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京都大学
Exploring the Legal Framework of Local Groundwater Governance in Japan

SAYAKA HORI
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Chapter 1  Introduction

1.1 Background

Groundwater, an underground natural resource, is usually invisible to the human eye: its total quantities and detailed flow characteristics beneath the Earth’s surface, for the most part, are unknown (Watanabe, 1995). Groundwater is crucial to all societies. Groundwater uses for home use, irrigation, and industry. Humans, animals, and plants all benefit from this life-sustaining resource, unlike surface water.

Groundwater is one of the essential water resources for society. Water moves around from the atmosphere to the ground continuously in the hydrological cycle. All elements of the cycle take an important role. Once groundwater pollution and groundwater level decline occurred, it is hard to recover.

Groundwater is rarely included in policy discussions at the national level in Japan (Tanaka, 2015). Groundwater is a valuable and indispensable natural water resource, but enacting a groundwater law has been postponed for a long time. Japanese water policy shows stronger sectionalism (Sanbongi, 1994 and 1999). For example, from the viewpoint of water management and its policy, there are many different ministries, and government offices take responsibilities from various roles and duties. Small conflicts sometimes occur between governmental offices due to different roles and measures.

Before World War II, groundwater was used every day from a community well or a private well as drinking-water. After the war, the main water supply system in this country was shifted from relying on groundwater to river water. The River Act was established in 1964, which is strictly applies management and conservation as river water on public laws. The Groundwater regulation established for each right and duties. On the contrary, so-called THE Groundwater Law has not enacted at a national level.

One aspect of groundwater quantity conservation, the Industrial Water Law (1956) and the Building Water Law (1962) have been established in those areas damaged by serious land subsidence. Another aspect of groundwater pollution is the groundwater pollution conservation law and the water resource conservation law enacted as a part of groundwater pollution controls and its management. However, limitations remain. Those laws do not provide enough conservation plans or regulations.
For example, groundwater pollution has been severely affected by domestic wastewater, industrial liquid waste, agricultural chemicals, and wastewater pumped out by garbage disposal facility. Public laws in Japan have difficulty in keeping pace with groundwater pollution controls. Under the circumstances, there are two theories to deal.

First, local ordinances should be enacted. Local municipalities and people are forced to be in charge of paying their effort for establishing local regulations for their local water preservation. Each local municipality has no choice but to enact local ordinances or regulations, in order to conserve the resource of life-sustaining water. In a case of groundwater subsidence’s problems, a local municipality should enact a restriction for groundwater collection at a particular preserved region.

Recently, the purchase of the potentially preserved land for groundwater is a problem at the local level. People have begun to build new original ordinances. The trend reflects the social condition of the days. Enacting ordinances appeals to the national government by sending a strong message of an importance of the national groundwater conservation law.

Second, there is no need to regulate because river water is now being used for drinking water. Groundwater Law is believed in status quo, without significant imminence, there is no need for amendment including a change in ordinance, regulation, and custom law. River Water Law was enacted in 1970 reflecting the shift in water use due to the change in lifestyle and environmental situation following the high economic growth period in the 1960s (Nakano and Matsuda, 1976).

The national government might reenact Groundwater Law, when the time has come. The substitute systems would be either a legal case that becomes a judicial precedent or new legislation.

…The convictions of articulate lawmaking by legislators, courts, and others, respond to social change if it is to fulfill its function as a paramount instrument of social order. Law and Social Change had, no doubt, its share of errors and prejudices… (Wolfgang, 1967)

In this regard, the highly charged issue of the Groundwater Law may not be a tense critical situation for the legislators, courts, and others in the present situation. If any problem occurs, policy makers should evaluate the necessity of establishing either local or national legislation among stakeholders.
…No more than to have dealt with major social phenomena of our time, as a challenge to which we must seek a solution, and which we cannot ignore by pretending that they are not the lawyer’s province, but that of the legislators, the politician, the sociologist, or the economist… (Wolfgang, 1959).

In 2015, the Water Circulation Basic Law was enacted. The law would be still in a wait-and-see mood. Although, there has been a new movement in society about legislation and controls of groundwater. Some land which is covered by green forest and which is a source of ground water had been bought by both foreign and domestic investors. This event has received much attention from media all over the country, and people have a good chance to reconsider how we could keep a sustainable groundwater supply system for future generations. In these circumstances, legislation and controls of groundwater are hotly disputed issues in Japan.

The current situation of groundwater legislation has also been affected by discussions of significant of groundwater on public or private. The important perspectives of local groundwater governance review are presented by understanding groundwater laws and municipal ordinances, besides, to consider the principle of sustainability is essential.

1.2 Problem Definition

This dissertation focuses on legal framework of local groundwater ordinance and its role for sustainable environmental management and local policy. The dissertation proceeds legal review to explore the legal framework of local groundwater governance in Japan with the concept of water awareness for sustainable local groundwater management.

appreciate the effects of local conservation social system, this paper must examine, in detail, a different case study on current situation from various perspective.

Ogawa (1990, 1998, 2002) conducted pioneering studies on the legal framework of groundwater governance. He gives a detailed description of local groundwater management and controls by building regulations and civic groundwater conservation awareness, especially a case study in Okinawa Prefecture. It is important to compare different local groundwater regulation case studies, which help to understand the appropriate legal framework of Japanese groundwater governance.

Understanding groundwater laws and municipal ordinances are essential to study the principle of sustainable local groundwater governance. In respect of the theory of legal research, the existing law should follow the Constitutions. Groundwater legislation in Japan should honor that as well.

This dissertation is about; a) the legal framework of local groundwater governance, and b) to introduce two methodologies to analyze general water awareness for local water governance.

1.2.1 Groundwater in the law

The legal structure for groundwater stands on the private water theory and the public water theory. Land is owned by its landowner registered by legal authorization.

In Japan, groundwater is privately owned property. Ownership of a land succeeds to the ownership of its groundwater property that flows underground. In despite of the highly-restricted situations on establishing public groundwater legislation, local groundwater ordinances and rules are built throughout the country. This dissertation provides two examples on Saijo City in Ehime Prefecture and Niseko Town in Hokkaido Prefecture.

1.2.2 National groundwater laws and ordinance

Groundwater legislation had been established only for Hot Spring Law and Irrigation Law. Since a long time ago, it uses for domestic water and agricultural water, which pumped out underground water in the layer of shallow stratum for natural well. The limited facilities of natural resource did not cause a serious problem both quality and quantity. However, after a technical development of digging a well, people could have dug a deep well, and pumped out water in the layer of deeper strata. At the same time, river water use had shifted to groundwater use, and industrial water, building water, and domestic water used for mass
production. As a result, some problems are encountered: serious water level lowering, groundwater depletion, groundwater subsidence, and groundwater salt damage. Groundwater Pollution Law in 1956, and Building Groundwater Law in 1964 were enacted for solving those problems. That statutory law is not enough for controlled chemical applications and preserved natural protection area. Japanese law respects an importance of private right and a private priority. Government takes deliberate action on the limitation of a private right, that regulation on groundwater conservation is not to be applied to private property. Since 1979, each municipality of a government tried to build new groundwater law to remove those obstructions from the present legislation.

Related groundwater law discusses later at this dissertation. Here is a brief introduction of related groundwater law; for instance, Groundwater Quality Law is not written for groundwater pollution prevention, in 1989, it was only an action that a chemical substance is newly added to the list of restriction substances in re-enacted Groundwater Quality Law. The above intention was the background of the groundwater policy, and there are many groundwater conservation ordinances by municipal level all over Japan. There are three characteristics of groundwater law, (1) a type of an ordinance for groundwater pollution control, (2) a type of an ordinance for groundwater quantity and conservation and, (3) a type of an ordinance for groundwater quality and conservation, which is preserved both perspectives of quality and quantity. This dissertation discusses the role of groundwater conservation system as a whole, especially focusing on a characteristics of groundwater law.

From viewpoint of international law for groundwater, there are not enough discussions on groundwater conservation. Most of the cases are relied on the law of a person’s native country (Burchi and Mechlem, 2005). In that sense, the analysis of the role of local groundwater law must be an example, in order to adapt different countries with similar problems. The main discussion of the dissertation analyses Japanese local case studies, and developing social system on changing environment both natural and human activity.

1.3 Research Objective

The objective of this dissertation is to explore the legal framework of local groundwater governance in Japan. The research used bibliographic survey and two fields study: (1) a case study in Niseko, Hokkaido (located in North Japan) and (2) a case study in Saijo, Ehime (located in South-west Japan). The intent was to gain knowledge of a leading case and a traditional case of Local Groundwater Law enacted by local administrations. The
information deeply focuses on both national and local legal framework. These researches insist importance of sharing the local knowledge and awareness when enacting or reenacting environmental laws and regulations. This is the innovated approach that proceeds legal review to explore the legal framework of local groundwater governance in Japan.

1.4 Outline of Discussion on Public or Private Priority

Most of environmental resources, including groundwater have two faces: public and private (Figure 1-1). Public and private interests come first in deciding on groundwater use. Figure 1-1 shows that legal perspective consists of public priority and private priority. The categories of public and private defined as actors, actions, resources and property rights to be either public or private. According to Sikor (2013), a look at current debates in resource governance, public and private lie at the core of key issues.

...There are as many privates as there are publics. Publics and privates demonstrate that it is not useful to think of public and private as singular entities. There are multiple publics and numerous privates, thus blurring their respective definitions... (Sikor, 2013).

What is the respective balance between public and private? Understanding this category, exploring groundwater governance is one good example for sustainable natural environmental management in Japan.

There are many groundwater related laws and local ordinances under Japanese law, but there is no the Groundwater Law. Groundwater related laws have been spread out. Some articles are written in Civil Law, some are written in the Constitutions, or the other laws. What it better balance of groundwater governance from the viewpoint of policy and legal perspectives?

Natural resources have two faces: public perspectives and private perspectives (Ogawa, 1998). When people think of “sustainability” of natural resource management, people notice that the balance of both publicity and privacy is ambiguous under Japanese laws. Figure 1-1 shows that sustainable perspective build a well-balance between its complexity and flexibility in this dissertation which will discuss through chapters 3 and 4.
Water resource is to be recognized to have two characteristics, public water and private water. As a volcanically active country, there are many natural hot springs around the country. Under the environmental circumstances, from custom to Customary law, hot springs belongs to the public. There is the Hot Spring Law at national level; even there is no Groundwater Law. In old days, people used to go to public bath every day, which is a Japanese old tradition. Public bath is no doubt to say highly public place. Hot spring is traditionally used for public bath. And, it is categorized hot springs as the public category.
Sanbongi, 1994 and 1999). Hot spa makes hot groundwater common property, such as public priority. The general public has right to access hot groundwater. Governments can control how to use hot groundwater in order to benefit the public. On the other hand, groundwater related laws show complex structures. Groundwater is to be recognized as private water. Private groundwater well belongs to the landowner. People did not establish the Groundwater Law ever. It seems there have been no crucial problems on complex groundwater related laws. This structure is well balanced with two faces both flexibility and complexity (van Rijswick, 2012).

For example, there is groundwater conservation articles in Civil Law, the Constitutional Laws, and the other laws and related ordinances. How could people make a balance between this complexity and flexibility? The author would like to recommend decision makers in Japan to understand both groundwater environmental mechanism and social situation taking the structure of groundwater governance into account. This dissertation could help this situation to explor for sustainable groundwater governance.

This dissertation provides an approach for the decision makers to analyze and improve the current sustainable groundwater issues in Japan. It introduces the general idea of groundwater resource government, discussing two core principles: the importance of legal framework and water awareness.

1.5 Outline of the Dissertation

This dissertation describes the complex legal framework of related local groundwater policy and regulations under the Japanese laws. The method used for supporting information is bibliographic survey and case studies. The bibliographic survey is performed on Japanese groundwater laws and local groundwater conservation ordinances. The case studies are done in Niseko, Hokkaido (Chapters 3 and 4), and Saijo, Ehime (Chapter 5). These objectives insist importance of sharing the local knowledge and awareness, at enacting or reenacting environmental regulations and laws.

The dissertation analyzes the functions of local autonomy and the role of ordinances and explains its changing functionalities of groundwater ordinances. Local ordinances are known as the stronger conservation legal network for sustainable groundwater policy in Japan. This dissertation concludes the implication of the “nested-governance”, one of the unique characteristics of Japanese legal framework involving local ordinances, which strengthens local conservation and water resource sustainability.
It has often been said that it is import to integrate existing legal and social systems, which is sometimes called integrated water law or integrated water administration. However, each society has a respective origins and backgrounds, policy makers and stakeholders should find out better solutions for current problems and issues, it does not discuss superiority of inferiority of the relative issues. Individual municipalities do play out their self-initiatives and ingenuity when solving a problem.

The dissertation consists of seven chapters. The research framework and the main contents are shown in Figure 1-2.

Chapter 1 begins with a background of dissertation, a problem definition, a brief explanation of groundwater law and ordinance, outline of discussion on public and private, and outline of the dissertation. This public and private differences must understand before starting this dissertation.

Chapter 2 describes effects of natural factors and social factors on groundwater. At the section of natural factors show Japanese groundwater characteristics on groundwater, such as hydrological cycle and hydraulic resilience time. It also designates groundwater use in Japan on groundwater quality and quantity for domestic use, industrial use, agricultural use, and other uses. At the section of social factors, it explains governance, sustainable development and international groundwater laws.

Chapter 3 describes groundwater conservation ordinance on local groundwater regulations and rules, and strategies. This chapter introduces a case study of new type of groundwater conservation ordinance established in Niseko, Hokkaido. Niseko shows an interesting new type of groundwater ordinance in Japan. Chapters 3 and 4 describe details of legal framework of local groundwater governance under the law.

Chapter 4 reviews legal framework of Japanese groundwater related laws and regulations from national to local levels. This is the core part of this dissertation. Chapter 4 is also a part of studies on legal framework of local groundwater governance as Chapter 3.

Chapters 5 and 6 introduce methodologies that how to abstract local knowledge and awareness.

At Figure 1-2, an arrow from the box of Chapters 3 and 4, which the main part of the dissertation, shows linkage of Chapters 5 and 6, which are supplementary approach and results of the research (Figure 1-2).

Chapter 5 analyses a case study in Saijo, Ehime, focusing on water awareness by using a method of open-ended question
Chapter 6 analyses newspaper articles on water and society, focusing on social understanding by using a method of text mining run by the KH coder which is a text-mining software. This chapter also presents a methodology of extracting local knowledge and awareness, especially from written materials like newspaper.

Finally, Chapter 7 closes with conclusions and future perspective. The final conclusions reached by the results of the main chapters on the aspect of law, with the supplementary results on the aspect of local knowledge and awareness (Figure 1-2).

