

SECTION 2

**LAKE MANAGEMENT FROM THE
PERSPECTIVE OF LOCAL RESIDENTS
AND INTEREST GROUPS**

SECTION 2.1

UNDERSTANDING THE STATE OF THE LAKE ENVIRONMENT FROM A SOCIO-CULTURAL PERSPECTIVE - AN EXAMPLE FROM LAKE BIWA, JAPAN

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2.1.1 Legends and Lakes

Once upon a time, there was a young fisherman who lived on the shores of Lake Biwa. One day, on the way back from fishing at the lake, he found some small children teasing a snake. He angrily scolded the children and told them they should never treat living creatures so cruelly. He then took the snake and let it go.

After a few days, he heard knocking at his door. He opened the door to find a beautiful young woman. She said, "Good sir, I have lost my way. Please can you give me shelter for the night?" At first, the fisherman, who lived alone, hesitated but her beauty overcame him and against his better judgment he allowed her to stay. One night turned to two, two to three and still she did not leave. She cooked and took care of him. They fell in love and got married. After a while a baby boy was born and his wife asked him never to look in on her while she was feeding the baby in the nursery room. The fisherman, however, could not resist the temptation. One day he peeped into the room and to his great surprise he found a huge snake cradling the baby.

It turned out that his wife was the lake spirit and that her usual form was that of a snake. Changing into a lady, the lake spirit had come to the young fisherman to thank him for saving her from the children. Now that her real form was known she had to return to the lake. With great sadness she departed leaving one of her eyeballs as food for the newborn baby. Unfortunately, some time later the fisherman accidentally lost the important eye ball. He went to the lake and asked the lake spirit for another. She gladly gave it to him. But without eyes she could not see the sun and plunged into darkness she would not be able to keep track of the time. So in return for the eye she asked that the father and the son ring the bell of the Mii Temple every morning and every evening. Even today the bell of Mii Temple rings twice a day.

This legend originates from the middle ages and is well known throughout Japan.

What sort of message does this story have for contemporary times? At least we can say that people around the lake once had a motherly image of the Lake Spirit and that they communicated with the spirit through the toll of the bell.

Man's image of the lake, however, is not always one of the caring mother. In other stories Lake Biwa is portrayed as a harsh and uncontrollable entity. Such stories are not limited to Japan. Similar fairy tales or legends are told in many Asian and European countries. Although from a scientific viewpoint such stories are without factual base they do help clarify our understanding of how people have traditionally viewed lakes and other natural phenomena. They also reflect certain cultural and natural characteristics.

2.1.2 How and Why?

This paper aims to identify the factors which reconcile the cultural and historical characteristics of the relationship between man and lake environment, and people's attitudes and perception of that environment. The paper also identifies the need to validate lake environmental management policy in the context of local socio-cultural settings.

It is important here to distinguish between two key issues related to lake environment management, namely "How?" and "Why?". The former focuses mainly on techniques and methods for the "sound management" of the lakes based on the scientific research and methodologies. These processes are relatively easy to communicate among people who are educated in the formulation of modern technological and scientific concepts. The latter, on the other hand, tries to find out why particular aspects or certain problems are selected from a huge number of possible standpoints and why a particular problem is considered to be a problem in a given social and cultural context. In other words, "Why?" is strongly concerned with the ways of thinking, experiences, value systems and behavioral patterns of ordinary people in relation to the notions of a desirable environment and lifestyle. It is recommended that the framework for a sound environment should be determined by the local people because they are most affected by changes in the lake environment. Policy-makers, scientists and planners should support this process.

2.1.3 Surveys of the Lake

People who live around a lake generally feel some kind of affinity (commitment) with the lake environment. Identifying the pattern and structure of this relationship from local production patterns and living conditions should be a basic requirement when pursuing lake environmental management plans. However, many such plans seem to jump too quickly to the "How?" stage and set out to define rational, scientifically based objectives. The "Why?" stage receives little attention and even worse the understanding of the problem and proposed solutions are often imported from another country without an assessment of their appropriateness. This occurs in both developing and developed countries. Some Chinese scientists referred to this problems as follows;

"...Countries and areas of differing development levels have different social and economic conditions, therefore there are different balances among different water-use purposes. China is a developing country and is facing increasingly obvious contradictions between demand and lack of water resources during economic development, and limited funds for treatment measures....."(Xiangcan J., et al. 1990, pp103).

