

Waju :

Ethos for Water Use and Flood Control

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This paper describes Waju as a specific Disaster Prevention Method by local residents. Waju is a society surrounded by a ring-shape embankment that protects the village or fields at Nobi plain from the floods of the 3 rivers, Kiso river, Nagara river, and Ibi river.

Traditionally, residents have been using rich water for transportation and fishing, but at the same time the rich water causes floods. The knowledge of living in Waju is the wisdom needed to enjoy the rich waters and be safe from floods.

One good example is the Juroku Waju case in Ogaki city Gifu. It is a community where residents use water together, share a sense of danger of flood risk, and feel the World of Water. The technologies of water usage are directly related to the flood-prevention, and the technology of controlling water is connected to the God of Water and its ritual.

Disaster prevention is not only a special technology for the resident of Waju, but also it is related to their daily life. This local disaster prevention will show us the method of living with natural disasters in our daily life.

目次 Contents

- I Introduction
- II The History of Waju
- III Water use and flood control in Juroku Waju
- IV Vernacular technology and Ethos of the community
- V Conclusions

Keywords

Waju
Water Use
Flood Prevention
God of water
Local Technology

I Introduction

1-1 Challenges of preventing disasters in modern Japan

What are the necessary things in order to live with natural disasters? Mechanism knowledge of the occurring disasters, education to convey the experience, technology to reduce the damage, community collaborations, and disaster prevention plans, etc. Perhaps, the essentials of all these elements, and most importantly, these elements are connected, and it is what is being practiced in one's individuals' life.

The Japanese archipelago is a natural-disaster prone area all over the world. Every year, earthquakes, typhoons, heavy rains occur anywhere in Japan. From time to time, we get disaster information through media. Evacuation drills are conducted in schools every year. Disaster research groups are also doing their best. Advanced civil engineering techniques are also developed. The administration encouraged the formation of a "voluntary disaster prevention organization" in local residents. Various elements to overcome the disaster seem to be fully aligned.

However, disaster prevention measures in Japan cannot be said to be satisfactory. Katada who is an excellent disaster prevention educator pointed out that: since the people depend only on the government when it comes to disaster prevention, they have lost their own initiatives in preventing disasters. One example is flood control; in Japan, river embankments have been developed to withstand the heavy rain that occurs once every 100 years. As a result, floods have been reduced and minor floods are no longer an issue. This is a great achievement, but at the same time, we have become vulnerable to disasters by leaving personal security to the government and managing disaster prevention. Advances in disaster preparedness have increased social and human vulnerability. Those who lost their initiatives just

consider following government hazard maps and evacuation advisories as disaster prevention. [Katada 2012: 38-52] Such situations may lead to delayed evacuations and more damages.

In other words, providing knowledge and services about natural disasters is not enough to realize truly proactive disaster prevention. So we cannot say that we are living with natural disasters. The important thing is that each element becomes meaningful and systematic wisdom is applied in our daily life. What kind of life is that? In this paper, I am going to report a case study about Waju, which has historically created a mechanism for living with natural disasters.

1-2 What is Waju?

"Wa" means a "circle, ring, surround", "and Ju" means "inside, community". The word Waju is a conventional term with multiple meanings. Waju is defined as mental equipment and social aspects.

1. It is a ring-shape embankment surrounding the houses and cultivated land in the floodplain
2. It is a community that protects properties from flood damages in a ring-shape embankment

[Ando 1988: 10-12] [Ito 1979: 19].

Examples similar to Waju can be seen in the Ganges Brahmaputra Plains and Polder in Netherlands. In Japan, such society was formed in the lower tone river basin of Kanto plain and lower Kiso River basin in Nobi plain. This paper focuses on people living in a society called Waju, which was formed in the lower Kiso river basin of the Nobi plain.

The people in Waju have created a deep connection with the waters during the repeated floods in history. They have sought ways to use water and prevent floods at the same time. We can learn the wisdom of living with natural disasters according to their lifestyle.

1-3 Research history of Waju

There is some research conducted about Waju

in 1930. We can read the actual history of the Waju region from this research. Research on Waju began due to society's interest in flood issues. [Nakazawa 1936, Matsuo 1939] In 1929, a conflict between the upstream and downstream inhabitants over the river improvement led to the dispatch of troops ("Saikawa Jiken"). The Academic attention was turned into Waju, the special society that caused the conflict, rural economists and local influential people wrote books about Waju.

Since WW2, research papers on Waju have increased. The main approach was geography and agriculture. Many Waju studies at that time included keywords such as "land improvements" [Sirai 1964, Kawamoto 1967, Oomot 1975]. The background of the problem, you can see that there is an interest on how to modernize the Waju area. The Waju area, which has a lot of floods but rich in water, has the potential for a granary. As part of the postwar increasing production policy, Waju got the attention. Since then, flood damage was reduced, and land improvement has progressed rapidly.

While the Waju area has been changing in this way, social sciences became interested in Waju's unique society increased. Ando and Ito systematically clarified the characteristics of Waju's history and life culture from a vast amount of data and fieldwork [Ando1975, Ando 1988, Ito 1979]. This valuable research conducted while Waju was changing is still the basic literature for learning Waju.

And as Japan's economy progresses, so does Waju in Ito's "Transforming Waju" published in 1996, it is reported that the elucidated characteristics of Waju have been transformed and lost. It is a complete transformation, not only its infrastructures, such as landscapes and river flows but also from residents' awareness.

The decreased in Waju's research since then may not be unrelated to the loss of Waju properties. Mr. Ito points out that the flood damage in 1976 raised awareness of flood control again, but 50 years have passed since then. More people in the Waju area have not experienced floods. Will this Waju be the legacy

of the past?

1-4 The uniqueness of Juroku Waju

In these circumstances, Juroku Waju is in a unique position. Juroku Waju is located in Juroku town, Ogaki city, Gifu prefecture, and still maintains the Waju embankment.

