama River which were developed from 1932 to 1957. Ogōchi Dam and Reservoir was planned to be built in the upper stream of Tama River with water of good quality, but on the account of the complex social situations at that time the construction was retarded for a long time.<sup>(2)</sup>

On the other hand, as the demand increase for water supply being serious, an emergency extension plan of Edo River water resource system has been begun since 1936. However, in around 1939, the demand of water supply became in excess of supply

capacity, and the supply amount was 1560.000m<sup>3</sup>/a day while the demand became 2.430.000m<sup>3</sup>/a day. Then it was necessary at any rate to consider to develop the upper stream of Tone River.

For the purpose of referring to the other redevelopment programs of Tokyo Metropolitan Region, the fundamental program would be shown which were designed under the Act of Tokyo Metropolitan Region Redevelopment, with the inquiry to the Council for Tokyo Metropolitan Region Redevelopment on August 31, 1956.

1) The Fundamental Program—According to the fundamental program, the period will be from 1958 to 1975, and Tokyo Metropolitan Region is divided into three parts, (1) existing urban districts, (2) suburban areas, and (3) environmental areas.

(1) Existing urban district which consists of wards of Tokyo, Mitaka city and Musashino city would be restrained new construction and reconstruction of large scale plants and university equipments etc. which might result in the increase of population. Also in Yokohama, Kawasaki and Kawaguchi, urban area will be redeveloped, and the location factors for plant shall be synthetically arranged by new formation of industrial land. Especially Yokohama city should be more advanced as a commercial city as well as an international trade port.

(2) Suburban areas shall be made into green belt districts which aim to restrain disordered expansion of existing urban districts and to plan a renewal of Metropolitan Region. The suburban areas shall be planned to conserve beautiful, scenic zones, and other natural environment, and to supplement park and green belt which are deficient in urban areas. At the same time, it shall be also planned to conserve good agricultural lands and to supply fresh food provisions. Some adequate policy should be applied for the purpose of improvement and progress of agriculture.

(3) In the environment areas of existing urban districts, several new town development areas shall be designated for the purpose of allocating population and industries on the basis of

present local cities. These cities should be developed generally as industrial cities by arranging synthetically location factors for industry and housing conditions etc. In this case, several highways and other transport facilities, which link together new town development areas and existing urban districts with each other, should be adjusted. In other suburban areas, also the transport facilities and water resource for new town development shall be required.

(4) Industrial development in existing urban districts as well as new town development areas except Down Town Tokyo district— In the coast areas, the adaptable industries such as heavy industries, for example, primary metal, transport machinery, oil-refinery, chemical industry etc. will be available for the location. In the inland areas, also the adaptable industries such as machinery equipment, metal products, textile industry, food products, woodenworks, atomic energy industries etc. will be recommended for plant location.

According to the report of Tokyo Metropolitan Region Redevelopment Commission the total population of Tokyo Metropolitan Region is to be in 1975 estimated about 28,880,000; among which the existing urban district will be 12,250,000, and the suburban areas will be 15,950,000. While Tokyo Ward district, Mitaka city and Musashino city may be limited to 9,350,000, Yokohama city will be estimated 1,850,000, Kawasaki city, 900,000, and Kawaguchi city, 150,000. These estimates are proposed by almost the same population with that of the present, therefore, about 200,000 among the population which may increase at the outside of existing urban district should be planned to include in new town development areas as satellite cities.

Whether the scale and the distribution of population within Metropolitan Region are appropriate or not, there would be some allowance for discussion. Especially in order to realize the distribution of population into the suburban areas, it would be necessary

to promote the relatively powerful synthetic policies, as these figures are assumed to be reliable under the present circumstances.

2) The Equipment Redevelopment Programs

The Equipment Redevelopment Programs are those of construction of various equipments which are derived from the design of the fundamental programs. As shown by the above-mentioned process, these equipment redevelopment programs are indispensable for the redevelopment of existing urban districts and development of new towns. The time lag between planning and delayed execution will show lack of balance among administration and social need. Therefore, public works cannot be made always as forward-investment for regional development.

The equipment redevelopment programs which have already been decided and announced to the public are shown as a following table.