Figure 1-2 Outline of the Dissertation

References


Chapter 2  Overview of Groundwater

2.1 Effects of Natural Factors on Groundwater

2.1.1 Groundwater and hydrological cycle

The source of groundwater is precipitation, and it is part of the hydrological cycle along with surface water. Some rain flows directly into rivers and other waterways. Direct runoff may flow into surface water which flows from the surface into streams, and subsurface runoff which flows into waterways as shallow groundwater after first seeping into the ground. Precipitation that does not directly runoff accumulates temporarily (e.g., in depressions in the ground, or seeps into the soil). Some of the rain that seeps into the ground is pulled downward by gravity and becomes groundwater (Smith, 1936).

Compared to surface water, groundwater flows more slowly underground. It reemerges in rivers, lakes, and surface water, and rejoins surface water (van Dijk, 2006). The average time that remains underground is said to be several hundred to several thousand years.

The hydrological cycle's processes are affected by the atmosphere and earth. For example, the replenishment of groundwater is controlled by the amount of precipitation, and geology and terrain influence groundwater circulation. Evaporation is affected by temperature, humidity, and vegetation, and the hydrological cycle is affected by man-made factors (i.e., water collection and land use).

2.1.2 Hydraulic resilience time

Heavy rains or melting snow may cause the water table to rise, or heavy pumping of groundwater supplies may cause the water table to decline. Groundwater is recharged by rain and snowmelt that percolates down into clefts from the lands surface. Consequently, forest conservation and sources of groundwater are substantial challenges for local water use planning. In some areas of the world, people confront significant water shortage problems, because groundwater is usually used faster than it naturally recharges.

Groundwater is also important to use for irrigation. Water for agriculture is probably the most important use of water. It is difficult to achieve a balance between the natural

### 2.2 Groundwater Use in Japan

The general properties of groundwater are its Ease of Use, Economic Efficiency, good Water Quality, and Homeothermy (consistency of temperature). Ease of Use means quality of groundwater is usually stable most of the time, except effected by salt, venomous chemicals or other problematic reasons, and in addition that, it is very easy that only drill a well into aquifer and setting a pump or other extraction equipment. Economic Efficiency means initial costs of drilling a well, setting up a pump or other extraction equipment, and running the pump to extract the water is less expensive than other water resource. This economic friendly water resource is often support for drilling wells in developing countries. Good Water Quality means that, since the water is underground for a long time, impurities are filtered out by the soil before it reaches the water table. Water quality is very good, and it contains moderate quantities of minerals. Homeothermy means the water in the aquifer has a stable temperature throughout the year, so it is cool in summer, and warm in winter. Well-water is more useful than river water.

*Table 2-1 A Multiplicity of Groundwater Use*

Each item is ranked in one of three categories by the author; ***good, **average, *fair.


<table>
<thead>
<tr>
<th>Water use</th>
<th>Use case examples</th>
<th>Water quality</th>
<th>Water temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking water</td>
<td>Residential use, Industrial use</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Cooking water</td>
<td>Residential use, commercial use</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Food manufacture</td>
<td>Sake, Soft drink, Tofu, Confectionery</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Industrial water</td>
<td>Cosmetics, Concrete production, Delicate equipment, Drying color use</td>
<td>**</td>
<td>**</td>
</tr>
<tr>
<td>Fish breeding</td>
<td>Eel, Sweet fish, Trout</td>
<td>**</td>
<td>***</td>
</tr>
<tr>
<td>Farm crop cultivation</td>
<td>Gardening</td>
<td>***</td>
<td>***</td>
</tr>
<tr>
<td>Bath water</td>
<td>Public bath</td>
<td>***</td>
<td>**</td>
</tr>
<tr>
<td>Snow melting</td>
<td>Heat pump, Snow melting pump</td>
<td>*</td>
<td>**</td>
</tr>
<tr>
<td>Use for cooling</td>
<td>Plastic factory, Rubber manufacture, Chemical factory</td>
<td>*</td>
<td>***</td>
</tr>
<tr>
<td>Other uses</td>
<td>Fountain, Spa</td>
<td>**</td>
<td>*</td>
</tr>
</tbody>
</table>
Groundwater is used for a variety of purposes (Table 2-1). Terms used in the table are defined as follows. Each case example is ranked in one of three categories: good, average, and fair. Each item has a different characteristic. Drinking Water is used for both residential use and industrial use. Water in Cooking is used for residential use and commercial use. Water in Food Manufacture is used for cosmetic and concrete production. Industry Water for Ingredients is used for cosmetic and concrete production. Industry Water for Washing Water is used for delicate equipment and dying color uses. Water for Fish Breeding is used for eel, sweet fish and trout. Farm Crop Cultivation is used for gardening. Bath water is used for public bath. Snow melting water is used for heat pumping and snow removal in snowy regions. Water for Heater is for protected horticulture, spinning factory use, and office use. Water for Cooling Uses is for plastic factory use, rubber manufacture use, and chemical factory use, and other uses is fountain and spa. The characteristics of stable temperature increase its variety of uses for many purposes.

In 2010, Japan used about 80.9 billion cubic meters of water (regarding water extracted) per year. Of that, around 15.2 billion cubic meters was domestic water, 11.3 billion was industrial water, and 54.4 billion was agricultural water (Ministry of Land, Infrastructure, and Transport, 2014). Municipal water use increased slightly since 1985 and then tended to decrease. Use of agricultural water also decreased due to the decreasing population of farmers.

Table 2-2 Total Groundwater Uses
(Source: Retrieved from Ministry of Land, Infrastructure, Transport and Tourism (2011))

<table>
<thead>
<tr>
<th>Groundwater use (100^8 m^3/y)</th>
<th>Groundwater and surface water use (100^8 m^3/y)</th>
<th>Dependence on groundwater</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic water</td>
<td>31.8</td>
<td>28.4%</td>
</tr>
<tr>
<td>Industrial water</td>
<td>31.7</td>
<td>28.3%</td>
</tr>
<tr>
<td>Agricultural water</td>
<td>28.7</td>
<td>25.6%</td>
</tr>
<tr>
<td>Fishery water</td>
<td>13.9</td>
<td>12.4%</td>
</tr>
<tr>
<td>Snowmelt water</td>
<td>4.9</td>
<td>4.3%</td>
</tr>
<tr>
<td>Building water</td>
<td>1.2</td>
<td>1.0%</td>
</tr>
<tr>
<td>Total</td>
<td>112.2</td>
<td>100%</td>
</tr>
</tbody>
</table>
2.2.1 Domestic groundwater

Groundwater usage heavily influences upon environmental conditions (topography, geology, and precipitation) and man-made factors (urbanization and population change), so it varies by region.

Table 2-2 indicates that domestic water is approximately 20% dependent on groundwater. By region, the groundwater dependence rate for domestic water is higher in the Minamikyushu (54.3%) and Sanin (51.9%) regions, where it exceeds 50%. It is also high in Shikoku (41.5%), Kanto-Nairiku (41.0%), and Hokuriku (39.8%). On the other hand, Hokkaido (6%) and Okinawa (8.5%) have a little dependence rate on groundwater for domestic water.

2.2.2 Industrial groundwater

Due to its ease of use, economic efficiency, good quality, and homeothermy, groundwater is widely used for industrial water. Large quantities of groundwater are for industries such as chemicals, steel, pulp, paper, and food processing for applications such as manufacturing, cleaning, and cooling.

The dependence on groundwater for industrial water is 29.5% nationwide. By region, it is highest in Hokuriku (62.7%), Kinki-Nairiku (54.8%), Kanto-Nairiku (46.0%) and Tokai (45.0%).

Since the postwar era, industrial-use groundwater has been drawn from deep artesian wells, but since factories built in alluvial plains, these regions tend to be damaged by subsidence and groundwater salinization.

2.2.3 Agricultural groundwater

The main type of water used for agricultural purposes is surface water. Since groundwater has come to be used as an auxiliary water source and in times of drought, its proportion of use for agricultural purposes is small. However, in Saijo, Ehime, there is a region where artesian water is drawn from a well in the middle of farmland (See Figure 2-2).
2.2.4 Other groundwater consumption

About 1.39 billion cubic meters of groundwater uses for raising fish, such as trout and eel, accounting for 12.4% of overall use. It is the fourth highest application after domestic consumption (28.4%), industrial use (28.3%), and agricultural purposes (28.7%) (Ministry of Land, Infrastructure and Transport, 2016). Besides, it is useful for snow removal in heavy snowfall areas where the temperature is not below freezing. Much groundwater also uses for hot spring water.

2.3 Natural Characteristics of Groundwater

As described above, groundwater policy and management cannot be addressed without consideration of individual users. It is important to understand the characteristics of natural groundwater resource before beginning discussions about water management and policy. Where does its groundwater come from? How had ancestors and local people been used groundwater? The author conducted several field surveys, and trying to understand an object area, which is a principle of on the spot decision-making.

Water is moving around up to down, from the sky to the ground, and again, from the ground to the sky, continuously. It is called the hydrological cycle. Groundwater is a part of the cycle. Groundwater is usually think of invisible, but it sometimes forms visible water, in which the overflow of lakes and rivers (van Dijk, 2006).

There are many types of groundwater, the most important classifications being phreatic and artesian.
1) Phreatic Water

Phreatic water is relevant to aquifer in hydrology that is a free groundwater. A free groundwater table is strongly influenced by inflow and outflow influenced by recent precipitation. For example, the groundwater table will rise when rain water pouring into the aquifer, while outflow lowers when groundwater flowing down to sea or river from aquifer (van Dijk, 2006). Even human activities, the natural groundwater table reveals large changes. Shallow well often uses preheat water.

2) Artesian Water

A confined layer above aquifer makes hydraulic pressure, and the pressure causes water to rise spontaneously to the surface (van Dijk, 2006). Here is a picture of artesian water in Saijo City, Ehime Prefecture (See Figure 2-2). Hydraulic pressure pushes up water to ground level.

![Figure 2-2 Land on Sale with Flowing Artesian Water Close to JR Saijo Station.](source)

(Source: Author’s photo taken at Saijo, Ehime Prefecture, October 2009)

Artesian aquifers abound in groundwater, used for both industry and domestic water supply. Chapter 5 indicates how to implement sustainable water management with these rich water resources, providing a case study of artesian water management.

People are inclined to think of groundwater as being under the ground; however, in this circumstance, phreatic water outflows to join the river. Regardless, the legal framework of water resource management is segregated into two distinct parts, groundwater and river water. River water means surface water. Water is a cycling water resource. The flowing water point, where water flow down, would change the responsible person, who takes in charge for water management. In that sense, it is important to understand how groundwater flowing down under the ground, and appearing to the surface. Water related laws or regulations
would change differently with flexibility, when water flowing through different objectives: mountain, river, lake, sea or pond, etc.

2.4 Groundwater Environmental Issues

2.4.1 Groundwater contamination

In the period of rapid economic growth after World War II (hereinafter ‘WWII’), significant groundwater contamination was caused by industrial factories (Goto, 2013). For example, volatile organic chlorine compounds have caused serious damage to groundwater quality. Water pollution standards first appeared in both ‘Environmental Quality Standards Concerning the Protection of the Human Health’ and ‘Environmental Water Quality Standards Concerning the Conservation of the Living Environment,’ introduced in 1971. After several improvements in 1993 and 1999 on its policy, the Environmental Standards of Groundwater Pollution designate 26 chemical substances that the use of chemicals is restricted to limited types of compounds (Muraoka, 1989).

Soil and shallow groundwater pollution has resulted from volatile organic chlorine compounds introduced by metallurgical and semiconductor industries, including trichloroethane, which is used as a cleaning solvent, and tetrachloroethylene, used for degreasing and as an alternative ingredient for CFCs (chlorofluorocarbons) (Ministry of Land, Infrastructure, Transport and Tourism, 2016). The quantity of these compounds found in the environment in excess of environmental standards is decreasing.

The characteristics of volatile organic chlorine compounds are that they are heavy, water-insoluble, barely absorbed by soils, have low adhesiveness and are highly volatile and do not easily decompose. These compounds cause groundwater pollution through the process of percolation, whereby water that has infiltrated the ground percolates deeply because of gravity, and eventually the compounds affect the groundwater throughout the aquifer.

Due to the advection of groundwater flow and water dispersion, the polluted area spreads. The effects of volatile organic chlorine on the human body are paralytic symptoms, respiratory disturbance, anemia, hepatic dysfunction; they are also carcinogenic.

Nitrate comes from nitrogen, a planet nutrient supplied by inorganic fertilizer and animal manure. Airborne nitrogen compounds given off by industry and automobiles are deposited on the land by precipitation and on dry particles. Other non-agricultural sources of nitrate include lawn fertilizers, septic systems, and domestic animals in residential areas.
In the soil beneath agricultural lands, nitrate is the primary form of nitrogen. It is soluble in water and can easily pass through soil to the groundwater table. Nitrate can persist in groundwater for decades and accumulate to high levels, as more nitrogen is applied to the land surface every year.

With regard to groundwater policy, nitrates are linked to untreated wastewater from milk farmers, cowsheds, and pig houses, etc. Some areas, such as Hokkaido Prefecture, Kirigaoka in Ibaragi Prefecture, and Onakanoko in Shiga Prefecture, face serious nitrate issues threatening groundwater quality in Japan.

2.4.2 Land subsidence

The most intense abnormal lowering of the groundwater level occurred during the period from 1945 to 1960. The marked decrease of groundwater level and drying-up of wells occurred in this period of rapid economic growth after World War II, because of unregulated groundwater use (Ministry of the Environment, 2016).

The excessive consumption of groundwater that occurs faster than the speed of groundwater recharge causes land subsidence. Under normal conditions, it can take a long time to recharge groundwater; once damaged by seawater, it can take longer.

Land subsidence caused by groundwater depletion was first chronicled in Japan south of the Kanto Plain in the first half of the 1890s, in the middle of the Meiji era, and at Osaka Plain in the middle of the 1930s, the first half of Showa era.

During the late 1950s and early 1970s, subsidence occurred in major metropolitan centers, such as Osaka and Tokyo, and surrounding areas. Some regions experience 20 cm of subsidence or more per year. Subsidence is occurring in the Osaka plains (Hyakushima, Nishiyodogawa, and Osaka), Nobi plains (Hakke, Nakajima, and Mie) and Saga plains (Tatsue, Shiroishi, and Saga). Subsidence beginning in the low-lying areas of the Kanto plains has expanded inland to Saitama, Ibaraki and Gunma. Subsidence in excess of 400 cm was recorded in 1972 in the Kanto plains (7-chome, Kameido, Koto-ku, and Tokyo).

In addition, subsidence caused by extraction of water soluble natural gas has occurred in the Niigata plains and Kujukuri, Chiba (Minamiyoshita, Mobara, and Chiba), and subsidence caused by intensive use of large quantities of water for snow removal has occurred in Kanazawa, Ishikawa, and Muikamachi, Niigata (Minamiuonuma).

After 1955, land subsidence decreased after water sources shifted from groundwater to surface water, and groundwater conservation laws were enacted. It is still necessary to
monitor groundwater carefully, as it is used as the source of emergency water supply and is a snowmelt water resource during heavy snow. In addition, in littoral regions, seawater intrusions into groundwater can adversely affect farm products.