In the 1980s, Gifu College of Economics conducted joint research on Juroku Waju, reporting on history, changes in land use and living spheres, flood control, agricultural ritual, etc. [Gifu College of Economics Regional Economic Research 1983]. The report notes that the land improvement and economic development have changed the livelihoods and land usage, but flood control activities and rituals have been maintained.

In "Transforming Waju" 1996, Yasuda, a local historian, introduced a case study of Juroku Waju. He introduces the activities of flood control and religion of water god, and points out that the high awareness of flood control is maintained.

In 2008, the Sociology Laboratory of Nagoya University reported "Reconstruction of Water Environment: Case of Ogaki City". In this report, Juroku Waju is positioned as an area to maintain the community of Waju compared to the urban area of Ogaki City.

These studies emphasizes that while the entire Waju region is developing, traditional mechanisms are maintained in Juroku Waju. Juroku Waju is "the Waju" that exists in modern times.

I have been doing fieldwork around the Juroku Waju since 2009 to explore the relationship of the peoples in the waters of Waju. I wanted to see not only the flood but also their whole relationship with the water. There are three perspectives: (1) how they have been using the water, (2) how it is associated with flood control, and (3) how spiritual values for water are expressed. The content of this report is based on my doctoral article published in 2015.

In the following, after describing the history of the entire Waju area (Chapter 2), we will examine

the actual conditions of water use and flood control in the Juroku area (Chapter 3) and discuss its characteristics. Perform an analysis (Chapter 4). From here, I would like to discover a concrete image of living with natural disasters.

II The History of Waju

2-1 The Birth of Waju

First, let's discuss the history and background of Waju in Nobi Plain. The Nobi Plain is located in the central part of Japan. The Kiso River, Nagara River, and Ibi River flow. These three rivers are collectively known as "Kiso-sansen". The Waju is located in the downstream area of Kiso-sansen. Its range is approximately 1800 square kilometers (Figure 1).

At present, Kiso-sansen is divided into three rivers, but it was man-made only. On the left side of Figure 2 is the Kiso-sansen drawn in 1754. It is shown that sansen is connected by a tributary and flows like a mesh. Many sandbanks were created like an island.

These lands were not developed until the 17th century due to floods during heavy rain.

Ando speculates that the first Waju was formed in Nobi Plain in the early 17th century [Ando 1988 : 320]. Since then, development has progressed in the 19th century. There are two reasons why the development of Waju has progressed in the 17th century.

1. The civil engineering technology was developed.
2. It is necessary to develop newly cultivated lands.

Figure 3, right side, is a model of a developmental process in Waju. The Waju was formed during the process of "partial embankment" to "ring embankment" development. A partial embankment is an embankment to prevent water from flowing to the upstream. The direct hit of the flood can be avoided, but the water can still slowly enter from the downstream.

The next step was to construct a ring-shape embankment to prevent water from entering the downstream side. This will allow all the lands within the embankment to be developed as paddy fields and