Every lake possesses its own ecological conditions, and people have utilized or developed the lake environment in relation to its ecological and historical conditions. It is essential, therefore, to collect basic information about the lake's socio-cultural conditions and local perceptions as well as natural conditions. There are two main ways to collect socio-cultural information. One is to utilize historical documents, administrative materials and statistics from published sources. The other is to gather first-hand material on living conditions, attitudes and/or desires and possibly conscious and unconscious knowledge about nature. The author of this paper and a group of anthropologists, sociologists, geographers, historians and folklore specialists conducted such field research at Lake Biwa and discovered several important aspects of the Lake's history (Torigoe and Kada, 1984, Torigoe 1989). This research was the first of its kind in the Lake Biwa area. It is relatively simple to undertake and does not require costly machines nor big organizations. The only necessary conditions are an awareness of the importance of this type of work and the questions it addresses, and a deep curiosity about phenomena and behavior otherwise taken for granted. As Kenneth Ruddle (based on years of experience of resource management research and practice) states;

"Only a small part of what is known about the nature, utilization and sound management of renewable natural resources in non-Western societies has been documented. Yet the users of such resources are an important and sometimes the only source of information. Although many traditional empirical models of renewable natural resource use are capable of further refinement and improvement, they can still serve effectively as a basis for new, low-cost investment schemes in both tropical and temperate lands and waters."(personal communication).

These traditional empirical models, however, perhaps have another more important role. That is they provide increased opportunities for local people to enhance their awareness of the implications of everyday practices on living environment systems. This awareness and the new information source it produces is an important input to the lake management process. As the American physicist, Fritof Capra, says;

"we need to combine our rational knowledge with an intuition for the non-linear nature of our environment. Such intuitive wisdom is characteristic of traditional, non-literate cultures, in which life was organized around a highly refined awareness of the environment. In the mainstream of our culture, on the other hand, the cultivation of intuitive wisdom has been neglected. (Capra F., 1982, pp25)

Modern societies place too much faith in scientific knowledge and rational and/or efficient decision-making. But that very knowledge in most cases is only a partial and limited understanding of the deep and stochastic nature of the social and environmental system.

2.1.4 Historical Changes in Lake Environment Activities

Each lake has a varied relationship with people and society. It provides, for example, fishing opportunities, a source of drinking water and a route for transportation. Taking the example of Lake Biwa, let us next overview the historical changes in the relationship between lake and people.

2.1.4.1 Utilization of Aquatic Resources

(A) Fishes and Shells

In ancient times, the first and foremost role of lakes was probably resource supply for the subsistence of the local population. Around 10,000 years ago, when people first settled near Lake Biwa, the staple diet included lake fish and shells, nuts, water birds and game. It is highly likely that the people who utilized the local fauna and flora gradually acquired detailed knowledge about the availability and possible utilization of those resources. For example, quite recently, evidence from a shell mound found at the bottom of Lake Biwa showed that people at that time ate a variety of food according to the seasonal changes, Shijimi shell in spring, fish in summer, nuts in autumn, and ducks and some game in winter. This tells us that the lives of people in those days were much more closely tied to the seasonality of nature than they are now. In addition, only large Shijimi shells were discovered (no infants). There may be a number of possible explanations for this but it does seem to suggest that the people may have been concerned about resource preservation and thus did not gather the infant shells. Such a system of aquatic resource utilization continued into the agricultural stage. In the case of Lake Biwa, after rice cultivation was introduced, resources obtainable from the lake and surrounding environments continued to be utilized right up to modern times.

Table 2.1.1 outlines the key changes in the environmental activities at Lake Biwa from the ancient to modern times. In recent years, the relative importance of lake fishing activities in relation to the total economic activity has been declining. The number of fishermen declined from about 10,000 in 1900 to about 3,000 in the 1980's. Figure 2.1.1 shows the recent changes in total amount of fishery catch. The amount of fish caught has slightly increased whereas the amount of shells gathered has declined since the 1960's. In addition to the quantitative changes, fishing at Lake Biwa has experienced qualitative changes. For example, recently the emphasis has been on catching certain types of fish in order to stock rivers all over Japan for sports fishing rather than food (this is especially the case for the Ayu fish, whose spawning grounds in many rivers have been environmentally degraded).

(B) Evaluation of Eutrophication and the Use of Water Plant and Sediments

After the introduction of agriculture farmers began to use water plants and muds from the lake bottom as fertilizers. In addition some reeds and water plants were utilized as roofing or screens for houses or certain types of fixed gear for fishing. However, these have now almost been completely replaced by synthetic materials.

It is not known when the practice of using plants and lake muds as fertilizers first started but at least in Edo period we can find written documents referring to the utilization of these lake aquatic nutrients. This continued until the 1960's when artificial fertilizers began to be used in the area. In addition to the lake water or lake muds, domestic effluents from the kitchen or human nightsoils and cattle manures were also used as fertilizers. This practice is thought to have helped prevent the eutrophication of Lake Biwa itself. This is not to say that eutrophication is necessarily bad. In fact in the context of water resource utilization in a subsistence economy, a degree of eutrophication may be desirable. Jin Xiangcan states:

"Euthropic is not always harmful and dystrophic is not always beneficial, especially in developing countries where protein demands are increasing and (such as when producing the aquatic products) water bodies prefer relative euthropic to dystrophic. (Xiangcan J., 1990, pp104)

(C) Social Institutions for Water Space Utilization

Aquatic resources are limited. Consequently, people living in the vicinity of seas, lakes and rivers tend to invent certain customs or institutions to control aquatic resource use. In this context the term "Water Tenure" can be used. This concept has been recognized by a number of scholars (Ruddle and Johannes, 1985). Before its introduction to water resource thinking most scholars thought that water space was free in both access and utilization terms. A great deal of research has been carried out on the subject of sea tenure. However, work on lake and river tenure remains in the initial stages with very little information available. The concept of lake tenure is however vitally important to the investigation of the relationship between lakes and people.