As recently as 2011, there were 14 regions in which land sank more than two meters, the total area of subsidence being 5919.5 km². This total is well over that of last year, six regions and 5.5 km² in 2010 (Ministry of the Environment, 2016).

2.4.3 Artificial groundwater recharge

With increased urbanization, the construction of asphalt-paved roads coats the earth’s surface, and gradually, there are diminishations of both infiltration capability to the underground and draining capacity of rainwater. This has prompted many studies on artificial groundwater recharge, which is often undertaken to raise groundwater level and quantity of flow.

The recovery of the groundwater level is difficult on the alluvial plain, as it is difficult to inject water directly into the aquifer by injection well. Accordingly, the surface cultivation method through osmosis water treatment becomes the main method for artificial groundwater recharge.

2.5 Effects of Social Factors on Groundwater

2.5.1 Governance

Governance is the capacity of government to make and implement policy, in order words, to steer society’ (Jon and Guy, 2000).

‘Governance’ does not define only as “state”. State consists of three aspects: land, people, and its domination (Ashibe, 2002). The definition of governance refers to something broader than government, to the extent ‘governance’ must be explained as land, people, its domination, authority, sovereignty and local intelligence with public participation.

Etymologically, governance can be traced back to the Greek verb Kubernān (to pilot or steer), and was used by Plato with regard to how to design a system of rule. The Greek term gave rise to the Medieval Latin gubernare, which has the same connotation of piloting, rule-making or steering. The term has been used as synonymous with government, as the definition in the Concise Oxford Dictionary implies (Concise Oxford Dictionary, twelfth edition).
2.5.2 Sustainable development

Sustainable development has many different definitions. The most commonly quoted is that from Brundtland report, *Our Common Future*: ‘development that meet the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED, 1987). Environmentalists speak of ‘sustainable development’ in trying to demonstrate the relevance to development planners of their ideas on proper management of natural ecosystems (Adams, 2003). Future Environmentalist shall try to propose sustainable management plans for next generations by groundwater governance.

2.5.3 International groundwater laws

International guideline of regulating how rivers and their connected groundwater that cross-national boundaries is announced by the Helsinki Rules on the Uses of the Waters of International Rivers, adopted by the International Law Association (ILA)\(^1\) in Helsinki, Finland in August 1966.

Article II: An international drainage basin is a geographical area extending over two or more States determined by the watershed limited of the system of waters, including surface and underground water, flowing into a common terminus.

Groundwater that is not connected to surface water is not dealt with under the Helsinki Rules. The definition of international drainage basins that left confined aquifers out of the ambit of the Helsinki Rules (Krishna and Salman, 1999). The Seoul Rules on the international Groundwater, 1986, fill the gap existed in the Helsinki Rules with respect to shared groundwater resources (Appendix).

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\(^1\) The ILA is a scholarly non-governmental international organization which has made significant contribution to the development of the emerging rules of international law (Krishna and Salman, 1999)
Article II: Hydraulic Interdependence

1. An aquifer that contributes water to, or receives water form, surface waters of an international basin constitutes part of an international basin for the purpose of the Helsinki Rules.

2. An aquifer intersected by the boundary between two or more State that does not contribute water to, or receive water form, surface waters of an international drainage basin constitutes an international drainage basin for the purpose of the Helsinki Rules.

3. Basin states, in exercising their rights and performing their duties under international law, shall take into account any interdependence of the groundwater and other waters including any interconnections between aquifers, and any leaching into aquifers caused by activities and areas under their jurisdiction.

The Seoul Rules laid down, for the first time, rules related to groundwater, both in confined and connected aquifers. The Helsinki Rules and the Seoul Rules have no formal standing, however, they are to be considered only as an effort to read special principles, which are no more than recommendatory (Krishna and Salman, 1999).

Although Japan is an island, those laws rules about international groundwater issues. However, it shows some useful concepts about applying to domestic groundwater governance. As Article 2nd in the Seoul Rules, it addressed progressive definition about groundwater. As a viewpoint of understanding local groundwater governance, those international groundwater laws are lack of rules and principles for domestic groundwater management.

References


Chapter 3  Groundwater Legislation and Controls for Sustainability, the Case of Niseko

3.1 Introduction

Groundwater is one of the significant natural water resources in addition to surface water. Nevertheless, Japan did not have a comprehensive law on water, and incomplete national or local system’s responsible for managing groundwater from the perspective of conservation of sustainable groundwater in Japan.

Chapter 3 describes groundwater conservation ordinance on local groundwater regulations and rules, and strategies. This chapter introduces a case study of new type of groundwater conservation ordinance established in Niseko, Hokkaido. Niseko shows an interesting new type of groundwater ordinance in Japan.

Recently, groundwater is facing new challenges. In the Forestry Agency of the Ministry of Agriculture, Forestry and Fisheries published a press release on the 9th December 2010, which confirmed transactions involving wasteland and green forestland with foreign investors in Japan. This snippet of information was successful in drawing the attention of society to the problem and people gradually realized that the development of sustainable solutions for groundwater is vital and indispensable. The fundamental principle for groundwater legislation had disputed. Water laws divided into many branches depending on their individual characteristics. For example, we have Industrial Water Law, Building Water Law, Mining Act, Quarrying Law, Gravel Digging Law, Environmental Pollution Prevention Act, Environmental Basic Law and the Water Pollution Prevention Act, and other laws. Under these circumstances, each municipality has to take the initiative in groundwater conservation instead of the national government. The lack of state law, local authorities have to make local laws (Tsuchiyama, 2015).

From a viewpoint of history, why has the passing of the Groundwater Law been postponed? Before World War II, most of the people made a living from agriculture and water supply relied on both groundwater and surface water. There were many border disputes between villages related to what is a fair distribution of water. It is evident that there was a lack of national groundwater rules. After World War II, the primary water supply system shifted to surface water from groundwater. After the River Act passed in 1971, there was a
decrease in conflicts among private individuals. The majority no longer discussed the need for a groundwater policy. In the middle of 1970s, the contamination of groundwater and land subsidence became social problems during the rapid economic growth. The government only enforced The Industrial Water Law, Building Water Law, and Environmental Pollution Prevention Act.

After the press released the news that some land, which is a source of groundwater, had been bought by both foreign and domestic investors society has gradually paid attention to how the groundwater resource could preserve in a sustainable way for future generations. Niseko is a good example of a groundwater policy. The municipal government established a new type of groundwater legislation in 2011. There are many transactions involving wasteland and forestland. This chapter analyses a case study of the Groundwater Conservation Ordinance in Niseko, Japan.

3.2 Methodology

This chapter analyses the new approach and process for groundwater conservation in a case study of Niseko, Hokkaido. In a case study of Niseko in February 2012, interviews mainly from local administrative officers including five of water bureau, and a few local people about ten inhabitants, farmers, and workers. It also analyzes legal documents required in the implementation of the groundwater conservation management, and aims to develop solutions for sustainable groundwater legislation and controls.

3.3 Description of the Study Area

3.3.1 Niseko’s geographic and climate settings

Japan is a spindle-shaped island country in East Asia comprised of a large stratovolcanic archipelago extending along the Pacific coast of Asia. Tokyo is capital, where is situated at a latitude of 35°40’ N and a longitude of 140°E. Japan consists of several thousand islands, of which Hokkaido, Honshu, Shikoku, Kyusyu, and Okinawa are the five largest. The population of Japan was estimated at 127,083,000 in 20 October 2015 (Ministry of Public Management, Home Affairs, Post and Telecommunications, 2016). The population density in Japan is 343 people per km² (Ministry of Public Management, Home Affairs, Post and Telecommunications, 2016).
Because of the mountains running down the center of Japan, there is a large population in a small territory, and the precipitation per person is about one-third of the global average (de Graaf and Hooimeijer, 2008). The annual precipitation is 1,690 mm, about twice the world average, which is estimated at 810 mm. The potential groundwater resource per person is 3,200 m³ per year, less than half the world average that is about 8,400 m³ (Ministry of Land, Infrastructure, Transport and Tourism, 2016). Due to its location in the Asian Monsoon zone, the rainfall is concentrated in typhoon season (Ogura, 2009). Most of the potential water resource flows into the sea without flowing into the ground. Japan has a mountainous topography with steep slopes and its rivers are short and flow rapidly out to the sea (Mushiake, Takahashi, and Ando, 1981). Under these circumstances, a sustainable management of groundwater is indispensable.

Niseko is located in western Hokkaido, an island in northern Japan, surrounded by Mts. Yotei, Niseko - Annupuri and Mt. Konbudake. It locates approximately at latitude 42.52 degrees north and longitude 140.48 degrees east (Figure 3-1). The area is 197.13 Km². Mt. Yotei has an elevation of 1,898 m, Mt. Niseko-Annupuri 1,308 m and Mt. Konbudake 1,045 m. Niseko and its neighboring areas of Otaru, Kutyan, and Rusutsu, are designated as national parks. They comprise around the year tourist resort with beautiful natural settings. The national park occupies more than 14% of the land area of Niseko and 74% of the natural forest. The Shiribetu River is the 6th longest river in Hokkaido flows approximately in the center of Niseko and joins the Magari River and the Konbu River. The highest average annual temperature is 21 degrees, and the lowest is -6.0 degrees. In winter, the northwest monsoon brings moisture from the sea causing falls of snow when it hits the mountains, where is an area of heavy snowfall; the deepest snow accumulation of the year is 2 meters. The melted snow flows into the Shiribetsu River running through the town.

![Figure 3-1 Location of Niseko, Hokkaido](image_url)
3.3.2 Economic and demographic factors

The main industries of Niseko are agriculture and tourism, which is especially famous in the winter season. The population of Niseko is 4,669, and the number of households was 2,217 in May 2013. The primary agricultural products are potato, rice, melon, and asparagus. This area is known for its ski resorts. The number of tourists is about 1.40 million throughout the year and in 2007 the number of foreign tourists was ten times larger than in 2001. Most of the visitors are from Asia and Oceania. After successful strategies for developing the tourism industries, which was beyond expectations, both foreign and domestic investors also found the value of Niseko from a different perspective.

3.3.3 Water availability and demand

In the areas with heavy snowfall in the winter, melted snow flows into Shiribetu River, which runs through the town. In the resort areas, the average consumption of piped water per person is larger than in other regions (See Table 3-1). It is an under-regulated environment for sustainable management of the groundwater. A groundwater policy is necessary to seek how to give a balance between sustainable conservation and the key industry. Individual water consumption per day in Ikoi village and Hot spring village, and the volume of water supplied are extremely high. How does regional authority design the sustainable strategy in Niseko? Figure 3-2 is an advertisement board which is rarely found those commercials written in English at this kind of countryside in other area of Japan.

![Figure 3-2 An Advertisement of Real Estate Agent for Foreign Investors in Niseko.](Source: Author’s photo taken at Niseko, 2011)
Table 3-1 Water Uses and Population Served Piped Water, Niseko (2012)
(Source: Retrieved from Niseko town official website: http://www.town.niseko.lg.jp/)

<table>
<thead>
<tr>
<th>Town</th>
<th>Water consumption (m³)</th>
<th>Population served by piped water</th>
<th>Water consumption per person (m³)</th>
<th>Individual water consumption per day (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town center</td>
<td>335,146</td>
<td>2,788</td>
<td>127.4</td>
<td>340.0</td>
</tr>
<tr>
<td>Soga</td>
<td>99,329</td>
<td>513</td>
<td>193.6</td>
<td>530.5</td>
</tr>
<tr>
<td>Miyata</td>
<td>21,518</td>
<td>205</td>
<td>105.0</td>
<td>287.6</td>
</tr>
<tr>
<td>Kondo</td>
<td>50,084</td>
<td>299</td>
<td>167.5</td>
<td>458.9</td>
</tr>
<tr>
<td>Niseko</td>
<td>129,158</td>
<td>228</td>
<td>566.5</td>
<td>1,552.0</td>
</tr>
<tr>
<td>Katsura</td>
<td>1,894</td>
<td>21</td>
<td>90.2</td>
<td>247.1</td>
</tr>
<tr>
<td>Onsenkyo</td>
<td>1,878</td>
<td>2</td>
<td>939.0</td>
<td>2,572.6</td>
</tr>
<tr>
<td>Ikoi no mura</td>
<td>242,534</td>
<td>5</td>
<td>4,906.8</td>
<td>12,443.3</td>
</tr>
<tr>
<td>Fukui</td>
<td>21,155</td>
<td>289</td>
<td>73.2</td>
<td>200.5</td>
</tr>
</tbody>
</table>

3.4 Principles of the Groundwater Ordinance

The development of sustainable water conservation has discussed for a long time, ever since the Meiji era when the emperor restored to power. Groundwater is always an important natural water resource as well as surface water. As explained above before, there is a discussion about a sustainable groundwater policy and its management. There is no fundamental groundwater law passed by the government, Groundwater Ordinances at a local level. Why are those municipal ordinances considered as the basic legislation for sustaining the regional environmental resource? It is because the River Act states that Groundwater is public property. But on the other hand, the Civil Law states that Groundwater is private property. This private property implied, this means that the laws did not match reality. To understand Groundwater regulations in Japan, customary law also covers its weakness of private ownership.

However, time has gradually changed the views of society as the people are increasing who thinks that groundwater may no longer regarded as private property. For example, it is tough to divide liquid water under someone’s land. A border between two houses is obviously visible. There may be a wall between them. When people think about the groundwater, how could people divide water from a huge water jar under the ground? Besides, it flows all the time within the water jar. Japanese people traditionally admit that groundwater is public property which is what customary law states.
3.4.1 Niseko groundwater conservation ordinance

The town of Niseko gave a press release that the Groundwater Conservation Ordinance became effective in September 1st, 2011 (Niseko Town, 2013). This ordinance is a strong initiative by municipal authority themselves to protect their local drinking water (Hokkaido Prefecture, 2013). Town hall specified a large area of land to preserve in its natural state as public property. The ordinance calls for the efficient utilization and equitable access and sharing of the region’s water resources to ensure a sustainable social, environmental and economic benefit for all. The key principles of Niseko’s Groundwater Conservation Ordinance are summarized below:

This ordinance based on the principle of the Niseko Environmental Basic Ordinance. (Niseko Ordinance No. 29, 2001). The main intention is the control of water pollution and drought, and to authorize some natural conservation areas in and around the source of drinking water. Protecting the irreplaceable groundwater for the future will be great contribution the health and culture of the local people (Article 1).

The responsibility of the town council is to protect the sustainable social, environmental and economic benefits of groundwater, especially to protect citizens from hindrance on their, and to pursue a groundwater policy (Article 3). The responsibilities of water users are recharging groundwater, reducing water usages and cooperating with the local authority in the management and its policy of sustainable groundwater (Article 4). People whom cannot excavate groundwater must have authorization decision by the mayor of the town.

