

Looking for New Futures for the Springs in Japanese City of Mito

Takayuki Kumazawa

Ibaraki University, Hitachi, Ibaraki, Japan

Abstract: This study demonstrates a transition in the environment and human behavior surrounding spring water over a 100-year period. First, 38 remaining springs in the city of Mito were investigated by local residents and the local authority, analyzing how waterfront spaces and survey locations were used. According to the results, spring water was used as drinking water, washing water, and firefighting water. Spring water close to farmland was used for agriculture. However, in recent years, water quality has degraded and it can no longer be used as drinking water. Therefore, a park with hydrophilic water was recently constructed. Some springs near shrines were seen as sacred places for water spirits to cleanse themselves. In addition, some spring water was used for environmental education and disaster prevention training. Based on these findings, it is important for us to consider the active use of spring water and waterfronts in order to promote the use of springs for multiple purposes.

Key words: human behavior, hydrophilic water, spring water, waterfront

1. Introduction

Mito of terrain have a complex relief, which is compounded by the plateau and the basin there. Between the plateau and the basin, spring water is overflowing. Springs have provided resting places for people from the 1800 s and have been used in people's daily lives. In specially, Kairakuen is well-known as a city park in a central area of the City of Mito in Japan. The Kairakuen was founded by Tokugawa Nariaki, the ninth feudal lord in Edo-era. The Kairakuen was a landscape gardening project started by Nariaki Tokugaw. The park opened in July 1842. The name "Kairakuen" comes from a saying within the Book of Mencius which states, "The ancients would share the pleasures with people, so their pleasures would be hearty and deep." Togyokusen (a natural spring) which is analysed in this paper, is located at Kairakuen. Many people have been known to have been healed by

Togyokusen. Togyokusen is a treasure, it has been used as a healing source. Thus, spring water is treasured by residents in a center area of Mito-city. At the spring location in a central area of the Japanese city of Mito, a healing culture around springs has been nurtured in close relationship with daily life.

However, the amount of spring water has been reduced due to the influence of recent urbanization. The relationship between daily life and springs has been diminished by the spread of water supply facilities. After hearing from local residents, it became clear that awareness of the presence of springs has diminished. Springs are a valuable cultural resource in the region, and were an important water source for firefighting at the time of the disaster. Under these circumstances, the Japanese Ministry of the Environment issued guidelines for spring water conservation and renewal in March 2010. In recent years, there has been a growing movement for conservation and renewal of spring water. In a review of previous papers, there were few that discussed spring water and human behavior.

Corresponding author: Takayuki Kumazawa, Ph.D., Associate Professor, research areas/interests: city planning and architecture design, landscape design. E-mail: takayuki.kumazawa.1@vc.ibaraki.ac.jp.

This study focused on springs which has familiar to people as a healing source from the 1800s, and investigated the remaining spring water locations in Mito city centres. Besides, the transformation process behind the exploitation, topography, and utilization of spring water has been investigated. In addition, it proposes methods for renewing spring water in the future.

2. Methods

Firstly, 38 remaining spring water locations were found in Mito city centres while walking systematic and hearing from local residents. As a result, this study investigated the distribution of all 38 locations of spring water, their current present condition, type of topography, installations, and positional relationship between neighbouring temples and shrines. A field survey of springs was carried out from December 2nd to 30th, 2014. This study assumes the springs to be natural.

Next, 16 spring locations with installations were interviewed by local residents and the local authority, analyzing how waterfront space and survey locations were used. Information derived from hearing research was based on current utilizations of spring water, changes in the surrounding environment, current development conditions, and factors for these transformations. Interviewees were residents and people involved with neighbouring temples and shrines. In addition, we asked the local authority how to have involvement in spring water. The survey took a total of 10 days in December 2014.

3. Results of Investigation into Locations, Conditions, Topographies, and Circumstances of Springs

Fig. 1 shows spring water locations in a central area of the Japanese city of Mito. There are 5 areas in which spring water is concentrated.