Lake Biwa is one of the few cases where documentation is available and some of the customs are still on-going concerns for the local people (Kada, J., 1984). The earliest documents concerning fishing in Lake Biwa date from the 9th century A.D. when the Emperor authorized a wier be constructed at the point where the Seta River flows out of the lake. Fishermen were given permission by the Emperor, local aristocrats, shrines and temples to exploit the fishing grounds.

At the start of the feudal period fishing rights were given to each local community in exchange for taxes. Although there were some variations according to the type of fishing, these taxes were usually levied on fishing villages by the administrative units (Shogunate or local fief). Inside the village, each fisherman or fishing group were

allotted the rights by the village council. The nature of fishing rights in Lake Biwa in the Edo Period was similar to a "right in rem" which allowed exclusive rights as well as several methods for their transfer; sale, rental, pledging and/or inheritance. Similar principles were applied in the relation to the use of water weeds, bottom muds and reeds exploitation. This means that lake resources were managed by each village community in the same way that the village land was managed. After the modernization of Japan, when the national Fishing Law or Fishing Association Law was established, the basic idea of local management of fishing resources was inherited.

2.1.4.2 The lake as a Water Resource

Since ancient times human energy has been used to take water from Lake Biwa for the irrigation of paddy fields. Initially the irrigated area was limited to the paddy directly facing Lake Biwa and the canals. In the 1910's automated irrigation pumps were first utilized around the lake and in the 1960's lake water was being pumped to around 30% of the paddy fields in Shiga Prefecture (Fig. 2.1.2). As far as industrial water is concerned, the textile industry began to locate at the shore of the lake in the 1920's and benefited greatly for the abundant supply of water of appropriate quality for artificial textile production. In the 1960's, when Japan entered a period of rapid economic development, the role of Lake Biwa as a water resource was identified by local administrators and the general public. Domestic water use was switched from well or river water to tap water systems (Fig. 2.1.3), and per capita water use increased ten times from the early 1960's to the 1980's. Fig.2.1.4 shows the increases in the area where the population relies on water from Lake Biwa for drinking usage from the 1960's to the 1980's. The water supply systems have been geographically widened and now even people living far away from the lake rely on it for water. The population relying on Lake Biwa water accounts for more than 13 million people in the Western part of Japan. Their attitude towards the lake, however, is one of indifference and lack of concern. This is one of main problems facing the management of Lake Biwa and some programs are needed to enhance public awareness of the importance of this water resource.

2.1.4.3 Lake as a Pollutant Reservoir

There are three main types of pollution threatening Lake Biwa's water quality. First is pollution by toxic substances. Second is pollution by eutrophication, and third is

pollution by waste or garbage. Pollution by toxic substances has tended to be very localized although recently the use of chemicals in agriculture and at golf courses has become more widespread. The use of toxic substances can be considered a "civilization" specific problem. Pollution caused through eutrophication and waste, on the other hand, can be described as "culture" specific problems. Eutrophication means that the nutrients originally necessary for the growth of organisms are present at levels over certain acceptable standards. The standards are determined by human values which are in turn determined by the culture. Waste is created when a thing is considered as unnecessary during a process of production or in life in general. An empty can can be a resource when it is used as a water cap in an African village or when it is recycled. But it is waste when discarded by visitors to the lakeshore.

According to a survey in the surroundings of Lake Biwa, those who said "the lake has become dirty lately" meant mainly that waste in the lake has been increasing. We can find waste everywhere along the lakeshore. The things that are considered waste include not only the recent industrial products such as empty cans and polystyrene foam but also water plants which were once used as fertilizers and ditch reed which was used for roofing. This tells us that the value we place on things is not static but constantly changing,

Unfortunately as the amount of water use increase so does the amount of effluent entering the lake. Accepting this effluent is also a role of Lake Biwa. One simulation showed that seventy percent of the nutrients flowing into Lake Biwa are deposited at the lake bottom, and only thirty percent flow downstream. Most of the sewage treatment plants constructed to prevent eutrophication are near the lakeshore. A cycle has developed whereby the water supply department of the local government draws more and more from the lake and the sewage treatment department has to construct more sewage treatment plants. Both are following rational judgments based on the social mechanisms involved. The consequence of which is the creation of more effluent and the further eutrophication of Lake Biwa.

