A study on the Revitalization of Tamagawa Waterway Landscape and Water Cycle in Tokyo

Mikiko Ishikawa, professor of Environmental Information
Sorami Shiinoki, Graduate School of Media and Government
Keio University, Japan

Abstract

This paper proposes the prototype of how the present Tamagawa waterway contributes to the revitalization of the water cycle in Tokyo from the viewpoints of the role and culture of water network supported by Tamagawa waterway. The research method involved walking 43km along the waterway. This was followed by creating “water cycle maps” and diagrams of the Tamagawa waterway that flows through Tokyo in the Meiji era and the present. It is found there is 8km of waterway that can be opened in the very near future. However the waterway is hidden in the present day, it could be said that the Tamagawa waterway is Tokyo’s artery and it holds together the water and greenery of the city. With modernization the water source is being lost and the water cycle does not function and the land is taken for railroads and roads. Tracts of green land connected by water are becoming isolated. The above problems have manifested themselves in Shinjuku, the center part of Tokyo, and from a city water cycle perspective, a Tamagawa waterway regeneration project has been proposed.

Keywords: water cycle, Tamagawa waterway, regeneration, water take of

1. Purpose of this paper

Focusing on the Tamagawa waterway-based water network, this study aims to analyze the changing role and culture of the waterway over time and propose prototype for how the present day Tamagawa waterway can contribute to the restoration of the urban water cycle.

The Tamagawa waterway steers water through ridges from Hamura to Okido gate. It created a water cycle that sent water through 33 diversion water
lines to rivers using only natural energy. Right now, 12.8km of the 43km Tamagawa waterway is covered and, therefore, hidden, and 97% is within the Tokyo metropolitan area. Moreover, it is impossible to walk along the waterside for 12.2km of those 12.8km, but it was discovered in this course of this research that 8.0km of covered waterway could be opened immediately. The conduit of the Tamagawa waterway still runs up to Okido gate.

![Fig.1 Existing Tamagawa Waterway](image)

This research aims at studying water circulation among water source forests, the Tamagawa waterway, diversion channels and natural rivers by examining the Tamagawa waterway. We would like to discover a clue for how the invisible Tamagawa waterway should be positioned in the city planning and how it is linked to urban redevelopment.

2. Method

As for Tamagawa waterway, there are other studies taken from the standpoint of planning of Edo city, ecological corridor, and the relationship with diversion channels. Suzuki(2003) examined the role of the waterway in urban development in the Edo period. Kosaka(1991) focused attention on open Tamagawa waterway as ecological environment near at hand in the city. Watabe(1989) show the actual condition of the diversion channels and water restoration in Musashino platform.
This research focuses on the controversial Tamagawa waterway in the area of 23 wards which is invisible and buried under the city and then the background and the history of why the waterway was covered are examined. The change in water circulation which was enabled by the Tamagawa waterway is shown by drawing the diagrams of water circulation in the Meiji Era and today. The potential and culture of the natural environment of the covered Tamagawa waterway including green land enfolded by the waterway and its diversion channels were analyzed. We think there is novelty in this research in the respect that in addition, the Tamagawa waterway including green land was examined from the viewpoint of an urban water source; and that a case study was made; and that a scenario of restoration of urban water circulation including the Tamagawa waterway was drawn up.

In the water circulation centering on the Tamagawa waterway, the history of the function of this waterway is traced. The water circulation diagram was drawn to serve as a base map by tracing the whole surface of water including the diversion channels network and rivers. The distribution diagram of open space around Tamagawa waterway (green land of court nobles, park athletic fields, farmland, forests, wilderness, schools, glands, temples, shrines and graveyards that were drawn from topographical maps published by Geographical Survey Inst. and Metropolis of Tokyo) was superimposed on it. Then the green areas linking with water were extracted and the inheritance of the water circulation was examined from landscapes handed down to the present time.

3. Transition of water system by Tamagawa waterway

Water circulation diagrams in Meiji Era and today were compared. The following were clarified: That the Tamagawa waterway was a water source of water circulation in Musashino area; that it enabled development of new paddy fields not only in Edo city but also in the suburbs; and that the diversion channels supported water circulation in the region until 1955-1965.

The axis line of Tokyo which penetrates southern ridge of the Musashino plateau which extends in east and west is the Tamagawa waterway. As the waterway ran the watershed of the Kanda river water system and the
Furukawa and Meguro river water system in 23 wards, it was possible to pour water into many diversion channels in north and south. As the Edo city was arranged with pipes, the water was supplied to the Edo castle, feudal lord mansions, samurai residential areas and tradesmen residential areas. It was extensively utilized for daily life water, garden pond water, moat water, water for fire fighting, sewage water, etc. and it was a lifeline of water in Edo City.

