

UDC 712.03
DOI: 10.56318/as/2.2023.20

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The historic Lake Biwa Canal as a permanent catalyst for the development of Kyoto's landscape architecture

Abstract. The historic Lake Biwa Canal, an artificial waterway that supplies water from Lake Biwa to Kyoto, was built to revitalise Kyoto after the capital was moved to Tokyo in 1868. Apart from its main function, the canal plays a significant role in organising the cultural landscape of the surrounding areas. This study raised topical issues of sustainable development, preservation, and revitalisation of historic engineering structures. The artificial waterway was considered in terms of its pulling effects on the surrounding environment, both urban and landscape. The purpose of this study was to find the characteristics of the landscape-organising role of the Biwa Canal and its transformation over time, specifically with adaptation to the relevant problems of modern time. The study was conducted mainly using in situ field research methods. As a result, the key role of the canal as a constant catalyst for the development of Kyoto's landscape architecture was outlined, which has changed substantially over time, but has not weakened and has always been innovative, organically combining modern industrial achievements with local traditions. In the first period of its existence (until 1951), the focus of landscape organising activities in the areas adjacent to the canal was on the creation of private and temple gardens, but from the second period of its existence (1951-early 1990s), the focus of landscape activities around the canal shifted to public recreational and park aspects. During the third period (since the early 1990s), when the canal was recognised as a National Historic Site, trends in the development of industrial and landscape tourism were also observed. The experience of preserving, revitalising, promoting, and adapting the landscape role of the Biwa Canal to the new needs of the present can be used as an example of the direction of similar activities for historic waterways in the world

Keywords: cultural landscape; historical waterways; Kyoto landscape gardens; industrial tourism

INTRODUCTION

Japan has a variety of preserved historic canals on its territory, many of which require the development of a conscious strategy for protection and revitalisation. Since 2006, thanks to the efforts of local municipalities and volunteers, a considerable number of them have been included in a specially created national protection system Important Cultural Landscape property, which unites mostly historical cultural landscapes associated with various types

of water resources (Agency for Cultural Affairs, n.d.). Several new (as of 2023) scientific studies were devoted to the investigation of individual examples of the Important Cultural Landscape of Japan, which touch on the historical, functional, and socio-cultural aspects of the development of these protected areas in view of the modern problems of revitalization, the preservation of the cultural and ecological environment, the development of the local volunteer

Suggested Citation:

Shevtsova, G. (2023). The historic Lake Biwa Canal as a permanent catalyst for the development of Kyoto's landscape architecture. *Architectural Studies*, 9(2), 20-34. doi: 10.56318/as/2.2023.20.

Journal homepage: <https://arch-studies.com.ua/en#>

Architectural Studies, 9(2), 20-34

Received: 07.09.2023 Revised: 21.11.2023 Accepted: 15.12.2023

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movement, etc. (Watanabe *et al.*, 2019; Koike *et al.*, 2021; Ochiai, 2022). At the same time, it is worth noting the emergence of comparative studies related to the water cultural and historical landscapes of Japan and England (Hutcheson, 2021), as well as the historical water supply systems of Japan and Algeria (Rezig & Shevtsova, 2022). In general, according to the list of Important Cultural Landscapes of Japan (2015), this protection system mostly unites landscapes of rural areas and small towns.

The example of the industrial waterway Lake Biwa Canal (or Biwa-ko Canal in other sources) in metropolitan Kyoto, which was inscribed on the list in 2015 as part of the Okazaki Historic Urban Area (Important Cultural Landscapes, 2015), is unique in this regard. The Biwa Canal is the most iconic landmark of its kind in Japan, and its industrial and cultural role in the development of the city during the Meiji period cannot be overstated. The historical periodisation, functional diversification, and processes of the modern revitalisation of the Biwa Canal are discussed in G. Shevtsova & M. Parkhomchuk (2022). The study by A. Hosler (2023) contains a description of private villas with landscaped gardens available for viewing in the canal's influence area (Nanzenji Temple area, Keage district).