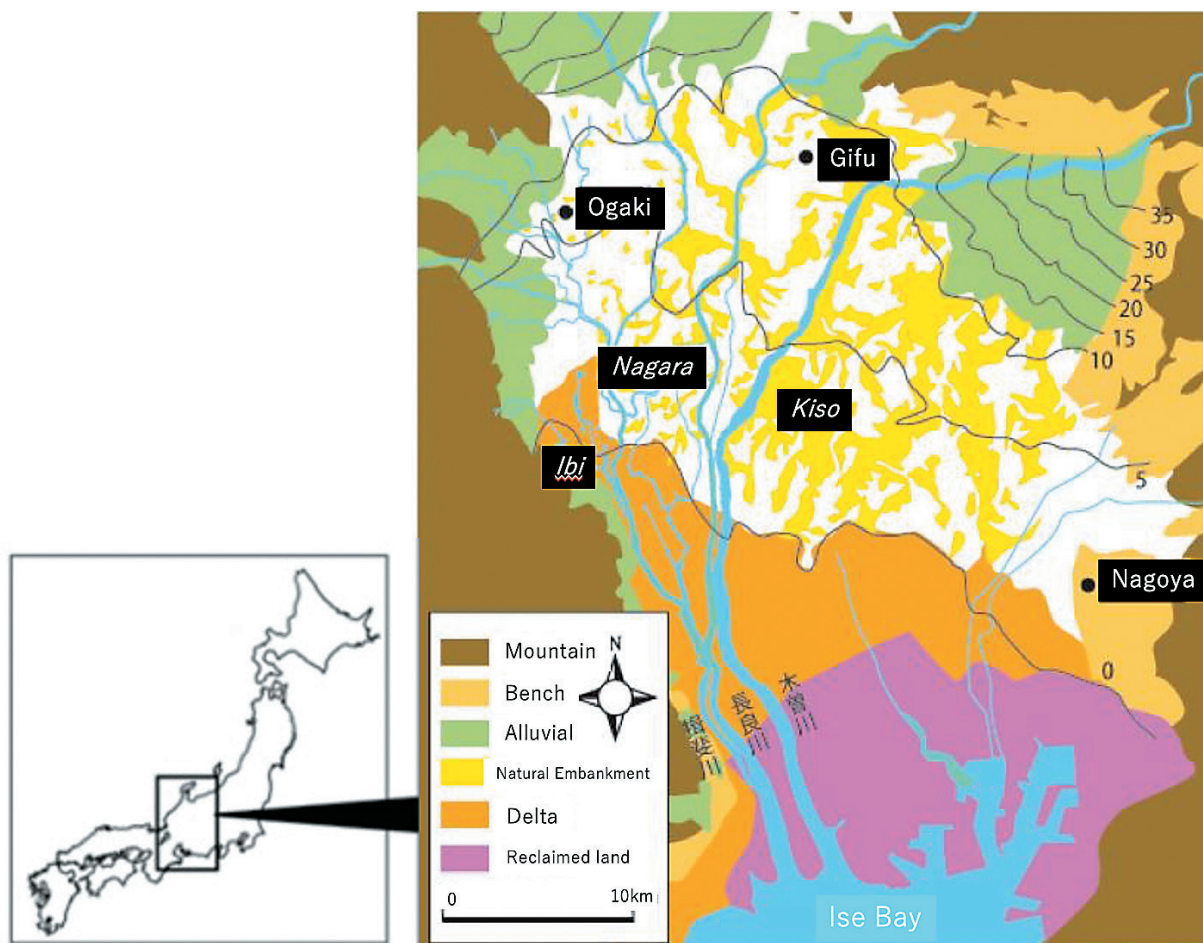


Figure 1. Kiso-sansen in Nobi plain

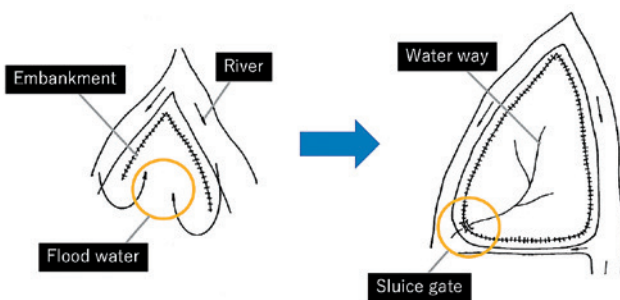
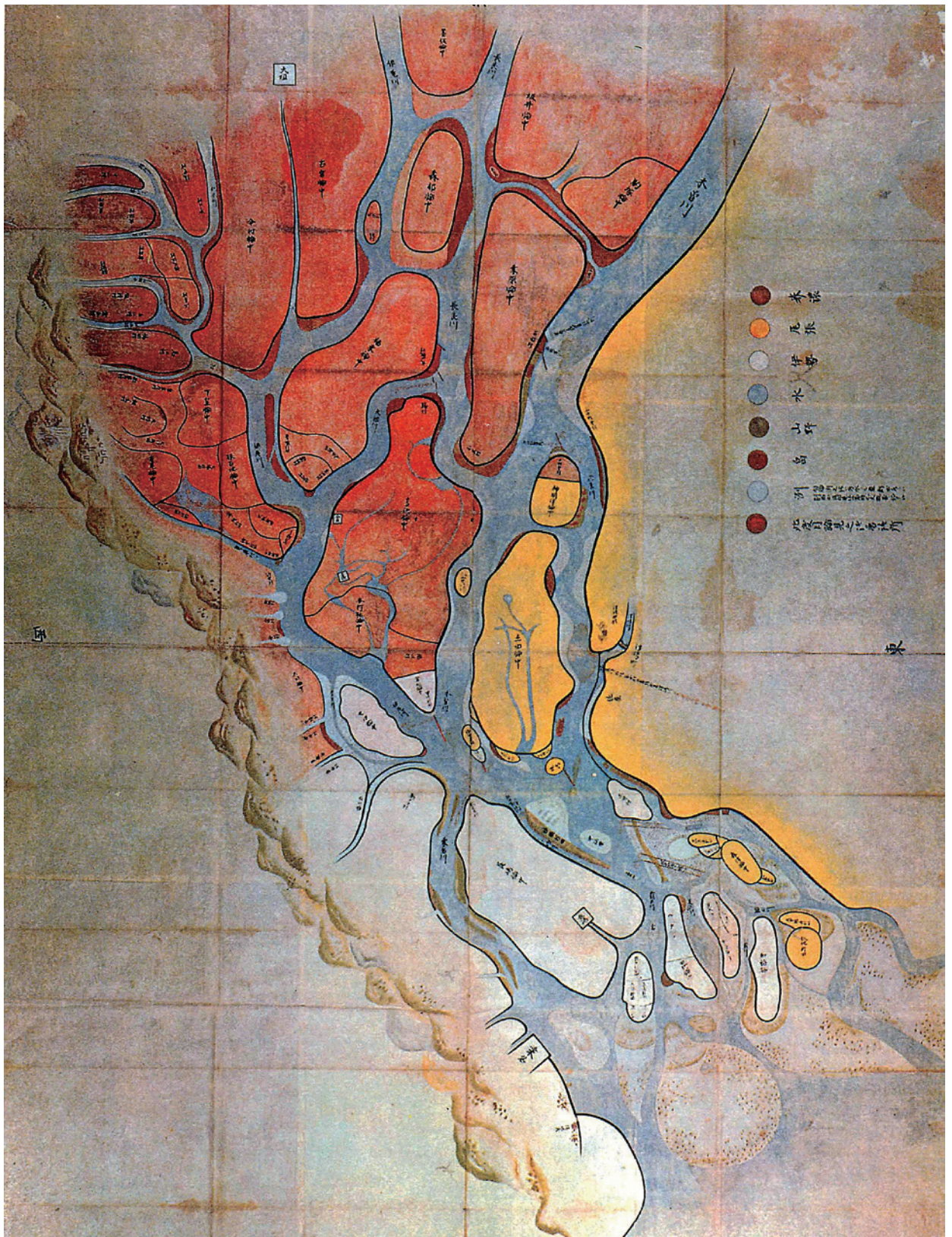


Figure 2.
 『Satsumahan-Otetsudai-Bushin-Mokuromi- Ezu』
 [Yoshioka 1986:13]

Figure 3.
 The Stages of Waju's development
 [Based on Ando1988 : 19]

making a waterway sluice gate to drain the water in the embankment. In this way, a typical Waju has been developed.

2-2 The Development of Waju

The Waju has made it possible for residents to use rich water while preventing floods. The downstream area of Kiso-sansen is rich in water. Therefore, many waterside cultures flourished. Such as water transportation, rice cultivation in waterways, river fishing, original river fish dishes, etc. And also groundwater is abundant. There are many flowing wells where the water continues to spring.