2.1.4.4 Role as a Traffic Network

The significance of the lake as a traffic route has been recognized from ancient times: canoes were found in remains from the prehistoric age which suggests that the lake was utilized as a traffic route. Historically, Lake Biwa was an important route for the transportation of people and goods. The interchange of goods between the northern and southern areas Japan was supported by a route from the Japan Sea

via Lake Biwa to Kyoto and Osaka. In the Edo era it was estimated that there were as many as 3000 ships transporting goods on the Lake. Agricultural products and sea foods from northern Japan were transported to Kyoto and Osaka, while finished goods such as fabrics, mosquito nets, and ceramics went in the opposite direction. The role of Lake Biwa as a transportation route disappeared completely after motorization in 1960s. The only traffic on the lake now consists of sightseeing and leisure boats.

2.1.4.5 Generating Electricity

Hydropower in Japan began in Kyoto in the 1890's. Kyoto used water from a canal connected to Lake Biwa to produce electricity for the operation of the street car system and to support industrial development. At the start of the 20th Century additional hydropower generation plants were constructed in Uji and elsewhere. These plants are still in operation. However, Lake Biwa's role as an energy supply source declined in significance from the 1960's onwards with the advent of major dam construction programs in the mountainous areas of Japan. Few local residents are aware that Lake Biwa is being utilized for hydropower generation.

2.1.4.6 Scenic Beauty

Lake Biwa once represented a place of beauty and mystery for the people of Kyoto and has been the theme of many Japanese poems. One such poem is "Ausaka o uchiidete mireba oushinomi, siramomen banani namitachiwataru" (After passing over Ausaka Hill, I can see the beauty of the lake shore white as cotton flower). It was only after the eight beauty spots in Omi Province (the old time provincial name for the Lake Biwa area) were designated that the scenic beauty of Lake Biwa became known to the majority of Japanese. Color prints of the eight beauty spots in Omi Province were mass-produced in the middle of the Edo era. More recently, people have tended to prefer the beauty of the mountains and the sparsely inhabited areas to the original Omi beauty spots. Lake Biwa nevertheless has retained its scenic value and the first sight-seeing boats appeared at the beginning of the 20th Century. After some ups and downs in the history of tourism at the lake, at present, about one million people utilize the sightseeing boats annually.

For the local population familiarity with the scenery seems to breed complacency. It tends to be travelers and newcomers that recognize the scenic value of Lake Biwa. The increase in water front development in the 1980's, however, did serve to bring the issue of preserving Lake Biwa's scenic beauty to public attention.

2.1.4.7 Leisure Activities

Leisure in this section refers to swimming, yachting, boating, sports fishing activities and the like. The first bathing spot at Lake Biwa was established in the 1920's. Lake Biwa was important for the people living in the Kinki District as the place for bathing and swimming. Yachting and boating also began in 1920's. As water leisure activities diversified in the 1980's, the lakeside at holiday periods became more crowded with people enjoying yachting or surfing. Also in line with the current trend of resort construction in Japan, there is strong pressure for the construction of marinas and hotels resorts in the lakeside area. This resort construction boom, however, may result in some destruction of the living environment: traffic jams, scattered waste and damage to fishery have become serious problems in some areas.

2.1.4.8 Fear of Flood

Water from almost all of Shiga Prefecture flows into Lake Biwa. There are as many as 100 rivers flowing in whereas there is only one river flowing out, the Seta River. Heavy rain in the rainy season or from typhoons can suddenly raise the water level of the lake, causing flooding over fields and houses at the lakeside. This is called "Mizukomi" and is greatly feared by the local inhabitants. According to records of a village in the Edo era, "Mizukomi" occurred on average once a year. The highest water level ever recorded was +3.76 meters in 1896, when the present Otsu City and other towns in the lakeside such as Hikone and Nagahama were flooded and about 20 thousand hectares of ricefield were damaged. To prevent damage from flood, the villages in the Edo era prepared flood defenses, stored materials to fight the flooding and monitored the state of the banks on rainy nights. When they thought that the bank was in danger, they rang an alarm bell to call all adult men aged 16 to 60 years from the village to try to protect the bank. For the distribution of boiled rice and for the support of people whose fields or houses were damaged, Shasoumi (corresponding to the present mutual aid insurance) was offered. The procedures, expenditure and construction work necessary for repair of the bank were supported at times by the superior administrative organs but were mainly the responsibility of the villagers. The villages which often suffered flood damage cooperated together to protect against flooding, for example, by dredging the Seta River.

From the Meiji era onwards, prevention of flood damage has been one of the main

concerns not only of the inhabitants in the lakeside but also of those living in Osaka and other downstream areas. They dredged the Seta River, strengthened riverbanks and constructed dams to control the water level (Nango Araizeki). Fig. 2.1.5 shows the change of the water level of Lake Biwa in the past 100 years, suggesting that the danger of flooding was reduced dramatically after the Nango Araizeki was constructed.