After comparing locations and topography, spring water appears to be more distributed along cliff lines,

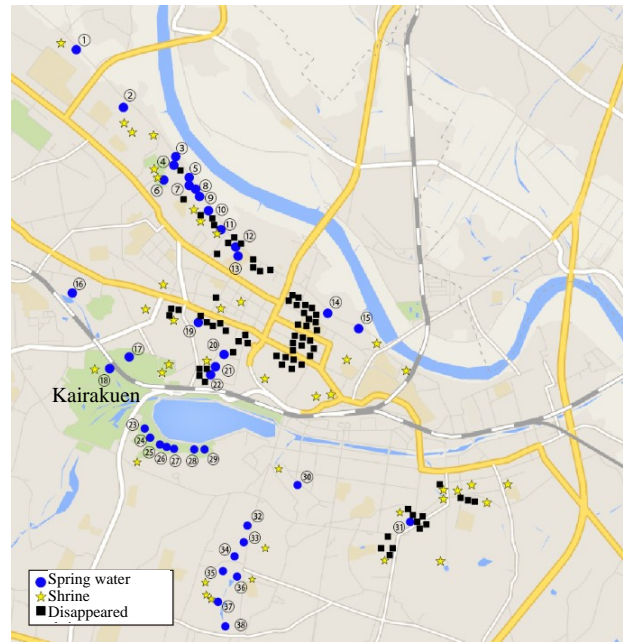


Fig. 1 Spring water locations in a central area of Mito.

such as mountain slopes, cliff bottoms, and valleys. Table 1, shows the condition, topography, and circumstance of the spring water. Fig. 2 shows types of topography. Type (a) is a cliff-line type gushing from the cliff face of a plateau-terrace; type (b) is a valley-head type gushing from valley terrain, such as a horseshoe, type (c) is wetland or pond type groundwater seeping into the lowland. The examination results of all 38 locations show that 75% of the spring locations are of a cliff-line type, a), and that 25% are a valley-head type, b). Many springs are fragmentarily spread along the cliff line, and from a small valley distant from the cliff. The next survey checked whether or not there are installations at the springs. In this study, an installation is considered to be a space directing human behavior into a certain setting according to space planning. The results confirmed installations at 34% of the springs. Furthermore, these installations are currently accessible. There is a difference in height of installations. We also confirmed that 26% of springs neighbour temples and shrines. If springs are located close to temples and shrines, they are presumed to have some relationship.

Thus, springs are concentrated in five areas. Additionally, there is a tendency at some locations for

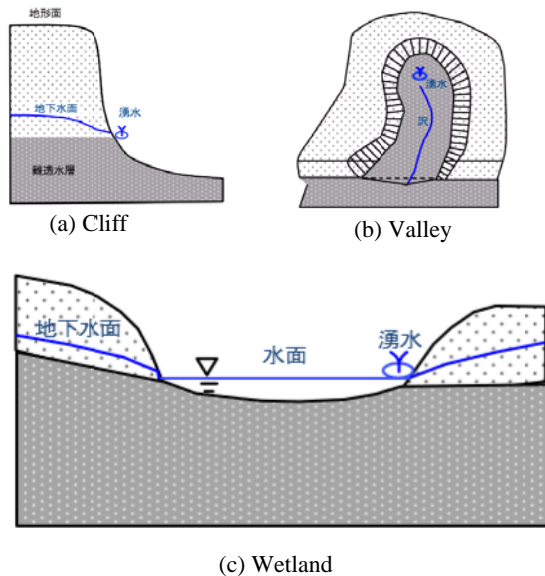


Fig. 2 Types of topography.

spring water to flow into the ground. Table 1 shows different tendencies in present condition, types of topography, and installations. Specially, it was predicted that there would be a close relationship between installations and neighboring shrines, and that daily use at shrines would contribute to the active use of spring water. Based on this analysis, it was predicted that 18 springs are connected to installations or shrines. The next sections analyze these 18 locations in detail.

4. Results of Investigation into Transformation of Spring Exploitation

This section investigates 18 springs particularly through the results of hearing from local residents, as well as the local authority, and analyzes how waterfront spaces and survey locations are used. Table 2 shows a transition in spring water fishing beginning 100 years ago. Although springs had familiar to people as a healing source from the 1800s, springs have changed the role after 1900 or later. Since the recent 100 years changed very large role, this study analyzed paying attention to the last 100 years. As a result of considering the changed role, seven roles have emerged. This study analyzed whether these seven roles had penetrated to what extent, to analyze the state of transformation of springs. In Tables 3 and 4, it was

Table 1 Condition, topography, and circumstance of springs in a central area of Mito.