In general, this practically exhausts the list of relevant research studies as of 2023 on this or closely related scientific topics. The landscape role of the Biwa Canal is still understudied, with little coverage in the scientific literature, while the issue of proper preservation and conservation of historical monuments of engineering and landscape architecture is important, but impossible to resolve without substantial renovation, revitalisation, and rethinking of their functions within the architectural and social structure of settlements. That is why the purpose of this study was to identify the role of the Biwa Canal as a catalyst for the development of landscape architecture and landscape design in Kyoto from the end of the 19th century (the time of the Canal's construction) to the present day.

MATERIALS AND METHODS

This paper is based on the study by G. Shevtsova & M. Parkhomchuk (2022). The historical periods of development of the Biwa Canal and the analysis of the historical diversification of its functions were used to build a chronological scheme and identify the main areas of research. The study also drew on a wide range of Japanese and English-language scholarly literature on the industrial and economic development of the Biwa Canal (Tanaka, 2002; Ono *et al.* 2012; 2014). Information on the landscape component of the surrounding areas, specifically, the work of the garden designer Ueji (Ogawa Jihei VII), who in the late 19th and early 20th centuries, using water from the Biwa Canal, laid the foundations for a new type of Japanese park design, is mostly in the plane of popular literature (Amasaki, 1990; Shirahata, 2008a). In other cases, the author of this study had to use empirical sources of information. First of all, it is the archival and media base of the Lake Biwa Canal Museum in Kyoto (Lake Biwa Canal Museum, 2009; 2012).

The Biwa Canal Museum holds an extensive collection of visual archival materials: photographs of the construction and early periods of the canal, design maps and models of its engineering systems, and unique video footage, including a video of the Keage incline trolleys transporting boats across the Keage watershed, made in the late 1940s, almost before the railroad closed. Information from official Internet resources (Lake Biwa Canal Museum, 2018; The Lake Biwa Canal cruise Kyoto-Otsu, n.d.), promotional booklets of exhibitions and events related to the canal, etc. were also used as auxiliary materials. The study also draws heavily on the author's own experience in the in-situ study of the Biwa Canal, conducted within the framework of a research grant from the HAKUHO Foundation at the University of Kyoto.

The main methods of field research were field surveys and photography. The structure, surrounding landscape, and current state of the First (oldest) branch of the Biwa Canal, from its outlet from Lake Biwa (Otsu, Shiga Prefecture) to the distribution pond in the Keage district of Kyoto, as well as the structure of the Keage rail incline and the Nanzenji Suikoku aqueduct, Philosophers' Path, Higashiyama Ryokuchi Park, and the Lake Biwa Canal Museum were examined using the field research method. An internal visual survey of the First Canal Branch tunnels was also carried out (using a motorboat), as well as the cultural landscape and revitalisation practices of the Keage Filtration Plant. A separate block of time was devoted to the field study and photographic recording of the landscape gardens by the master Ueji: Maruyama-koen public park, the gardens of Heian-jingu, Nanzenji, Eikando and Honen-in temples, the Westin Miyako Kyoto hotel, the Namikawa Cloisonne Museum (former estate of the Namikawa family), as well as villas Murin-an, Hekiun-so and Kaiu-so. The author also examined modern manifestations of landscape design on the Biwa Canal (both permanent and temporary) and took part in new tourist and excursion events to promote the waterway and the historical engineering infrastructure of the Biwa Canal. The results of the field research were classified and structured, and comparative, chronological, causal, and graphical analyses were conducted on their basis.