2.1.4.9 Religious and Symbolic Meanings

As mentioned at the beginning of this paper, the legend of the Spirit of Lake Biwa is known throughout Japan. The Mii Temple in the story is the main temple of the Jimon sect of the Tendai, an important sect of Buddhism, and the legend suggests that the lake spirit and man communicated with each other via the bell of the temple. The head temple of the Sanmon sect of the Tendai, another important sect of Buddhism, which has often feuded with the Mii Temple, is located on Mt. Hiei in the south of Lake Biwa. One of the teachings of the Sanmon sect is that the lakewater goes up Mt. Hiei and then comes down back again to the lake. This idea may reflect the notion of the transmigration of souls. Lake Biwa is a kind of holy place in Tendai teachings. Lake Biwa, like religion, holds a symbolic meaning for the people of Shiga Prefecture. It is a symbol of their unity (all rivers in Shiga lead to Lake Biwa) and as that symbol has become increasingly threatened by environmental problems the unity of the local population has increased. The symbolic meaning of the Lake has recently gained greater significance in the media, school education and administrative campaigns.

2.1.5 Appropriate Management

An old man living in a village near the lake, my mentor, often warns me that the relationship between the local inhabitants and the lake have not always been harmonious nor beneficial. This suggests that management of water resources which only aims to promote convenience for human beings may face significant problems in the future. Water not only fulfills basic needs but also poses considerable dangers.

In the context of Lake Biwa, the water supply and sewerage system has in itself contributed to the eutrophication of the Lake. The system has broken the link between human-consciousness and the lake and increased reliance and belief in technology. The lake as an appropriate source for public water supply, however, is not necessarily appropriate for fishery. All of the functions of the lake (which are often conflicting) have determined the present state of the lake and will likewise determine its future.

Whether the resources of the lake should be managed by the residents themselves or by national or administrative organs has been the subject of some discussion over the last 10 years or so. It is not a matter of two mutually excluding alternatives but of mutual concessions between the groups and opinions with different and various cultural backgrounds. In planning the appropriate management of the lake environment, it is important to be aware of the existence of the socio-cultural system based on the recognition of the diversity of human and natural- ecological systems and their relationships. Attaining an ideal state of the lake environment is no simple task because of the diversified demands involved. The point that I would like to lay emphasis on in this paper is that management of water resources is a problem which includes both the ecological system and human society. Moreover, the social-cultural processes of the latter are specific to time and culture.

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Table 2.1.1 Historical Changes in the Environmental Activity of the Lake

	Pre-Historic (-6C)	Ancient (6C-12C)	Medieval (13C-16C)	Feudal (17C-19C)	Modern (19C-1960)	Present (1960-)
Aquatic fish/shell Resource waterweeds Use reeds, etc.	⊙	⊙	⊙	⊙	○	Δ
Water Resource	Δ	Δ	Δ	Δ	○	⊙
Transportation	Δ	Δ	⊙	⊙	○	X
Pollutant Reservoir	?	?	?	?	Δ	○
Generating Electricity	X	X	X	X	Δ	Δ
Scenic Space	?	Δ	Δ	⊙	Δ	Δ
Leisure Space	?	?	?	?	Δ	⊙⊙
Religious or Symbolic Activities	?	○	○	Δ	Δ	⊙⊙
Food Control	?	?	?	Δ	⊙	○
Pollution						
Eutrophication	?	?	?	X	X	Δ⊙
Garbage pollution	?	?	?	?	?	Δ⊙
Toxic pollution	?	?	?	?	?	Δ○

- ⊙ : Most Important Activity
- : Considerably Important Activity
- Δ : Slightly Important Activity
- X : Almost Nonexistent Activity
- ? : Very little information available as to extent of this Activity