*Tokyo Metropolitan Region*

The equipment redevelopment programs of important connective main roads. (July 4, 1958)

Existing Urban District

1. High-rise building program ( " )
2. Housing equipment redevelopment program ( " )
3. Public parking area redevelopment program ( " )
4. A house-lot redevelopment program (July 25, 1965)
5. Track line equipment redevelopment program (July 4, 1958)
6. Reclamation program within harbor district ( " )
7. Tokyo harbor equipment redevelopment program ( " )
8. Lowground countermeasure program ( " )
9. Sewage equipment redevelopment program (July 27, 1961)
10. Equipment program of compulsory education (July 4, 1958)
11. Equipment program of public unoccupied land ( " )
12. Street redevelopment program (July 4, 1958)
13. Water supply redevelopment program ( " )

14. Urban highway redevelopment program (July 4, 1958)
15. River redevelopment program (April 6, 1958)
16. Cleaning equipment redevelopment program ( " )
17. Government center redevelopment program ( " )
18. Bus terminal redevelopment program (July 25, 1960)

#### Designation of New Town Development Areas

1. Sagami-hara-Machida Area (August 7, 1958)
2. Hachioji-Hino Area (May 27, 1959)
3. Omiya-Urawa Area ( " )
4. Ota-Oizumi Area (April 30, 1960)
5. Chiba-Ichihara-Goi Area (May 1, 1961)
6. Kumagaya, Fukaya Area ( " )
7. Maebashi-Takasaki Area ( " )
8. Utsunomiya Area (November 1, 1961)
9. Mito-Katsuta Area ( " )
10. Hiratsuka-Chigasaki-Fujisawa Area ( " )
11. Aome-Hamura Area (June 30, 1962)
12. Koyama-Mamada Area ( " )

However, among these equipment programs, they do not include water projects in Tokyo Metropolitan Region such as industrial water, irrigation except water supply redevelopment program. What should we think about the facts which there is no synthetic programs of water system recourse development and no Tokyo Metropolitan Region Comprehensive Programs?

Especially, according to the Water Supply Redevelopment program, the demand of water is growing rapidly by the increase of population and progress of industry, and the demand of water for industry will be also a great amount.

At the present time, this industrial water depends upon underground water, and excessive pumping of underground water causes the sinking of the ground foundation. Therefore, the Water Supply Equipment Redevelopment Program should be reconsidered from the view point of the water resource development for the river basin.

Table I. The expansion plan of water supply amount in each city

		Population of cities (A) 1.000	population to be supplied (B) 1.000	to rate of diffusion % (B/A)	Largest capacity per day (m <sup>3</sup> )
Tokyo to	1959	7.215	5.844	81	1.222.000
	1966	8.500	7.810	92	3.124.000
Musashino city	1956	99	28	28	7.000
	1966	127	78	61	22.600
Mitaka city	1956	69	0	0	0
	1966	100	41	41	9.500
Yokohama city	1956	1.182	915	77	468.000
	1966	1.500	1.223	82	568.000
Kawasaki city	1956	476	378	79	16.000
	1966	694	589	88	21.000
Kawaguchi city	1956	143	78	55	16.000
	1966	176	100	57	21.000
Total		9.189	7.243	79	1.908.000
		11.097	9.841	88	4.040.000

This program will aim to develop from the diffusion rate 79% of water supply and maximum capacity of 1900.000m<sup>3</sup>/day to 89% of diffusion rate and 4.040.000m<sup>3</sup>/day. The following table will show the expansion plan of water supply amount<sup>(3)</sup>.

### III. Decision Making Process for Construction of Yagisawa Dam, Tone Waterway, and Numata Dam planning.

#### 1. Yagisawa Dam

(1) Outline of Decision Making Process of the Construction Program

The planning for dam construction at the joint-point of Yagisawa and Tone River has been appeared in the memorandum connected with a river control program of Gumma Prefecture which was provided to and allowed by the Construction Bureau and the Electricity Bureau of Ministry of Interior, for the purpose of irrigation and electric generation in December 1939. The program is mainly 13m<sup>3</sup>/sec agricultural water for increasing foods and also electric generation by the prefecture<sup>(4)</sup>.