However, the development of Waju caused some water problems. In Figure4 a diagram of the developmental process every 50 years from

1600 to 1900 is shown. The green line shows the Waju embankment. During the first fifty years of the 17th century, Waju developed significantly in the delta area, which was previously undeveloped at zero meters above sea level. Over the next fifty years, floodplains will gradually develop. In this area, which consists of the natural embankment and back swamp, it is probable that the construction of the Waju embankment made it possible to use the back swamp. Waju's development in the 18th century was slower than the 17th century. However, it can be seen that the alluvial was developed without the need for Waju embankment. The reason why Waju was formed in the alluvial area is that the flood damage in the entire area increased due to the development of the downstream area. And then Waju will expand into the sea through reclamation and it will be

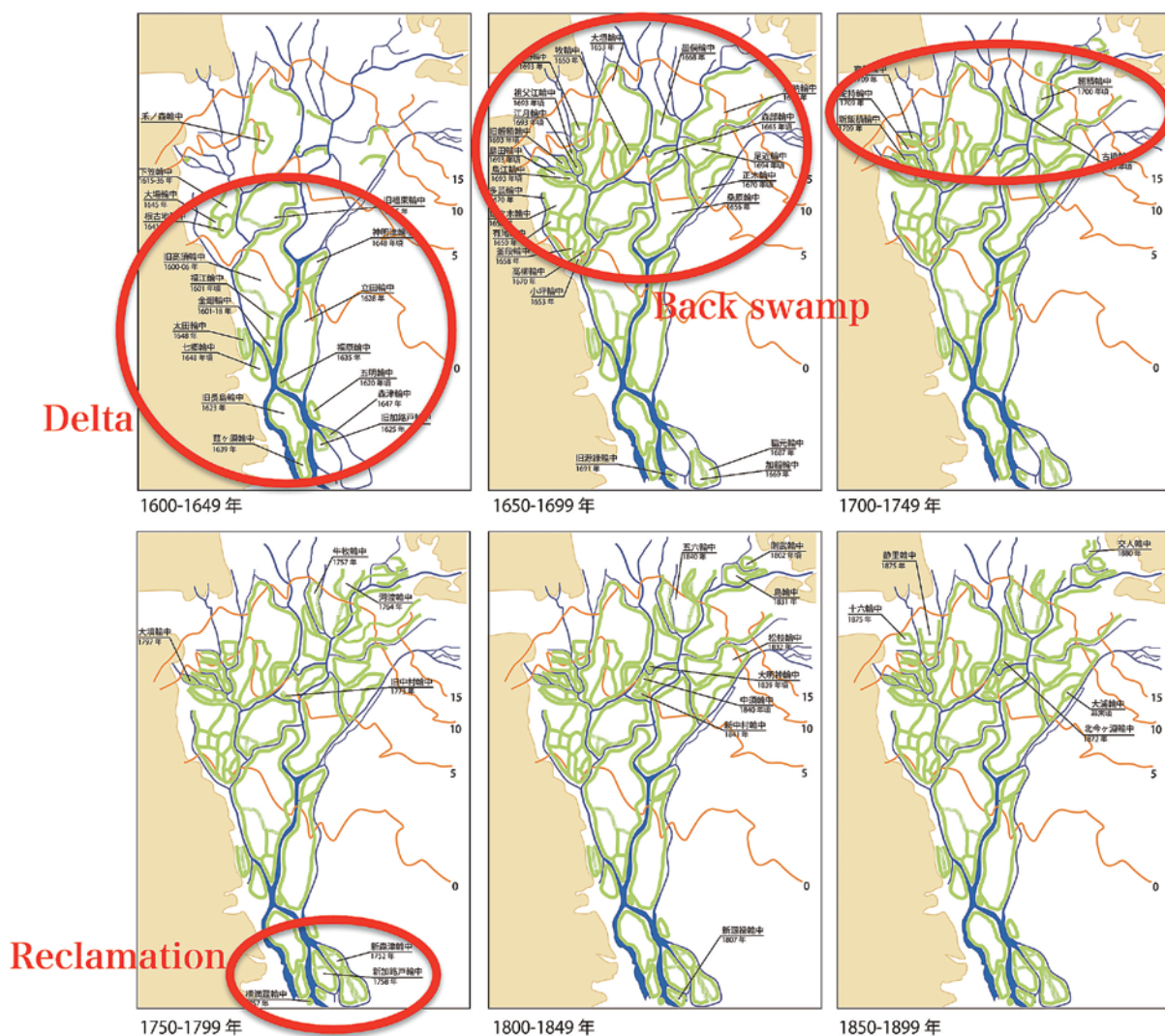


Figure 4. Development history of Waju [Based on Ando 1988]

formed from the small remaining lands.

However, thorough Waju development has brought more negative aspects than the benefits of water. The development of Waju without gaps eliminated the flood control basins where floods could freely enter. In addition, sedimentation had progressed due to the fixed river channels, and the riverbed had a higher elevation than the land, and the river had become a ceiling river.

Due to these effects, it is difficult to drain out the water inside the Waju and flood always stays inside. This situation accelerates as the number of Waju increases. As a result, floods occur frequently and caused bigger damage. Rice harvest has been reduced due to floods. Waju was supposed to be created to increase rice fields but instead, it was reduced. This was the contradiction in the circle.

2-3 The Declining of Waju

In the late 19th century, flood damage in the lower Kiso-sansen was severe. Therefore, it was necessary to stabilize the flow of the whole river at the national level, instead of small-scale renovation work for each area as before. It is a project to make the water flow to the sea promptly by separating Kiso-sansen and straightening the river. However, it is not easy to divert the huge Kiso-sansen. Civil engineering technology brought from the West during the Meiji era made it possible. As a result of the construction work from 1887 to 1911, the Kiso, Nagara, and Ibi rivers became independent rivers and transformed into straight-running rivers (Figure 5). This drastically improved water stagnation in the lower Kiso Mikawa basin.