One cross section of pump’s exhaust slot should be over 8 cm². Also, to change the arrangement and position of pipe strainer, or to amplify an area of cross section, it is needed to ask permission of the mayor of the town. The mayor may not grant permission to water users unless they satisfy the conditions of the licensing standards written in by Article 6. Before the government or other local public bodies agree to utilize the groundwater of Niseko, the head of the town must agree under Article 1. The town mayor has the authority to add additional qualifications or conditions on water users if it is necessary (Article 5).

There are four main licensing standards in groundwater conservation;
(1) It shall not impede an efficient water supply for citizens.
(2) It shall not have an adverse influence on the existing system of the source and provision
(3) The use of the water should be necessary and consistent with sustainability.
(4) It should agree that there is no alternative (Article 6).

The applicant must explain the plan of the installation work in a meeting for the residents. This session should be announced in public ten days beforehand and notified by letter to the town head. The registration applicant has to report the results of the meeting to the town mayor without delay. When the matter is under discussion, the applicant must reach an agreement with local people (Article 7). A registration applicant shall submit an application to the town mayor.

Application for a license with the following information (Article 8);

(1) The name of the authorized representative
(2) The name of the company
(3) The purpose for which groundwater will use
(4) The position of pipe strainer, the kind of pump
(5) The cross-section area of the exhaust slot, the average quantity of pumped water per day
(6) The location of the well with a map
(7) Other information which the town council may require

When City Hall has accepted the application, town mayor shall discuss it with the Niseko committee responsible for the source of groundwater (Article 9). The town mayor should announce his decision within 60 days according to the provisions of Article 8 (Article 10). After completion of the well, a report must be submitted to the town council within 15 days who will conduct an inspection in the name of the town mayor (Article 11).

People who obtain the permission is under the obligation both to construct the well must include an instrument for measuring the amount water drawn per month this must be reported each month to the town mayor (Article 12). A person who inherit, borrow or amalgamate with their well, a permitted well-facility shall succeed to its status to a legal heir. They shall report the changes within 30 days to the town mayor (Article 15).

The license for the well shall withdraw if:

(1) When the business is closed.
(2) When the water does NOT mechanically pump up.
(3) When its area of cross section reduces to less than 8 cm$^2$. 
When a licensor is against the rules, it must be reported to the town mayor (Article 16). The town mayor shall rescind the license granted to applicants who applied by deceitful or improper means. If a company uses groundwater without permission, the Town Council shall as a matter of urgency order a cut in the water intake after a warning has been given and ignored for the specified time (Article 17). The town mayor shall request the administrative officers to enter and inspect the facilities if that is necessary (Article 18).

The town mayor shall advise or guide licensors or deputies and to recommend taking any necessary steps (Article 19). After the recommendation in Article 19, if licensors or deputies neglect their duties, the town mayor may order the implementation (Article 20), and licensors or deputies obey town mayor’s recommendation in Article 18 or orders in Article 19, it is necessary to report the town mayor about an examination result from administrative officers (Article 21). If any person does not obey the order under Article 20, then the town mayor shall order the abeyance of the licenses (Article 22). Any person, who refuses the recommendation of Article 19, and the order of Article 20 without justifiable grounds, shall announce one’s name in public (Article 23). Any person who refuses the orders given under the preceding paragraph of Article 17, 20, and 22 shall pay a fine not exceeding 500,000 yen. Any person, who neglects or forgets to notify the town manager within 15 days after the facilities operated, shall pay a fine not exceeding 300,000 yen. Making a false declaration or refusing, disturbing or evading an on the spot investigation shall pay a fine, not more than 300,000 yen (Article 25). This ordinance shall also apply mutatis mutandis to any act in violation of the preceding articles to any representative of the juridical person, deputy, employees, and other workers (Article 26).

3.4.2 Conservation strategies and challenging in Niseko

As the melted snow flows into Niseko Town, the rich forests utilize recharged groundwater such as sump and subsoil water. People could not live without the benefits of nature, and they have to use the limited water resources that we have carefully. How can people manage sustainable development in economic, social, and cultural? Groundwater policy delayed establishing the fundamental law that replaces customary law and other legislation related to groundwater. The most notable regulative feature of Niseko is that the states of penalties the requirement to giving revealing one’s full name in public specified in the ordinance with legal sanctions. It states that groundwater is local common property. At the same time, it sends a strong message to protect local environments by levying a fine on
the violators of the rules. This article is a new approach compared with other ordinances from different regions. Most of the environmental problems are the result of gathering tiny environmental changes day by day. Water policy must also be adapted to those environmental changes, no matter whether they are small or big. There is no doubt that regional administrative authorities know the current environmental circumstances in their area. They have the capacity to make a prompt response to the urgent environmental problems (Ito, 2004). These new kinds of the ordinance have covered the lack of fundamental groundwater laws at a local level (Tsuchiya, 2015). Although the legal structure is not sufficient at present, Japan has legal treaties for water conservation. When we think about preserving local water, we need to be flexible in our approach. Water supply and demand should be in a one to one ratio. Lately, there has been a press release of a report from both a voluntary member of the House of Representatives and the House of Councilors. They produced ideas for establishing a new fundamental groundwater law, which can combine domestic and local legislation to ensure sustainability in the management of groundwater.

Children should inherit a sustainable system for managing groundwater. Policy makers and stakeholders must continue to find ways of preserving the water environment. Figure 3-3 shows a summary of Chapter 3. Sustainable groundwater governance consists of four actions and strategies; natural resource conservation, a leadership of the mayor, to build conservation procedure for groundwater environmental changes written in ordinance, and some protected area should be designed. When more or less four actions succeeded, effect could be expected much more. Each individual case reacts on different actions. Policy maker should be flexible to achieve properly for each case.
3.5 Conclusions for this Chapter

After the Groundwater Conservation Ordinance of Niseko had come into force in September 2011, groundwater conservation after the ordinance was followed. There were many obstacles in enforcing the regulation from the beginning. Town hall carried out surveys of land where the source of drinking water, like groundwater, is located. The town administrative office could not identify the contact information of some of the landowners from outside. Complicated social issues connected with each other in water management. For example, in the past, a tiny piece of worthless land was sold by unscrupulous real estate developers (Kawakubo, 1995). It is hard to track the owners of land after inheritance. One of the key solutions is that a local administrative government must cooperate with the other local administrative bodies if it is to respond promptly to a problem (Mizutani and Urakami, 2001). In January 2013, when the author did the first field survey in Niseko, we found that there was one drinking water company that had avoided building a manufacturing plant in the preservation area. The reason was that many intricate examinations deter investors. Niseko passed pioneering legislation. The town mayor showed a strong initiative to sustainable water resource management. It is crucial to work with the consensus of local people in considering regional water resources, but it also vital to have a strong leader to achieve it. Policy makers should see long-term benefits of sustainable water management. It often takes priority over
the short-term benefits for the town. Small cities tend to rely on a corporation tax for a larger part of their income. The local government makes a balance between conservation and local finance; the national government can include a budget for part of the cost of local water governance in regional water policy (Milliman, 1959). However, the regional authority should be allowed to make decisions about authorizing environmental water controls. For next challenge for legislation and controls in Niseko, the ordinance should be studied in the context of the various cases in every time. Enacting legislation is only the starting point. The environment has not changed slowly. However, once water polluted, people will suffer badly for decades. This research should continue analyzing how the legislation works for a sustainable preservation of the environment in near future.

References


Chapter 4  The Structure of Local Groundwater Law for Sustainable Groundwater Policy

4.1 Introduction

Chapter 3 describes groundwater conservation ordinance on local groundwater regulations and rules, and strategies. Chapter 4 reviews legal framework of Japanese groundwater laws and regulations from national to local levels. This is the core part of this dissertation. Chapter 4 is also a part of studies on legal framework of local groundwater governance as Chapter 3.

Groundwater is crucial to all societies. It provides a reliable and ample supply of water in many places for home use, irrigation, and industry (Ministry of Land, Infrastructure, Transport and Tourism, 2016). In Japan, the law governing groundwater nationally is inadequately developed. We do not even have a water law. We only have a river law and several other regulations (See 3.3.2).

Articles 13 and 25 of the Constitution of Japan on life, liberty, and the right to the pursuit of happiness provide the authority to build local ordinances for the conservation of sustainable groundwater (Ashibe, 2002). They have become well-grounded articles in every groundwater protection policy.

Groundwater has accumulated underground; seeping slowly through soil and rock, so that protecting the surface land is also essential. In recent years, water supplies have progressively depended on upon groundwater, where access is comparatively easy, and the water requires less stringent treatment than surface water. It is estimated that more than 1.8 billion people worldwide rely on groundwater to meet their daily water needs (UNICEF, 2016). In Japan, it gives about 12% of the total water consumption (Ministry of Information Affairs and Communications, Statistic Bureau, 2015).

In recent years, groundwater is facing new challenges. The Forestry Agency of the Ministry of Agriculture, Forestry, and Fisheries has published a press release in 2010, stating that there are active transactions in wasteland by foreign investors as well as by domestic investors. A land covered by green forestland or paddy fields that are an area that can recharge groundwater (Hori, 2013). This press release has received much attention from
media all over the country, and people have had a good chance to reconsider how we can keep a locally sustainable groundwater supply for future generations. In these circumstances, legislation and controls of groundwater are hotly disputed issues in Japan (The Forestry Agency of the Ministry of Agriculture, Forestry and Fisheries, 2016). It triggered controversy about natural conservation as well as the preservation of groundwater resources and influenced domestic issues by external factors. For example, in the USA, most states’ surface water and groundwater have been placed in the public domain. Each state has its local conservation and management system (Johnson, 2013).

There are not enough regulations to enact any local ordinances by local government itself. Consequently, a local government obeys local rules and the old tradition of sustainable groundwater conservation (Nakashima, 2013). Groundwater law, in Japan, has an “overlapping legal structure” (Zafonte and Sabatier, 1998). When an environmental problem, which is related to groundwater, results in a court action, then it appears at a glance that there are only a few laws for groundwater conservation. Other environmental laws cover the preservation of groundwater resources in a complex manner. This overlapping legal structure has used for the natural conservation of groundwater.

However, no particular problems have so far occurred under these circumstances. If a difficult issue happens in the future, it is not clear how we can protect groundwater resources without a groundwater law.

4.2 Use of Groundwater

Groundwater is more useful for supply and less vulnerable to pollution than surface water, and it constitutes about 12% of the total water consumption in Japan. Its temperature varies little through the year, so it is warm in winter and cool in summer. Groundwater is used to melt the snow on traffic routes and roofs (Numazawa, 2002). Groundwater uses for tap water for industrial purposes such as the sake brewing industry, the cosmetic industry, the bottled water industry, the food industry, the hotel industry, public facilities, and others. The percentage uses of groundwater in 2011 is about 30% uses for industry, 29% domestically, and 24% for agriculture (Ministry of Information Affairs and Communications, Statistic Bureau, 2015). Thus, when we discuss groundwater policy, the policy makers in Japan tend to give a higher priority to industry and agriculture (Ministry of Land, Infrastructure, Transport and Tourism, 2015). When a natural disaster occurs, groundwater becomes something necessary for survival (Taniguchi and Nakashima, 2013). For example, at the time

4.3 Water Governance

Groundwater is often considered as an unseen and therefore inexhaustible resource. In fact, it is often a fragile resource susceptible to pollution and over-extraction. Thus, it is essential that the government have a sustainable groundwater policy. The Japanese government is responsible for formulating and implementing a water policy at a national level (Ministry of Land, Infrastructure, Transport and Tourism, 2015) in which the ministries of Land, Infrastructure, Transport, and Tourism play a central role. The ministries prepare a comprehensive plan for the development and conservation of water resources, for example, by making a plan for dam construction, building irrigation drainage, river management, etc. On the other hand, the local government takes charge of the operation within the framework of the national policy. However, there is an exception in the local groundwater policy. Local government has been conserving its own groundwater resource independently by using local ordinances. This is discussed in the next chapter.

4.3.1 Organizational structure

The national government formulates and implements comprehensive policies: The development of water resources, the administration of waterworks, and the protection of water quality. There are five related ministries to take charge of the various administrative areas, and cooperate with each other to formulate policies. They are (1) the Ministry of Land, Transport, and Infrastructure; (2) the Ministry of the Environment; (3) the Ministry of Health, Labor and Welfare; (4) the Ministry of the Economy, Trade and Industry; and (5) the Ministry of Agriculture, Forest and Fisheries (Ministry of Land, Infrastructure, Transport and Tourism, 2016). Table 4-1 shows the role of relevant government office related to groundwater.

The local governments manage the domestic, industrial, agricultural, and sewerage water utilities and their related facilities. The percentage of the national population with access to water resources reached 97.7% in 2015 (Environmental Protection Department, 2016). The local environmental division in each region continuously monitors the quality of public water and supervises local private companies to ensure that the standards for
wastewater effluents are being met to prevent any environmental pollution caused by the effluent from factories (Muraoka, 1989).
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration Duties/Responsibilities</td>
<td>Water supply</td>
<td>Land, water and other resources which is related to agriculture; Water control system for Agriculture; Agricultural land improvement project</td>
<td>Promote Industrial water supply projects</td>
<td>Impose legal controls of antipollution</td>
<td>Maintenance; Uses and Preservation on Water Management which is River management; stream flow management; surface water management.</td>
<td>Manage the Basic Plan for Water Resource Development, and other related plan</td>
</tr>
<tr>
<td>Observation and Research</td>
<td>Water quality investigate drinking water both tap water and groundwater</td>
<td>Investigate groundwater for irrigation water; Groundwater observation</td>
<td>Investigate appropriate level of usage of ground water: Industrial water; Guideline on industrial water uses; Ground water observation</td>
<td>Survey and investigation on countermeasures of ground subsidence</td>
<td>Investigate the actual state of groundwater use; Ground water observation Levelling</td>
<td>Promotion of the Guideline</td>
</tr>
<tr>
<td>Related to Guideline and project on Measures for Prevention of Ground Subsidence</td>
<td>Water project</td>
<td>Alternative water supply project; Measures for ground subsidence; Agricultural land improvement project</td>
<td>Industrial water supply projects</td>
<td>Operation of committees for concerned government agencies</td>
<td>Ensuring alternative water source for design and construction; Disaster recovery projects and other projects implementation in river management.</td>
<td>Operation of committees for concerned government agencies</td>
</tr>
</tbody>
</table>

**Table 4-1 Relevant Government Officers related to Groundwater**
(Source: Retrieved from Ministry of Land, Infrastructure, Transport and Tourism; Ministry of Health, Labor and Welfare; Ministry of Agriculture, Forestry and Fisheries; Ministry of Economy, Trade and Industry; Ministry of Environment)
4.3.2 Legal framework of groundwater policy

The legal framework for groundwater management in Japan is divided into two parts: (a) the national level; and (b) the local level, i.e., local groundwater ordinances, regulation, rules, and old traditions (Muramatsu, 1997). On the other hand, water laws are divided into four parts: (a) Laws related to hydrology (Table 4-2); (b) laws related to groundwater quality preservation (Table 4-3); (c) laws related to groundwater uses (Table 4-4); and (d) laws related to groundwater research and development (Table 4-5).