At that time, Tokyo Metropolitan Government made an expansion program of water works in accordance with urbanization, and after the development of Tama River, it had been required to introduce water from Tone River as a third expansion program.

related to water use of Tone. When Gumma Prefecture planned the Yagisawa Dam, Tokyo Metropolitan Government hoped to secure 10 m<sup>3</sup>/sec water for supply and got an approval of Gumma Prefecture in 1940, which had been planned to construct from 1942 to 1954 as a continued project.

Also Japan Electric Generation and Transmission Co. had made a research of Tone River for electric generation and had planned the dam construction of Yagisawa since about 1911. But the Yagisawa Dam program could not help being stopped by the outbreak of the Pacific War in 1941 (the World War II), and left as it is until the end of the war.

When the reconstruction of post-war was opened, Japan Electric Generation and Transmission Co. required to get water rights for electric generation to Governor of Gumma Prefecture, and the rights was transferred in June 1950. In 1951, when Japan Electric Generation and Transmission Co. was dissolved and 9 electric companies were established, the water-privilege for generation at Yagisawa Dam was to be transferred to the Tokyo Electric Power Co. Since then, Yagisawa Dam program had been planned as a joint water use dam by the three concerned, agricultural water of Gumma Pref. water supply of Tokyo, and electric generation of Tokyo Electric Power Co.

In 1950, the National Land Comprehensive Development Act came into existence, and the Tone River Basin was to be designated as a development area, the program of which was being formed mainly by Economic Council Agency. At the end of 1952, the Tone Specific Area Integrated Development Program was provided to the cabinet by the Ministry of Construction and was designated without detailed designs. The Yagisawa Dam Program was made in a concrete form from the viewpoint of synthetic development as well as water utilization, and this program was promoted by the three Water Users and the Economic Council Agency.

During these periods, the mutual negotiation among the three

members concerned had been held without a successful program.

In 1950, the Yagisawa Dam Joint Investigation Committee was established by the arrangement of the Economic Council Agency, and the first meeting of this committee had been held in February 1950<sup>(5)</sup>. In this committee, Economic Council Agency, Ministry of Construction, Ministry of Trade and Industry, and Ministry of Agriculture and Forestry had joined as the related observers, with the main three members, Gumma Prefecture, Tokyo Metropolitan Government and Tokyo Electric Power Co. The Committee was opened until 1952, but on account of excess in water demand of the three members concerned, than new water utilization by the Dam, it was difficult to coordinate the distribution of water.

Since the tremendous flood of Tone River by Catharine Typhoon in 1947, Ministry of Construction had planned to join into the Yagisawa Dam Program from the viewpoint of flood control policy for Tone River, which might be planned to construct a dam & reservoir and control the stream flow.

In 1952, the Specific Multi-Purpose Dam Act (Law No.35, March 31, 1952) was established, then Ministry of Construction got the authority of a multi-purpose dam construction as a work of direct control. By the act, it has become to make an integrated program connected with flood control and water utilization for a synthetic development of water resources by the arrangement of the Economic Planning Agency(Ex-Economic Council Agency). So much so that, Economic Planning Agency asked Ministry of Construction to arbitrate the dam construction by this act to the three members concerned, in order to overcome a difficulty of the joint committee which came to a deadlock by a problem of water distribution.

Although Ministry of Construction did not have an interest in the Yagisawa Dam Construction by the reason that a specific multi-purpose dam act would be available only for flood control purpose over 59%, the Authority planned to satisfy the water distribution with additional utilization from the Shimokubo Dam expansion and

announced the construction programs of Yagisawa and Shimokubo Dam as a work of direct control under Ministry of Construction.

As the program of Ministry of Construction satisfied the demand of the three agencies concerned, the concrete program of construction was launched immediately, which program was assigned into the Tone Area Development Program.

Since then, the Yagisawa Dam construction work was transferred from Ministry of Construction to Water Resource Development Corporation in 1962 by the two water resource development acts of 1961<sup>(6)</sup>.

## (2) Detailed Process for Decision Making of Fundamental Programs.

As the process of which Ministry of Construction planned the Yagisawa Dam as a multi-purpose dam, originated from the arbitration of Economic Planning Agency, let us say about the more detailed process of decision making.

