

## Chapter 22 WATER ENVIRONMENT CONSERVATION PLANNING OF NAGANO PREFECTURE

### 1. Topography of the Prefecture

As shown in Fig. 1-1, Nagano Prefecture is located in the central part of Honshu Island, extending approximately 120km from east to west, 210km from south to north, with total area of 13,585 sq. km., being the fourth largest prefecture after Hokkaido, Iwate and Fukushima.

The topography consists of a mountain area, so-called "Roof of Japan", with 16 peaks rising over 3,000m height, a level of Nagano Basin, Saku-Ueda Basin, Matsumoto Basin and others basins surrounded by the mountain area, and intermediate area connecting the mountain and the level. The major rivers are Chikuma and Sai Rivers which flow northward to the Japan Sea Japan, (two rivers connect into Chikuma River, changing the name to Shinano River after entering Niigata Prefecture), Tenryu River and Kiso River which flow southward into the Pacific Ocean and other rivers. Their drift is shown in Fig. 1-2. These rivers are multi-purposely used for drinking water, industrial water and agricultural water in not only Nagano Prefecture, but also in the downstream prefectures, as used in the Aichi irrigation etc. The level is characterized by river terrace, as in Tenryu and other rivers, slope of which plays a role of "green belt".

The climate in the whole prefecture is inland climate with considerable annual and daily ranges of temperature difference. The northern part and the southern part are influenced by climate of Japan Sea and the Pacific Ocean respectively, which, together with geographical and topological features of the each region, causes a most diversified characteristics of climate. In particular, the difference of climate is presented by the snow depth in the winter season. As for the amount of precipitation, in the eastern part, Ueda-Saku Basin, and the northern part, Nagano Basin, of the prefecture the precipitation amounts to around 1,000mm a year, one of the smallest in Japan, while on the other hand, in the western and southern parts of the prefecture there are Mt. Ontake with annual precipitation of over 3,000mm and Nagiso Town with over 2,000mm rainfall and other areas (Fig. 1-3).

Forest accounts for about 80% of the territory of the prefecture, presenting a diversified ecological system due to complicated topography and geography, as well as variety of the climatic conditions.

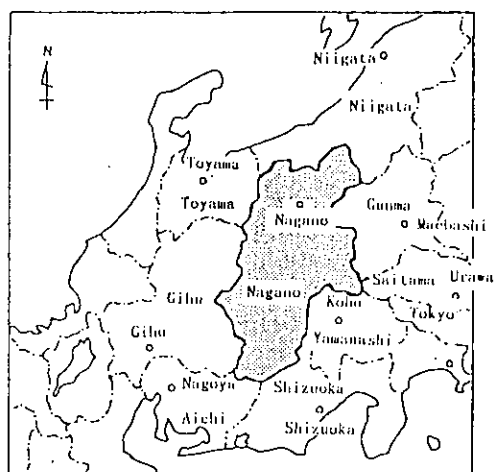


Fig. 1-1 Location of Nagano Prefecture

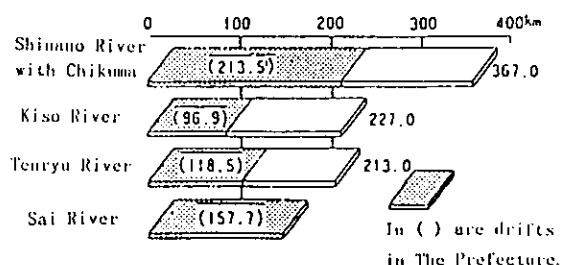


Fig. 1-2 Drift of Major River

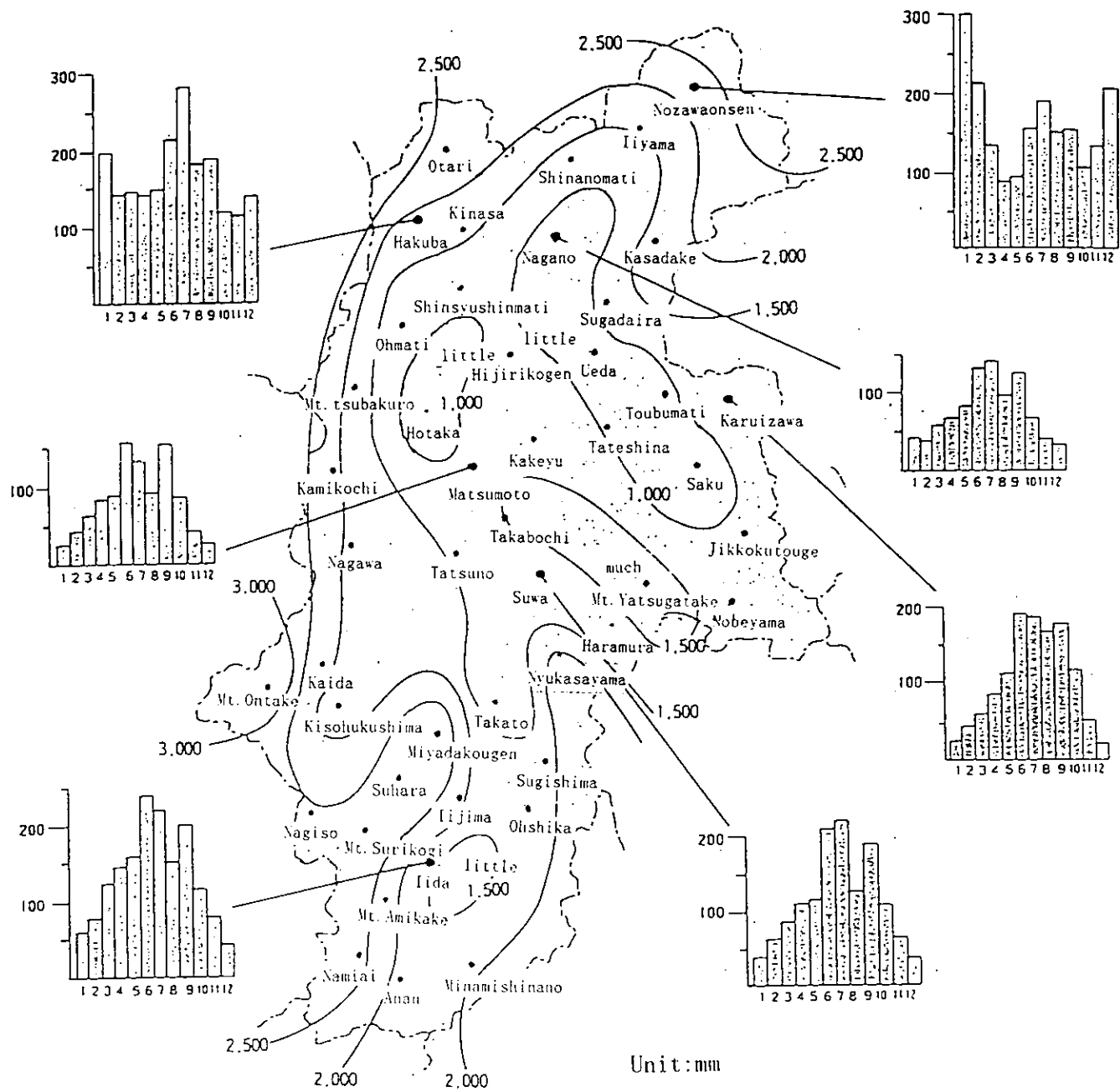


Fig. 1-3 Amount of Precipitation

## 2. Water Quality

### 2.1 Results of Water Quality Measurement

#### (1) Water Quality of Public Water Area

For conservation of public water area, such as rivers and lakes, water quality measurement is conducted under water quality measurement program according to Water Pollution Control Law by the Ministry of Construction, Nagano Prefecture, and Nagano and Matsumoto Cities designated by the Law.

In major rivers and lakes for which typical designation of environmental quality standard for water pollution is established, 24 items related to human health protection (health items) and 15 items related to living environment (environment items) are measured.

As for health items, environmental quality standard is continuously satisfied in all items, except for arsenic of natural origin, such as hot spring, which content exceeds at 2 measured sites.

Environmental quality standard attainment rates for biochemical oxygen demand (BOD:river) and chemical oxygen demand (COD:lake) are given in Fig. 2-1 which says the rates are remaining on the same level or worsening for the last several years, and especially in lakes the rates are on a low level. Fig.2-2 shows the situation of each river and lake in 1996. In Chikuma River and Sai River water quality are worsened at the points affected by urban area with concentrated location of factories and housings. In Tenryu River water quality worsens in upstream affected by Suwa Lake, but the quality is improved as much as downstream by self-purification ability and dilution by clean tributary streams. Among lakes, Suwa Lake, where eutrophication process, such as Microcystis, is taking place, shows the worst situation in the prefecture from the time of typical designation in 1971.

About 70 of medium and small rivers for which type designation is not made are subject to measurement, as they affect on water quality of major rivers and lakes. Approximately 70% of medium and small rivers show under 5mg/l of BOD. Some number of rivers, mainly urban rivers, show over 10mg/l, but water quality is being improved thanks to sewerage system construction and increased consciousness on domestic sewage.

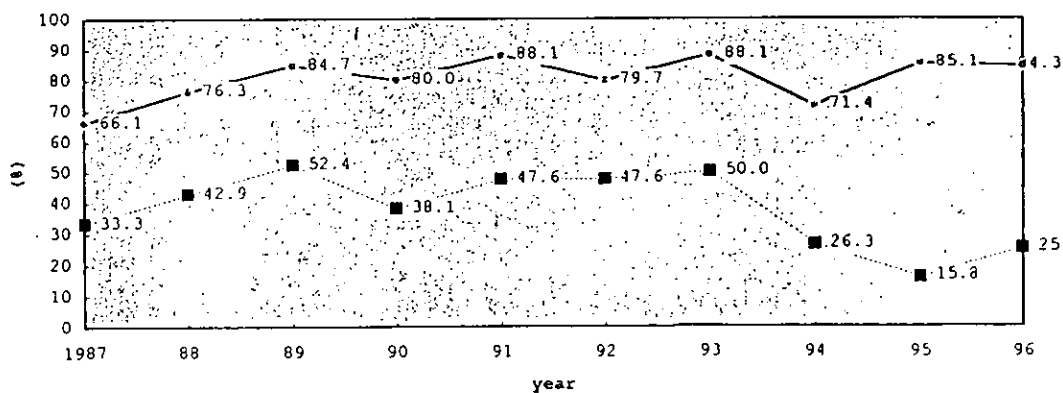


Fig. 2-1 Dynamics of Environmental Quality Standard Attainment Rates in Major Rivers and Lakes



## (2) Groundwater

For checking pollution of groundwater an overall survey and regular monitoring of polluted sites are conducted. The overall survey is conducted in about 80-100 wells with measurement of environment quality standard items and surveillance-requiring items (chloroform, nitrate nitrogen, nitrite nitrogen) in areas, excluding mountain area, divided into 191 meshes every year from 1989. Up to 1996 in 124 wells has been revealed contamination, including trichloroethylene in 26 wells, tetrachloroethylene in 29 wells, 1,1,1-trichloroethane in 2 wells, nitrate nitrogen and nitrite nitrogen in 72 wells (wells repeated). However, no remarkable excess of standard has been shown in the polluted wells, and the results of regular monitoring for organochlorine compounds indicate a trend of improvement with 12 wells having over-standard measurement continuously from 1986.

## (3) Upper Stream Rivers

Upper stream river surveillance is conducted in upstream rivers with drinking water supply source and presenting possibility of water pollution caused by large-scale development such as waste disposal and golf course. Measurements being made in about 50 rivers for items for which water quality control target (see 5.4) is established; metallic compounds, volatile organochlorine compounds, pesticide and others. As of today, no water pollution suspiciously connected with the development has not been revealed.

## 2.2 Factories and Business Establishments

Specified factories and business establishment for which a registration under Water Pollution Control Law is required are shown in Fig. 2-3. As of the end of March, 1997, 11,565 registrations have been made, the most of which falls on hotels ; 6,793 (68.7%). The number of specific establishments for which effluent standard shall be applied is 2,291.