Table 4-2 Laws related to Hydrology
(Source: Retrieved from Ministry of Land Infrastructure, Transport and Tourism)

<table>
<thead>
<tr>
<th>Laws</th>
<th>Year enacted</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Law</td>
<td>1964</td>
<td>According to the “Basic policy for river improvement” and “Government ordinance for enforcement of River Law,” wrote that this law is to consider in a comprehensive way of river use, stream flow management and recharging groundwater efficiency.</td>
</tr>
<tr>
<td>Erosion Control Act</td>
<td>1897</td>
<td>A local administrative office may prohibit certain behavior of changing stream flows against erosion controls for river improvement.</td>
</tr>
<tr>
<td>Landslide Prevention Act</td>
<td>1958</td>
<td>To construct prevention facilities of landslide should use water conduit pipe for groundwater removal construction. Inside the prevention area of landslide, a behavior of collecting groundwater, groundwater removal construction, discharging groundwater, or promoting transportation should apply for a permission by prefectural government.</td>
</tr>
<tr>
<td>Act on Prevention of Disasters caused by Failure of Steep Slope</td>
<td>1969</td>
<td>Inside steep slope area in danger of failure, a behavior of discharging water, promoting transportation, rebuilding reservoir and irrigation canal should apply for a permission by prefectural governor. Constructing steep slope failure prevention is provided effective and appropriate ways.</td>
</tr>
<tr>
<td>Forest Act</td>
<td>1951</td>
<td>Specified protected forest may be designed for watershed cultivation, sediment control, and landslide prevention.</td>
</tr>
<tr>
<td>Land Improvement Law</td>
<td>1949</td>
<td>Agricultural land improvement project defines as building a facility of agricultural pipe drain, road, and land. A newly established facility on the purpose of agricultural conservation is also included.</td>
</tr>
<tr>
<td>Laws</td>
<td>Year enacted</td>
<td>Details</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Basic Law for Environmental Pollution Control</td>
<td>1967</td>
<td>The law defines Environmental Pollution as the damage to human health and living environment by air pollution, water pollution, soil poisoning, noise pollution, vibration, land subsidence, and offensive odor.</td>
</tr>
<tr>
<td>Basic Environmental Law</td>
<td>1993</td>
<td>The government shall specify desirable standards required for human health and living environment of air pollution, water pollution, soil poisoning, and noise pollution.</td>
</tr>
<tr>
<td>Water Pollution Law</td>
<td>1970</td>
<td>The law specified framework of methods and apparatus for purifying ground water; a prohibition against hazardous substance-containing sewage going underground, and promoting water quality monitoring system for groundwater pollution prevention</td>
</tr>
<tr>
<td>Water Pollution Control Law</td>
<td>1970</td>
<td>An owner of a higher ground may run water through lower grounds to dry out his/her higher ground in cases where that land is flooded, or to discharge surplus water for household or agricultural or industrial use until the water meets a public stream or sewage system. In such cases, the location and method that cause the least damage to the lower ground must be selected (Article 221), however, that he/she must may compensation for damages arising as a result (Article 222).</td>
</tr>
<tr>
<td>Criminal Law</td>
<td>1907</td>
<td>There are articles on environmental crime; pollution of pure water (Article 142), pollution of water supplies with poisonous materials and causing death (Article 146).</td>
</tr>
</tbody>
</table>
Table 4-4 Laws related to Groundwater Uses  
(Source: Retrieved from Ministry of Land Infrastructure, Transport and Tourism, Building Water Law, Mining Law, and Grave Gathering Law)

<table>
<thead>
<tr>
<th>Laws</th>
<th>Year enacted</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Water Law</td>
<td>1956</td>
<td>In the designated area, a company, who is going to use groundwater for industrial uses, should apply for a permission by a prefectural governor. The position of strainer pipe, and a square area of an outlet for water should be reported to the governor. The designated area is specified an area of groundwater where damaged by industrial use, which is caused by collecting groundwater, sinking groundwater level abnormal, being salty water, some harmful substances mixed in groundwater, or groundwater subsidance. Industrial water uses a large quantity of water. Area is specified within first year before a new industrial water supply facility is planning to build. There are 10 specified designed area.</td>
</tr>
<tr>
<td>Building Water Law</td>
<td>1962</td>
<td>In the designated area, a company, who is going to use groundwater in building, should apply for a permission by a prefectural governor. The position of each strainer pipe, and a square area of an outlet for water should be reported to a governor. The designated are is defined as “the area is in danger of disaster such as groundwater subsidence and floods.”</td>
</tr>
<tr>
<td>Mining Law</td>
<td>1950</td>
<td>Article 35, when the mining of minerals in mining application area is found to have no economic value, be harmful to health, destroy facilities for public use or any facilities equipment to the above, disrupt the protection of cultural properties, parks or hot spring resources, or impair the interests of agriculture, forestry and other industries, and be extremely adverse to public welfare, the director of regional bureau of economy, trade and industry shall not permit such applications for such area. Article 53, when the mining of mineral is found to be harmful to health, destroy facilities for public use or any facility equipment to the above, hinder the protection of cultural properties, parks and other industries, and be extremely averse to public welfare, the director of regional bureau of economy, trade and industry shall make dispositions to decrease such pat of the mining area or rescind the mining right thereof.</td>
</tr>
<tr>
<td>Quarrying Law</td>
<td>1950</td>
<td>The permission of plan pertaining to quarrying industry is a part of important process on prevention of damage, destruction, or disaster for public facilities.</td>
</tr>
<tr>
<td>Gravel Gathering Act</td>
<td>1968</td>
<td>The permission of plan pertaining to quarrying industry is a part of important process on prevention of damage, destruction, or disaster for public facilities.</td>
</tr>
<tr>
<td>Laws</td>
<td>Year enacted</td>
<td>Details</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Country Investigation Law</td>
<td>1951</td>
<td>This law enacted with the goal of contributing river management and water use. Under this law, national research center analyzes some researchers on natural conservation. The result of national research shall be reported as a map or a report; weather, inland water flow; water quality; quicksand phenomena; water quantity; water expense; and drainage discharge.</td>
</tr>
<tr>
<td>Water Resource Development Promotion Act</td>
<td>1961</td>
<td>This was built in 1961 when Japan was ongoing industry development and increasing in population. The goal was contributing to provide a water supply system which assure necessary minimum supply of tap water and has highly efficiency.</td>
</tr>
</tbody>
</table>

4.3.3 Overview of national law-related to groundwater policy

There is no law, which could be called the “Groundwater Law,” that is written about the comprehensive and fundamental principles of groundwater, whereas many separate laws have been established to govern groundwater operation, management, and conservation (Ministry of Land, Infrastructure, Transport and Tourism, 2015).

These laws related to the use and conservation of groundwater consists of a strong network. It is a complicated composition, but this system has been quite effective at the different levels of laws. The priority in understanding groundwater is from the national legislation. At the next level, there are many water laws by special classification. If there are not enough rules under those water laws, then local rules cover their limitations for natural conservation. There is also the general basic principle in understanding groundwater policy under Japanese law.

4.4 Groundwater: Legal Basic Framework and Ordinance

Local ordinances usually codify the laws of a political division, which is smaller than a state, such as a prefecture or a municipality. Ordinances are enacted by any prefecture or municipality under the authority granted by Article 94 of the Constitution of Japan.
Article 94 (Local Self-Government)

Local public entities shall have the right to manage their property, affairs, and administration and to enact their regulations within the laws.

Ordinances must be approved by a local assembly, and promulgated by a city mayor or a prefectural governor, who may demand a second vote, but may not veto the ordinance. It may impose a penalty of up to two years’ incarceration and/or a fine of one million yen, although any penalty under an ordinance must be prescribed in accordance with the Code of Criminal Procedure, which is written in the local autonomy law. Some ordinances are banned on undeclared land transactions where they are closely connected with groundwater preservation. The expected benefit is deterring the overharvesting of groundwater.

4.5 Local Self-Government

The local authority relies upon parliamentary democracy and upon the theory of the separation of political powers; hence, the principle of local self-government is fully appreciated. It is said, “local self-government functions as an elementary school for democracy.” Ashibe (2002) states that it is significant that the decentralization of power would suppress the strength of the centralization of administrative power (Ministry of Land, Infrastructure, Transport and Tourism, 2016). The Constitution of Japan in the Meiji era had not provided for local authority with the law. The definition of local authority at that time was the direct administration by the local government. In contrast, the Constitution of Japan established after World War II provided for the right of “local self-government”. The guarantee of this right did not mean natural or inherent rights, which are defined as a right held by a human being; hence, it is understood that local self-government is guaranteed for reasons of institutional security as a historical and traditional system.
4.6 Local Ordinance by the Constitution of Japan

The general principle of local self-government is described in Article 92 of the Constitution of Japan:

Article 92 (Local Self-Government)
A law in accordance with the principle [sic] of local autonomy shall fix the regulations concerning the organization and operation of local public entities.

“The principal of local autonomy” has two meanings: (1) resident self-governance, and (2) self-governing body. It is independent of the national assembly. Local government takes its responsibilities and duties from the principles of decentralization and liberalism. As quoted earlier, “Local public entities shall have the right to manage their property, affairs, and administration and to enact their regulations within laws” (Article 94 of the Constitution). Therefore, to make such a self-governing body, a local assembly or an advisory committee is a right given by the Constitution of Japan.

Article 93 (Constitution)
1. The local public entities shall establish assemblies as their deliberative organs, in accordance with law.
2. The chief executive officers of all local public entities, the members of their assemblies, and such other local officials as may be determined by the law shall be elected by a direct popular vote within their several communities.

Article 95 (Constitution)
A special law, which is applicable only to one local public entity, cannot be enacted by the Diet without the consent obtained in accordance with the law of the majority of the voters of the local public entity concerned.
The people’s right might demand that the local parliament be dissolved, because there is a right to vote in a public, political election, which shall be recognized as local government referendum (specified by local autonomy law).

4.7 Local Ordinance by Local Autonomy Law

A local ordinance is a right of self-government by a local public body described by the local autonomy law. This chapter shows the general legal framework of local self-government and the power to enact the regulations under the law.

Article 2 (Local Autonomy Law)

1. Each local public body shall be considered as a legal person.
2. Each ordinary local public body shall perform its own community affairs and the other affairs devolving upon itself by law or by cabinet order duly authorized in law.

Local public entities are given the right to manage their own property, affairs, and administration and to enact their own regulations within the law (See Article 94, the Constitution of Japan). Hence, the purchase of a catchment area for its groundwater by a foreign capital investment company in Japan may be one of the causes of a special regulation such as the enactment of Niseko Groundwater Ordinance in 2011. This action raised the environmental awareness and triggered public controversy (Hori, 2014). Each ordinary local public body shall determine its own community affairs by ordinance according to Article 2 of the local autonomy law. The local government is authorized to provide a new framework for groundwater conservation by law.

Practically speaking, the meaning of local government enactment is explained by Article 15 and 138, Section 4 of the local autonomy law.

Article 15 (Local Autonomy Law)

The chief executive of an ordinary local public body shall have the power to enact a regulation on any subject within the scope of his/her powers, insofar as it is not in conflict with the law.
Article 138, Section 4 (Local Autonomy Law)

1. There shall be established by law, in addition to the chief executive, commissions or commissioners as executive organs of the ordinary local public body.

2. Commissions of an ordinary local public body may issue rules and other regulations, within the law or bylaws or rules of the ordinary local public body.

3. An ordinary local public body may, in accordance with law or bylaw, attach to any executive organ local disputes management commissioners, inquiry committees, examination committees, investigation committees, or other organs for the purpose of arbitration, inquiry, consultation, or investigation. This provision shall not be applicable to the executive organs specified by cabinet order.

Formally speaking, Article 2, paragraph 2 of the local autonomy law is a basic principle for the enactment of ordinances (See also Article 14 and 96):

Article 2, paragraph 2. (Corporate Status and Affairs of Local Public Bodies)
Each ordinary local public body shall perform its own community affairs and the other affairs devolving upon itself by law or by cabinet order duly authorized by law.

Article 14 (Bylaw)

1. Each ordinary local public body shall have the power to enact a bylaw on any subject covered in paragraph 2 of Article 2, insofar as it is not in conflict with law.

2. Each ordinary local public body shall be able to impose duties or restrict rights only by law unless otherwise prescribed by law.

3. An ordinary local public body may include in its bylaw penal provisions consisting of the imposition of imprisonment with or without hard labor not exceeding two years, fine not exceeding 1,000,000 yen, detention, minor fine, confiscation or administrative fine not exceeding 50,000 yen for a violation of its bylaws, unless otherwise specified by law.
Article 96 (Powers)

The assembly of an ordinary local public body shall be by resolution:

1. Enact, amend or abolish bylaws;
2. Fix the budget;
3. Authorize the settlements of accounts;
4. Fix the levy or collection of local taxes or the collection of assessments, charges, initial charge or fees, except as provided for by laws or by cabinet orders duly authorized by laws;
5. Authorize such contracts as may come under the scope prescribed by bylaw according to the standards established by cabinet order on the purpose and the amount of money involved;
6. Authorize the barter, investment or offer as a means of payment, or session or lease without compensation of the public property, except in cases provided by bylaws;
7. Property to be left in trust;
8. Authorize the procurement or disposition of such public properties as may come under the scope prescribed by bylaw pursuant to the standards established by cabinet order with respect to the category and the value, except as provided above;
9. Accept contributions or donations;
10. Renounce any right, except in those cases provided by laws or cabinet orders duly authorized by laws or bylaw;
11. Confer the exclusive right to use important public facilities that are specified by bylaw for a period longer than that prescribed by bylaw;
12. Authorize the compliant (appeal for reviewed), lawsuit, settlement, mediation, conciliation or arbitration in a case where the ordinary local public body is a party;
13. Fix the indemnity legally due thereto;
14. Exercise overall adjustment of the activities of various public organizations within the area; and
15. Perform otherwise such affairs as may come under the powers thereof by laws or by cabinet orders duly authorized by laws (including bylaw duly authorized by laws or cabinet orders).
Ordinances are intended to regulate only the general affairs of the autonomous local government. Local legislation has nothing to do with the national law as a general rule, although a local self-government body is able to pass independent regulations.

4.8 Niseko’s Groundwater Conservation Ordinance Example

The Town of Niseko once pointed out in a press release that the Groundwater Conservation Ordinance would come into force on 1 September 2011 (The Forestry Agency of the Ministry of Agriculture, Forestry and Fisheries, 2016). This was a strong initiative by the municipal authorities to protect its own local drinking water (Environmental Protection Department, 2016). The town hall specified a large area of land to be preserved in its natural state as public property (Kato, 2010). The ordinance calls for the efficient utilization and equitable access and sharing of the region’s water resources to ensure a sustainable social, environmental, and economic benefit for all. The key principles of Niseko’s Groundwater Conservation Ordinance are summarized below:

This ordinance is based on the principle of the Niseko Environmental Basic Ordinance (Niseko Town, 2001). The main intention is the control of water pollution and drought, and to authorize some natural conservation areas in and around the source of drinking water. Protecting the irreplaceable groundwater for the future will be a great contribution to the health and culture of the local people (Article 1).