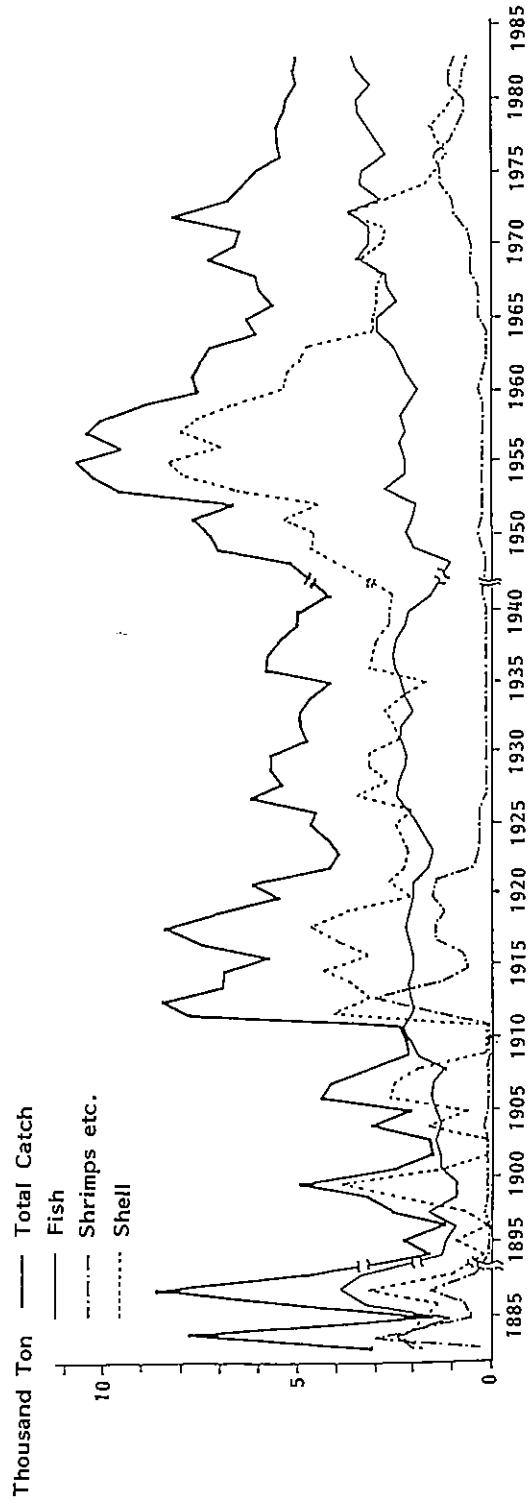


Figure 2 1.1 Annual Change in the Fishery Catch (1883 - 1983)
Source: Shiga Prefecture Fishery Experiment Station

-Legend-

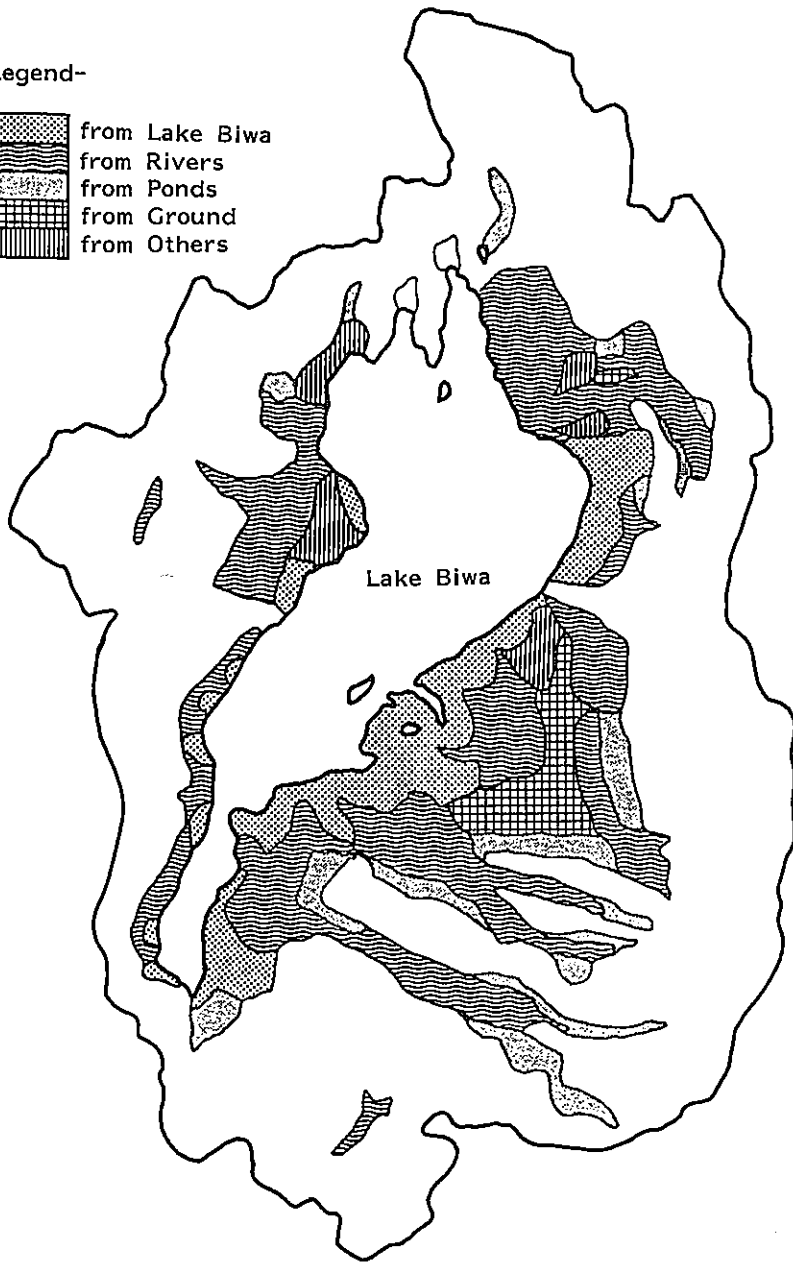
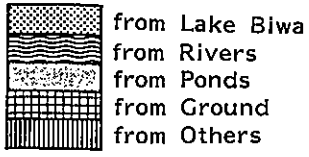