No	Area	Name	Present condition	Type of topography	Installation	Neighbouring shrine and temple
1	North Horse Tableland	Surround Ibaraki University	Small Park	b)	-	present
2		Bakui	Pond	b)	present	-
3		Yougyojyo	park	b)	present	-
4		Musho	Park	b)	present	-
5		Ibaraki high school	Unusable	a)	-	-
6		Meisei	Large park	b)	present	present
7		Kyudou	Small park	a)	-	-
8		Nanamagari	Small park	a)	present	-
9		Ochanomizu	Small park	a)	present	-
10		Gion	Small park	a)	-	-
11		Sinnyou	Small park	a)	present	present
12		Taro	Small park	a)	-	-
13		Sensinsen	Small park	a)	-	-
14		Ozawa	Park	a)	present	-
15		Kensatu	Unusable	a)	-	-
16	South Horse Tableland	Sawawatari	Unusable	a)	-	-
17		Togyokusen	Park	a)	present	present
18		Gyokuryusen	Park	a)	present	present
19		Kodaira	Pond	b)	present	-
20		West Vally 1	Unusable	b)	-	present
21		West Vally 2	Unusable	b)	-	present
22		West Vally 3	Unusable	b)	-	present
23	Senba Park	Senba Park 1	Park	a)	-	-
24		Senba Park 2	Park	a)	-	-
25		Senba Park 3	Park	a)	-	-
26		Senba Park 4	Park	a)	-	-
27		Senba Park 5	Park	a)	-	-
28		Senba Park 6	Park	a)	-	-
29		Senba Park 7	Park	a)	-	-
30	Y Tableland	Mito Kouei	Unusable	a)	-	-
31		Yoshida Shrine	Pond	a)	present	present
32	Sakasa Green Park	Komon Bridge 1	Park	a)	-	-
33		Komon Bridge 2	Park	a)	-	-
34		Komon Bridge 3	Park	a)	-	-
35		Komon Bridge 4	Park	a)	-	-
36		Kashahara	Large park	a)	present	present
37		Sakasa River	Unusable	a)	-	-
38		Shiohashi	Large park	a)	present	-

Table 2 Transition in fishing at springs starting 100 years ago.









3. Yougyojyo	100 years ago	50 years ago	Now		19. Kodaira	100 years ago	50 years ago	Now	
Life use					Life use				
Agricultural use					Agricultural use				
Hydrophilic use					Hydrophilic use				
Subsistence use		✓	✓		Subsistence use		✓	✓	
Faith use					Faith use				
Environment/Educational					Environment/Educational use				
Disaster prevention use					Disaster prevention use				

Table 3 Transition in daily spring use starting 100 years ago.









2. Bakui	100 years ago	50 years ago	Now		4. Musho	100 years ago	50 years ago	Now	
Life use	✓				Life use	✓			
Agricultural use	✓	✓			Agricultural use	✓	✓		
Hydrophilic use			✓		Hydrophilic use			✓	
Subsistence use					Subsistence use				
Faith use					Faith use				
Environment/Educational					Environment/Educational use				
Disaster prevention use					Disaster prevention use				
8. Nanamagari	100 years ago	50 years ago	Now		9. Ochanomizu	100 years ago	50 years ago	Now	
Life use	✓				Life use	✓			
Agricultural use	✓	✓			Agricultural use	✓	✓		
Hydrophilic use			✓		Hydrophilic use			✓	
Subsistence use					Subsistence use				
Faith use					Faith use				
Environment/Educational					Environment/Educational use				
Disaster prevention use					Disaster prevention use				
14. Ozawa	100 years ago	50 years ago	Now		38. Shiohashi	100 years ago	50 years ago	Now	
Life use	✓				Life use	✓			
Agricultural use	✓	✓			Agricultural use	✓	✓		
Hydrophilic use			✓		Hydrophilic use		✓	✓	
Subsistence use					Subsistence use				
Faith use					Faith use				
Environment/Educational					Environment/Educational use				
Disaster prevention use					Disaster prevention use				

applied as same. Table 3 shows a transition in daily spring water use beginning 100 years ago. Further, Table 4 shows a transition in spring water use at shrines and temples beginning 100 years ago. Spring water use in daily life is divided into 7 categories: drinking water, agriculture, hydrophilic parks, various means of subsistence (such as fishing), faith, environmental education for children and local residents, and disaster prevention use such as firefighting. In the hydrophilic park, users in park can commune with spring water, plants, soils and living things. Local residents around the 18 springs mentioned the seven methods during the interview.