The responsibility of the town council is to protect the sustainable social, environmental, and economic benefits of groundwater, and especially to protect citizens from hindrance in their life, and to pursue a groundwater policy (Article 3). The responsibilities of water users are to recharge groundwater, to reducing water use, and to cooperate with the local authority in the management and in the policy of sustainable groundwater (Article 4). People cannot excavate groundwater without permission from the mayor of the town.

For example, one cross section of pump’s exhaust slot should be over 8 cm². If someone shall change the position of pipe strainer, or expand the pump’s exhaust slot, then s/he must ask the permission of the mayor of the town. The mayor will not grant permission to water users unless they satisfy the conditions of the licensing standards written in Article 6. Before the government or other local public bodies agree to utilize the groundwater of Niseko, the mayor of the town must agree that it is permitted under Article 1. The town mayor has the
authority to add additional qualifications or conditions upon water users if s/he deems that it is necessary (Article 5).

There are four main licensing standards in groundwater conservation: (1) It shall not impede an efficient water supply for the citizens; (2) It shall not have a negative effect on the existing system of the source and supply of water; (3) The use of the water should be necessary and be consistent with sustainability; and (4) It should agree that there is no alternative (Article 6).

The applicant must explain the plan of the installation work in a meeting for the local residents. This meeting should be announced to the public within 10 days beforehand and notified by letter to the town mayor. The applicant must report the results of the meeting to the town mayor without delay. When the plan is disputed, the applicant must reach an agreement with the local people (Article 7).

An applicant shall submit an application to the town mayor with the following information: the name of the authorized representative, the name of the company, the purpose for which the groundwater will be used, the position of pipe strainer, the kind of pump, the cross-section area of the exhaust slot, the average quantity of water to be pumped per day, the location of the well given with a map, and any other information that the town council may require (Article 8). After Town hall has accepted the application, the town mayor shall discuss it with the Niseko committee responsible for the source of the groundwater (Article 9). The town mayor should announce his decision within 60 days according to the provisions of Article 8 (Article 10). After the completion of the well, a report must be submitted to the town council within 15 days who will conduct an inspection in the name of the town mayor (Article 11).

The well must have a device for measuring the amount of water taken, and this amount must be reported to the town mayor every month (Article 12). In the event a person inherits, borrows, or amalgamates it with their own well, a permitted well-facility shall be succeeded to its status to legal heirs. People who inherit as the legal heir a permitted well-facility, and people who borrow or amalgamate a well with their own well, shall report the changes within 30 days to the town mayor (Article 15).

The license for the well shall be withdrawn: (1) When the business is closed; (2) If the water is NOT mechanically pumped; (3) If its area of cross section has been reduced to less than 8 cm². When the license expires, it shall also be reported to the town mayor (Article 16). The town mayor shall rescind the license granted to applicants who applied by deceitful or improper means. If a company uses groundwater without permission, the town council shall
as a matter of urgency order a cut in the water intake after a warning has been given and it has been ignored for the specified time (Article 17). The town mayor shall order the administrative officers to enter and inspect the facilities if that is necessary (Article 18).

The town mayor shall advise or guide licensors or deputies and recommend any necessary steps (Article 19). After the recommendation in Article 19, if licensors or deputies neglect their duties, the town mayor may order the implementation (Article 20). When licensees or deputies obey the town mayor’s recommendation in Article 18 or orders in Article 19, the administrative officers shall report the results of the examination to the town mayor (Article 21). If any person does not obey the order under Article 20, then the town mayor shall order the abeyance of the licenses (Article 22). Any person, who refuses the recommendation of Article 19, and the order of Article 20 without any justifiable grounds, shall be named in public (Article 23). Any person who refuses the orders given under the preceding paragraph of Article 17, 20, and 22 shall pay a fine not exceeding 500,000 yen (approximately €1 = 123 yen as of 15 April 2016.) Any person who neglects or forgets to notify the town manager within 15 days after the facilities are finished shall pay a fine not exceeding 300,000 yen. Making a false declaration or refusing, disturbing, or evading an on-the-spot investigation shall pay a fine not more than 300,000 yen (Article 25). This ordinance shall also apply mutatis mutandis to any act in violation of the preceding articles to any representative of juridical person, deputy, employees, and other workers (Article 26).

4.9 Conservation Strategies and Challenges in Niseko

As the melted snow flows into Niseko town, the rich forests utilize recharged groundwater such as sump and subsoil water. People could not live without the benefits of nature and have to use the limited water resources that they have carefully.

The most notable regulatory feature of the Niseko ordinance is the requirement of publishing one’s full name together with the penalties for failing to do so. It states that groundwater is a local common property. At the same time, it sends a strong message to protect local environments by levying a fine on the violators of the rules. This is a new approach compared with other ordinances from different regions. Most of the environmental problems are the result of the accumulation of tiny environmental day-by-day changes. Water policy must also be adapted to those environmental changes, no matter whether they are small or big. There is no doubt that the regional administrative authorities know the current environmental circumstances in their own area. They have the capacity to make a prompt
response to the urgent environmental problems (Ito, 2004). These new kinds of ordinances have covered the lack of fundamental groundwater laws at a local level (Tsuchiya, 2015). Because the legal structure is not sufficient at present, local Japanese city or town councils have begun to make groundwater ordinances for water conservation in their own community. For example, there is the Niseko Groundwater Conservation Ordinance, the Fukushima City Groundwater Conservation Ordinance, the Environmental Pollution Prevention Ordinance, Suzuka City Drinking Water Conservation Ordinance, etc. The number of ordinances total 517. They are complimentary to each other. Another example is the combination of the Niseko Groundwater Conservation Ordinance and the Hokkaido Groundwater Conservation Ordinance (Niseko, 2016 and Hokkaido, 2016). The Niseko Town is located in the Hokkaido prefecture. The jurisdiction of the Hokkaido Groundwater Conservation Ordinance includes the entire Hokkaido area. Thus, when the Niseko Groundwater Conservation Ordinance could not prevent natural destruction by a land developer, the Hokkaido Groundwater Conservation Ordinance was perfect for conserving the local groundwater. When we think about preserving local water, it is needed to be flexible in our approach (see Figure 4-2). Water supply and demand should be in a one-to-one ratio. A voluntary member of the House of Representatives and the House of Councilors published ideas in a press release for establishing a new fundamental groundwater act. Japan might establish new national groundwater law, which can combine the national laws and regulations to ensure sustainability in the management of groundwater in the future. Children should inherit a sustainable system for managing groundwater. Policy makers and stakeholders must continue to find ways of preserving the water environment (Frans, Coenen, Huitema, and Laurence, 1998).

4.10 Hokkaido Groundwater Ordinance

Hokkaido Groundwater Ordinance enacted by the Hokkaido prefecture. Both Groundwater Conservation Ordinances collaborate each other from the destruction of the natural environment. Two barriers against the demolition of groundwater conservation; (1) The duties of reporting the land transaction information and new land owners. (2) Based on the proposal of the mayor of the municipality, the governor will be designated as water resources conservation areas (Hokkaido, 2015).
4.10.1 Hokkaido conservation area

Water resources conservation areas is decided as an area where the water resources is appropriate to use for the purpose of industrial, domestic, or agriculture, etc. The Conservation Point is considered where the facility shall be installed to incorporate raw water for public use or not (Hokkaido, 2016).

4.10.2 The combination of ordinances between town and prefecture

Niseko Water Resource Conservation Ordinance and Hokkaido Groundwater Conservation Ordinance build up both regional defense networks. The forest area for preservation is increasing recently. It recognizes as the double-checked system for not only groundwater conservation, but also Hokkaido natural protection (Hokkaido, 2015).

4.11 Discussion

4.11.1 Capacity of local ordinance

The rights of local authorities to make laws are limited if an ordinance related to its own community and other affairs constrains a basic human right. Japan recognizes the right to have water at a community level. Historically, rice farmers have moral ties on water conservation for irrigation (Igarashi, 2007).

Therefore, the limitations of private property rights to groundwater could not immediately argue that it infringes on constitutionality. Therefore, local public entities shall have the right to manage their property affairs and administration and to enact their own regulations within law. As a general rule, then, without any special commission, a local administration must enact their own ordinances within the law.

Municipalities have tended recently to enact both an ordinance of groundwater conservation and an ordinance for conservation of the catchment basin of groundwater in a policy of sustainable groundwater conservation management. They see this as the most democratic way for local people to protect their water, independently of national policy trends. Ordinances in various localities around Japan have also recently included some form of punishment. This is a first step in developing a social structure and a plan whereby local people are able to manage rural resources in accordance with local environmental policy. This overcomes the limitations of national policy in rural policy.
However, there is a limit to the effectiveness of local ordinances and this may give an impulse for a new model for the conservation of natural resources.

4.11.2 Limitation of local groundwater ordinance

Sustainable water conservation has been discussed for a long time, ever since the Meiji era, when the emperor was restored to power. Groundwater has always been an important natural water resource, in addition to surface water. As explained above, there has been some recent controversy about a sustainable groundwater policy and management. The government has passed no fundamental groundwater law, and groundwater ordinances exist only at the local level. Municipal ordinances are considered to be the basic legislation for sustaining a regional environmental resource, because the River Act states that groundwater is public property, whereas Civil Law states that groundwater is private property. To understand the groundwater regulations in Japan, customary law must also be considered because it also addresses aspects of private property that bear on these concepts.

For example, in America, most states’ surface water and groundwater have been placed in the public domain (Johnson, 2013).

Over time, society has gradually changed its view that groundwater should be regarded as public property (Taniguchi, 2015). For example, it is very difficult to divide water under someone’s land. As a consequence, groundwater is generally considered as public property as per the old tradition, which is expressly acknowledged in customary law.

4.12 Water Circulation Basic Law

This law is enacted in 2015, aiming at establishing sustainable water uses, to comprehensively promote the policy for the maintenance and restoration of water circulation. It is the first time that water resource, including groundwater, is legally positioned as “valuable asset of the national share, those highly public (Water Circulation Basic Law, art.3 of 2)”.

“Water Circulation” means the cycle of water evaporation, rainfall, flowing-down, sinking into the ground, and reaching to the sea. River water is the centers of the circulation as surface water and groundwater (Water Circulation Basic Law, art.2).

The highlight of the Act is that, the headquarter of the water circulation policy is “the Cabinet.” The Cabinet director is a prime minister. Besides, formulating such “water
circulation basic plan” shall make every five years by the government, and the August 1st becomes “Water Day”. This shall deepen the public’s understanding and interest about the importance of water cycle.

The national government shall establish a Water Circulation Basic Plan (Water Circulation Basic Law, art.13). National and local government shall improve the maintenance the cultivation function, for example, proper retention of forests and management of farm lands (Water Circulation Basic Law, art. 14).

4.13 Conclusions for this Chapter

This chapter described the legal framework of the related local groundwater policy and regulations under Japanese law. In conclusion, the existing legal structure is adequate as a whole, to ensure the protection of groundwater. Existing laws oblige local administrations to protect and preserve the groundwater environment against social changes. The case study of Niseko shows a good example of overlapping legal structure.

The complex legal systems have been discussed to understand the limitations of Japanese groundwater policy. Groundwater law is referred to as a “nested groundwater legal structure”, or an “overlapping legal structure”. Those laws are complementary to each other (Bressers and Lulofs, 2010). At a glance, environmental laws are not enough for groundwater management; however, other laws cover the issues of environmental conservation. If those existing environmental laws do not preserve local groundwater, then the local groundwater ordinances cover alternatively the legal limitations on the protection of this source. The legal radical principle and its effects on groundwater conservation have proved that groundwater ordinances and related regulations have already given exact disciplines for natural conservation. The overlapping groundwater legal structures are unique aspects of the Japanese conservation policy. However, if an overlapping legal structure is no longer suitable for a change in social and/or environmental risk, it might be necessary to strengthen the legal structure of groundwater with local perspective in the future.
References


Chapter 5  Water Awareness for Sustainable Local Groundwater Management

5.1 Introduction

This chapter analyses a case study in Saijo, Ehime, focusing on water awareness by using a method of open-ended question. Chapters 5 and 6 introduce methodologies that how to abstract local knowledge and awareness.

Saijo City is nationally famous for its groundwater. The city has chosen as one of the Select Best Waters in Japan, which implemented by the Ministry of the Environment. In 2009, the City Hall began to consider revising the Saijo Groundwater Ordinance to cope with the new natural environmental problems in the future of both water quality and quantity. It shows unique environmental trends and difficulties with domestic water. Each household owns its private well in their garden. In other words, there is one well for domestic use for one home use. The users have their experience about their well.

The consolidation of smaller municipalities – the old Toyo region, the old Komatsu region, the old Tanbara region and the former Saijo region – has formed the New Saijo City since 2004. Most of the citizens who live in the old Saijo region and the old Toyo region pump groundwater up from their garden for their domestic use. Hence, they notice the changes in both quantity and quality of their private well-water. This idea comes from their daily experience. This propose a hypothesis that local people have individual knowledge about using their groundwater and if this is so, we need to include their potential water awareness actually into the local water governance. Water awareness is one sort of individual knowledge. Arcury (1999) called this water awareness as environmental knowledge. Arcury (1999) also proved how environmental education could achieve results for the individual. According to Arcury (1999), increased knowledge about the environment is assumed to change attitudes, and both environmental knowledge and attitudes are expected to influence environmental policy. Environmental knowledge is found to be consistently and positively related to environmental attitudes. With the correlation of knowledge and attitudes, the low level of environmental education has disturbing implications for environmental policy (Arcury, 1999).
The goal of this chapter is the development of a water awareness methodology which can apply in practice to water governance;

1. To have a new understanding of individual knowledge and outreach related to water.
2. To have one administrative body applying this analysis of water awareness into local policy in the future.

5.2 Methodology

This study includes an analysis of questionnaires for city residents living in Saijo City in 2008, and the field study we implemented in 2009. From the standpoint of water awareness, we focus on the answers given by local people about water awareness obtained by an open-ended questionnaire. Open questions are ones that require more than one-word answers. All open questions are alike in that the respondent is not given a choice of replies. However, the reasons for using this structure and the level of cognitive effort needed to respond to the question can vary. The answer could come in the form of a list, a few sentences or something longer such as paragraph or essay. Open-ended questions require a response with more depth and length. Open-ended questions are also helpful in finding out more about a given situation. The open-ended question does not provide categories of answers (Ballow, 2011).