The Tamagawa waterway in the Edo period which covered the area of 23 wards today was diverted into 10 water channels, and in addition, those water channels branched out into smaller ones and flowed to the Shibuya river, the Meguro river and the Kanda river. The Mita diversion channel which was diverted right and left through the watershed, supplemented water to spring water points in small valley flats and farmers living in plateaus. The water sources of the Shibuya River were spillways, the Sendagawa diversion channel, the Imori River (spring water) and the Kogai River. And its hydraulic power encouraged people to build factories in the Meguro district. Water sources of the Meguro River were the Karasuyama and Kitazawa diversion channels. In addition, Takaido and Hatagaya diversion channels flow to the Kanda River where the water was supplied from the Kanda auxiliary water moat as well. The Mure diversion channel flows into the Shinagawa service water and then the service water was supplied to Shinagawa. By utilizing the landform of a myriad valley flats which went into the Musashino plateau, the structure of the water circulation of the region beginning from the water in ridges to rivers was formed.
In the circulation diagram in 2003, treated water of the sewage has been introduced to the Tamagawa waterway from the upstream sewage disposal plant of the Tama River. Diverted channels are all isolated and reclaimed water has been introduced to the Meguro river and the Shibuya river which once received the water from the Tamagawa waterway, since daily quantity of water became scarce. Though the old rivers including the Kitazawa and Karasuyama diversion channels which were covered and became green ways support the water system of Tokyo as a trunk line of the sewage, the water circulation of the region is lost. The water environment which was linked by the Tamagawa waterway is isolated and only survives as ponds in parks and water lines.

4. Water system and landscape

The water circulation of the Tamagawa waterway was once the system which was combined with green land. Then we focused attention on the inherited green land as a base of the Tamagawa waterway.

The distributions of the green land are roughly divided into four. Up to Sengenbashi through the section of the open waterway in 23 wards, the waterway passes through housing areas; and productive green and silva areas are concentrated there. Inogashira Park is a spacious green area and
the small open space of which leads to the Mure and Karasuyama division channel. The area where the covered Tamagawa waterway runs parallel to the Kanda River abound in athletic fields of schools and enterprises, temples and shrines. It used to be the old external open space zone of Kanda water supply. However, its utilization is now limited and a technique for publicly handing down this green land should be found. The open waterway appears from the Izumi water station onward here and there. Parks and green areas are scattered among overcrowding residential grounds. Nearer we approach the city center, smaller become the scale and the number of green areas. Shinjuku Gyoen national garden is located at Okido gate. Differences in distributions resulted from designation of the ring green zone by urban planning in the Showa period and difference in existence or non-existence of water.

The nodal points of water running from the Tamagawa waterway to diversion channels were utilized as open spaces in Edo City. Shinjuku Imperial Garden as a leisure space (spillways and the Sendagaya diversion channel) and Kumano shrine as a terminal (the auxiliary water moat of the Kanda River) were examined as the handed down landscape. The diversion channel was incorporated into the garden and the religious site by utilizing water from the Tamagawa waterway, spring water and the landform.

5. Covered conduits of the Tamagawa waterway and the characteristics

The examination is carried out on how publicity of water environment has made terms with urban development. 23 wards were divided into several districts according to the background in which waterway were covered and then comparison between the districts was made.

The Tamagawa waterway for water supply was surrounded by green land and conserved as an integrated urban axis from the Edo period when it was built until the early Showa era. The Maintenance of green environment at the revetment of the Tamagawa waterway was indispensable in order to ensure the quality of drinking water. In 1940-43, the green belt between the Kanda river and the Tamagawa waterway was planned in order to make excursion roads and green wedges designated in the Tokyo green land plan. The
Tamagawa waterway did the active service of water circulation until the Yodobashi water purifying plant was abolished in 1965. The decline period began when the water purifying plant was transferred to Higashi-murayama along with the extension of Tokyo. Decrease in water of the Tamagawa waterway led to disappearance of the familiar water environment. The Tamagawa waterway; the public space running almost parallel to Koushu Road, was turned into the site for railways, highways and roads. Construction of covered waterway began in 1965-1975 and a change of site planning of the radial route No.5 made this movement decisive. However, with the increase in the concerted action by the residents, the land over the covered Tamagawa waterway was developed into green ways, parks and public spaces one after another. Uninterrupted extended pedestrian pavement running through 23 wards was not materialized, since this development was carried out in a small scale by each ward. Though the waterway was the infrastructure for water supply of the Edo city, it was badly severed by infrastructure building for roads in Tokyo; and the idea of controlling the 43 km public space as a whole was faded away. There are two different projects for the radial route No.5 at present. And the role of the Tamagawa waterway in the city is being asked now.