Kiso-sansen diversion also means no use for Waju anymore. When the river itself became straight, the ring-shaped embankment was cut off.

Furthermore, river renovation started in 1927 to strengthen the river embankment in the Kiso-sansen. The introduction of an electric drainage machine reduced the flood damage in the Waju area.

The need for Waju embankment has diminished, and the remaining Waju embankment has been

demolished for land development and road maintenance.

Residents have lost the environment surrounded by a ring-shaped embankment. It is no wonder that as flood damage decreases, industrial structures and motorization changes, the social significance of a community that lives and protects property from flood damage in a ring-shaped embankment has also been lost.

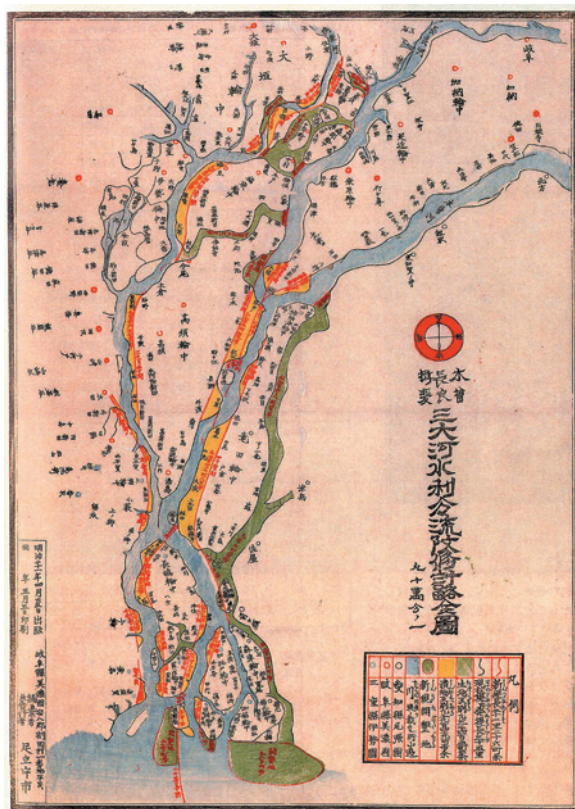


Figure 5. 『Santaiga-SuiribunryuKaisyukeiryaku-Zenzu』 [Yoshioka 1986:23]

In such situation, the complete ring-shaped embankment in Juroku Waju is maintained up to the present. Why is that so? How are they balancing water use with flood control? In the next chapter, we will focus on the Juroku Waju.

III Water use and flood control in Juroku Waju

3-1 The Declining of Waju

The reason why Juroku Waju maintains its Waju embankments according to the water environment

Juroku Waju is a small Waju located at the end of the Alluvial fan. It is known for its self-injecting groundwater springs below the end of the Alluvial in the Nobi Plain. In recent years, the area has shrunk, but Ogaki City is still famous for its self-injecting groundwater. Juroku Waju is not exempted. The quantity is small, but some people come to fetch quality water from a distance.

Focus on the water environment of Juroku Waju. Juroku Waju is located at the junction of the Otani River and Ai River tributaries of the Ibi river (Fig. 6). Otani River has a “weir”. Weir reduces the risk of the embankment to collapse by making a part of the embankment lower than the surrounding area so that the river overflows when the amount of water in the river exceeds a certain amount. In other words, the western part of the Otani River is a basin for water to escape when the Otani River rises.

There was a historical background to the fact that the weir was built here. The Otani River was originally a river without an embankment, and at the time, the area was flooded with water. In the 17th century, Waju embankment was built along the river in the eastern part of the Otani River to prevent floodwater intrusion. In other words, there was an embankment only on the left bank of the Otani River.

Since then, the Otani River flood has only flooded the western basin. The situation did not change even if Juroku Waju built the Waju embankment

in the 19th century. However, a land improvement project that began in 1954 included a plan to build an embankment on the right bank of the Otani River to develop the western part of the Otani River into farmland. At that time, there was the opposition who is eliminating the flood control basin would create a flood risk. In order to respond to that opinion, a weir was built on the right bank of the Otani River [Gifu Prefecture 2004: 5].

Ai River and Otani River are at risk of causing floods in Juroku Waju. In the Ai River and Otani River, the water volume tends to rise rapidly because the distance from the water source to the junction is short. Because it is a small tributary, it cannot flow smoothly under the influence of the Ibi River, which has a large flow. There is no place for the water to go, causing flood damage.

The worst damage to the Waju is the broken embankment of the Ai River. Historically, Ai River embankment has been broken many times. According to the records, it has been broken 14 times between 138 years from 1815 to 1953, and it has been broken once every 10 years. After it was damaged in 1953, Ai River embankment was reinforced and repaired between 1959 and 1964. Since then, Ai River embankment has not been broken. Flood damage has been reduced by river improvements as in other Waju areas.

However, the eastern part of Juroku Waju is still a flood control basin and the risk of flooding continues. Sixteen overflows have occurred since the weir was created in 1959 [Gifu Prefecture 2004: 5]. Photo 1 shows the most recent flood that overflowed from Otani river weir in 2004. A large area of 178ha was flooded in the Arasaki area of Ogaki city. However, there was no major damage during Juroku Waju because the water was prevented from flowing in by the Waju embankment. It