5 categories of business not controlled by Water Pollution Control Law such as auto-repair works are required to be registered by Pollution Control Ordinance. 302 establishments are subject to registration as of March, 1997. In October, 1997 restaurants and others of not-specified establishment scale under Water Pollution Control Law newly became specified establishments due to revision of Ordinance.

In our prefecture effluent from factories and business establishments is controlled according to more stringent effluent standard established in 1972 based upon Water Pollution Control Law. However, an overall review of more stringent standard has been made for BOD(COD) and SS, as needed to work out new measures against factory and business effluent under the circumstances that 1) environment standard attainment rate remains on the same level, 2) construction of sewerage system will be completed in whole Nagano Prefecture by 2020 as countermeasure for household effluent under a long-term prefectural planning. Newly established more stringent standard is characterized by 1) prefecture-wide unification of standard which varied depending upon water area and business category, 2) more stringent standard values based upon the up-to-date level of wastewater treatment technology, 3) wider application of standard, covering small-scale establishment which were not controlled, in consideration of the extended sewerage system. New standard shown in Tab. 2-1 has been effective as from October, 1997.

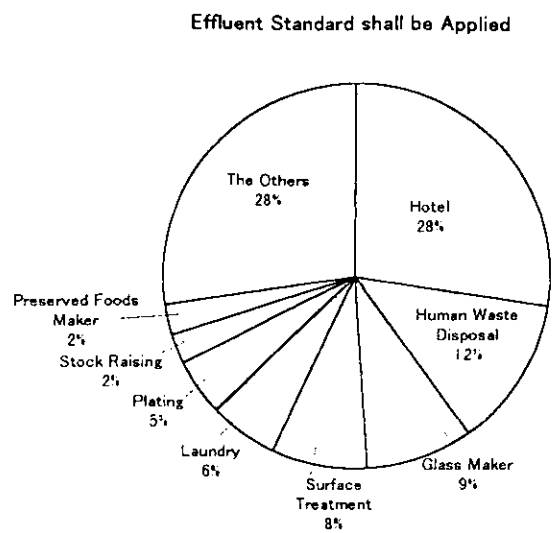
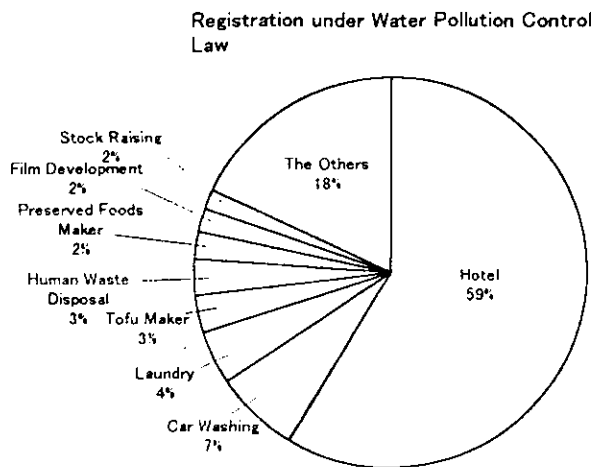


Fig. 2-3 Specified Factories and Business Establishment under Water Pollution Control Law (March, 1997)

Tab. 2-1 Stringent Effluent Standard for BOD (COD) and SS

Division			Item and Allowable Limit			
			BOD (COD) (mg/l)		SS (mg/l)	
			Max.	Day Average	Max.	Day Average
Industries other than shown below	Effluent	10 cu. m.	60	40	90	60
		- 50 cu. m.				
		Over 50 cu. m.	30	20	50	30
Gelatine Producer	Effluent	Over 10 cu. m.	60	40	90	60
Japanese Sake Producer						
Live-stock Industry/Agriculture (with over 250 sq. m. horse house and over 500 sq. m. cowhouse)	Effluent	Under 10 cu. m.	160	120	200	150
		10 - 500 cu. m.	160	120	85	70
		Over 500 cu. m.	30	20	50	30

### 2.3 Household Effluent

According to 1994 research pollution factors of rivers and lakes in the prefecture included household-related (44%), factory and business-related (27%), and agriculture-related and others (29%). The household effluent presents the largest pollution factor. For this reason, maintenance of sewerage system, rural community sewerage, community plant, combined type Johkaso or private sewage treatment system (further, sewerage and other systems) is needed and planned consolidation is being realized based upon "Sewerage and other systems Consolidation Concept Area Map" worked out in consideration of topographical and regional specific conditions.

As shown in Fig. 2-4, the percentage of sewered population is 52.1% as of March, 1997, enabling every second population to use the sewerage and other systems. Middle-term comprehensive planning of Nagano Prefecture has a target to lift the percentage of sewered population up to 66% by March, 2001.

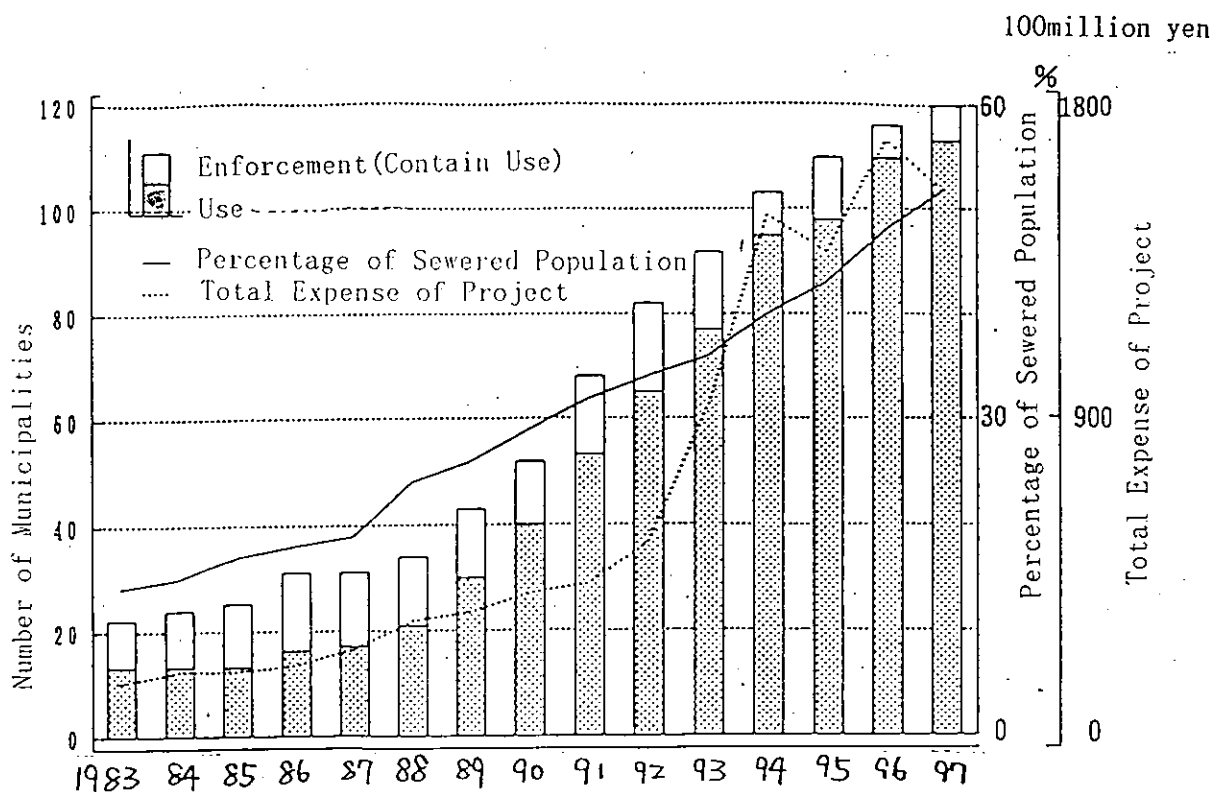


Fig. 2-4 Percentage of Sewered Population

### 3. Present Situation of the Waterside Consolidation

There are 8 water systems with 740 rivers of first category, total length of which is as long as 5,121.1km. In addition to natural conditions such as steep topography and fragile geology, change of land utilization of catchment area; urbanization for the recent years, form of agriculture, forest type, intensive land utilization, consolidation of waterway; lead to lowering of water retaining capacity, penetration capacity and flood control capacity originally available for catchment area and flood control safety is jeopardized, flood disaster are frequent. For this reason, river and lake banks are being protected and river protection rate is 32.7% in 1996.

While flood control measures give remarkable results in respect of protecting human life and property from flood disaster, concrete rivers eventually isolate rivers from people. Thus from mid 80's people began to pursue not only material, but also mental richness, which has led to insistence on creation of "comfortable environment", deeming waterside as playing spot or place of mental cure.

On such background, river improvement incorporate conservation or consolidation according to 3-zone zoning shown in Tab. 3-1 to create more desirable river environment with well-concorded conservation and utilization, taking actual situation of utilization into account.

Furthermore, "creation of multi-nature type river" is being realized with construction of light-sloped banks and water park, and attention to local fauna and flora. 72.2km of such river was completed in 1996 (Tab. 3-2). An artificial beach and trial to re-vive a reed field on Suwa Lake are typical examples in our prefecture.

For well nature-coordinated landscape Landscape Ordinance of Nagano Prefecture was established in 1992 to serve conservation and creation of natural landscape.

From old times people has been tightly connected with water in our prefecture, where up to today a specific food culture "zazamushi" and traditional culture of festival "misogi" or a purification ceremony continue to exist. Trade with ship transport, using rivers, also played an important role in the past.

However, the relationship between people and waterside has weakened because of change of life style, water pollution and flood control measures. At present, the relationship is being reviewed through introduction of class lessons using canoe or observation of aquatic organism, triggered by rising environmental consciousness of the last years.



Tab. 3-1 Zonig of River

Division	Description
Natural Zone	Space which is supposed to be used as a place for contact with the nature as it is, with conservation of specific natural river environment and landscape, without, in principle, artificial modification except for flood control and water utilization purpose
Nature Utilization Zone	Space which is supposed to be used as a place of a walk and nature-oriented recreation, taking an advantage of specific river environment and improving sub-natural environment such as natural observation area, wild grass square and urban agricultural land
Consolidated Zone	Space which is supposed to be consolidated as a place of various kinds of recreation and sport activities or demonstration of river channel fire works, with utilization of high water channel and banks and consolidation of multi-purpose squares, parks, sport squares, stair type bank protection, sloped bank protection etc.

Tab. 3-2 Results of Constructed Multi-natural Type Rivers (km)

	1994	1995	1996
Extend Distance	54.0	62.1	72.0

## 4. Water Environment Conservation Ordinance of Nagano Prefecture

### 4.1 History of Establishment of the Ordinance

Recently, with socio-economical changes, e.g. progressing urbanization, intensification of industrial structures, a problem of water pollution by household effluent and contamination of drinking water supply source by ground water polluted by new chemicals is emerging in our prefecture. Deep concern is expressed by prefectural population to conservation of catchment area - waterside and forest - .

To cope with such a change of situation around water environment, together with repletion and strengthening of ongoing conservation measures, such as water quality surveillance, "Water Environment Conservation Conference" was organized in 1990 from national authorities with rich knowledge of water environment to study a matter of development of a comprehensive planning for organic promotion of systematic measures, newly incorporating waterside consolidation and catchment conservation.

On the other hand, as a number of construction of waste disposals and golf courses were planned, some cities and towns in the country, located in the upstream water supply source area, with concern of drinking water supply source contamination, established their ordinance preventing water supply area from various sorts of development. Our prefecture due to geographic condition - near location to the metropolitan area - has been selected for a lot of resort facilities construction. For example, there were 47 golf courses in 1987. Further, with establishment of so-called "Resort Law" aimed to improve recreation facilities by private sector, from 1987 till 1990, in the period called "Bubble Epoch", 11 golf courses were newly constructed, as shown in Tab. 4-1. In such situation of continuous construction of resort facilities like golf courses a fear of contamination of drinking water supply source was rising among the prefectural population.