Based on the results of interview, human actions at springs are as follows:

- (1) Daily life uses, such as drinking, washing vegetables, and washing clothes.
- (2) Agricultural use in the irrigation of rice paddies and upland fields.
- (3) Subsistence use in breeding fish and producing sake.
- (4) Hydrophilic use in recreation, beautiful landscaping, and tourist destinations.
- (5) Faith use in mental relaxation at temples and shrines, and for guardian spirits.

Table 4 Transition in spring use at or near shrines and temples starting 100 years ago.

1. Small Park	100years ago	50years ago	Now		6.Meisei	100years ago	50years ago	Now	
Life use	✓				Life use				
Agricultural use	✓	✓			Agricultural use				
Hydrophilic use					Hydrophilic use	✓	✓	✓	
Subsistence use					Subsistence use				
Faith use					Faith use	✓	✓	✓	
Environment/Educational					Environment/Educational use				
Disaster prevention use					Disaster prevention use				
11. Sinnyou	100 years ago	50 years ago	Now		17. Togyokusen	100 years ago	50 years ago	Now	
Life use	✓				Life use	✓			
Agricultural use	✓	✓			Agricultural use				
Hydrophilic use			✓		Hydrophilic use	✓	✓	✓	
Subsistence use					Subsistence use				
Faith use		✓	✓		Faith use	✓	✓	✓	
Environment/Educational					Environment/Educational use			✓	
Disaster prevention use					Disaster prevention use				
18. Gyokuryusen	100 years ago	50 years ago	Now		20-22. West Valley	100 years ago	50 years ago	Now	
Life use	✓				Life use	✓			
Agricultural use					Agricultural use				
Hydrophilic use	✓	✓	✓		Hydrophilic use			✓	
Subsistence use					Subsistence use				
Faith use	✓	✓	✓		Faith use				
Environment/Educational					Environment/Educational use				
Disaster prevention use					Disaster prevention use				
31. Yoshida Shrine	100 years ago	50 years ago	Now		36.Kashahara	100 years ago	50 years ago	Now	
Life use	✓				Life use	✓	✓	✓	
Agricultural use					Agricultural use				
Hydrophilic use		✓	✓		Hydrophilic use	✓	✓	✓	
Subsistence use					Subsistence use				
Faith use			✓		Faith use	✓	✓	✓	
Environment/Educational					Environment/Educational use			✓	
Disaster prevention use					Disaster prevention use			✓	

(6) Educational use for biological and environmental education.

(7) Disaster prevention and relief, such as drinking water and firefighting water during a disaster or disaster prevention training.

The reasons springs were no longer used were considered to be reduction of water availability, changes in the aquifer, and water quality deterioration.

Firstly, those interviewed described a transformation in the exploitation of water at spring installations. The results revealed a reduction in the amount of water available due to urbanization, deterioration of water quality, water spread, daily use, and the agricultural use of the Edo era. However, in recent years, as installations have been built by the local authority and

community, many people have engaged in hydrophilic use.

A transformation in human behavior at springs and neighboring shrines and temples was also described. This section investigates temple precincts and the spaces neighboring springs. At temples and shrines neighboring springs with installations, the installations were used by the temples and shrines. In celebration and worship rituals carried out regularly over long periods of time, these spaces have become bases for the local community. This has led to the implementation of a variety of spring water uses.

Finally, transformations in the uses of spring water installations were also described. Table 5 shows human behavior in open spaces at spring installations. Daily

Table 5 Human behaviour in open spaces at spring installations.