Since February 1955, a regular investigation for the construction program was proceeded from the two aspects of water demand and supply, as the Joint Committee had been already established by the arbitration of Economic Planning Agency in 1950.

After five times conferences, the scale of the dam, new amount of water use, and water demand of the three concerned were fairly clarified.

The original water use of 13m<sup>3</sup>/sec for irrigation and 10 m<sup>3</sup>/sec for water supply of Tokyo had changed to increase into maximum 19m<sup>3</sup>/sec and normally 12m<sup>3</sup>/sec for irrigation and 16m<sup>3</sup>/sec for water use in Tokyo, which amount will exceed the limited water supply by Yagisawa Dam. Therefore, the construction program of Yagisawa Dam might not cover the water demand from the three concerned, if the other additional program would not be provided.

Thereby, the conference among the three concerned could not be successful to arrange the respective interests. The reasons

were derived not only from the water demand, but also from the change of social situations, which means the facts that, (1) the traditional hydrolic power generation would not be profitable because of increasing steam plant generation; (2) the water use for power generation would decrease by the utilization for irrigation and water supply; (3) in Gumma Prefecture, in spite of decreasing water use for irrigation, the securing of industrial water in future was strongly required; and (4) the construction program of Ogochi Dam being under way, the Tokyo Metropolitan Government was not in a hurry to plan the other construction.

However, the Economic Planning Agency had desired to settle the problem in order to make the integrated development program as soon as possible. Therefore, when in 1957 the Specific Multi-Purpose Dam Bill was introduced and expected to pass in the Diet, Mr. Inoue, the Chief of the Integrated Development Bureau, Economic Planning Agency asked for Mr. Konishi, the Chief of Development Section, the River Bureau, Ministry of Construction to coordinate the three concerned by the program on the basis of this Specific Multi-Purpose Dam Act.

Mr. Konishi planned to expand the scale of Shimokubo Dam, which was already investigated as a flood controlling dam, to satisfy the Gumma Prefecture and Tokyo Metropolitan Government, by the new water use of  $16\text{m}^3/\text{sec}$  of Shimokubo Dam and  $17\text{m}^3/\text{sec}$  of Yagisawa Dam, adding 20% flood control function, and announced the construction of Shimokubo and Yagisawa Dam as a work of direct control under Ministry of Construction.

The plan of Ministry of Construction satisfied the three concerned, because it was very advantageous by the reasons as follows, (1) the water users could decrease their own burden on account of a direct work of Ministry of Construction, (2) Gumma Prefecture and Tokyo Metropolitan Government could secure the respective water demand. (3) It would be more profitable for Tokyo Electric power Co. to have the right of using on the basis of

Multi-Purpose Dam Act than to perform a separate work by themselves. (4) Tokyo Metropolitan Government desired to start a construction program for solving the water shortage as soon as possible.

Therefore, the joint committee making a decision to support the plan of Ministry of construction, a field investigation for the Dams construction has been begun since 1958. As in the Tokyo Electric Power Co. run-off river type of generation of hydrolic power can only produce 27,000 kw, the company is planning to generate a maximum 210,000 kw by pumped storage generation system, connecting Yagisawa Dam with Sudagai Dam just underneath.

At that time as a calculation of economic efficiency about pumped storage generation did not be included into cost arrangement, economic efficiency about run-off river type generation was computed. Thereafter, the program of generation was revised to maximum 240,000 kw.

The Yagisawa Dam construction program has been behind time for the water shortage of Tokyo, in spite of early setting about the program, and would not include the arrangement of relations between water resource prefectures and water use ones, relations with industrial and economic planning, and relations with national land development and Tokyo Metropolitan Region development.

Then the Ministry of Construction having prepared no materials and preliminary program about Yagisawa Dam, they made an investigation on the basis of materials of Tokyo Electric Power Co.

It was September, 1962 that the fundamental program of construction was formally established, which had been proceeded as preliminary conference until then.