In 1990 Prefectural Coordination Meeting for Establishment of Water Supply Source Protection Ordinance of Nagano, with more than 120,000 signatures, made a direct claim for establishment of "Ordinance on prohibition of golf course development in water supply source and other areas" to the effect that any development of golf courses, waste disposals and resort facilities should be prohibited in the water supply source and supply source areas in the prefecture to conserve drinking water supply source. The prefectural government, after detail examination of contents of ordinance draft, submitted the draft to the prefectural assembly with negative opinion that it is difficult to specify the water concentration area and thus to forecast areas to be prohibited, as well as wide area prohibition might seriously affect life of population and industrial activities.

Finally the assembly rejected the draft in December, 1990, but after that the movement for establishment of ordinance was continued by Social Democratic Party of Japan and the Lawyers Association of Nagano Prefecture, and the public opinion in the prefecture resulted in an active campaign.

In these circumstances, the above-mentioned Water Environment Conservation Conference has concluded that it is necessary to establish an ordinance in any form to make the comprehensive planning for water environment conservation more effective, in response to which "Water Environment Conservation Ordinance of Nagano Prefecture" was established in March, 1992.

As an ordinance aimed at conservation of "water environment", comprehensively covering water and its environment, such as water quality, waterside and catchment area, the ordinance is the first one in the whole country.

Tab. 4-1 Number of Golf Course Newly Constructed in the period of "Bubble Epoch" (1987 - 1990)

	1987	1988	1989	1990	1997
Newly Constructed Golf Courses	3	0	6	2	2
Accumulation	50	50	56	58	67

#### 4.2 Outline of the Ordinance

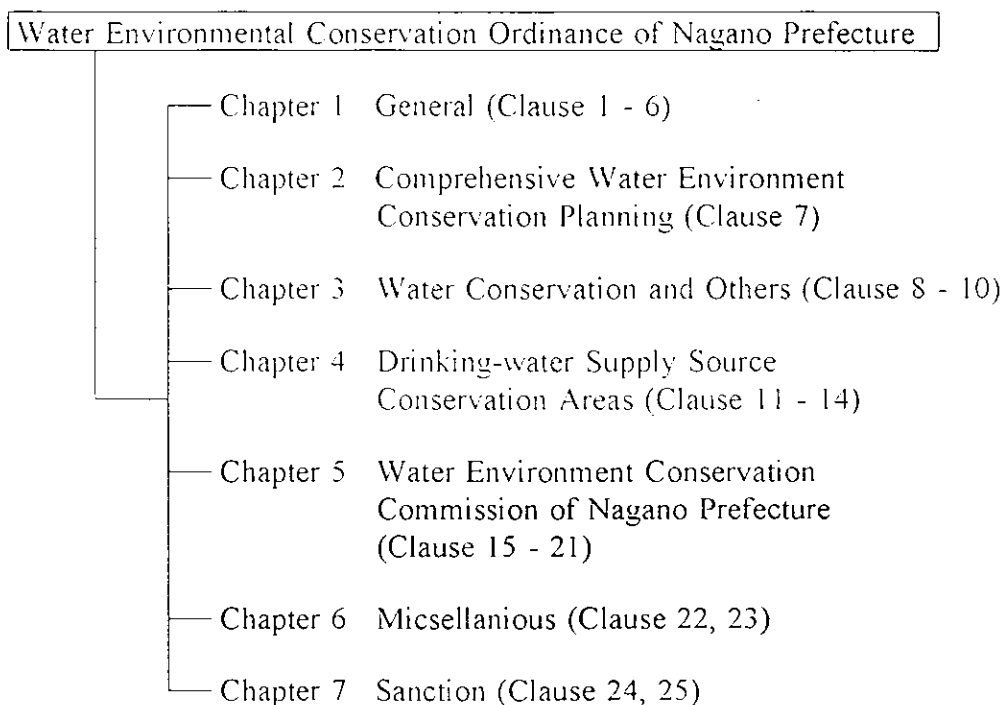


Fig. 4-1 System of Water Environmental Conservation Ordinance of Nagano Prefecture

System of Water Environment Conservation Ordinance of Nagano Prefecture is shown in Fig. 4-1.

In Chapter 1, Clause 1 declares the purpose of ordinance; to promote comprehensive measures of water environment conservation through clarification of the obligations of the prefecture, the cities, towns and villages, and population and enterprises in respect of water environment conservation, as well as working out of necessary issues on development of comprehensive water environment conservation planning and designation of water quality surveillance areas and water supply source conservation areas, and thus to ensure healthy and cultural life of the population. In Clause 3 through 5 the obligations of the prefecture, the cities, towns and villages, and population are specified.

Chapter 2 provides the establishment of "Comprehensive planning for water environment conservation" which shall specify items concerning policy and measures for water environment conservation. (See 5. "Comprehensive planning for water environment conservation").

In Chapter 3, in view of the fact that golf courses and waste disposals are sited even in the upstream water supply source areas, necessary water quality surveillance is provided for conservation of supply source water quality depending upon local land utilization situation. Based upon this provision, Nagano Prefecture conducts, separately from regular surveillance by Water Pollution Control Law, water quality surveillance and measurement of upstream areas, having set out the points and measurement items.

Chapter 4 provides that the Governor, upon the application by the mayor of the subject city or town or village, has a right to designate the area specially requiring conservation of drinking water supply source as drinking water supply source conservation area. Besides this, the Governor can, upon the application by the mayor for designation of a area, belonging to the area of other mayor and after consultation with related mayor, designate as drinking water supply source conservation area.

It is provided that any who plans to construct golf course, to install final waste disposal, or to transform the land over 1ha according to Executive Regulations to Water Environment Conservation Ordinance of Nagano Prefecture, shall consult in advance with the Governor to obtain his consent. The Governor shall, at the consultation, make hearing from the mayors of the related communities and Water Environment Conservation Commission, and can attach conditions to the extent needed for drinking water supply source conservation (Clause 12).

Clause 13 provides that the Governor can order to suspend the act or to restore the status quo when preliminary consultation has not been made or attached conditions are violated. Clause 14 further provides the Governor's right to be reported of execution status of approved act, or to inspect on the site in respect of consulted acts.

Clause 24 of Chapter 7 sets forth the penalty provision for violations of Clauses 12 through 14, so that protection of drinking water supply source is secured for drinking water supply source conservation area.

Chapter 5 provides the institution of Water Environment Conservation Commission for research and deliberation of the important issues concerning water environment conservation.

Clause 22 of Chapter 6 provides that the Governor appoints Water Environment Conservation Promoter for effective promotion of water environment conservation.

At present 150 promoters are appointed and, in contact with the communities, are conducting campaigns for higher water environment conservation consciousness, as well as patrolling and observing the river catchment area.

## 5. Water Environment Conservation Comprehensive Planning

### 5.1 Purpose of Planning

Recently, with socio-economical changes, as concern about water pollution in the upstream area and problems of contamination of ground water by new chemicals, and further, eutrophication of lakes by household effluent are emerging, prefectural population are being more conscious to conservation of catchment area - waterside and forest - .

To cope with such change of situation around water environment, the prefectural government worked out Water Environment Conservation Comprehensive Planning in July, 1992, based upon Water Environment Conservation Ordinance of Nagano Prefecture established in March, 1992.

This planning , together with River Environment Management Master Plan and Regional Forest Plan and others, is aimed to comprehensively promote measures of water environment conservation for ensuring high quality of water and rich catchment area creation hereafter.

### 5.2 Nature of Planning

The nature of Water Environment Conservation Comprehensive Planning is 1) to show basic direction of water environment conservation to be followed by our prefecture, 2) to show comprehensive measures for integrated covering water and its environment, such as water quality, waterside, catchment area, and creation of healthy, comfortable and rich water environment, and 3) to show method of water environment conservation, based upon coordination and cooperation of citizens, enterprises and the prefecture, utilizing each regional features of the prefecture.

### 5.3 Structure of Planning

Structure of the planning consists of “water environment targeted by Nagano Prefecture” and “comprehensive measures for achievement of the target” , as shown in Fig. 5-1.

“Water environment targeted by Nagano Prefecture” consists of “idea of water environment conservation” - basic concept of water environment conservation, “policy of water environment conservation” - core of measures, and “target of water environment conservation” - target of planning.

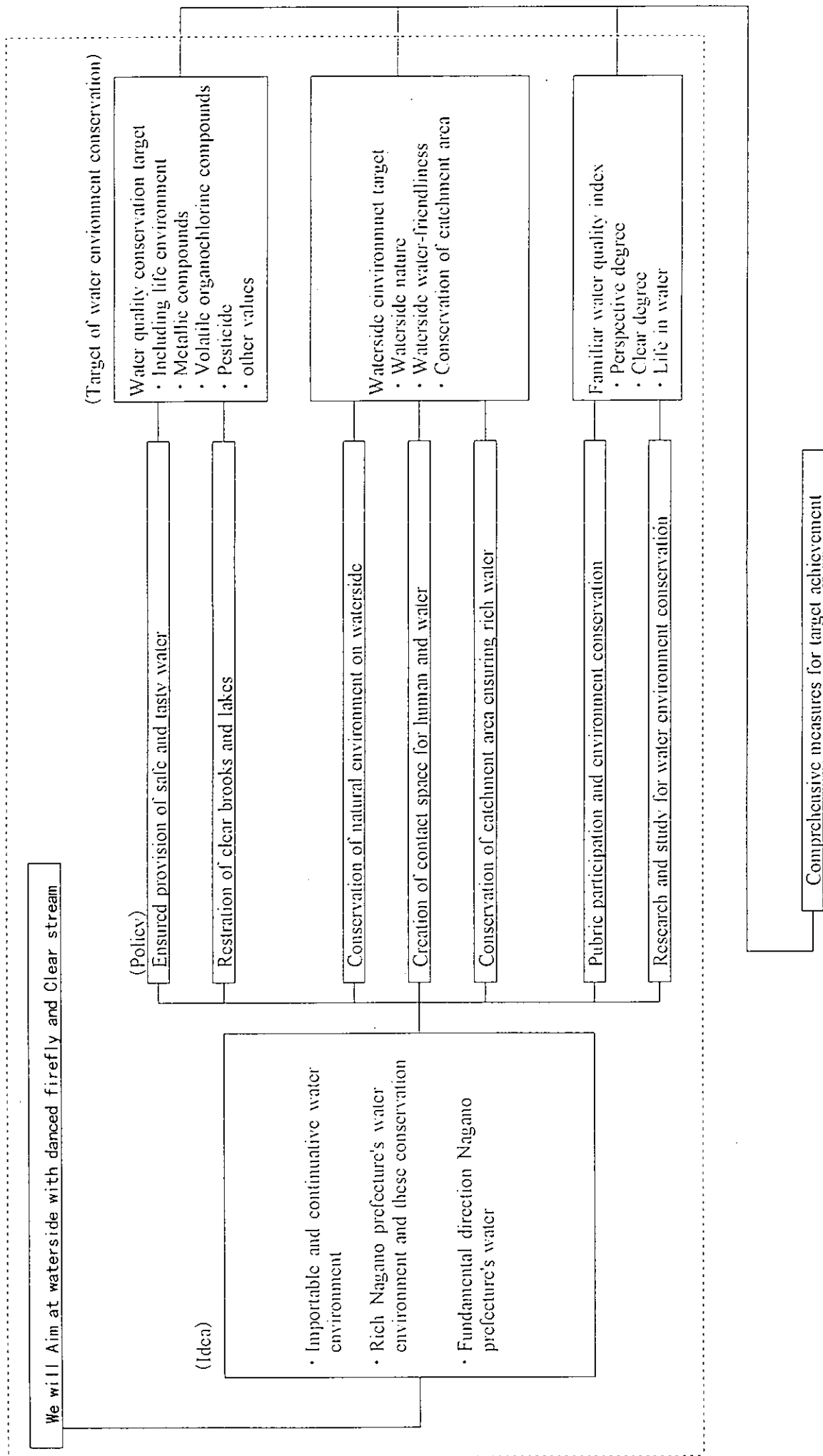


Fig5-1 Structure of Nagano prefecture's water environment conservation comprehensive planning

## 5.4 Outline of Planning

### (1) Water Environment Conservation Policy

“Policy of water environment conservation” which is core of measures consists of the following 7 policies:

- ensured provision of safe and tasty water  
(conservation of water quality of water supply source, such as water surveillance in upstream area )
- restoration of clean brooks and lakes  
(promotion of countermeasures for contamination sources such as household effluent)
- conservation of natural environment on waterside  
(protection and rearing of various fauna and flora, conservation and creation of waterside landscape)
- creation of contact space for human and water  
(improvement of water-friendly waterside, promotion of making “mother-land” rivers)
- conservation of catchment area ensuring rich water  
(conservation of forest and others ensuring water)
- public participation and environmental education  
(developmental education of citizens on water environment conservation, promotion of voluntary activities)
- research and study for water environment conservation  
(research and study on water environment conservation of river and lake, on consolidation of comfortable waterside environment)

### (2) Target of Water Environment Conservation

In promotion of the planning, target of water environment conservation consists of water quality conservation target and waterside environment target.