RESULTS

The structure and history of the Biwa Canal in Kyoto. The Meiji era in Japan (1868-1912) was characterised by substantial changes in all spheres of life. At this time, Japan, which had been isolated from the outside world for several centuries due to the isolationist policy of the Tokugawa shogunate, and thus lagged far behind the world's progress, opened its external borders. Literally, the name of the Meiji era translates as the Age of Enlightenment, which fully reflects the general spirit of those times. With the beginning of the Meiji period, Japan's artificially preserved feudal structure gave way to a new capitalist system, which was introduced in 1868 based on a symbolic restoration of imperial rule. The Meiji Restoration marks the boundary between "traditional" and "new" Japan, when new European knowledge and traditions began to penetrate the country that



had been closed for about three centuries. A multi-year programme of economic and military modernisation was adopted, which allowed Japan to avoid colonisation by the West and subsequently gain weight in the world. Young Japanese people were sent to study in Western European countries and America in large numbers to learn the secrets of banking, medicine, railway, and road construction, heavy engineering, and other engineering (and other) specialities. Foreign specialists were also invited to work in Japan. The country was rapidly industrialising, with new plants and factories appearing and the rural population flocking to the cities. Western culture has spread widely in Japan. However, soon enough, the local traditional aesthetics regained its position, and Japan, having absorbed the new experience, entered the next stage of development of the national culture (Young & Young, 2004).

The construction of the industrial and transport water supply canal from Lake Biwa to Kyoto is directly related to the events described above. The Canal was conceived and implemented to support the economy and revitalise the city of Kyoto, which had begun to decline due to a sharp decline in population caused by the relocation of the capital and the move of the imperial court to Tokyo in conjunction with the Meiji Restoration. The idea of building a canal to deliver water from Lake Biwa to Kyoto has been popular in Japan for a long time and was discussed even in the Middle Ages, although at that time it was more of a dream that did not have the technical capacity to come true (Shevtsova & Parkhomchuk, 2022). But at the beginning of the Meiji period, almost immediately after the imperial family moved to Tokyo, Kitagaki Kunimichi, the 3rd governor of Kyoto Prefecture, mentioned this ancient idea (Lake Biwa Canal Museum, 2012). As a result, an extremely original and innovative industrial water supply project was implemented for Japan at that time. The canal was designed to transfer significant volumes of water from Lake Biwa to Kyoto, which, due to its geographical location in a mountainous basin, has historically experienced a shortage of water for agriculture. With the advent of the industrial era, this problem has become extremely acute, as the development

of enterprises dramatically increases the consumption of water needed to generate electricity. Thus, according to Kitagaki Kunimichi, who planned to build new factories in Kyoto, the Biwa Canal was to contribute significantly to the development of Kyoto's industry by meeting the city's growing needs for industrial, agricultural, and drinking water, as well as serving to transport goods and passenger boats between Lake Biwa and Kyoto. The construction costs were partly covered by the emperor and partly by the city of Kyoto (Lake Biwa Canal Museum, 2018).

The construction of the Canal was Japan's first major industrial project carried out by local engineers alone, without the help of foreign specialists. The Biwa Lake Canal has been in use for over 130 years and as of 2023 is still playing its direct role of water supply. In the second half of the 20th century, there was a period of certain decline in the canal, when its transport role was lost. But since the end of the 20th century, the Biwa Canal has been actively revitalised, gradually becoming a tourist and cultural attraction in the city. An extremely significant feature of the canal is its landscape function, which has been formed since the beginning of the canal's creation and, at the time of 2023, is still of no less importance (Shevtsova & Parkhomchuk, 2022).

The Biwa Lake Canal system consists of two main water supply branches. Construction of the first of them began in 1885 and was completed in 1890. It starts at Lake Biwa in Otsu and extends to the main water distribution point in the Keage district of Kyoto, with a length of approximately 11 km (Fig. 1). Then the canal goes on for about 9 km through the city to the Fushimi district. The first branch of the canal consists of a system of open water areas interspersed with four tunnels. The first and longest of these, the Nagarayama tunnel, is 2,440 m long, while the shortest, the second tunnel, is only about 124 m long. The second branch of the canal was completed 20 years after the first to increase the volume of water supply to Kyoto. It is more advanced in technical terms and is only 7.4 km long, but it is deeper and runs entirely in a tunnel, close to the bed of the first branch of the canal between Biwa and Keage (Tanaka, 2002).