## 2. Tone Waterway<sup>(7)</sup>

(1) Outline of Decision Process of the Construction Program--  
The Dam construction program for water supply of Tokyo at the

upper stream of Tone River should have included a program how to bring water into Tokyo. However, the construction program had not been decided until the fundamental program on the basis of the Water Resource Development Promotion Act was revised partially on March, 1963.

Besides, a construction program of Tone Waterway had been designed by Ministry of Construction at the same time with the formation of Yagisawa Dam program. This program was called "the first main line," which was planned by the Planning Section, River Bureau, Ministry of Construction, was to take water at Yagisawa, and was to supply to Higashimurayama by tunnel along the mountains of Saitama Prefecture, but the program had not been settled by the opposition of farmers at the lower reaches of the river.

In October 1960, the two Water Resource Development Relations Acts being decided, the waterway was included in 1961 into a program in conformity with these acts. In March 1963, the waterway program was approved by the Cabinet of Japanese Government which was added into the fundamental program of Tone River in the Water Resource Development Corporation. And at that time, as construction expense was not arranged sufficiently, the construction was begun with loan from special account of fund application in Ministry of Finance.

(2) Detailed Process of Decision Making of the Fundamental Program.

The Tone Waterway program was planned as a first main line by Ministry of Construction, with the construction program of Yagisawa Dam in 1957 but there were some difficult problems in order to settle this route as a final plan. The first was derived from the opposition of farmers along the lower stream of the river which had been caused by the fear of infringement upon agricultural water rights. Next was occurred by the water use policy of Saitama Prefecture.

In 1961, the Planning Office, Construction Department, Agricultural Land Bureau, Ministry of Agriculture and Forestry announced the alternative waterway plan of Minumadai which will include irrigation and water supply for Tokyo acquired through a gathering facility of the waterway at the lower stream of Tone River.

The plan of Ministry Construction was supported by the Tokyo Metropolitan Government because the Government desired to introduce the water of Tone River to Higashimurayama, and the plan of Ministry of Agriculture and Forestry was held up by Saitama Prefecture, for the plan had accepted the requirement of farmers of Saitama, but the Tokyo Government did not agree with the plan on account of location of the waterway near by the north district of Tokyo as well as water quality of the lower stream of Tone River.

Although it was an very urgent need to settle one waterway program for the purpose of water problem solving, respective ministries could not arrange their programs, having not conceded their own opinion.

When the Water Resource Development Corporation was established, in May 1962 the Water Resource Bureau, Economic Planning Agency and the Corporation launched into the arbitration among the three Waterway programs. In the Corporation, the promoters of arbitration plan were Mr. Oki, Chief of Planning Department who came from Ministry of Agriculture and Forestry, and Mr. Konishi, Director of the Corporation, coming from Ministry of Construction.

In September 1962, preparing three preliminary waterway programs, they promoted a conference with the Governors of Saitama Prefecture and Tokyo-to, Engineering Officers of Ministry of Construction, Ministry of Agriculture and Forestry, Ministry of Welfare and Ministry of Trade and Industry. At the same time, these tentative programs were arranged to one program by the

coordination of the Water Resource Bureau, Economic Planning Agency. These three programs are called respectively, "Dekijima plan," "Minumadai water use plan" and "Arakawa River plan," as are shown on the attached table.

Among them, the Arakawa River plan is the cheapest cost, and the shortest period, compared with the other plans, which period related a little with the Olympic game in October 1964 and the accomplishment of Yagisawa Dam. Also this plan had an advantage of water uses of Arakawa River as well as a disadvantage of water pollution followed by the growth of industrialization and urbanization. The "Arakawa River plan" was supported by Saitama Prefecture and Ministry of Agriculture, and Tokyo Metropolitan Government also supported the plan by planning a construction of a new water-cleaning plant and connecting with Higashi-murayama reservoir.

In May 1963, the Cabinet of Japanese Government decided a final program provided by the Corporation as a formal design, and ordered to start the construction of program. This Arakawa River plan was difficult to allocate program cost among several users, consisting from several parts of different users, Saitama Prefecture, Tokyo Metropolitan Government and various industries. Then the construction work was begun by the loan fund application account of Ministry of Finance.