#### - Water quality conservation target

Water quality conservation target sets forth target values for 77 items, including life environment, metallic compounds, volatile organochlorine compounds, pesticide and other values. These values are determined to achieve drinkable level of water quality, such as environmental quality standard and drinking water quality standard.

As for pesticide, Nagano Prefecture’s own target value is also set forth.

Apart from concrete target values, as simple criteria for water quality surveillance and practical activities of water environment conservation conducted by community citizens, “near-at-hand” indexes are also set forth to raise citizens’ consciousness of water environment conservation.

#### - Waterside environment target

Waterside environment target for waterside nature, waterside water-friendliness and conservation of catchment area sets forth prefectural common target and local target based upon regional features and present state (Tab. 5-1).

### (3) Comprehensive Measures for Target Achievement

“Comprehensive Measures for Target Achievement” systematizes the measures by each of 7 policies of water environment conservation, as shown in Fig. 5-1, to make clear present state and problem of each measure and shows contents of measures to be taken hereafter.

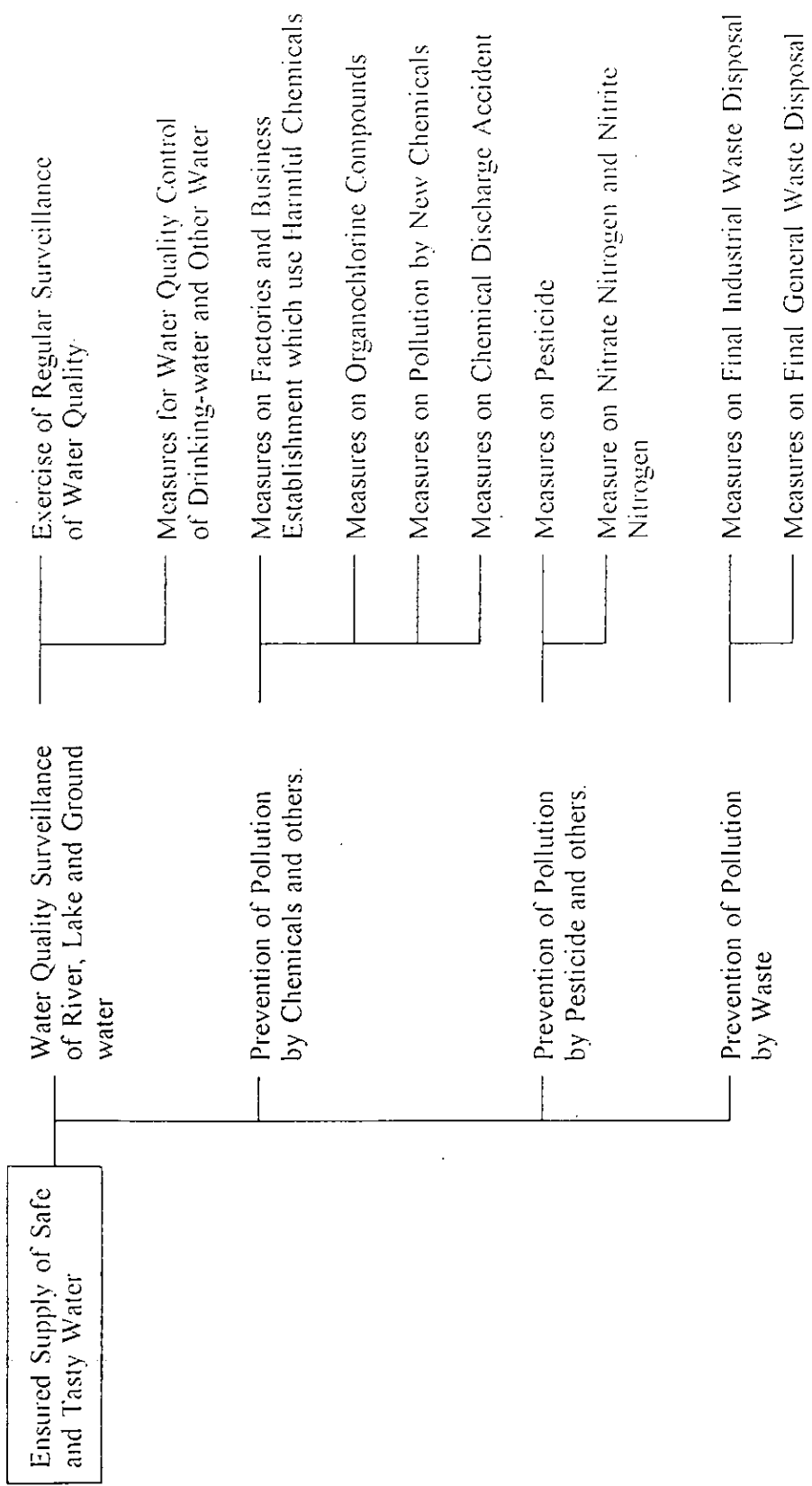
#### 5.5 Promotion of Measures

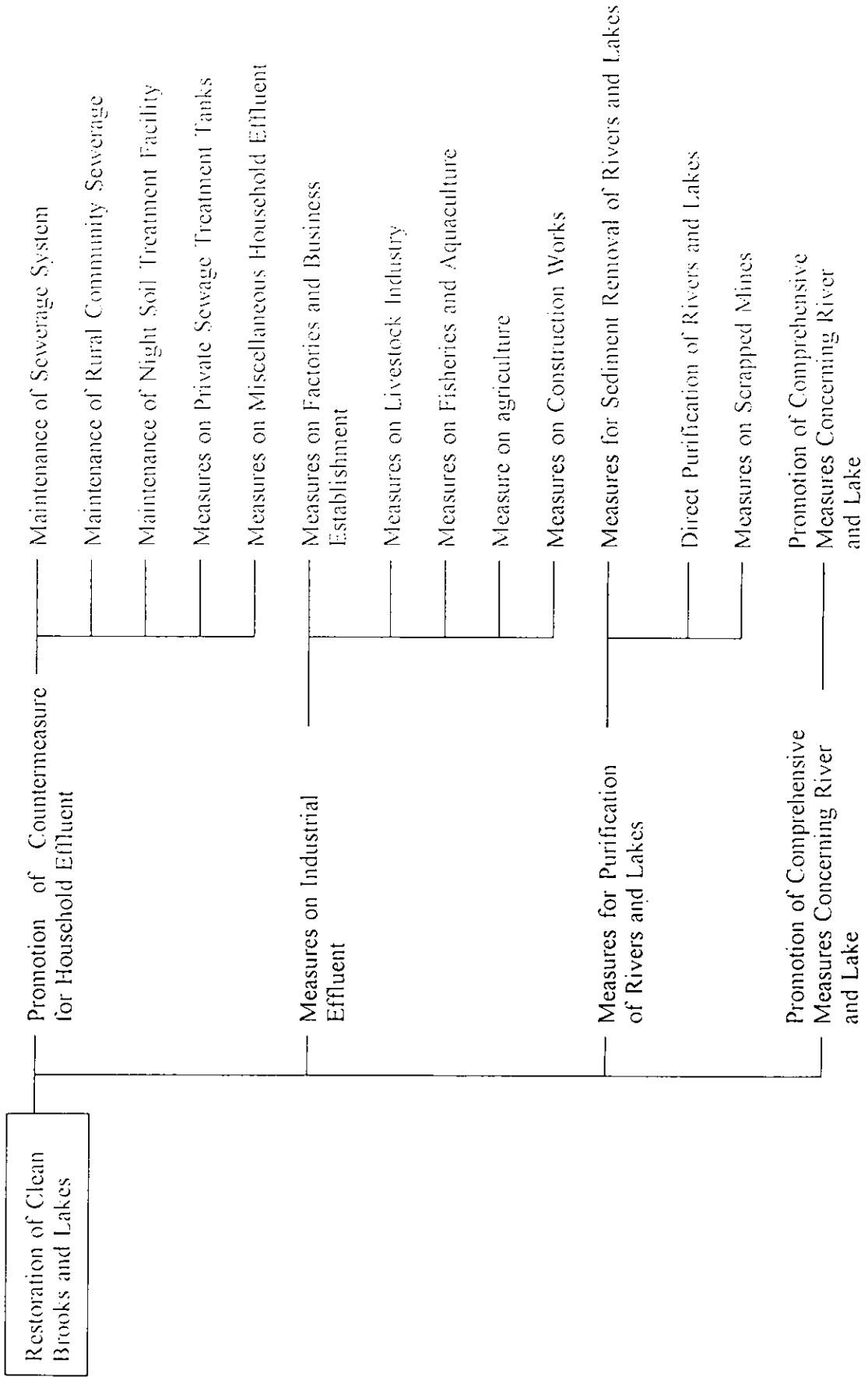
The progress of measures is checked every year for water environment projects. The measures are promoted at water environment conservation meeting consisting of related sections (offices) which conduct such projects to further improve water environment conservation measures and achieve the target.