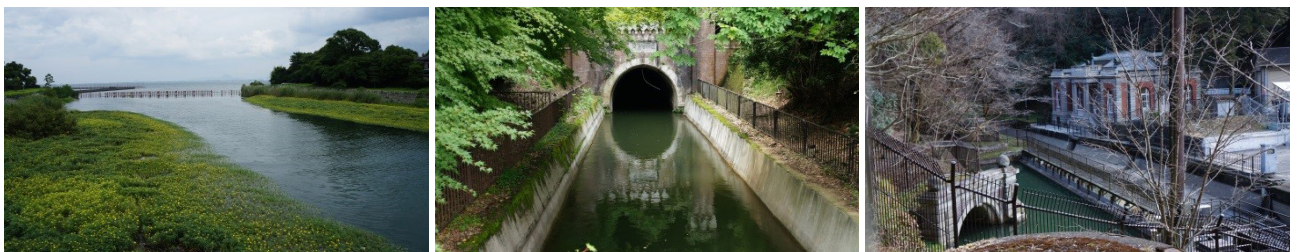


Figure 1. The start of the canal from Lake Biwa, one of the tunnels of the first canal branch and the Keage distribution pond
Source: photos taken by the author, 2019; 2022

The project was developed by Tanabe Sakuro, a young engineer who graduated from the Imperial College of Engineering in Tokyo. Tanabe Sakuro studied at college with Henry Dyer, a famous Scottish engineer who did much to develop Western-style technical education in Japan. After

graduating from college, Tanabe developed his thesis, which was an imaginary project for the construction of a water transport canal from Lake Biwa to Kyoto. With this in mind, Kyoto's leaders decided to immediately invite Tanabe to carry out a real project on site. In the end, this



somewhat risky invitation to such a responsible role for a young specialist with little or no real construction experience paid off. Many new methods were used during the construction works, such as the construction of the tunnel using vertical shafts that were driven into the future tunnel, serving as added excavation points (Tanaka, 2002). This made it possible to correlate the still insufficiently exact geodetic methods at that time and levelled the difficulties of ascending parts of the tunnel dug from different sides. Two structural shafts, 47 and 20 metres deep, which helped to construct Nagarayama's longest tunnel, are still in place as of 2023 and are used for ventilation and as emergency exits and are visible from both inside the tunnel and from the outside, in the mountain forest above the tunnel.

With the completion of the first branch of the canal, Japan's first commercial hydroelectric power plant was built in the Keage area (Kansai Electric Power, n.d.). The power from this plant was used for factories and night lighting in the city. At the same time, the canal became a powerful waterway for the movement of cargo boats transporting coal, wood, rice, and much more. There was also a passenger connection by canal, and many people even used this route for tourist purposes – to see the sights of the

city. After a few years, the water in the first canal became insufficient, as Kyoto's electricity needs increased significantly. Therefore, the then mayor of Kyoto, Saigo Kikudjiro, initiated the construction of the second canal from Lake Biwa, which took place from 1908 to 1912 (Tanaka, 2002). At the same time, the Keage filtration plant, which is still in use today, and several new hydroelectric power plants were built (Kansai Electric Power, n.d.).

A distinctive feature of the Biwa Canal project was the way boats were transported from the upper distribution pond in Keage to the lower jetty of Nanzenji Temple, where it was impossible to build a continuous waterway due to the 36-metre difference in the height of the watersheds of Lake Biwa and Kyoto. Therefore, boats were transported from Keage Pond to Kyoto via the so-called "Keage Incline", a 582-metre-long inclined rail track (Tanaka, 2002). On the shore of the upper Keage Pond, boats were loaded onto small open rail platforms that moved downhill on balancing cables, similar to a funicular, to the lower Nanzenji Pond, where the canal continued to the Kyoto area, gradually branching off in different directions (Fig. 2). In the Lake Biwa Canal Museum, one can watch a unique video of the rail transport of boats along the Keage Incline, which stayed in operation until the late 1940s.