Figure 2.1.2 Status of Water Use (1985)

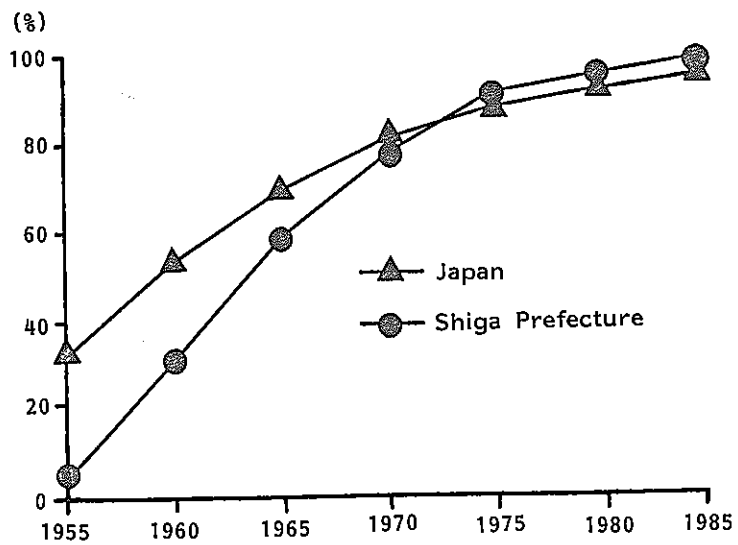


Figure 2.1.3 Change in Water Supply Provision in Shiga Prefecture and Japan 1955 to 1985.