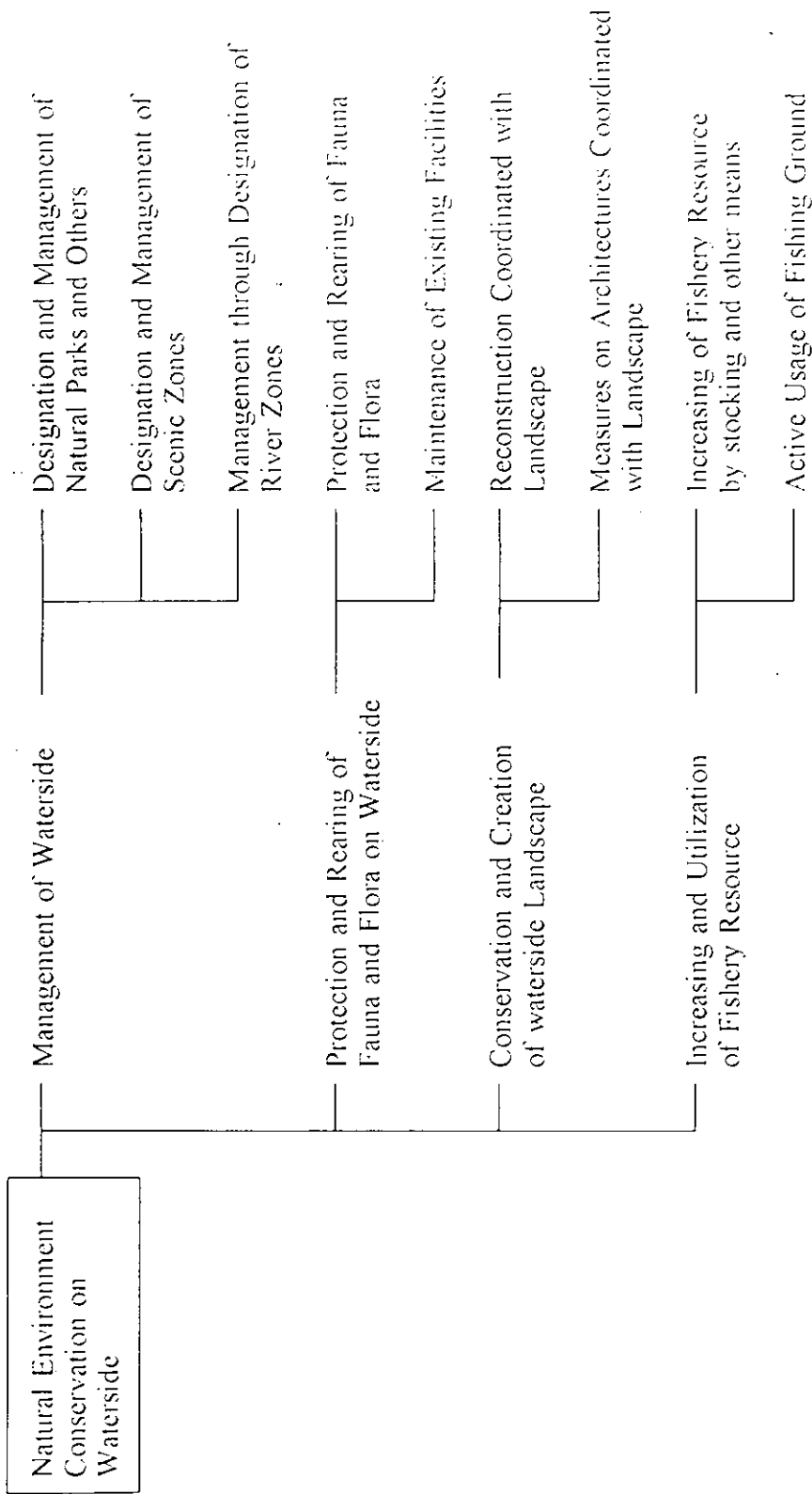


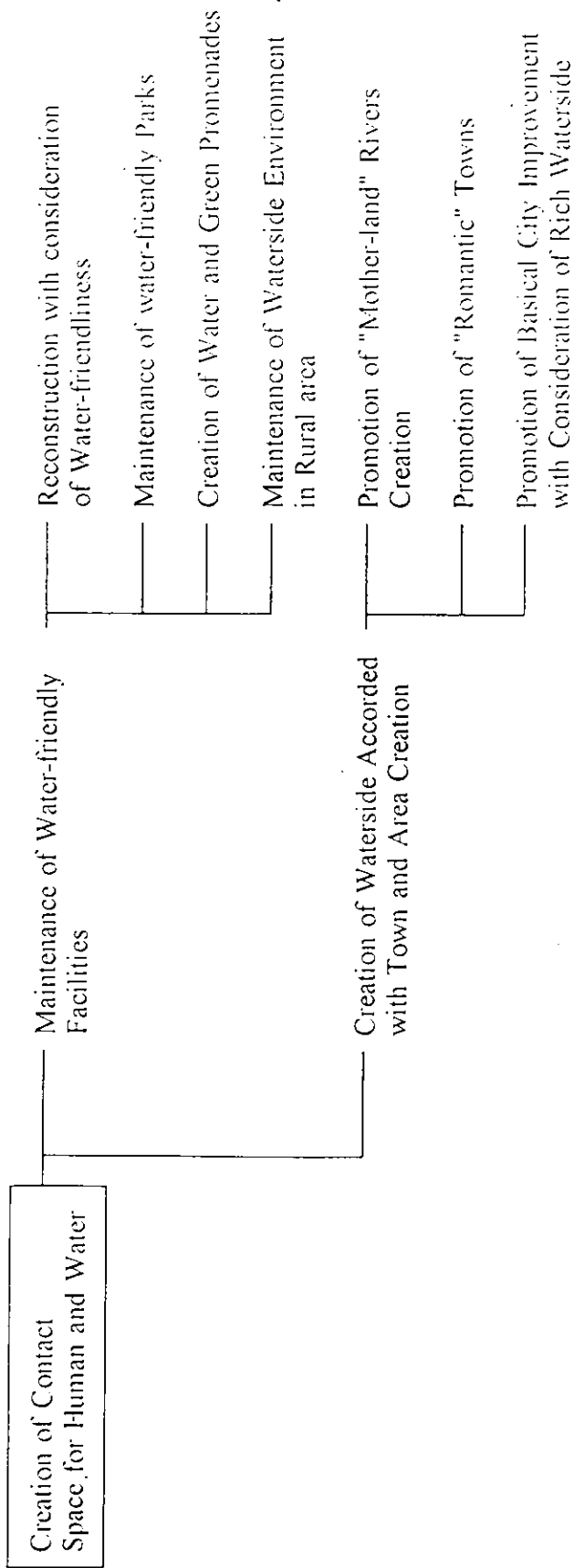
Tab. 5-1 Example of Local Waterside Environment Target (Suwa Region)

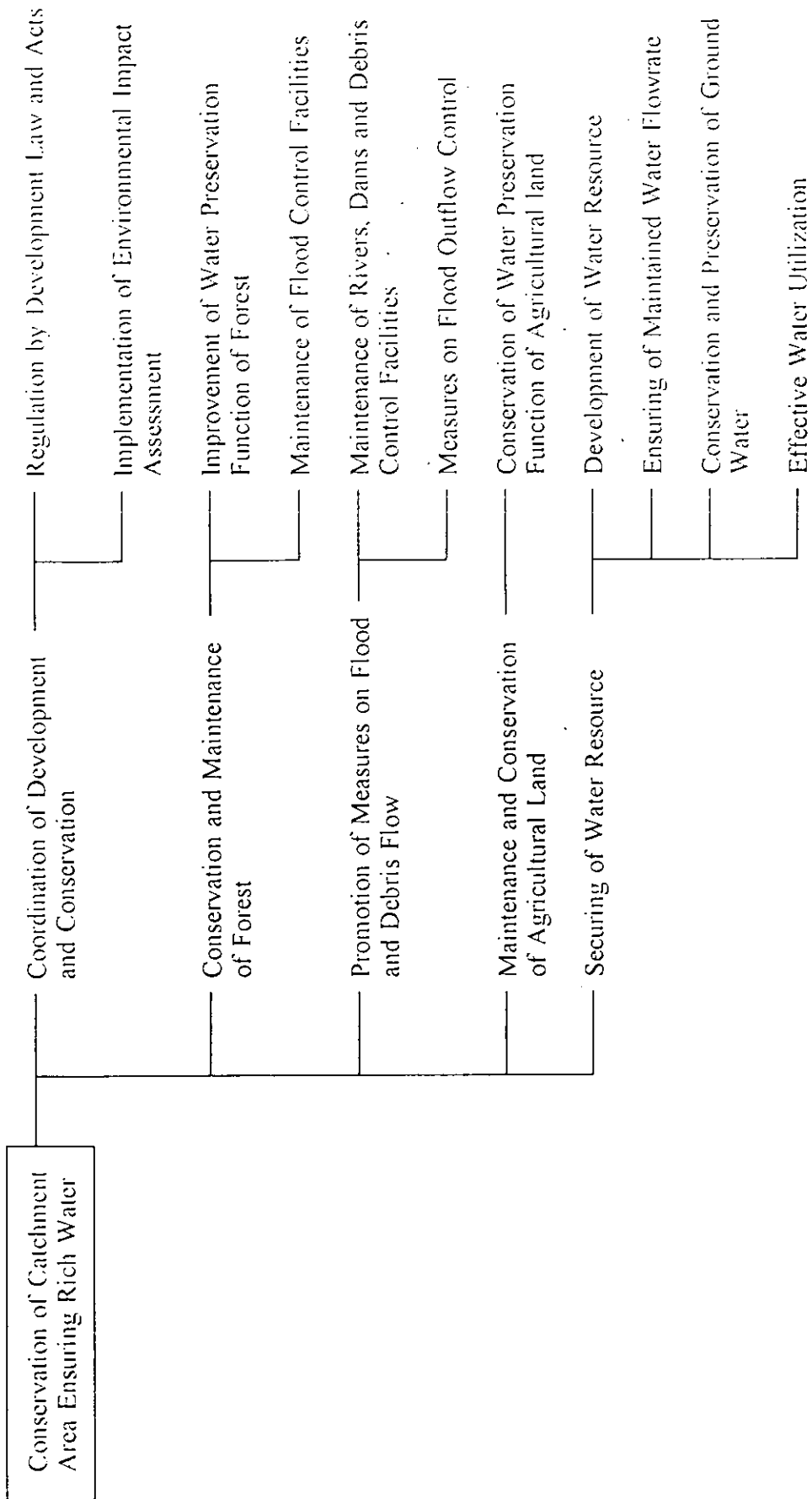
	(1) Nature of Waterside	(2) Water-friendliness of Waterside	(3) Conservation of Catchment Area
3. Suwa	<p>- to consider coordination of waterside of Suwa Lake's upper stream and landscape of mt. Yatsugatake</p> <p>- to consider conservation of marsh plant community of mt. Yatsugatake, p. Kirigamine and Takabotch Height as well as bioenvironment of the rare amphibian, living there</p> <p>- consider bioenvironment of dragonflies and others, peculiar to p. Kirigamine and Tateshina Heights</p>	<p>- to endeavor to conserve nature rich waterside of rivers flowing at the foot of mt. Yatsugatake and used as famous resort as well as to improve water-friendly facilities for its utilization</p>	<p>- to endeavor to maintain storage, filtration and other facilities for outflow control in catchment areas</p> <p>- to maintain forest, mainly red pine and larch, and diversify trees for higher water supply source preservation function</p> <p>- to consider well organized water circulation in urban areas</p> <p>- to consider surrounding natural conditions in water resource development as dam construction</p>
2. Suwa Lake	<p>- to endeavor to restore and create lake side for revival of Suwa Lake in the mid 60's as its prototype scene</p> <p>- to maintain and create lake shore plant community suitable for spawning and growth of fish</p> <p>- to maintain waterside with attention to bioenvironment of migratory birds such as swan and wild duck</p> <p>- to aim at "swimmable Suwa Lake" by means of water quality purification in collaboration with citizens</p>	<p>- to maintain waterfriendly facilities such as "welcome beach" utilizing lake water surface, lake shore</p> <p>- to maintain a walk way utilizing waterside space</p> <p>- to endeavor to maintain facilities supporting recreation activities such as fireworks and boat sailing at lake surface and lake shore</p>	
3. Kama nasi River	<p>- to consider bioenvironment of a char, bullhead and other fish</p> <p>- to consider bioenvironment of firefly widely living in the level land</p>		