Figure 2. Keage Incline and rail platforms between the upper and lower distribution ponds

Source: photos taken by the author, 2022

The study by G. Shevtsova & M. Parkhomchuk (2022) identified three main historical periods of the formation and development of the Biwa Canal. The first period of the canal's initial prosperity took place from 1890 to 1951. During this period, the canal acquired and strengthened its core functions. The second period, from 1951 to the early 1990s, was characterised by the loss of the transport function and a certain decline of the canal. The third period began in the early 1990s, when the canal was listed as a National and Kyoto City Historic Site and the Lake Biwa Canal Museum was built, which began the active revitalisation of the canal and the acquisition of new modern functions. This periodisation can be considered quite reasonable, and it is therefore considered appropriate to use it as a basis for further research into the landscape-organising role of the Biwa Canal.

The landscape component of the Biwa Canal in the first period of its existence, 1890-1951. From the very beginning of the Biwa Canal's existence, its water has been actively used to develop the surrounding landscape. The network of canal branches in Kyoto has created fire protection belts for the Imperial Palace and the surrounding major temples and

shrines, such as Heian-jingu, Nanzenji, Eikando, etc. Most importantly, however, the emergence of new waterways has led to the formation of a unique cluster of landscaped gardens in the Keage area, such as the Heian-jingu Shrine Garden Complex, Maruyama Public Park, the chamber garden at the Namikawa cloisonné enamel master's house, the gardens of the Murin-an, Hekiun-so, Kaio-so aristocratic villas, and the garden of the Westin Miyako Kyoto Hotel. All of them were created by Ueji (1860-1933), the outstanding garden master of his time, also known as Ogawa Jihei VII (Shirahata, 2008a; 2008b).

This Japanese gardener was born in the Kyoto suburb of Nagaoka-kyo, his name was Yamamoto Gennosuke. In 1877, he married Mitsu, the youngest daughter of the famous Ogawa family of landscape artists in Kyoto, and was adopted by the family, receiving the surname Ogawa (Ono, 2008). The tradition of adopting a daughter's husband has been widespread in Japan since ancient times and was done in cases where the family had no male descendants to legally pass on the family name and family business to the daughter and her husband. In 1879, after the sudden



death of his wife's father, Ogawa Gennosuke became the head of the family at the age of 19, inheriting the Ogawa manor in Kyoto along with the business and the name Ueji VII, which was the name of the eldest master in the Ogawa family. Since his daughter's father, Ogawa Ueji VI, died too young, Ueji VII did not have time to learn anything from him, and generally studied the art of Japanese landscape gardening on his own. His first significant works in this field date back to the early 1890s, meaning that Ueji VII began to work seriously in the field of landscape design after the age of 30. The growth of his skill is directly related to the water of the Biwa Canal, completed in 1890, which served as a fruitful basis for the development of Ueji's distinctive creative style. Thanks to the many connections of the Ogawa family, Ueji was able to meet prominent businessmen and politicians of his time, and eventually start working for them (Ono, 2008).

During the 1890s, the influential Nanzenji Temple, located in Keage right next to the main structural elements of the Biwa Canal, sold off some of its peripheral land, which was bought by wealthy citizens to build their own villas, which specifically gave Ueji's work such a powerful impetus (Ono, 2008). Ueji first used the water of the canal in 1894 to create a garden at the estate of his neighbour, the cloisonné enamel master Namikawa Yasuyuki, who was a leading expert in his field and repeatedly received prestigious Japanese and international awards for his works. Namikawa's estate was also home to his workshop, and he already had industrial water diverted from the canal, which