At that time, the total amount of water supply for Saitama and Tokyo was  $20 \text{ m}^3/\text{sec}$ , but it was found to be more advantageous to expand the width of the waterway. Therefore, the expansion plan of the waterway was provided, which could be planned from  $20 \text{ m}^3/\text{sec}$  to  $50 \text{ m}^3/\text{sec}$ . This is a kind of forward investment, which increases construction cost of only about ¥ 1.2 billion, below 10% of total amount.

As the Tokyo Metropolitan Government supported the  $50 \text{ m}^3/\text{sec}$  waterway program, considering a long range water demand, the Water Resource Development Corporation arranged  $30 \text{ m}^3/\text{sec}$  water

increase among respective agencies and Saitama Prefecture. This amount would be taken from Tone River, when the stream flow will exceed over the level of regulated water rights. However, Gumma Prefecture, as water resource supplier, have a strong feeling unbelief toward water demanders.

So much so that, the Water Resource Development Corporation started to construct the 50m<sup>3</sup>/sec waterway program, designing the program of integrated water gathering facility of the Tone and arranging the cost allocation. The gathering facility was approved in July 1963, and the cost allocation in December 1963 by all respective agencies.

In August 1964, a part of the Waterway was accomplished just before Olympic games, as generally known, and also connected with Tone River and Arakawa River in March 1965.

The following table will show the three original schedules for construction of waterway.

Table II. The three plans of waterway (<sup>¥</sup>100 = \$0.28)  
(1 km = 0.62 mile)

	Dekijima plan	Minumadai Water use plan	Arakawa River plan (Tone Waterway)
Length	63 km new construction	61 km expansion of Minumadai Waterway	24km + Arakawa 30 km (including Minumadai Waterway)
Cost	24 billion Yen	18.6 billion Yen	16.4 billion Yen (original)
Sluice Place	gathering sluice near Dekijima	" near a sluice of Minumadai Waterway	"
Clearing Plant	new construction near Kitano connecting with Hamura line	undecided	same to Dekijima plan

### 3. Planning for Numata Dam Construction

#### (1) Summary of Dam Construction Planning

The plan Numata Dam construction which was announced by Industrial Planning Conference in July 1959 was active capacity 0.8 billion tons, 125 meter height which would serve for new water use  $75\text{m}^3/\text{sec}$ , maximum generation 1,300,000 kw by pumped storage and flood control of  $34\text{m}^3/\text{sec}$ <sup>(8)</sup>. The construction cost would be 52.2 billion Yen for dam construction, 110.7 billion Yen for generation and waterway, total amount of 162.9 billion Yen. Besides, there are various political problems about sunken area of 1200 ha fields and 2200 houses, which would be required to transfer or to redevelop.

Heretofore, Ministry of Construction had a plan of Iwamoto Dam, height 85 m, reservoir capacity of 0.14 billion tons. Besides, when the Numata Dam plan was announced by Industrial Planning Conference, the Congress of Gumma Prefecture passed an opposite vote at once. Since 1960, Ministry of Construction has pursued a preparatory investigation of Numata Dam by about 10 million Yen every year. The present plan of Ministry of Construction is a reservoir of capacity about 0.5 billion tons, height of 100 m—110 m, and water use of  $40\text{m}^3/\text{sec}$ , which is a little smaller than that of Industrial Planning Conference.

From the Engineering view point, it will be possible to make various scale programs of dam construction. However, Numata Dam problem should be considered from the other standpoint, such as land planning or redevelopment of the metropolitan region. Industrial Planning Conference proposed the establishment of Tone River Development Board and Tone River Water Use Association for the construction of Numata Dam. But at present the Water Resource Development Corporation promotes the development of Tone River area as a designated river on the basis of the Water Resource Development Promotion Act, which corporation was not yet founded in 1959.

There are two development methods of the Water Resource Development Relations Acts and the Specific Multi-Purpose Dam Act for the water resource development, as well as the other way of establishment of new public corporation, such as Aichi Water Use Corporation.<sup>(9)</sup> Especially Gumma Prefecture desires to promote a special legislature for Numata Dam Construction. Therefore, comparing with these several methods for Waterway and Yagisawa Dam, it is necessary to find a possible adequate way for Numata water resource development.