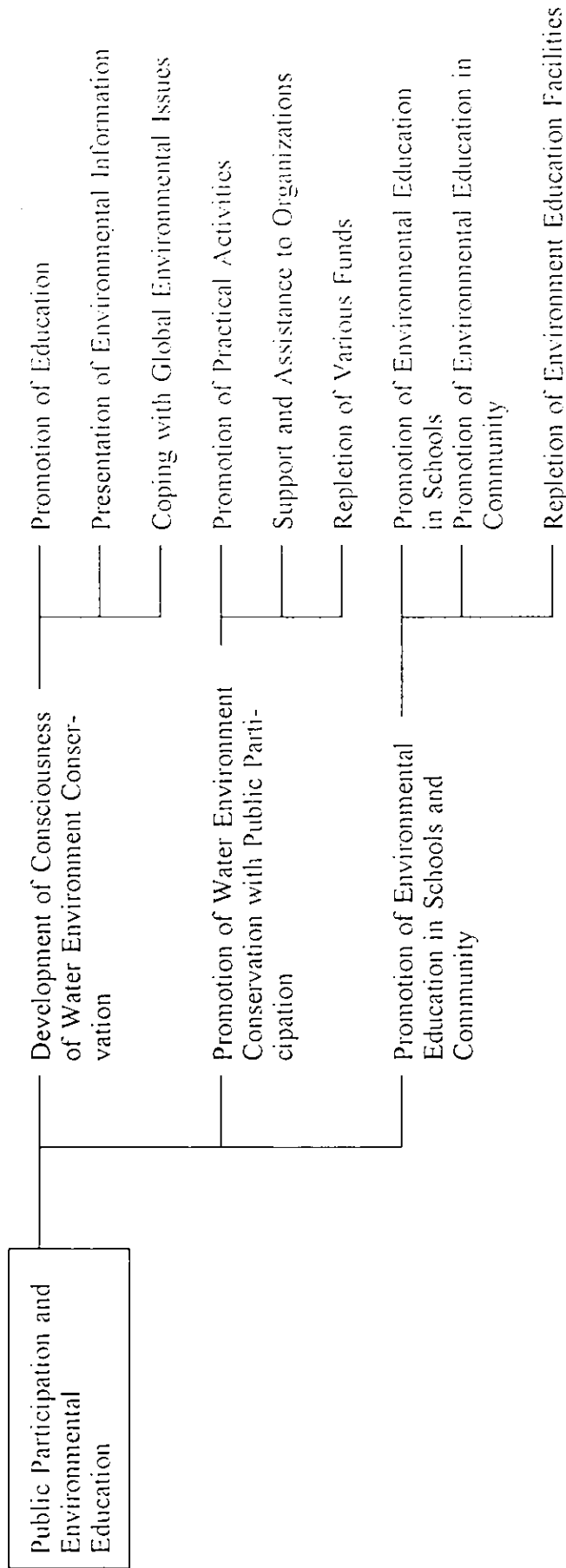












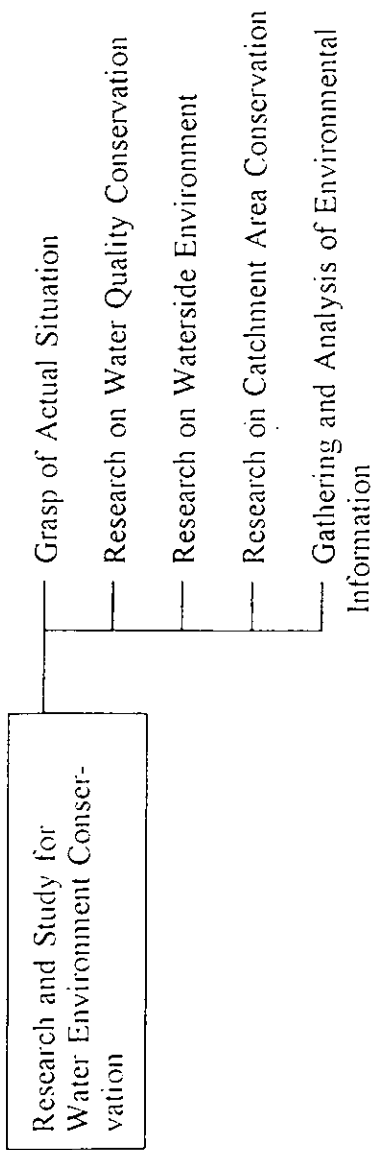


Fig. 5-2 System of Measures for Water Environment Conservation



## 6. Conservation of Drinking water Supply Source

### 6.1 Outline of System

In recent years an increasing attention is being paid by citizens of our prefecture to protection of drinking-water supply source from resort and other development in the upstream areas. To cope with the problem, of Water Environment Conservation Ordinance of Nagano Prefecture provides that the Governor designates areas required for conservation of drinking water supply source as "drinking water supply source conservation area" upon application or request of the mayors of the communities ("application and others") and obligates enterprises to enter preliminary consultation with the Governor in respect of the projects connected with golf course construction, location of final waste disposal, land transformation over 1ha and quarrying.

From the time of establishment of the Ordinance 29 areas have been designated as drinking water supply source conservation area in the prefecture, as shown in Tab.-6-1.

### 6.2 Concept of Area Designation

Areas to be designated as drinking water supply source conservation area are, in principle, selected by the mayors who submit application or request. However, as designation is made in a centralized manner by the prefectural government, basic concept of area designation was required. For this reason, in September, 1992 was published "Concept of Drinking water Supply Source Conservation Area Designation" which is used as reference when the mayors submit application and others.

- (1) Surface water (river water, infiltration water, lake water and dam water)  
areas where effluent may reach drinking water supply source without sufficient dilution  
(Fig. 6-1, 6-2)
- (2) Ground water (shallow ground water, deep ground water and spring water)  
areas where a separate act may affect drinking water supply source  
(Fig. 6-3)

When establishing areas the community which make application and others shall conduct preliminary research on topography, geology, water condition, and others for flexible selection depending upon actual conditions of the subject water supply source.

Tab. 6-1 Status of Designated Areas of Drinking-water Supply Source Conservation (as of November, 1997)

Wide Area	No. of Regions	No. of Water Supply Sources	Area (ha)	Name of City, Town, Village
7	29	36	2,287	22 Names

## 1. Concept

- (1) In respect of river water, the area is basically established in such zone of the catchment basin of a drinking-water intake point, in which effluent may reach the intake point without sufficient dilution, taking into consideration the intake condition, shape and flow of the river, water quality and other factors, situation in the catchment basin.
- (2) The above-mentioned concept is, in principle, applied to infiltration water, too.

## 2. Establishment of the area

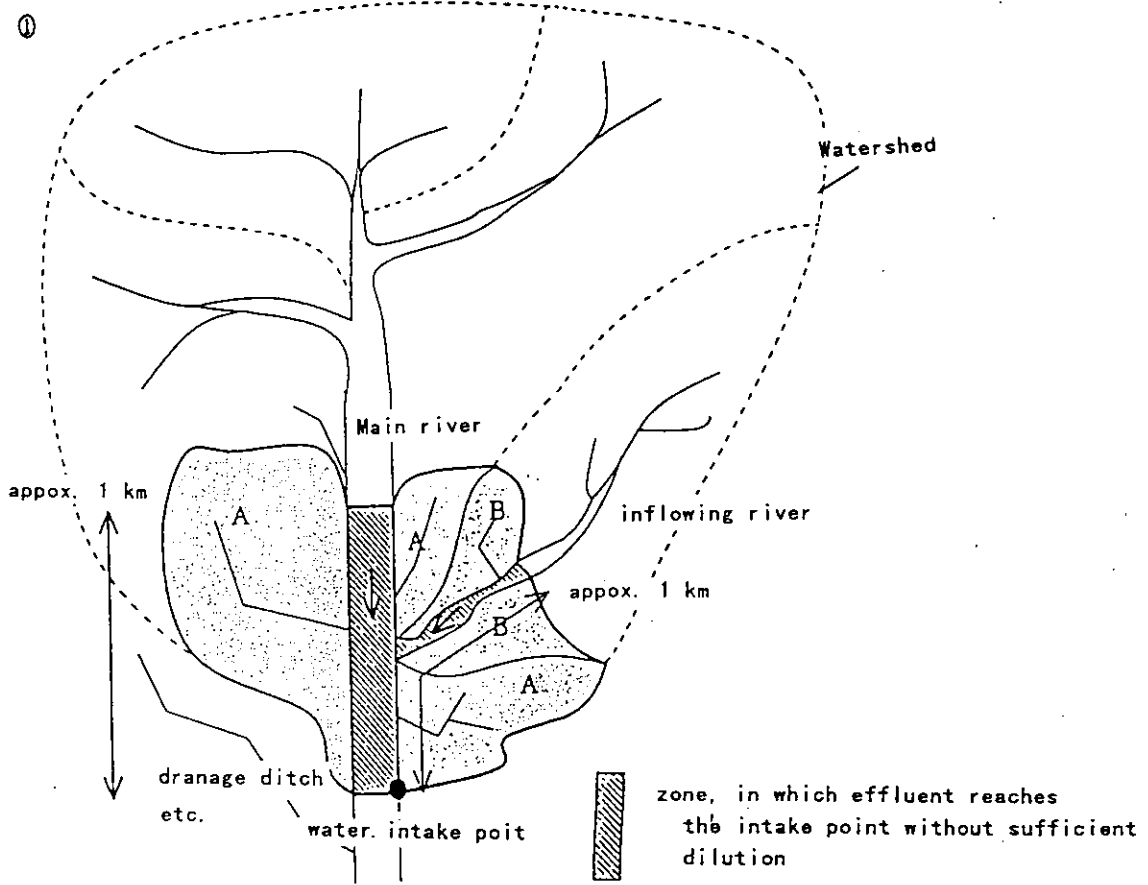
### (1) Range

The above "zone, in which effluent may reach the intake point without sufficient dilution" shall be a zone of direct catchment in the range of approximately 1 km upstream from the taking point (including inflowing rivers). However, this provision does not apply to rivers for which sufficient dilution water flowrate is not ensured.

### (2) Items to be considered

- water intake condition: intake position, intake quantity
- shape of river: width, depth, slope, form of watercourse, roughness of river
- condition of river flow, water quality: flow status, flow velocity, water quality
- condition of catchment basin: watershed, topography, water system, waterway, geographic structure, vegetation, precipitation, land utilization
- others

Concept of Area Designation (River Water, Infiltration Water)



- A: Area of direct catchment basin at aпроox. 1km upstream of water intake from main river (area of direct inflow of precipitation, effluent etc. to main river)
- B: Area of direct catchment basin at aпроox. 1km upstream of water intake from inflowing rivers (area of direct inflow of precipitation, effluent etc. to inflowing rivers)

(Note) The arrow shows diriction of river flow.

② In case of a river without efficient quantity of water for dilution

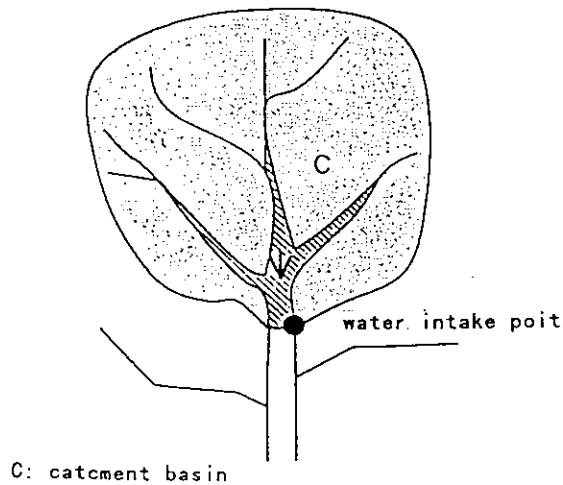


Fig. 6-1 Concept of Area Designation (River Water, Infiltration Water)

## 1. Concept

The area is basically established in such zone of the catchment basin of a drinking-water intake point on lakes and dams, in which effluent may reach the intake point without sufficient dilution, taking into river of lakes and dams, water quality and other factors, situation in the catchment basin.