he used to polish finished products. Ueji made clever use of this opportunity by diverting the same water to create a pond (Ono, 2008). In his very first work using the water of the Biwa Canal (and it is possible that this was Ueji's first independent project), the master introduced some of his signature innovative techniques, which at the same time seemed to be within the framework of traditional Japanese garden construction, but stood out with extremely original accents (Fig. 3). Ueji uses stone basins for washing hands (the so-called *tsukubai*) of an unusual shape, which will later be developed in his other works. The composition of the garden is also characterised by the use of artificially processed stones from the Lake Biwa basin, which were transported to the construction site by the same canal. In this case, elongated stone blocks from the ruins of a castle in the town of Zeze were used for the threshold of the house. Almost the entire surface of the garden is covered by a pond with stones and a large island in the middle. The water flows in and out under the piles of the two-storey wooden house and workshop, filling everything around with murmur, as if subordinating the lives of the inhabitants to its own special rhythm. At that time, the use of a virtually continuous pond for a small plot of land of an urban residence was a revolutionary phenomenon, and later the theme of water became a leading one in Ueji's works. The presence of a pond creates the illusion of a wide space in a confined area, and a series of flat stones in the water, forming a kind of bridge for crossing (the so-called "steppingstones"), creates the illusion of water depth.

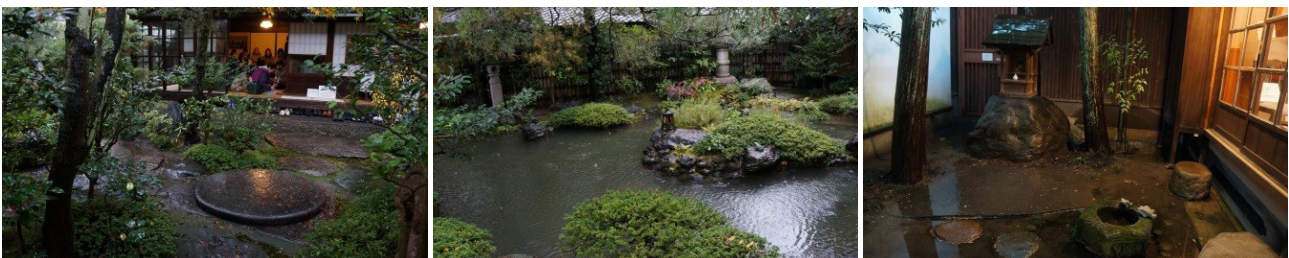


Figure 3. Garden of the Namikawa Museum

Source: photos taken by the author, 2019

Work on the garden of Murin-an Villa began in 1894 and became an example of the incorporation of the progressive landscape ideas of the villa's owner, an influential member of the Japanese government, General Yamagata Aritomo, and the skill of traditional Ueji garden construction (Yagasaki, 2012; Kato *et al.*, 2017). Water from the Biwa Canal was also used to create the Murin-an garden, for which an auxiliary water branch was diverted towards Murin-an. This was made possible by the local authorities' policy of turning this area of the city into a recreational destination. Aritomo Yamagata had a good education and a talent for design. He personally outlined the main priorities for future construction. Yamagata wanted the natural slopes of Mount Higashiyama to become the main element of the garden's composition. He also insisted that the garden should be formed based on an open grass lawn, rather than moss surfaces, as

was traditional for Japanese gardens. The lawn and mountain landscape were to be combined with large fir trees and fern-surrounded stones that seemed to have come down from the mountains (Kato *et al.*, 2017). The water from the Biwa Canal had to be incorporated into the landscape, it had to look like it was flowing straight from Mount Higashiyama. This innovative approach immediately reveals Yamagata's rejection of the traditional religious symbolism of the Japanese garden and the artificiality of the "garden-painting" as a three-dimensional interpretation of painting, which was borrowed by Japan from China and practiced for centuries as a central component of local gardening (Itoh, 1984). Yamagata proposed a naturalistic approach to garden design that would appear to be an improved extension of the natural landscape. Ueji did not accept Yamagata's ideas at first, trying to refer to the traditional foundations of stone



garden design (Ono, 2008), but eventually appreciated the boldness and breadth of the client's idea and brought it to life even more artistically than the author of the ideas had

imagined. The impression of naturalism in the Murin-an garden, however, is the result of precise calculations and detailed preliminary planning (Fig. 4).