## (2) Compensation Countermeasure

The location of multipurpose dam will be choosed a remote place amongst mountains, as you can find from an case of Yagisawa Dam.

The reason why a Dam site would not be at the middle of the river, is not dependent upon geographical location, but upon many obstacles of sunken areas and compensation problem.

No matter how what the congress of Gumma Prefecture decided an opposite vote, there would be a very delicate problem how to change their response in future as a whole.

### 1) Redevelopment problem of mulberry fields

Gumma is the first rank sericulture prefecture, which has about 40,000 chōbu (around 8,163 square miles).

However, with the decline of silk-raising industry, redevelopment of mulberry fields is the biggest problem to be solved. The only way for solution of this problem would be to convert mulbery to paddy fields, but it will entirely depend upon irrigation water. If the water for the conversion will be secured by the Numata Dam reservoir, the biggest problem for Gumma Prefecture will be settled.

### 2) The tourist industry

The construction of Numata Dam will mean to make a reservoir of 3 times of Ashino lake in Hakone, surrounded by Mt. Akagi, Haruna, Tanigawa holding hot springs of Minakami in North

and Ikaho in South which artificial lake will be the first class tourist area of Metropolitan Region, being along the line of railway and highway to Niigata with 2 or 3 hours from Tokyo. Therefore, if the compensation problem will be settled successfully, the Prefecture will approve the construction of Numata Dam.

Next, the sunken areas belong to City of Numata. Consequently the construction of the Dam will depend upon the attitude of citizens of Numata, but there are supporters for and opponents against the Dam. Among supporters there are many inhabitants of center of City of Numata in unsubmerged area, and many opponents are inhabitants of submerged area.

Many supporters have an opinion that their occupational situation will be more advantageous than before, and the transportation will become more convenient, railway and high-way being changed on the plateau. On the other hand, the opponents would insist upon the fear of living rights. According to a tentative calculation, 2,500 of sunken houses consist of 1,800 of special farmers, 700 of others, and sunken fields are 1,200 ha (paddy field 600 ha) forest of 500 ha and others.

The organization and method for compensation problem solving are indicated as follows. (1) Establishment of Compensation Finance Corporation, (2) To estimate the sunken land as a goods investment of farmers, (3) To prepare alternative land for removal of compensated inhabitants.

In the sunken land area, there are not so large companies, except silk, rubber manufactory, and lumber mill, among which silk manufactories are not in operation by the decline of silk price. Rubber factory and lumber mill will not change in business operation, if the transportation condition is to be convenient. Referring to other commercial business, if tourist industry will become prosperous in a new center of Numata City, there would not be any other problem than the removal of their houses. Therefore, the success or failure of Numata Dam construction would

mainly depend upon the compensation and countermeasure for area development.

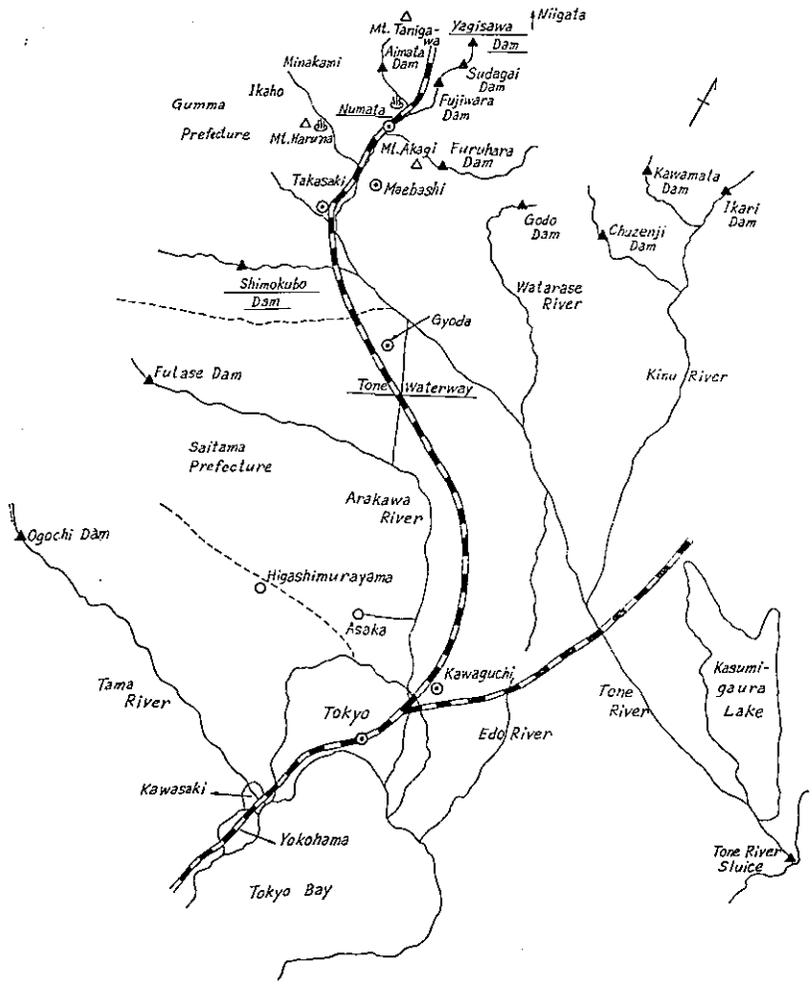
#### IV. Future Program of Water Demand and Supply in Tokyo Metropolitan Region