## 2. Establishment of the area

### (1) Range

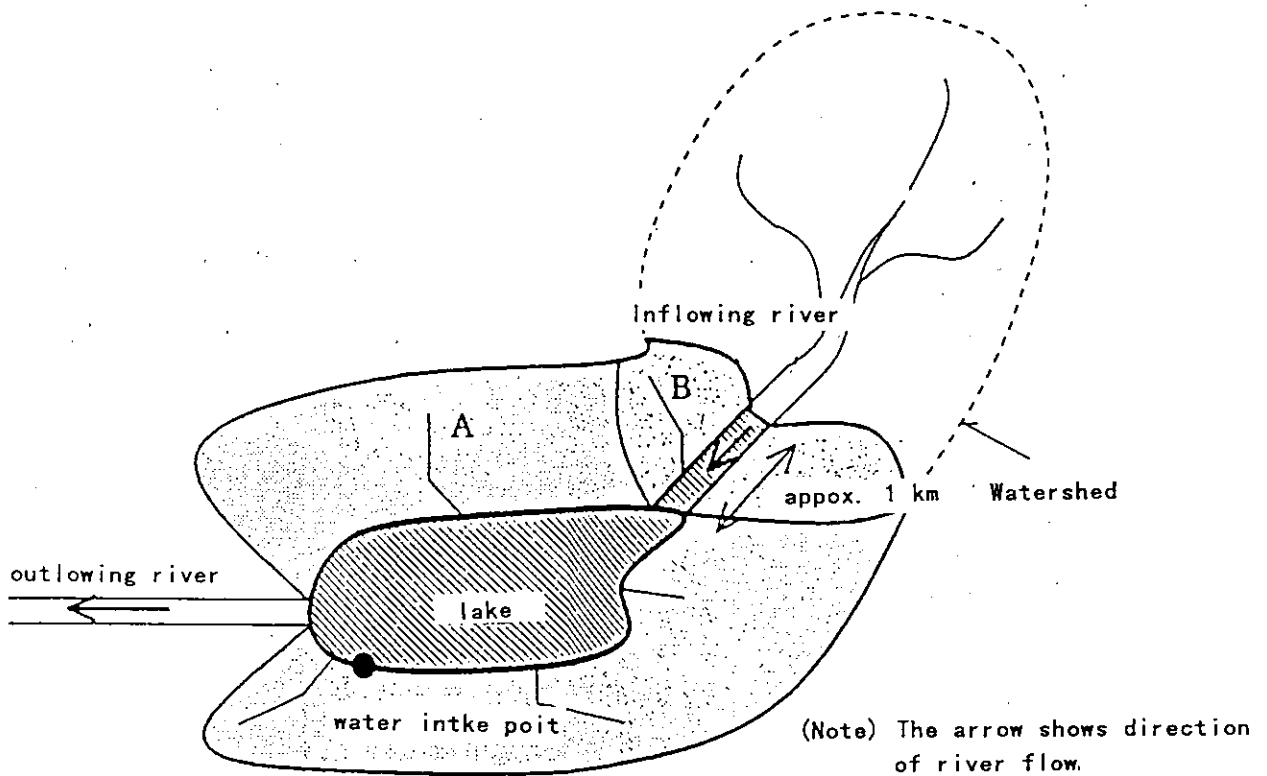
The above "zone, in which effluent may reach the intake point without sufficient dilution" shall mean:

- (a) a zone of direct catchment of lakes (dams)
- (b) a zone of direct catchment in the range of approximately 1 km upstream from the inflowing point to lakes and dams in respect of inflowing rivers. However, this provision does not apply flowing rivers for which sufficient dilution water flowrate is not ensured.

### (2) Items to be considered

- water intake condition : intake position, intake quantity
- shape of lake (dam lake) : area, depth, volume, shape of lake (dam)
- condition of lake (dam), such as water flow, water quality: inflow and outflow rate of water, water flow of lake (dam), water quality
- shape of inflowing rivers : width, depth, slope, shape of watercourse, roughness of rivers
- conditions of inflowing rivers, such as water flow water quality : flow status, flow velocity, water quality
- condition of catchment basin : watershed, topography, water system, waterway geographic structure, vegetation precipitation land utilization
- others

Concept of Area Designation (Lake Water, Dam Water)



A: Area of direct catchment basin on a lake (area of direct inflow of precipitation, effluent etc. to the lake)

B: Area of direct catchment basin at approx. 1km upstream of water intake from water inflow to the lake (area of direct inflow of precipitation, effluent etc. to inflowing rivers)

Fig. 6-2 Concept of Area Designation (Lake Water, Dam Water)

## 1. Concept

The area is basically established in such zone, where a separate action may affect on drinking-water supply source, taking into consideration the intake condition, condition of water take, situation around water source and preservation area, as well as depending upon the condition of separate water source.

## 2. Establishment of the area

### (1) Range

The above "zone, where a separate action may affect on drinking-water supply source" shall be as follows:

- a) in respect of shallow ground water, zone within a range of approximately 1 - 2 km from the water intake point, provided that, if there is a considerable watercourse such as an old river waterway, then it shall be in the range of 3 - 4 km upstream along the watercourse from the water intake point.
- b) in respect of deep ground water, it shall be in a range defined with consideration of preservation area such as watershed, topography, and geological structure.
- c) in respect of spring water, the range for shallow or deep ground water shall be applied depending upon condition of each water source.

### (2) Items to be considered

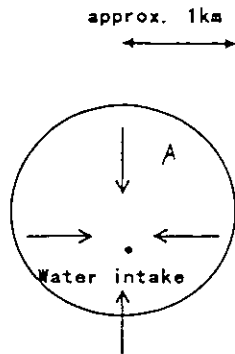
- water intake condition: intake depth, intake quantity, level lowering at water intake
- conditions around water source: characteristics and distribution of water bearing layer, flow direction of ground water
- condition of preservation area: watershed, topography, geographic structure, vegetation, precipitation, land utilization
- others

Concept of Area Designation (Shallow Ground Water, Deep Ground Water, Spring Water)

Illustrations:

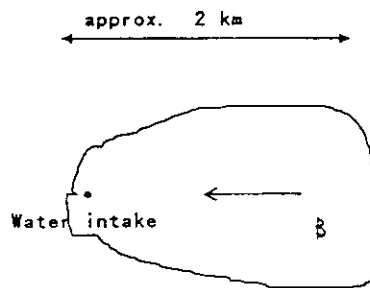
① In case of shallow ground water

a) without ground water



A: zone approx. 1km from water intake point

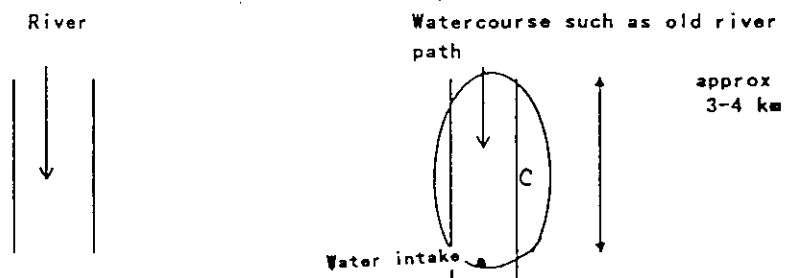
b) with ground water



B: Area at approx. 2km upstream of water intake.

However, in case of weak ground water flow due to, e. g. small ground surface slope, and with large amount of water to be intaken, downstream area of water intake point shall also be taken into account.

② In case of shallow ground water with considerable watercourse



C: Area approx. 3-4 km along the watercourse upstream of the water intake point

(Note) The arrow shows direction of river and ground waterflow

Fig. 6-3 Concept of Area Designation (Shallow Ground Water, Deep Ground Water, Spring Water)

## 7. Conservation of Lake Water

In our prefecture there are many lakes and marshes which form a rich natural environment, as well as are multipurposely used as water supply source. However, in some lakes, as the Suwa Lake, the process of eutrophication is taking place, and in 14 lakes for which environment standards are established the standard attainment rate (COD) is as low as 25.0%, which makes water quality conservation in such lakes very urgent issue. Furthermore, as unique environment of lakes and their surroundings is never met in rivers, the lake conservation is also needed.

The Suwa and Nojiri Lakes designated under Law concerning Special Measures for Conservation of Lake Water Quality (Clean Lake Law) are subject to comprehensive measures of water quality conservation, and similar measures are being taken in respect of the 3 Nishina Lakes ;the Aoki, Nakatsuna and Kizaki Lakes.

The outline is as follows:

### 7.1 Suwa Lake

Suwa Lake is the largest in our prefecture with an area of 13.3 sq. km and catchment area population of 180,000, being a place of historical industrial activities, and thus representing our prefecture. In the past the Suwa region surrounding the lake was famous as the biggest producer of silk, and afterward - for fine mechanics such as watches and cameras, which together with its landscape worn by the lake and mountains around made the region called "Oriental Swiss". People loved the lake, swimming there in summer and skating there in winter.

From the mid 50's, however, with the intensive economic growth of our country the water pollution has been progressing, which has led to increasing eutrophication such as water bloom with abnormally grown phytoplankton - "Microcystis" in the summer period of the year.

The prefectural government, from the commencement of dredging of benthic mud in 1969, has conducted measures such as improvement of sewerage system in the catchment area and strengthening of factory effluent control. After the lake was designated by the Clean Lake Law, the lake water quality conservation planning was established to promote further comprehensive measures of conservation. As a result of this, the percentage of sewered population in the catchment area has reached 81% and water quality shows a trend of improvement, as shown in Fig. 7-1, but environmental quality standard has not yet been ensured, as well as water bloom is continuing taking place. However, in the situation when improvement of water quality in the country's 10 designated lakes is going on in the not-so-good manner, it may be said that the lake enjoys relatively high effect of the taken measures.

The waterside maintenance project which provides the maintenance of the waterside divided into 8 zones is started to improve it taking each specific environment and utilization form into consideration, which, together with water quality conservation, is to realize good water environment conservation.



## 7.2 Nojiri Lake

Nojiri Lake is located on the northern part of the prefecture, on the border with Niigata Prefecture, having lake area of 4.56 sq. km. Surrounded by Mt. Myukou, Mt. Kurohime and other grand mountains and tablelands, it is a nature-rich lake in the Joushin-etsu National Park. The water quality is relatively good, being used for drinking water supply to Nagano city, some enjoy waterbath in it in summer.

In late June through July, 1988 due to abnormal growth of phytoplankton - Urogrena - the first freshwater red tide in Nojiri Lake occurred. The lake surface was colored in red-drown, offensive odor floated in the air around. This triggered taking measures for water quality conservation, which has led to primary treatment of household effluent, working-out of planning and commencement of sewerage system construction and designation by Clean Lake Law.

At present, in accordance with Law concerning Special Measures for Conservation of Lake Water Quality, are being conducted improvement of the sewerage system as main program, construction of agricultural effluent treatment facilities, planning of the waterside maintenance and other programs. As a feature of nature-rich lake, the weight of pollutant load from natural system is very high, so it is not easy to improve lake water quality, though trial is made for water purification using water plants. The water quality for the last several years shows a constant level by COD and decreasing tendency by T-N and T-P.

## 7.3 Nishina Sanko Lakes

Nishina Sanko Lakes is located in the western-northern part of the prefecture, being a collective name of Aoki, Nakatsuna and Kizaki Lakes, lying along Fossa Magna which crosses Honshu Isl. from south to north. The collective name was given to the three lakes, because in the past a powerful family Nishina ruled this region. Some call these lakes "mirrors of the north Alps", as the lakes reflect figures of the north Alps, standing on the west of them.

Nature around is rich, having similar environment to Nojiri Lake, the water quality is relatively good in all of the 3 lakes.

About at the same time as Nojiri Lake, in summer of 1988, a freshwater red tide by phytoplankton - Peridinium - occurred in one of the lakes - Kizaki Lake.

Nishina Sanko Lakes have not been designated under Clean Lake Law because of the water utilization purpose, lake area and other reasons. The prefecture established own "Water Quality Conservation Planning for the 3 Nishina Lakes", in accordance with which taking due measures in collaboration with one city and one village consisting the catchment area of the lakes. Coordinated with the concept of "Water Environment Conservation Comprehensive Planning of Nagano Prefecture", this planning takes the rich natural environment into consideration and provides for organization of "Nishina Sanko Lakes Water Quality Conservation Measures Meeting" from public bodies such as communities self-governed, organs, fishermen's association, sight-seeing association and others for conducting practical activities in the tight contact with the local community.