To begin with, in the section of Tamagawa waterway from the Sengenbashi where precious open waterway remains among 23 wards to the Murebashi, urban planning for radial route No.5 was changed in 2004 and will go into operation. The waterway of about 1.3km will be left in the center of the traffic-lane, and the link to the nearby green land and streets is difficult. Based on the Tokyo green land plan (1939), urban planning decision for health and fireproof roads made by the old Tokyo prefecture was originally given to the Tamagawa waterway. And it would have been an epoch-making plan to give the waterfront to citizens by introducing health roads along the Tamagawa waterway and to make a green belt together with the Kanda river. In 1946, as another part of the war damage reconstruction plan, it was decided to make the radial route No.5 road which would have passed straight through the north of Koushu Road. However, the plan of health and fireproof roads was suspended, as the radial route No.5 was changed to be constructed over the present Tamagawa waterway according to the route change in Mitaka route No.3-2-2 of the Chuo Highway (1966). In the
highway countermeasure conference of Suginami ward in the Tokyo planning and zoning commission (1966), the residents submitted a petition requiring conservation of the space over the Tamagawa waterway as the green land. The conference gave an answer to this petition, saying that a park was under the control of city planning and “It is better to build the facilities of the park collectively rather than partially conserve the strip-shaped park”. The green belt along the rivers had been positively considered as the axis of Tokyo in the Tokyo green land plan. Judging from this, it is unbelievable that priority is given to urban roads authorized in city plan in 27 years later, and that evaluation of the green belt of the Tamagawa waterway which has a potential of making a network of water and green comes down.

While, the partial waterway at Shinjuku was covered and used as the ground for rail tracks at the Shinjuku station in 1885, and the waterway from the station to Okido was reclaimed accompanied by road pavement construction carried out in the end of Taisho Era. The investigative committee for protecting precious green land of the Shinjuku Gyoen national garden was established accompanied by the start of operation of the radial route No.5 (1986); and the Shinjuku Gyoen tunnel was completed in 1991. In addition, the information center and promenades were opened along with opening of the Shinjuku gate in 1995; and the access to the national garden was improved, moreover a charge-free promenade where the residents and visitors could enjoy green of the garden was opened. The revival of the Tamagawa waterway examined in the tunnel improvement project was taken up again on a suitable occasion in the 100th anniversary of the garden and it was selected as a subject for national urban restoration model investigation (2005). Academic experts, local residents, NPO groups and administration-related organizations (Environment Ministry, Metropolis of Tokyo, Shinjuku ward, Shibuya ward) participated in the Exploratory Committee for restoration of the Tamagawa waterway. And they have groped for a realization of renewal of the waterway controlled by the community organization from the design to maintenance.
There are problems in the area of 23 wards as follows: First, water sources have been lost in the process of modernization; second, the water circulation does not function; third, the land that has been used as railways and roads has divided streets; and fourth, green areas of water sharing spots which were linked together by water have been isolated. Even though the open waterway in Suginami is protected as a preservation area of historic environment, it will be segmented by on-going road constructions. On the other hand, the lost Tamagawa waterway is being restored with the surrounding green land in Shinjuku. The case study was carried out in order to restore the Tamagawa waterway as an infrastructure for water circulation in the city.

6. Recovery of water circulation in the city with Tamagawa waterway

Intrinsic problems of Tamagawa waterway are evident in the vicinity of Shinjuku Gyoen national garden—an important location in the history of the Tamagawa Waterway. Though located in the middle of a metropolis, there are a number of water sources: wetlands that are a remnant of the Musashino spring, groundwater, treated water from plants in Ochiai and Tama, the national garden as water-source forests with surrounding rainwater recharge, as well as water drawn from the Tama River. This research project assesses three distinct options—maintaining the status, environmental improvement
and revitalisation of local natural environment—from the standpoints of ecology and activity with reference to Shinjuku Gyoen water sources, routes and distribution destinations. As a result, it is clear that the greatest potential lay in the plan involving revitalization of local natural environment.

Of the water from the Tamagawa waterway drawn from the ridge, that which is channeled at the first diversion located at the Shinjuku main street intersection to create a wetland area at the Tenryu temple and streamed through the upper pond in the national garden, as well as water that serves to improve the quality of Tamamo Pond at Ōkido and runs through the spillway streams in the valleys, is used to recreate the Shibuya River. Water is to be secured through rainwater collection within the Shinjuku Gyoen catchments area, which should net around 1,000m$^3$ per day. Tama River is a water source of tap water. Additional 85000m$^3$ water can be secured as water for conservation of environment, if metropolitan citizens save tap water by 10% based on the mutual agreement. And then water circulation will be restored and cover not only the region around the Imperial garden but also many districts in 23 wards through many sharing water diversion points.

Fig.4 Potential and restriction of water cycle
7. Conclusion

This research project led to the following three conclusions.

1. The Tamagawa Waterway was the water source for the Meiji water cycle, flowing from channels and rivers to the sea.

2. The Tamagawa Waterway was used and protected as an urban oasis together with open spaces, but its aqueducts were covered in conjunction with the increase in urbanization, and were converted for use as major traffic infrastructure.

3. Its diversion waterways, the meeting points of ridges and valleys, cradle greens and landscapes unique to watered areas.

The Tamagawa Waterway system is an axis that connects Tokyo’s water and greenery in a bunched fashion. It is important that we recognize that there are approximately 8km of waterway that can be uncovered immediately, along which are located numerous parks, temples, gardens and other protected open spaces. Designing a “local waterside” by making recreational hubs of Tokyo’s water cycle, with the Tamagawa Waterway as its focus, would lead to the creation of an urban foundation. An urban water cycle founded on the local natural environment is sorely needed in this age of environmental concern.

References

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