Finally, the future estimate of water demand and supply in Tokyo Metropolitan Region should be described for the purpose of proper policy of water resource development. However, there is some difficult problem because of lacking an adequate program for water demand and supply. The present water demand by 1970 connecting with related prefectures along Tone River would consist of a ten years program of land improvement, a ten years program of water supply equipment, a ten years program of industrial water, and a five years urgent program of industrial water etc., which are estimated 70 m<sup>3</sup>/sec. of agricultural water, 44 m<sup>3</sup>/sec of drinking water, 30 m<sup>3</sup>/sec. of industrial water, and total 144 m<sup>3</sup>/sec as a whole, which will exceed over total 200 m<sup>3</sup>/sec, if adding the respective demands of related prefectures which were required to Economic Planning Agency by each prefecture.

On the other hand, Economic Planning Agency, which had examined to the various factors of demand, made a decision of goal of water supply of 120 m<sup>3</sup>/sec as a supply program in 1970<sup>(10)</sup>. However, this goal of water supply shows a tentative program for water resource development of Tone River Basin. Therefore, if considering unsettled program of water supply equipments except of about 60 m<sup>3</sup>/sec program, it would be extremely difficult to make a balance of water demand and supply by 1970.

- 1) Redevelopment of National Capital Region, 1962.
- 2) Shiro Sato, Water Works in Tokyo, 1960 Tomoji Ichinose, Financial Management of Public Enterprise, 1961, Chapter 3.
- 3) Redevelopment of National Capital Region, 1962, p. 76.
- 4) Summary of Water Resource Development Policy, Gumma Prefecture Integrated Water Use Program of Gumma Prefecture, 1963

Map of Tone River Basin, 1=850.000



- Economic Synthetic Program of Gumma Prefecture, 1964.
- 5) Materials of the Yagisawa Dam Joint Investigation Committee, 1950.
  - 6) Water Resource Development Corporation is a kind of public corporation, which was established for the purpose of water resource development in Japan under the control of Economic Planning Agency, Prime Minister's Office and Ministry of Construction.
  - 7) Summary of Tone Waterway, Water Resource Development Corporation, 1964.  
Fundamental Program, and Execution Program of Tone Waterway, Water Resource Development Corporation, 1964.  
Annual Report of Water Resource Development Corporation, 1964.
  - 8) The 8th Recommendation of Industrial Planning Conference, Water from Tone River, Industrial Planning Conference, 1959.
  - 9) Aichi Water Use Corporation was established for the purpose of Kiso-River development near Nagoya and Central Economic Areas of Japan, which is compared generally with Tennessee Valley Authority of U. S. A.
  - 10) Fundamental Programs of Water Resource Development of Tone River Basin, Economic Planning Agency, Prime Minister's Office, 1964. Summary of Water Resource Development Policy, Gumma Prefecture 1964, pp. 5-6.