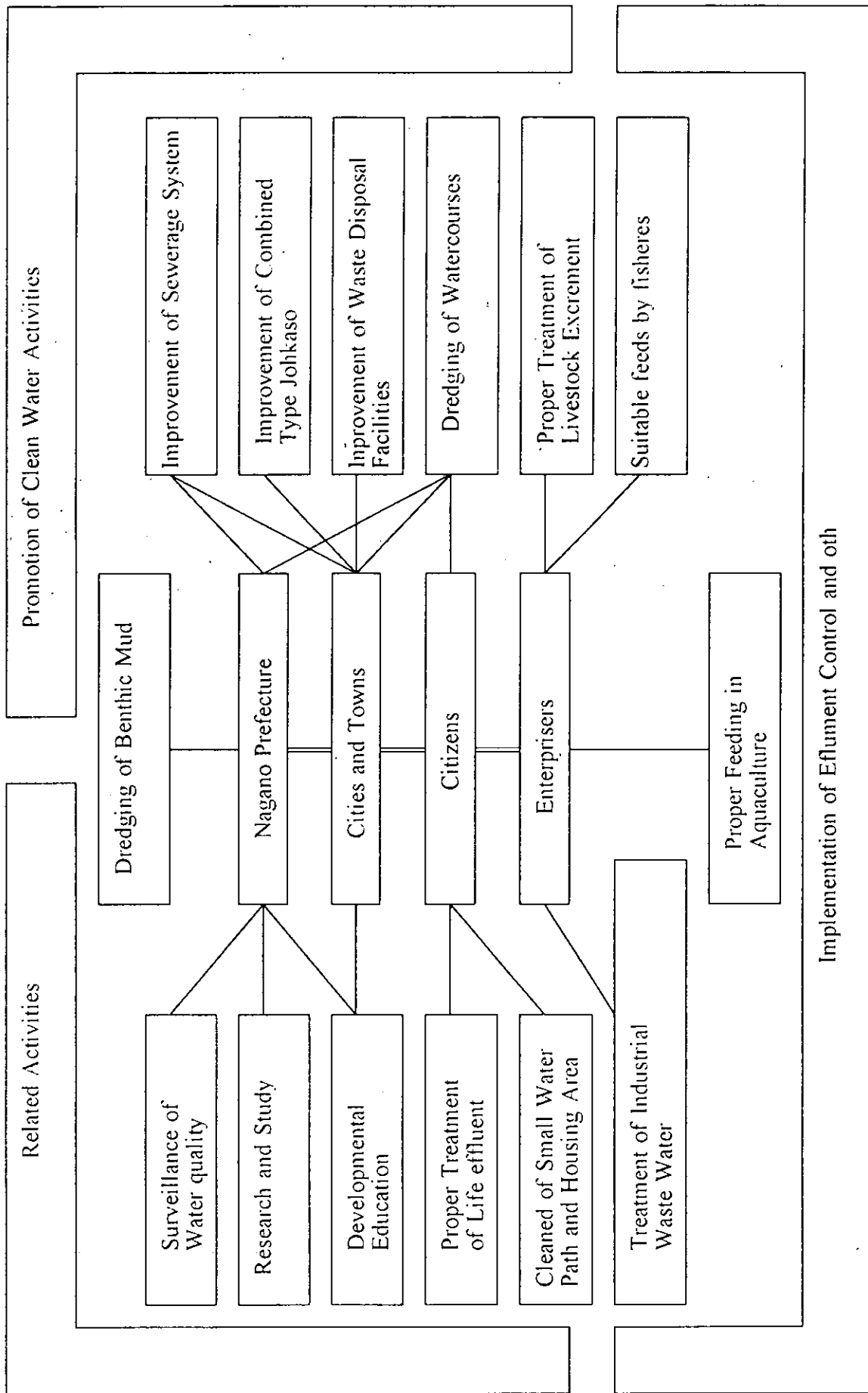
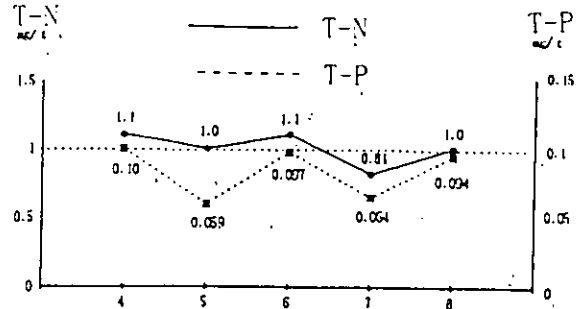
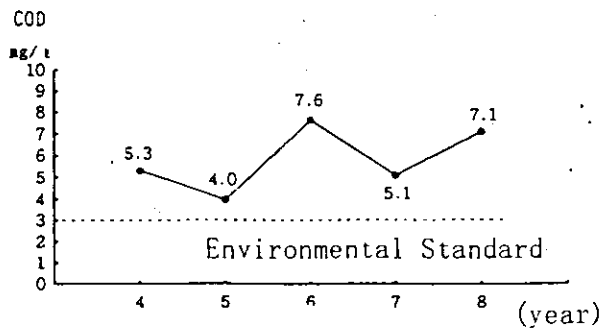
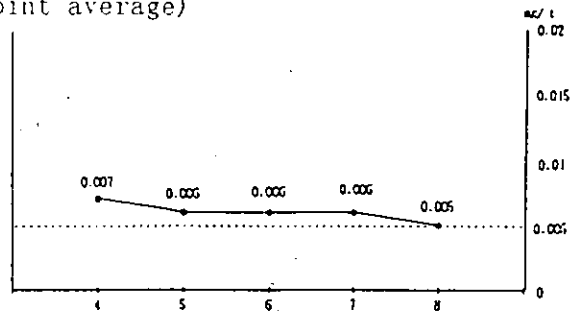
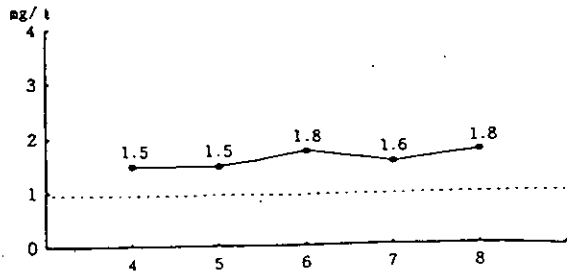


Fig.7-1 Systematic Scheme of Lake Water Quality Conservation Planning (Suwa Lake)

Suwa Lake (3 point average)



Nojiri Lake (3 point average)



Kizaki Lake (2 point average)

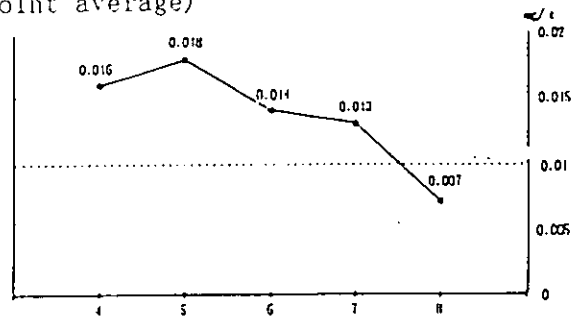
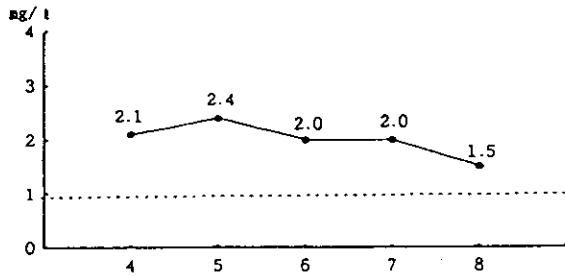


Fig. 7-2 Dynamics of COD, T-N and T-P in Major Lakes

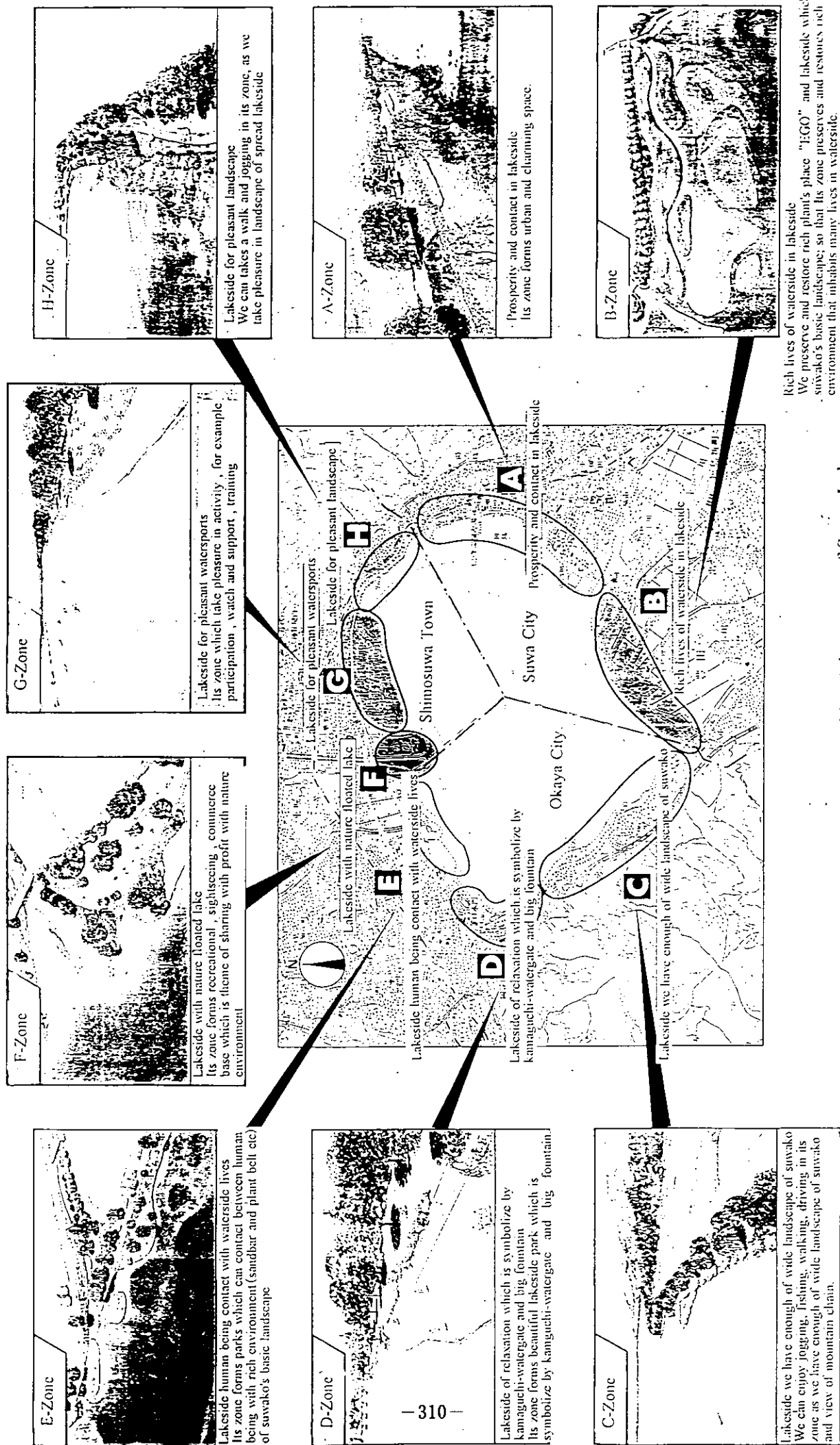


Fig. 7-3 Outline of the Waterside Maintenance of Suwa Lake

## 8. Further Steps of Planning

At present in our prefecture "The Second Water Environment Conservation Comprehensive Planning" and "Lake Water Quality Conservation Planning in Suwa Lake" are being worked out. These plans, in addition to the ongoing measures, shall provide for 1) measures for preventing pollution by unspecified pollution source in the agricultural land and urban zone, 2) guaranteed good water circulation, 3) water environment conservation activities by citizens' initiative and other measures.

Pollution by unspecified sources imposes considerable pollution load on rivers and lakes, for example, water quality of the road effluent in the beginning of rain shows a COD value of 40 - 60mg/l. Although no effective method has not been established as of today, urgent measures have to be taken, additionally to that being conducted in respect of industrial and household effluent, as sedimentation of pollutants inflows at the time of rain may cause a serious problem.

Further, with increasing urbanization, an original water circulation when precipitation slowly penetrates and springs out is being damaged, which leads to a fear of decrease of ground water, spring water and river flow rate, as well as water quality deterioration resulting from it. Thus urban planning and river maintenance which take penetration factor into consideration. Practice of effective water usage - water saving privately and in business establishments is also important to keep water circulation in a good condition.

Consciousness and action of separate citizen of the prefecture are as well indispensable for water environment conservation. In the recent days observation and study on aquatic organism, clean-up movement and other practical activities are becoming more frequent. But so frequent are the cases of garbage dump into the rivers and, as children, compared with the past, have less chances to be in touch with water, it is needed to widen the possibility of their learning through experience, ensure the relevant facilities and train the instructors. It is desired to spread a method to carry out practical activities in the community with the corresponding action target and self-evaluate before going to the next stage.

Besides the above, it is planned that more comprehensive measures for water environment conservation will be taken, incorporating culture by water, exchange through water and other additional aspects.