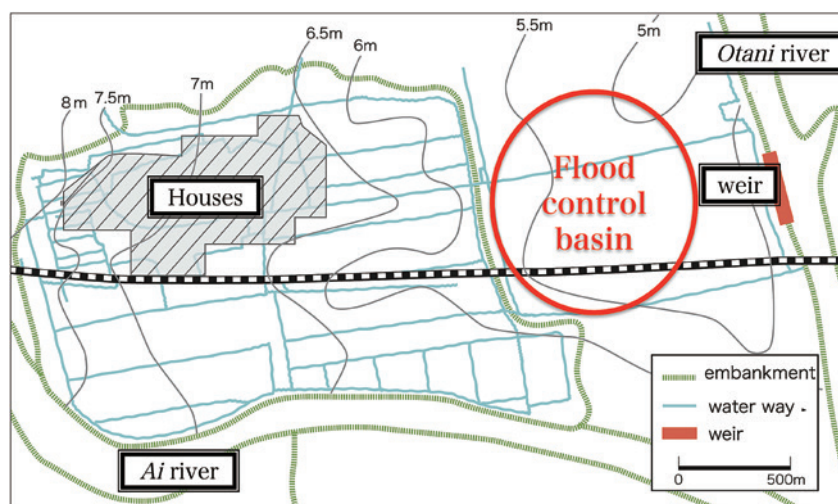


Figure 6. Water environment in Juroku Waju



Figure 7. Overflowed from Otani River in 2004[Asia Air Survey Co.,Ltd.]

means that Waju embankment worked completely.

After that, the weir was raised by 1.05 meters by renovation work in 2007. After this construction, no overflow has occurred from the weir to date. However, as long as there is a weir, the risk continues. Waju embankments are still needed to prevent flood damage.

3-2 History and Society

The village of Juroku Waju has a long history. However, Waju embankment was built in the latter half of the 19th century. The reason for the construction of Waju embankment is probably due to the development of the downstream area, which increased the impact of flood damage. It is recorded that it was difficult to negotiate with the surrounding villages when constructing a new embankment because the risk of flooding the surrounding villages increases when a new embankment is constructed.

There are approximately 160 households and 500 people living in Juroku town. Ogaki city's population increased significantly during the economic growth period of the 1970s and 1980s. However, in Juroku town, there was an influx of population from outside, such as the construction of two apartment houses, but the number is small. It can be seen that the traditional settlement size is maintained. However, at present, the number of people per household is decreasing. They are facing a declining birth rate

and an aging population as is the case in Japan as a whole. They belong to a community sharing on common destiny for floods.

In Juroku town, there are six groups called "Seko", which divides the settlements into parcels. Representatives from each Seko gather to form the Juroku town residents' association. Residents' association and Seko are the basic structure of self-governing in Juroku town. Each Seko has a designated person in charge of accounting, "Nengyoji", "Suibo (flood control officer)", "Bosai (disaster prevention officer)", and "Kairyokumiai (improvement cooperatives officer)". Nengyoji is a leader who is responsible for information transmission and shrine rituals. Suibo corresponds to flood and Bosai corresponds to earthquake and fire. Kairyokumiai is responsible for agricultural production. In this way, the autonomous organizations in Juroku town are united in autonomy, security, religion, and livelihood.

96% of the arable land area in Juroku Waju are rice fields. Historically, rice cultivation has been their main livelihood. It's one of their satisfactions to produce lots of rice. In order to keep the residents in line with the use of water agriculture, the Kairyokumiai will set the date for starting the irrigation, pest control, and rice planting. Rice farmers must adhere to these common rules.

In the past, everyone goes to the rice field before dawn to plant rice earlier than anyone.

However, even in Juroku Waju, the changes in the industrial structure has encouraged the residents to move away from rice cultivation. Making rice in small rice fields like Juroku Waju does not make enough money. By walking through Juroku Waju, you can see the whole rice field scenery. However, it is kept by only a few inhabitants entrusted with the rice fields.

3-3 Water use

Some water resources have been used in Juroku Waju. The water of Ai River (Figure 8-1), groundwater (Figure 8-2), flowing from the village upstream called Otare(Figure 8-3), and the waterworks that come through water pipes(Figure 8-4). Each has its own water properties or characteristics.

For example, Ai River's water was taken by

making a hole in the Waju embankment, which weakens the embankment and causes a high risk of flood damage. However, the water flowing from the mountains are rich in nutrients and suitable for agriculture. In addition, the amount of water is larger than other water sources.

The underground water is a convenient water source that keeps on springing when you dig, but it has a low temperature, so it needs to be heated to be used for agriculture. Also, once you dig, water will spring continuously, and the soil will be loose, therefore, caution is needed when using underground water. In addition, groundwater that springs in Juroku Waju has different water quality depending on the area. There are areas where clear water springs and areas where red "Sob-mizu" containing iron is springing. Both can be used for agricultural water, but Sob-mizu is not suitable for domestic



Figure 8. Water resources
1. River water, 2. Underground water,
3. Otare, 4. Water works.

water.

Otare is the least flooding water. However, the amount of water is not strong because it flows from the neighboring village.

Modern technology gave benefits to waterworks and public agricultural water resources. One example of this is that water can now be controlled only by a faucet. The amount of water is abundant.

Different water resources in Juroku Waju have changed overtimes. Figure 9 is a chart that sorts the water types used in Juroku Waju by time-based on interviews and pictures.

In the past, it seems that the water resources used for agriculture came from Otare, Ai River, and wells. Since digging well techniques were introduced in the 18th century, the number of wells increases. Afterward, the amount of groundwater decreased; therefore the electricity was applied to wells. The waters from Ai River has not been used since 1953 after the embankment was destroyed by the flood. Instead, since the year 2000, public agricultural water was introduced.

For domestic water use, flowing well has been useful for a long time, later on, waterworks was introduced in 1950. Until today, they are using both.

In this way, water usage is directly linked to technological evolution. For example, the technique of drawing water from the river over the embankment, and the technique of digging well was special. In addition, the introduction of electric pumps used for gathering more water from the well, waterworks, public agricultural water resources is all major changes. So it is said that water is more comfortable and easier to control. Although comfortable water resources are available, they are still using multiple water sources. The reason behind this is not clear, but it seems that using many options could help lower the risk of flood and control water away.

Even if the form of water usage was changed, there are parts that cannot be changed. One is the joint management of irrigation water. Unlike irrigation water that can be used for each house, irrigation water is directly linked to the flow of water. It is performed as follows.