The city questionnaire was a random sample of 5,000 citizens over 20 years old, which sent by post mail, and 40.78% of Saijo citizens answered the questionnaires. The details are below:

- Saijo region: 1,078/2,582 citizens
- Toyo region: 517/1,435 citizens
- Tanbara region: 230/583 citizens
- Komatsu region: 159/1,435 citizens

There are two factors revealed by open-ended questions about local groundwater issues in Saijo City. There were several points in common. The most interesting of this answer was about salty water and muddy water. We give the location address of where the respondent answers lived at that time. The results are displayed on a map using a Graphical Information System (GIS); we pinpointed the area using zip codes. This information suggests the importance of using the information about water awareness for local and rural water management.
This analysis is motivated by building a new framework for a local water administration policy. It aims to allow that individual water knowledge and awareness contribute democratically to society. The open-ended question methodology is the initial stage of the study.

**5.3 Description of Survey Area**

Saijo City covers an area of 509.07 square kilometers. The east-west distance is 29.71 km, and north–south distance is 25.86 km at their maximum. The city is the third largest city in the Ehime Prefecture. In the South, there is the peak of the Ishizuchi Mountains, and it is the highest peak in Western Japan. On the other side of the city is the Seto inland Sea of Japan. The city is located at 133 degrees 11 minutes’ longitude east and 33 degrees 51 minutes north (Figure 5-1).

The total population of the city is 113,845 (March 2013), and a total number of households are 48,463. The total population of Ehime Prefecture is 1,441 million. New Saijo city was formed on November 1st in 2004 by the consolidation of old Saijo City, Toyo City, Tanbara City, and Komatsu City. The north part of the city had been increased by the construction of artificial tidal lands.

![Figure 5-1 The location of Saijo, Ehime Prefecture](image-url)

The city is located in the eastern part of Ehime Prefecture on the Dozen Plain. The total city area is 231㎢. Mountains form about 73% and the rest is an open sea area, of which the coastal industrial zone is about 27%. The whole south part of the Saijo Plain and the West are one mountainous zone in front of the Peaks of Ishizuchi, which at 1,982 meters above sea level are the highest mountains in West Japan. The other zone is gentle flat land with the city
area and an agriculture zone. The Nakayama and Kamo Rivers flow into the town from the mountain area. The total flat area is about 509.05 km², of which 30% is a residential region and 70% is forests and fields. A boundary is formed by between flat zone and mountain zone by the Okamura dislocation. Along this dislocation, there is a clear line structure and the topography changes from East-North-East to West-South-East. The boundary between the seaside and the interior side has been affected by the distribution of groundwater. The inland side between the estimated dislocation and the Okamura dislocation has been formed by a belt of subsidence due to the activities of some faults, and that grew as a huge reservoir of groundwater resources.

Ehime Prefecture has four climate divisions such as, (1) Seto inland sea climate, (2) Mountain Climate, (3) Climate of Pacific Coast, and (4) The Plains.

1) Seto Inland Sea Climate

Seto Inland Sea Climate is the surrounding small islands of the Shikoku Island and the coastal area. The mean annual precipitation is about 1,200 to 1,600 mm. Here is a relatively warm climate with an average yearly temperature about 15 to 16 degrees.

2) Mountain Climate

Mean annual precipitation is estimated to be 2,294 mm. The north part of the mountains in the Ehime Prefecture is part of this climate with an annual precipitation of 1,900 to 2,000 mm and an average yearly temperature of 12 to 14 degrees.

3) Climate of Pacific Coast

Saijo city belongs to the Seto inland sea climate, which has only a little rain. However, due to the blessings of the nearby mountain range this area abounds in groundwater. Rain falling in the mountain region becomes the river water of the Kamo River. The river has its source in the Peak of the Ishizuchi Mountains. The rainwater penetrates through the riverbed and the old river line around the entrance of the flat land into the ground. Therefore, the groundwater of the Saijo Plain has a close correlation with the rainfall in the mountain region.

4) The Plains

The mean annual precipitation in the plains is about 1,334 mm. The average annual precipitation on mountain region is estimated 2,294 mm, which is about 1.7 times as large as annual precipitation on the plains. The surrounding small islands of Shikoku islands and the coastal area are Seto inland sea climate. The mean annual precipitation is about 1200-1600 mm. That climate has a relatively warm climate. The average yearly temperature at the region
is about 15-16 degrees. The north part of mountains in Ehime prefecture is part of mountain climate. The annual precipitation is 1900-2000 mm. The average yearly temperature is 12-14 degrees.

### 5.4 Answers on Domestic Use

The results of those answering the questionnaires indicated in Tables 5-1, 5-2, 5-3, and 5-4. Table 5-1 shows the age distribution of answers. Population aging does rise, 59% respondents are over 60s; 9% in the 80s, 28% in the 70s, 22% in 60s. Table 5-2 shows the sex distribution of answers, answers comprise 52% of female and 47% of male. Table 5-3 shows the duration of living in the city, 66% of answers live more than 20 years in old Saijo area. Table 5-4 shows type of water supply in each old city. 66% respondents of old Saijo people drink only groundwater. Each house has a house-well.

<table>
<thead>
<tr>
<th>Table 5-1 The Age Distribution of Answers</th>
<th>Table 5-2 The Sex Distribution of Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the 80s</td>
<td>Female</td>
</tr>
<tr>
<td>9%</td>
<td>52%</td>
</tr>
<tr>
<td>In the 70s</td>
<td>Male</td>
</tr>
<tr>
<td>28%</td>
<td>47%</td>
</tr>
<tr>
<td>In the 60s</td>
<td>No answer</td>
</tr>
<tr>
<td>22%</td>
<td>1%</td>
</tr>
<tr>
<td>In the 50s</td>
<td></td>
</tr>
<tr>
<td>19%</td>
<td>100%</td>
</tr>
<tr>
<td>In the 40s</td>
<td></td>
</tr>
<tr>
<td>12%</td>
<td></td>
</tr>
<tr>
<td>In the 30s</td>
<td></td>
</tr>
<tr>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>In the 20s</td>
<td></td>
</tr>
<tr>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>No answer</td>
<td></td>
</tr>
<tr>
<td>1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 5-3 The Duration of Living in the City</th>
</tr>
</thead>
<tbody>
<tr>
<td>Over 30 years</td>
</tr>
<tr>
<td>50%</td>
</tr>
<tr>
<td>20 to 29 years</td>
</tr>
<tr>
<td>16%</td>
</tr>
<tr>
<td>10 to 19 years</td>
</tr>
<tr>
<td>14%</td>
</tr>
<tr>
<td>5 to 9 years</td>
</tr>
<tr>
<td>8%</td>
</tr>
<tr>
<td>1 to 4 years</td>
</tr>
<tr>
<td>7%</td>
</tr>
<tr>
<td>Within 1 years</td>
</tr>
<tr>
<td>4%</td>
</tr>
<tr>
<td>No answer</td>
</tr>
<tr>
<td>1%</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Table 5-4 Type of Water Supply in Old Cities

<table>
<thead>
<tr>
<th></th>
<th>Tanbara</th>
<th>Komatsu</th>
<th>Saijo</th>
<th>Toyo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drink groundwater</td>
<td>17%</td>
<td>9%</td>
<td>66%</td>
<td>41%</td>
</tr>
<tr>
<td>Drink public water</td>
<td>69%</td>
<td>66%</td>
<td>26%</td>
<td>42%</td>
</tr>
<tr>
<td>Drink both groundwater and supply water</td>
<td>12%</td>
<td>24%</td>
<td>6%</td>
<td>16%</td>
</tr>
<tr>
<td>Others</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

Some people use both the public water supply and groundwater because of groundwater contamination (See Table 5-4). The public water supply is used for drinking and groundwater is used mainly for laundry, showering, and bathing.

According to the city report published in 2000, the citizens of the old Saijo City used only private household groundwater, except for a part of the mountain region (See Table 5-5). The percentages for the domestic use of water in 2000 were:

Table 5-5 Domestic Uses in 2000

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Only use groundwater</td>
<td>73%</td>
</tr>
<tr>
<td>Only use public water</td>
<td>26%</td>
</tr>
<tr>
<td>Others</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

The total percentage of the answers from old Saijo region, which was the old Saijo City, showed almost the same proportions. Therefore, the results from questionnaire could minimize errors in calculating the current situation.

5.5 Water Awareness

There are many ongoing discussions about how water awareness among residents influences water governance against the city policy. To examine this issue, we collected 2,039 answers from Saijo citizens by open-ended questions; “Please write your individual knowledge or awareness about your private well,” which had given to Saijo citizens in 2008. Our results suggest that local people should influence the city’s water governance with their potential water awareness based on their experience of everyday life. Open-ended questions
give local respondents the freedom and space to answer in as much detail. An open-ended question is a question that require a full answer using the subjects’ own knowledge or feeling.

As an example, Table 5-6 shows noticeable selected respondents, 712 out of 2,039 answers to the open-ended question answered by local people in old Saijo City. The amount of each written answer itself was obviously small; on the other hand, the details of written answer are what we have to focus on to identify the local water situation. Negative respondents are easier to collect than positive respondents in this case. The analyst should choose dominant answers to have an effect on a sustainable water policy in an early stage. That is to ensure the operation of the administration, which truly reflects the popular will.

<table>
<thead>
<tr>
<th>Table 5-6 Similar Noticeable Respondents by Old Saijo People (2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>-Well-water tastes saltier.</td>
</tr>
<tr>
<td>-After the dam construction, I feel the well-water level is decreasing.</td>
</tr>
<tr>
<td>-Well-water run dry only in summer.</td>
</tr>
<tr>
<td>-I am worried about water quantity for the next generations.</td>
</tr>
<tr>
<td>-There are impure ingredients with sand.</td>
</tr>
<tr>
<td>-I feel the well-water level dropped down.</td>
</tr>
<tr>
<td>-Well-water tasted more smoothly and tasty when I was a child.</td>
</tr>
<tr>
<td>-Well-water tastes iron.</td>
</tr>
<tr>
<td>-Well-water tastes like sewage.</td>
</tr>
<tr>
<td>-I am worried about water quality.</td>
</tr>
<tr>
<td>-There is a garbage yard in mountain. I am aware of water quality.</td>
</tr>
<tr>
<td>-The ground is getting muddy.</td>
</tr>
<tr>
<td>-The water pressure of our well is getting weak.</td>
</tr>
<tr>
<td>-Well-water temperature becomes gradually higher.</td>
</tr>
<tr>
<td>-Well-water stinks when the water pressure becomes lower.</td>
</tr>
<tr>
<td>-Well-water is not tasty anymore.</td>
</tr>
<tr>
<td>-Well-water contains algae.</td>
</tr>
<tr>
<td>-Well-water dried up.</td>
</tr>
<tr>
<td>-Coliform was detected in our house well.</td>
</tr>
</tbody>
</table>

This chapter introduces the most significant answers. When the author conducted field-studies in Saijo in 2009, the above selected open-ended answers confirmed local hearings as well.

This research selected results from two places located on the artesian aquifer in the area of the seaside. If something threatens the life of inhabitants directly, an analyst should use a sample survey to emphasize the problems that need to manage. There was no standard pattern for applying the management and conservation of groundwater. Water awareness can apply to sustainable solutions for its preservation and mitigation.
5.5.1 Awareness based on experience

People raise their awareness based on their everyday experiences. For example, “my well dried up in the summer”, “the water temperature becomes gradually higher”, “the groundwater is getting muddy”, and “our well-water tastes saltier”. We experience and understand the world through signals that are received by our senses and interpreted by the brain. Therefore, experiences raise the individual awareness.

5.5.2 Awareness based on both daily experience and self-taught knowledge

People understand and begin to study new Individual knowledge based on self-taught knowledge, transcendental knowledge, specialized knowledge and another knowledge (See Figure 5-2). Water awareness may be a figment of their imagination based on individual knowledge. For example, “I am worried about sustainable water quantity”, “there is a garbage yard in the mountain; I think it influences water quality”, “I am concerned about the amount of water taken from groundwater by the coastal industrial zone.” and “after the earthquake, the water became muddy” etc. As we explained, those answers had reflected their opinions related to environmental water issues. Hence, people raise their individual knowledge, and it was analyzed by each user level (See Figure 5-2).

![Diagram](image_url)  
*Figure 5-2 Water Awareness*
5.6 Location Identification on Water Awareness

How could we use water awareness for local water management and reflect on local water policy? We selected two answers to our open-ended questionnaire; “groundwater from our well-water tastes salt”, and “the condition of groundwater is becoming muddy”.

The answered locations that gave those answers are identified by zip codes. This survey has shown how to analyze water awareness in practice.

The first survey gives the places where they answered about salt damages. It indicates that we received information about salty water damages from some area of the downstream area of Kamo River. According to the field survey and the open-ended questionnaire, some rice farmers complained that they are no longer able to cultivate rice on some land along Kamo River. A few agricultural farmers reported salt damage in the interview in 2009. The region of the seashore has a direct influence on the infiltration of salt from the sea. Recently, “Ice Plant”, Mesembryanthemum crystallinum, which can grow up in high salinity soil, became a new arrival in a community store.

The second survey indicates the location of muddy water damages. In an old-Saijo region, several places answered the open-ended questions with the groundwater tastes oozy, stinks or is muddy, which is called alluvial groundwater presents. Those surveyed locations are often places, which are right next to the Riverside on the map. This alluvial groundwater is located in alluvial soil close to a river. Thus, the quality of the river water directly influences the quality of the groundwater (Santo, 1985).

Escherichia coli was detected afterward by chemical analysis close to the riverbank. This result was brought on local groundwater conservation management in administrative level. Scientific investigations should prove water awareness collected by open-ended questions before using individual knowledge for local water governance in general.

5.7 Conclusions for this Chapter

Using water awareness is the next challenging step for to implementing sustainable water governance in Japan. It has been thought that it takes time for water awareness to be reflected in local water policy. The attempt to improve public participation in taking environmental decisions should strive to develop mechanisms and forums of engagement that emphasize civil discovery through which citizens’ test and create social knowledge to uncover, assess, and resolve shared problems (Depoe, 2004). These are research results show
that when the locations of problems with water are clearly shown, local government should
the use civic water awareness for groundwater conservation and mitigate serious issues which
arise in a practical manner. The exchange of information between citizens and local
government would encourage an effective governance and management of water. The goal of
this chapter is the development of a new methodology for applying water awareness to water
management into society at the early stage of a groundwater revolution at a local
groundwater management level.

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Chapter 6  An Exploratory Analysis of Text Mining of News Article about “Water and Society”

6.1 Introduction

Chapter 6 analyses newspaper articles on water and society, focusing on social understanding by using a method of text mining run by a KH coder. This chapter also presents a methodology of extracting local knowledge and awareness, especially from newspaper.

The work presented here an exploratory analysis of text mining used for news articles about, “water” and “society”. It has not often been confirmed visually and is not clear that how individual interests created by people are in the relationships. It is unusual to show the connection between two words by an analytical study of newspaper databases. People get environmental information from television and newspapers (Schoenfeld, Meier and Griffin, 1979., Slovic, 2000., Ayagi-Usui, 2008) Words in newspapers always create some impression of the readers about current topics. The first words and phrases used to give rise to individual knowledge and gradually turn out as a custom. People use to being influenced by newspaper. On the other hand, newspaper have effect on the people on their social understanding. Then, it could be the source of acquire their knowledge.