Source: Statistics for Water Supply, Ministry of Health and Welfare

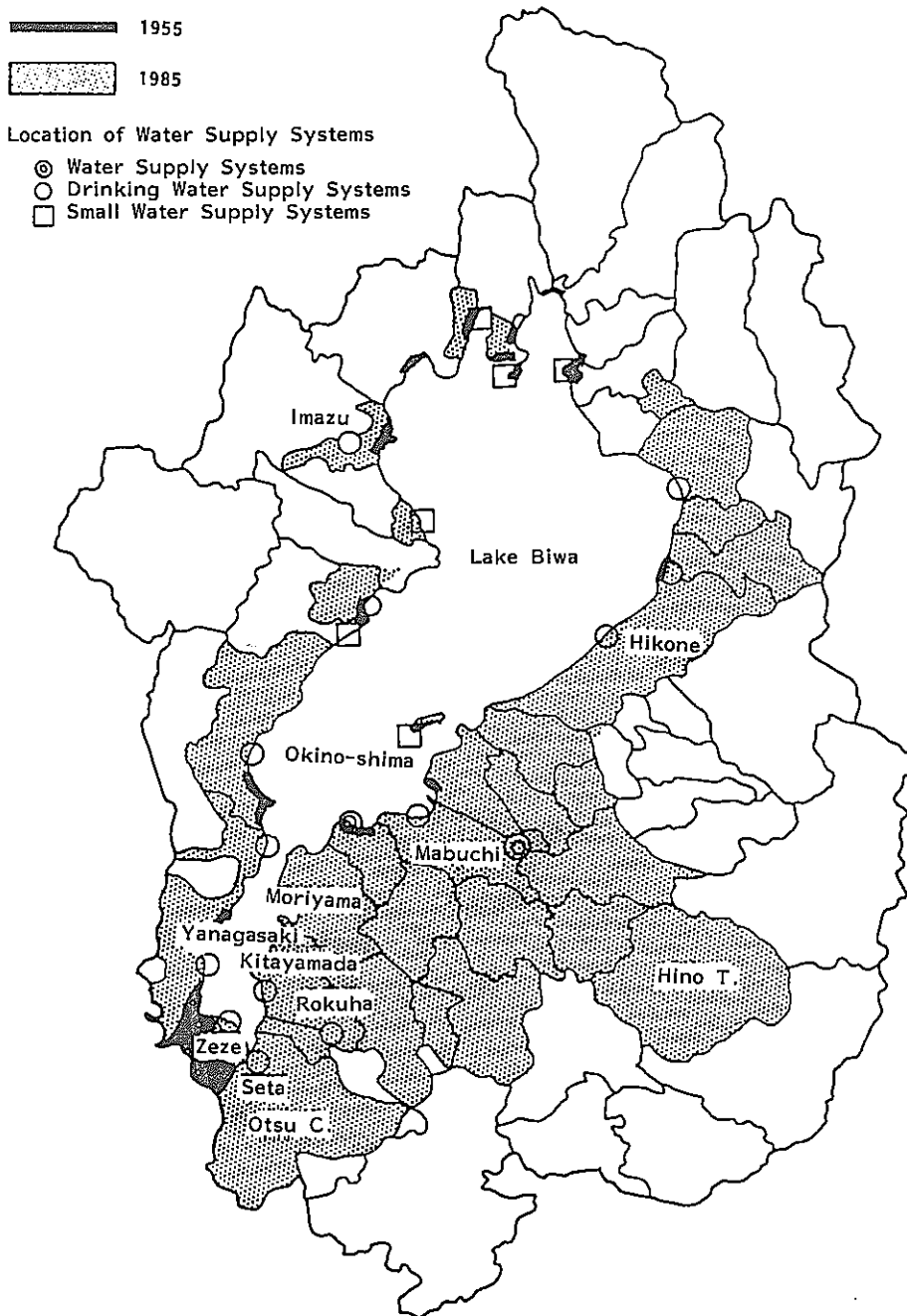


Figure 2.1.4 Expansion of area whose population are relying on Lake Biwa for drinking water - 1965 to 1985

Source: 1985 Division of Public Health, Shiga Pref., Division of Drinking Water of each Municipal Town and Village.
 1955 Observation by Lake Biwa Research Institute

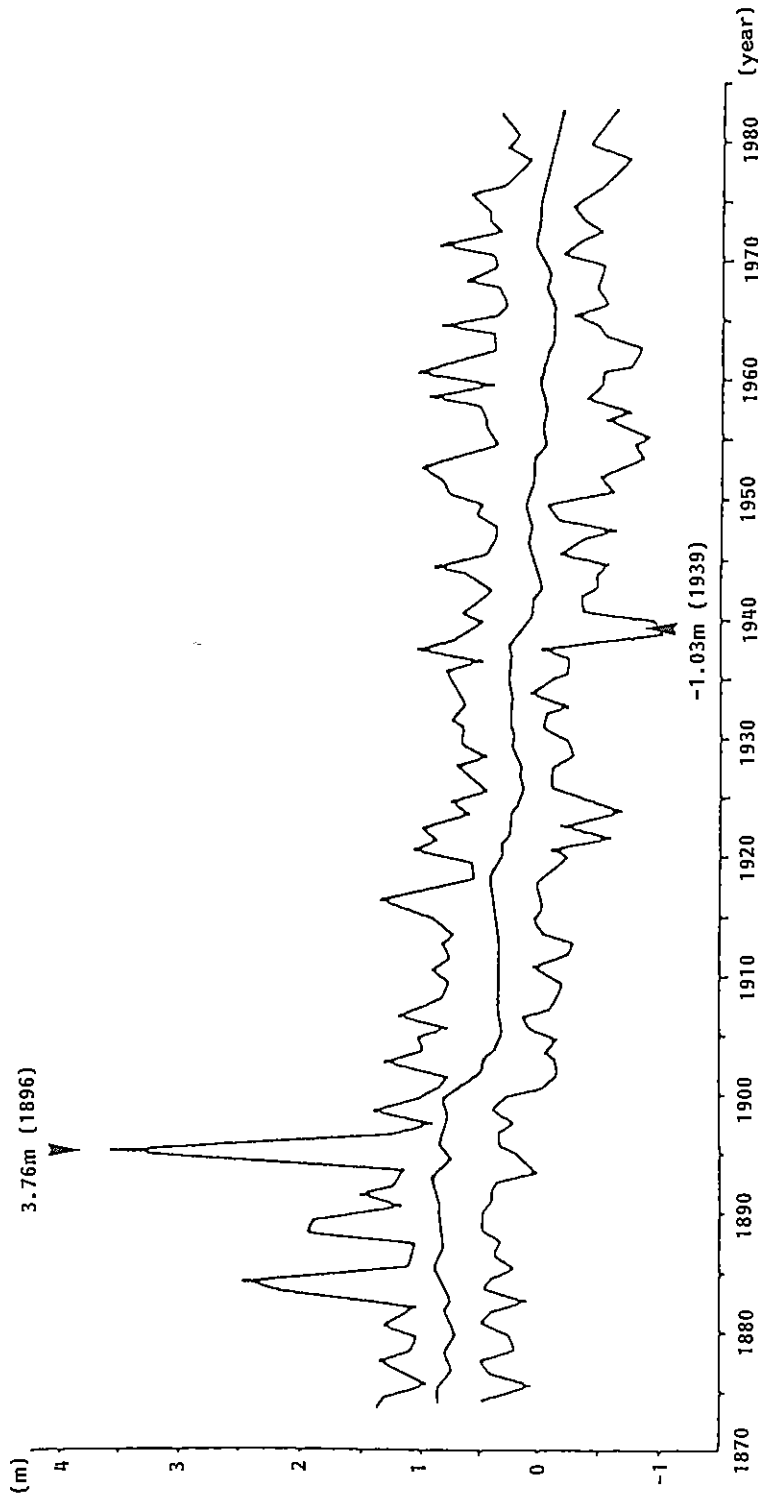


Figure 2.1.5 Annual Water Level Variation for Lake Biwa
 Source: Shiga Prefectural Govt.