	Installation	Neighbour shrine and temple	Daily life use	Agricultural use	Hydrophilic use	Subsistence use	Faith use	Environmental education use	Disaster prevention use
2	present	-	Decline	Decline	present	-	-	-	-
4	present	-	Decline	Decline	present	-	-	-	-
8	present	-	Decline	Decline	present	-	-	-	-
9	present	-	Decline	Decline	present	-	-	-	-
14	present	-	Decline	Decline	present	-	-	-	-
38	present	-	Decline	Decline	present	-	-	-	-
3	present	-	-	-	-	Decline	-	-	-
19	present	-	-	-	-	Decline	-	-	-
6	present	present	-	-	present	-	present	-	-
11	present	present	Decline	Decline	present	-	present	-	-
17	present	present	Decline	-	present	-	present	present	-
18	present	present	Decline	-	present	-	present	-	-
31	present	present	Decline	-	present	-	present	-	-
36	present	present	Decline	-	present	-	present	present	present
1	-	present	Decline	Decline	-	-	-	-	-
20-22	-	present	Decline	-	present	-	-	-	-

life use and agricultural use has declined at many spring locations, while hydrophilic use has been amplified by certain installations. In some cases, the local authority built installations at developing parks, or the local community built the installations themselves. In the latter case, the spring water location was recognized as a common property of the community. Installations were made at various levels, such as the development of local communities, city park development, or the development of temple precincts. Springs located within temple precincts, as neighbourhood installations, have multilateral uses for faith, environmental education, and disaster prevention. Based on my survey, the fact that these are much biotope in hydrophilic parks was suggested.

Since biotope with a natural spring water is to tell the truth to people, it is very effective for environmental education. Otherwise, when residents carry out disaster prevention activities in the region, residents can confirm an importance and location of springs by using the actual spring. Thus, in the central city, springs

without installations are not beautiful natural landscapes due to pollution and poor water quality, and so management of the environment is needed, such as by cleaning up unwanted dust and other unsanitary conditions. In addition, a project to regenerate springs as a healing source should be carried out, which has become less in recent years. Reconstruction of springs along with healing is required in useful during daily life and emergency.

5. Conclusion

Although the amount of spring water has been reduced due to the influence of recent urbanization, the relationship between daily life and springs has been diminished. Therefore, it became clear that awareness of the presence of springs has diminished. However, springs are a valuable cultural resource in the region, and springs were an important water source for firefighting at the time of the disaster.

This study focused on springs and investigated the remaining spring water locations in Mito city centers.

Besides, the transformation process behind the exploitation, topography, and utilization of spring water has been investigated. In addition, it proposes methods for renewing spring water in the future.

As results, space features in springs were continuous or fragmentary space, the degree of maintenance and largeness, types of topography, and the degree to enclose. In special, the most effectiveness for space feature is the degree of maintenance and the degree to enclose.

Furthermore, after transformation of an involvement between people and waterfront on the springs was analyzed, it was classified to five activity, which were “daily life activity”, “subsistence activity”, “recreation activity”, “faith activity” and “creation activity”. In details, life activities and agricultural activities has declined, subsistence activities was shrinking. And then, faith activities and creative activities were continued. In addition, recreational activities was increased by the development of a park. On the other hand, currently disaster prevention and educational activities is newly performed.

From these findings, a promenade to continuous and fragmentary space should be constructed, then the springs with community space should be built for diversity use, in addition, local authority should be constructed waterfront surround the springs by involvement with local community. Where residents share the spring water as common property, field installations have been constructed. Specifically, local communities have been centralized around everyday involvement at spring locations. There were differences in the transformation and location of exploitative spring functions and history. Where spring water locations are integrated into temple functions, special installations have been constructed. Through regular ritualistic festivals and worship, they became a base for local communities. Spring water has a wide variety of available uses for daily life, agriculture, hydrophilic use, faith, disaster prevention, education, and more.

In the past, spring water was used for drinking, washing, and fighting fire. Spring water close to farmlands was used for agriculture. However, in recent years, water quality has degraded, and it can no longer be used as drinking water. Therefore, parks with hydrophilic water have recently been constructed. Springs near shrines are sacred places for gods of water to cleanse themselves. In addition, some spring water has been used for environmental education and disaster prevention training.

In addition, the local community and the local authority should collaborate to develop installations at spring locations. At the same time, they should encourage diversified spring water uses, and cross-promote in order to use this diversity, specifically to develop foot-traffic networks and event programming at springs. They should work towards hydrophilic uses that include developing a promenade, furthering faith and local culture, and promoting complex uses for experience and environmental learning. In addition, disaster drills using spring water should be implemented. Processing methods necessary for using spring water in daily life should also be developed. It is important to assemble diversified uses. Specifically, it should be important for us to consider the active use of spring water and waterfronts in order to promote the use of springs for multiple purposes.

Acknowledgements

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