In Japan, it is very popular to analyze the impact of mass media on society. For example, Mikami (1995) examines how mass media in Japan influenced public awareness of global environmental issues. Ayagi-Usui (2008) for example revealed that the coverage of global warming by Japanese newspapers had an immediate but short-term influence on the public.

The effect of the mass media on public opinion is quite short lived because media coverage changes from issue to issue and often from day to day (Driedger, 2007). News agencies have a bias to write an article on a newspaper that serves as the framework for interest groups in mass media. On the other hand, the news has an influence on latest social information from the society.

As regards the influence on particular issues, mass media campaigns are often used as tools to attempt to influence public opinion. (Sampei and Aoyagi-Usui, 2009). Most people
do not think of environmental problems regarding either their causes or their effects (Carter, 1992) Some of the initial evidence shows a that most people had heard about environmental problems such as air or water pollution, but they often failed to draw any connection between the problem and the important causes, such as overpopulation (Simon, 1971).

This chapter uses the online databases of two newspapers: the Japan News and the International New York Times. This chapter aims at introducing a methodology of studying two newspaper comparatively to understand social needs on water issues. The newspapers are surveyed over a period of one year. The articles extracted from those databases are analyzed using a KH Coder and the generated Co-occurrence network.

In this study, there is a limitation that the comparison between Japanese and US's paper is not enough to understand the local needs itself. It is one example to introduce the analysis. There is a possibility that will get domestic demand on groundwater management and users by analyzing both local newspapers, and local reports, which is an agenda for the future.

6.2 Methodology

The databases of two online newspapers, the Japan News and the Times International New York Times, were searched using the term-water and society.

The Japan News is published by the Yomiuri Shinbun, which boasts the largest circulation in Japan. It was known as the Daily Yomiuri until it was renamed the Japan News in April 2013. The Japan News is the leading English language newspaper in Japan (The Japan News, 2015). The International New York Times is edited by Paris, London, Hong Kong and New York, and its news reporting is tailored specifically for a global audience (Sulzberger Jr., 2015).

The articles of Japan News Times are extracted from the “Yomidasu” online database run by the group of Yomiuri Newspaper Company. The contents of the International New York Times were extracted from LexisNexis Academic online database. The databases were consulted on 12th May 2015 looking for articles including the words “water” and “society” which dated from 12th May 2014 to 11th May 2015. Thirty-seven items were found in the Japan News and 175 in the International New York Times.

The articles were examined through text mining. Since nouns are most likely to express the contents of water and society issues, nouns were tagged after parsing the sentences. The frequency of each parse was counted, and the relationships between the
tagged parses were visualized by calculating Jaccard indices. The Jaccard index $J$ is calculated as shown in equation 1 in which $x$ and $y$ represent parses include in contents of water and society issues. $J$ indicates the degree of co-appearance of words. In this study, the contents consisting of words with large $J$ will be interpreted as the contents expressing the articles regarding water and society.

$$J(x,y) = \frac{|x \cap y|}{|x \cup y|} \quad (1)$$

The parses were clustered by using the method proposed by Newman and Girvan (New York Times, 2004). The parses which have close links with each other are divided into clusters based on the “modularity index” (New York Times). All parses were analyzed as English words, using the text mining software KHcoder (Higuchi, 2013).

Cluster analysis is a traditional technique used data analysis. Clustering in the context of text mining divides the collection of a document into mutually exclusive groups based on the presence of similar themes. Themes help in a better understanding of the concepts or events (Chakraborty, 2013). The KHcoder unit one similar theme with another expression of same theme. For example, it is to include “governance” into “government”. It is able to distinguish between uppercase and lowercase letters.

### 6.3 Results

The total 217,126 words were extracted from the International New York Times, and they included 4,184 nouns. On the other hand, there are 52,121 words from The Japan News, giving 10,847 nouns. The results are outline below;

#### 6.3.1 The results of The Japan News

Figure 6-1 shows the Co-occurrence networks of The Japan News, which is visualized by betweenness centrality; the word “hydrology” tends to co-occur with “people” and “government”. Figure 6-2 shows the Co-occurrence network visualized by betweenness and it also shows the result of cluster analysis.

The 1st cluster took information such as “nation,” “power,” “government,” “system,” and “measure.” For example, the article on 29th December 2014 with the news title “Japan in
Depth, Stimulus aims to lessen people’s burdens.” A part of the article writes about “The government will also help households purchase Ene Farm, a home system to generate electricity and heat by a chemical reaction of hydrology contained in city gas with oxygen in the air. If a person replaces an existing conventional hot water supply system with Ene-farm, the government plans to subsidize cost up to 350,000 yen. The government expects 60,000 applications for this subsidy system”. This cluster is about environmental policy relevant to water supply.

The 2nd cluster results from information such as “Country,” “right,” and “security.” For example, the article on 1st January 2015 has the news title “2015: A year to break ground on the road to a bright future.” A part of the article is about “There is also a pressing need to reform the social security systems with the aim of sustaining our nation as a society in which people can live in safety.” and “China must be urged to restrain itself from provocative behavior in waters around the Senkaku Islands in the Okinawa Prefecture.” The subject of this cluster is the issue of water and territory.

The 3rd cluster results from information such as “Area,” “number,” “work,” “world,” “time,” “year,” “people,” “society,” “company,” “problem,” “effort” and “number.” For example, the article on 25th August 2014, has the subject “Child Poverty SOS, living with hunger in a candlelight world”. This is about the problem of child poverty in Japan. To quote from this article, “One in six children live in poverty in Japan, the nation’s child poverty rate was at the record high of 16.3 % in 2012 according to figures released on July 15th by the Health, Labor and Welfare Ministry.” “When her mother came home, they took some empty plastic bottles to a nearby place to fill them with water.” This cluster shows the issue of water and poverty.

The 4th cluster results from information such as “Yen” and “house.” For example, the article on 1st April 2015 has the title “Government must support self-reliance of the needy by extending assistance early.” This article is about a new system started by local governments to help poor people become self-reliant. A part of article is that, “Local government employees should find those in need of such assistance by checking the records of arrears in the residence tax or water bills and by utilizing the information gathered by social welfare workers”. This cluster is also the problem of water and poverty.

The 5th cluster results from information such as “Hydrology,” “plan,” “facility” and “event”. For example, the article on 6th January 2015 with the title “Olympic village to be the 1st ‘hydrology town’”. This is about the decision of the Tokyo metropolitan government that the Athletes’ Village for the 2020 Olympic and Paralympic Games will be made into a
“hydrology town” where electricity and hot water are supplied from hydrology energy”. The 5th cluster is about water utility.

The words “Hydrology” tends to co-occur with “people” and “government.” The line shows what is the most used words on newspaper. When the value of centrality increase, it appears that it’s getting more thick line drawing circle. There are five categorizes.

*Figure 6-1 Co-occurrence networks of The Japan News*
6.3.2 The results of International New York Times

Figure 6-3 shows the Co-occurrence networks of International New York Times. The word “water” tends to co-occur with “people,” “government,” “year,” “time,” and “country.”

The 1st cluster took information such as “time,” “people,” and “country.” For example, the article on 15th November 2014 with the title “With Ebola, family ties fall apart; In Liberia, a mother flees the stigma arising from the deaths of loved one.” It is about “Though Redemption often did not have running water, it was one of the biggest medical centers in Liberia.” The 1st cluster is about the issue of water shortage and the lack of water utility.
The 2nd cluster took information such as “government,” “year,” and “water.” For example, the article on 27th December 2014 with the title “Mover forward with Cuba.” This is about “Cuba is the largest island neighbor of the United States. Opportunities for joint research, the definition of territorial waters and the prevention and clean-up of toxic spills will benefit both the United States and the Caribbean basin.”

Another article about “the National Audubon Society foresees danger for more than half of the 650 species of birds in North America” that has the title “Mass climate disruption is forecast for North American birds.” A part of the article is “Birds could feel the impact of a changing climate in different ways. Drought in Southern California is blamed for a sharp drop in the breeding among California raptors perhaps because the lack of water is killing the insects and small rodents they feed on.” This cluster is about environmental conservation.

![Figure 6-3 Co-occurrence of International New York Times](image)

The words “water” tends to co-occur with “year,” “people,” “government,” and “country”
6.4 Discussion

The Japan News shows mostly 4 subjects:

(1) Environmental policy (relevant to water supply)
(2) Water and poverty
(3) Water utility
(4) Water and territory

The International New York Times indicates mainly 4 subjects:

(1) Environmental conservation
(2) Water shortage
(3) Water utility
(4) Water and territory

Categories that overlap are:

(1) Water utility
(2) Water and territory

The Japan News has the tendency to cover domestic news. The issue of water and poverty in Japan is unexpectedness. The International New York Times covers more global environmental problems and international interests. Two online databases were picked up from different media sources. However, it is interesting to note that both results draw pictures using almost similar keywords for co-occurrence networks. The significant keywords in the issues of water and society are in general three: “people,” “water,” and “government”. This draws a conclusion from evidence of Figure 6-1 and Figure 6-3 that is co-occurrence network visualized by betweenness centrality. According to the results, the press tends to write articles in relation to those words.

This study is covered the current period of 1 year. The date of the extraction of the data was 12th May 2015 in both cases. However, it is obvious that news articles are not written regularly throughout the year. The total number of articles using words of “water” and “society”: was quite different. There were only 37 from The Japan News whereas 175
articles came from the International New York Times. If it were possible to use longer period for the study, the results might be different. This merits further research.

There is a limitation of this database research. The accumulated data for analysis is not only articles about water resource, but also the territorial issue, which is a highly political problem. To enhance the objectiveness of the assessment process, those territorial issues are not avoided in those research data.

6.5 Conclusions for this Chapter

Those articles related to the issues of water and society are composed of the same material as those of “people,” “water,” and “government.” These composition elements are important keys to understanding the situation of articles written in a newspaper.

The analysis of newspapers using text mining can improve at the beginning the social understanding of the appropriate and effective solutions for water management and social activity. Despite their simplicity, the results obtained by these methods give relatively accurate results, which are sufficient for the policy and management of water resources.

References


Chapter 7  Conclusions

This dissertation describes the legal framework of related local groundwater governance and regulations under Japanese law. In conclusion, the existing legal structure is adequate as a whole, to ensure the protection of groundwater. Existing laws oblige local administrations to protect and preserve the groundwater environment against social and climate changes. The case study of Niseko shows a good example of groundwater management, condition, requirement, and overlapping legal structure. Some studies have done on groundwater ordinance, however, this is the first paper that proceeds legal review to explore the legal framework of local groundwater governance in Japan.

Regarding the main research questions considers in this study, the following are the summaries and conclusions of each chapter:
Chapter 1 overviews the background of dissertation, a problem definition, a brief explanation of groundwater law and ordinance, outline of discussion on public and private, and outline of the dissertation. Chapter 2 overviews effects of natural factors and social factors on Japanese groundwater characteristics, such as hydrological cycle and hydraulic resilience time. It also designates groundwater use in Japan on groundwater quality and quantity for domestic use, industrial use, agricultural use, and other uses. Chapter 3 reviews the case of Niseko, which proceeds pioneering legislation. The town mayor showed a strong initiative to sustainable water resource management. The result shows that policy makers should see long-term benefits of sustainable water management. It suggests that for next challenge for legislation and controls in Niseko, the ordinance should be studied in the context of the various cases in every time. Chapter 4 reviews existing legal structure is adequate as a whole, to ensure the protection of groundwater. It presents that existing laws oblige local administrations to protect and preserve the groundwater environment against social and climate changes.

Chapter 5 analyses the case of Saijo. The result shows local government should use civic water awareness for groundwater conservation and mitigate serious issues that arise in a practical manner. The exchange of information between citizens and local government would encourage an effective governance and management of water. Using water awareness is the next challenging step for to implementing sustainable water governance in Japan.

Chapter 6 shows of newspapers using text mining proves at the beginning the social understanding of the appropriate and effective solutions for water management and social
activity. The results obtained by these methods give relatively accurate results, which are sufficient for the policy and management of water resources. Finally, Chapter 7 closes with a conclusion and future perspective.

The complex legal systems have been discussed to understand the limitations of Japanese groundwater policy. Groundwater law is referred to as a “nested groundwater legal structure”, or an “overlapping legal structure”. Those laws are complementary to each other. At a glance, environmental laws are not enough for groundwater management; however, other laws cover the issues of environmental conservation. If those existing environmental laws do not preserve local groundwater, then the local groundwater ordinances cover alternatively the legal limitations on the protection of this source. The legal radical principle and its effects on groundwater conservation have proved that groundwater ordinances and related regulations have already given exact disciplines for natural conservation. The overlapping groundwater legal structures are unique aspects of the Japanese conservation policy.

The over-pump of groundwater would have an impact on lower the level of the water level. However, an overlapping legal structure is no longer suitable for a change in social and/or environmental risk. It might be necessary to strengthen the legal structure of groundwater in the future, which will be a way of integration both river and groundwater. Policy makers and stakeholders shall find out some matured or developed nested governance style, which is based on the current policy system. Until then, people should respect on the role of local groundwater ordinance.
Appendix  The Seoul Rules on International Groundwaters (1986)

Article I : The Waters of International Aquifers

The waters of an aquifer that is intersected by the boundary two or more States are international groundwaters if such an aquifer with its waters forms an international basin or part thereof. Those states are basin States within the meaning of the Helsinki Rules whether or not the aquifer and its water form surface waters part of a hydraulic system flowing into a common terminus.

Article II : Hydraulic Interdependence

1. An aquifer that contributes water to, or receives water from, surface waters of an international basin constitutes part of an international basin for the purpose of the Helsinki Rules.

2. An aquifer intersected by the boundary between two or more State that does not contribute water to, or receive water from, surface waters of an international drainage basin constitutes an international drainage basin for the purpose of the Helsinki Rules.

3. Basin states, in exercising their rights and performing their duties under international law, shall take into account any interdependence of the groundwater and other waters including any interconnections between aquifers, and any leaching into aquifers caused by activities and areas under their jurisdiction.

Article III : Protection of Groundwater

1. Basin states shall prevent or abate the pollution of international groundwaters in accordance with international law applicable to exiting, new, increased and highly dangerous pollution. Special consideration shall be given to the long-term effects of the pollution of groundwater.

2. Basin states shall consult and exchange relevant available information and data at the request of any one of them. (a) for the purpose of preserving the groundwaters of the basin from degradation and protecting from impairment the geologic structure of the aquifers, including recharge area; (b) for the purpose of considering joint or parallel quality standards and environmental protection measures applicable to international groundwaters or their aquifers.

3. Basin states shall cooperate, at the request of any one of them, for the purpose of collecting and analyzing additional needed information and data pertinent to the international groundwaters or their aquifers.
Article IV : Groundwater Management and Surface Water

Basin states should consider the integrated management, including conjunction use with surface waters, of their international groundwater at the request of any one of them.

(Adopted by the International Law Association at the Sixty-Second Conference at Seoul in 1989.)
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