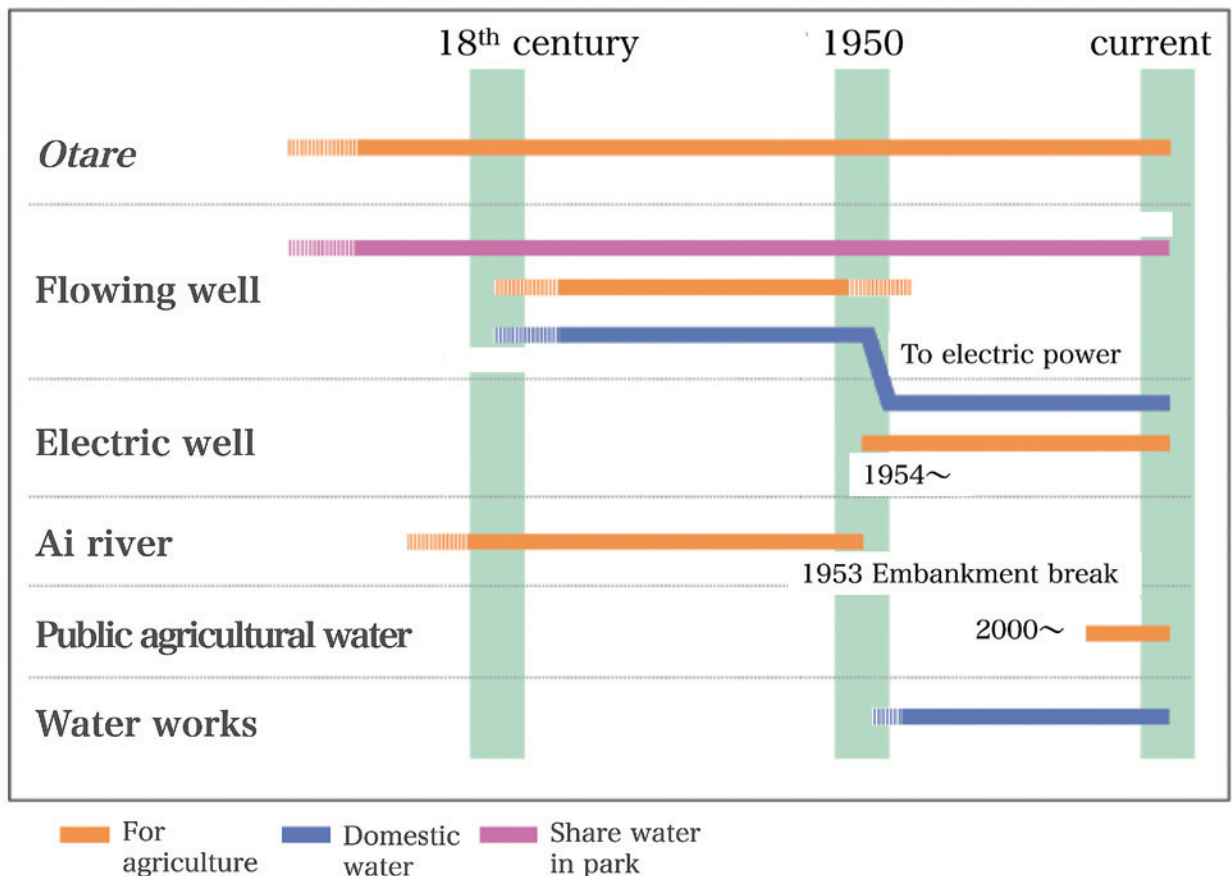


Figure 9. Changes of water use

At present, the common water irrigation system in Juroku Waju used for agriculture is the water from Otare, electric well and public agricultural water. These intakes are located on the high northwest side of Waju. After opening the intake, close the waterway gate and open the rice field intake and fill the rice field with water. After enough water was accumulated, fill up the next rice field. In this way, water is passed from the high lands to the low lands in Juroku Waju. During the rice planting season, the whole Juroku Waju is filled with water. Thus, the irrigation system is implemented with the cooperation of the residents.

3-4 Flood control

Next, I will discuss the resident's initiatives during floods. What are the preparations of each household for flood risk?

Daily preparation is as follows: In order to prevent submerging into water, houses are built in a stone basement. In wealthy houses, shelters are built on higher land with stone walls. It is called "Mizuya". (Figure 10) The evacuation boats lifted under the eaves are called "Agebune"(Figure 11).



Figure 10. Mizuya



Figure 11. Agebune

When the flood is rising, do the following: Bring up the home appliances and assets to the second floor. This action is called "Mizukatazuke". And preparation for black-out or if the gas supply has stopped, people keep emergency food, cook rice.

What are the preparations for flood in a Waju unit?

First of all, there is an annual event as a preparation for flood control. Disaster prevention

drills for flood damages(Figure 12-1). Mowing of the embankments(Figure 12-2). Cleaning waterways in Waju (Figure 12-3). It is a duty of all households.

When the flood risk increases, do the following: The flood season is the season for rice cultivation, so the water in Waju is drained. Judging from the water level of the river and the amount of rainfall, residents are dispatched. The first dispatch will be the residents' association member and "Nengyoji" of each Seko, the second dispatch will be a Suibo (flood control officer) of each Seko, and the third dispatch will be one man from every house. They go to the embankment place assigned for each team, check and look around and pile up sandbags on dangerous places and keep monitoring the place. This vigilance is prioritized over work regardless of occupation.

In this way, the residents are using water and controlling floods in Juroku Waju. By knowing the characteristics, nature of water and cooperation of the residents, the effectiveness of water control technology will increase. Although the burden on the residents is large, it is a rational mechanism.



Figure 12. Preparations for flood in a Waju unit
1. Disaster prevention drill,
2. Mowing, 3. Cleaning waterways

3-5 Oral traditions and rituals related to the waters

In addition, there are many oral traditions and rituals related to the waters of Juroku Waju. Each ritual and oral tradition accurately represents the characteristics and natures of water and it is an

annual event for the residents.

Looking at the Figure 13-1 drawn in the Edo period, we can see the water is close to the shrine. This is similar to the current “Otare”. This shrine is the most important among the Juroku Waju. So, we can say that the shrine was built at the location of the oldest water source. From this, we can understand the importance of this water source.

Ai River has another name called “Arakure-gawa (Rough river)”, an uncontrollable river. It’s because the water here suddenly increases and the embankment breaks down. There is a water god shrine on the embankment of Ai River (Figure 13-2). The location of the shrine tells the point that have a big risk, and also a ritual is held every year during the flood season. In this way, residents can remember the risk on Ai River and recognize the dangerous places.

Juroku Waju has many flowing wells, among which is a legendary well-known to have been dug by a famous monk with magical power (Figure 13-3). This well was so famous that it was written in the Edo period local magazine as a “well that never dries”. It is not just this special well that has an oral tradition associated with it. It is said that there is a water god in the flowing well. Because of this, the well shouldn’t be filled up with water to keep space for God’s blessings. In fact, if you fill up a well that has been dug, there is a possibility that the land might collapse.

Although it is different from the direct water source, rituals are also held on Waju embankment. It is a monumental ritual that recorded the name of the predecessor who built an embankment by struggling with conflicts with the surrounding villages (Figure 13-4). After the ritual, they clean the waterway. The residents confirm the importance of the embankment and collaborating on water control.

As mentioned above, each oral traditions and rituals teach the nature of water that has different characteristics, and its importance.



Figure 13. Ritual and oral tradition
 1. Oldest water source,
 2. Water god shrine,
 3. Living a water god well



Figure 13. Ritual and oral tradition
4. Monumental ritual

IV Vernacular technology and Ethos of the community

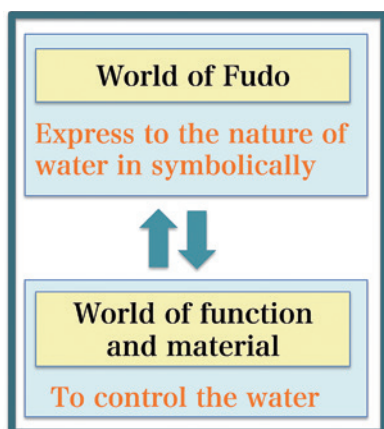


Figure 14. Vernacular technology

These oral traditions and rituals are based on their water control experience.

In other words, they discover the nature and characteristics of water, understand it, and express it symbolically. In particular, it seems the part that cannot be controlled by human technology is expressed as “God”.

The philosophers Tetsuro Watsuji and Berque called it “Fudo” to see the world as “something”

through active involvement. A Fudo is a word that expresses “the relationship of society to the earth.” In the Fudo world, the environment is not just material.

Everything has a meaning and every place has been given a human value.

In Juroku Waju there are two aspects, the world of Fudo and the world of function and material. The two complement each other without contradictions. In this way, the technology used for water and flood damage prevention in Juroku Waju, is unique and local.

To emphasize these non-generalized technologies rooted in the locality, Rudolfsky and Illich used the concept of “vernacular”. It is born under the “human life that is self-supporting, non-marketable, reciprocal and embedded in life”. It is to be distinguished from “human life derived from a uniform and standardized services and exchanges provided by specialists”.

The Juroku Waju residents are a community that uses and controls water base on this vernacular world. And they have the intent to maintain the structure of such a community. The obligation to “attend all households” to prevent flood and rituals is a matter of course as a member of Waju. Here you can read the internalized ethical orientation, or ethos, that is shared by the inhabitants of Waju as a member of the community. This ethos is not an abstract idea, but it is a practice through actual flood control, water use, rituals, and accumulated empirically. In addition, it has been inherited historically, and the people who live today are positioned as an extension of the history of the community.

V Conclusions

So far, we have seen how the Juroku Waju people made their living with water. The two major characteristics of their lives are: First, using water every day is connected to flood control. Second, technology and worldviews are connected.

Waju is a community that shares “rich water use”, “flood control risk”, and the “worldview of the divine water”. Actual use of water and flood

control technologies are linked to the world of water including its divinity, also water control technologies and water divinity are fused. This is the unique composition of Waju, which has both the risk and fear of flooding and abundant water resources.

Water, a natural thing, is beyond human control. You can get benefits from it, and you may suffer a disaster. You need to know the nature of water to continually derive benefits and minimize disaster. And also water does not exist as an objective H₂O, it varies from source to source, from location to location, and from time to time. They are expressed in oral traditions or rituals, and indigenous technologies tailored to their characteristics are created.

The Waju case is a rare example of a connection between everyday life and disaster prevention. This disaster prevention is different from the objective information in one's mind. We can conclude that the Waju system is not easy to maintain in today's modern society. The Waju system is run by the people who work together in the same livelihood and also prevents the flood. Nevertheless, we should be able to learn this Waju knowledge for the future rather than considering it as "old wisdom."

In short, what they do is simply: to identify the nature of something that cannot be controlled completely, to give significance and express it. Challenge and bring out the benefits. To avoid disaster as much as possible. And, to check all the things by their actual practices that are repeated every day. In this paper, we called it a vernacular technology.

Could such a system become unnecessary as science technology develop furthermore in the future? Probably, it is NOT. It's because we cannot completely control nature such as water disasters, earthquakes, eruptions, etc., and since we perform our daily life in these places, without any of our participation, our disaster prevention methods will become fragile.

Of course, science technologies are not denied. Rather, the introduction of ICT technology should be welcomed. However, when talking about disaster

prevention, thorough "vernacularism" and "everyday practice" will be an absolute basis. How to design technology created from universal laws as vernacular technology? And, how do you apply it to your everyday practice? This wisdom will be needed by the local residents when considering disaster prevention in the future.

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