Figure 4. Garden of Villa Murin-an

Source: photos taken by the author, 2019

The plot for the villa was allocated an elongated shape, the main living space is located at its end, from where the garden also begins, divided into two zones: smooth, calm and light low hills of the lawn are cut by two streams, along the banks of which tall fir trees enter the composition, hiding the tea room. Behind the fir trees, there is a pond with flat round “steppingstones” that create point transitions over the water. The pond is fed by an artificial waterfall flowing down dark rocks. By incorporating the surrounding landscapes of Mount Higashiyama into the composition, the garden looks much larger than it actually is. Against the background of this new coordinate system, some of the techniques and details of traditional Japanese gardening are accentuated, such as the shoals covered with large pebbles along the banks of the pond, which are clearly a reminiscence of aristocratic Japanese gardens of the Heian period. Thus, the effect of symbiosis of Yamagata's innovative ideas with Ueji's traditional artisanry emerges, which laid the foundation for a new generation of Japanese gardens. In the future, Ueji adapts, hones, develops, and improves this principle in his works. The gardens of two more great villas, Kaiu-so and Hekiun-so, also based on the principles developed during the creation of Murin-an, were created by Ueji shortly afterwards in the same area of Keage. The fundamental principle of the landscape gardens in both included the use of water from the Biwa Canal and the surrounding landscape of Mount Higashiyama (Shirahata, 2008b).

The plot for the construction of Villa Kaiu-so was purchased from the Nazenji temple by Inabata Katsutarō, a successful businessman and pioneer of Japanese cinema. The fact that this area was once a temple territory is evidenced by the wooden bell tower that is still preserved there. Ueji worked on the Kaiu-so Garden from 1905 onwards, redesigning and completing it several times until 1928 (Amasaki, 2008). The site is located on a slope directly below one of the outlet branches of the Biwa Canal, from where Ueji directed three streams down to the garden, one of which feeds the main pond, entering it in the form of a smooth waterfall flowing over artificial rocks and intruding slightly to the side into the field of view from the main veranda of the villa. The second stream flows into a small pond near the Rugin-an tearoom,

past which a path leads to the top of the hill, where the second tea room, called Sodo, is located. Along the way, the trail passes through an artificial tunnel with a stone tsukubai, a tea basin for washing hands. There are also small additional waterfalls in the garden, hand-washing basin in the form of hollowed-out stone gutters and stream crossings on flat steppingstones, typical of Ueji's work. The owner of the villa, who had studied in France, used the garden not only for traditional Japanese tea ceremonies, but also for Western style “garden parties” (Shirahata, 2008b).

The owner of the villa Hekiun-so, a major businessperson and art collector Nomura Tokushichi II, used his garden by Ueji in a similar way. Work on the Hekiun-so garden was started in 1917 by Ueji's eldest son, also an exceptionally talented young landscape designer, Hakuyo, who died unexpectedly in 1928, so Ueji had to take over the project (Shirahata, 2008b). The pond of the Hakiun-so villa was adapted for boating and is by far the largest pond of all Ueji's projects. The garden has 7 tea rooms, a stage for Noh theatre performances and another adapted for traditional Japanese dances. It is also a multifunctional garden, and it is important because it has not changed hands or been rebuilt throughout its history, fully preserving its authentic form (Amasaki, 2008). Ueji achieved a magical and innovative effect on the perception of the garden by placing a small round stone tsukubai washbasin in the pond water near the shore, almost flush with the edge of the water surface, so that water can flow over its edges, and those who lean into the basin can see the panorama of the Higashiyama Mountains over the far edge of the pond. Owner Nomura Tokushichi, who was a collector of Japanese antiquities, obtained large natural stones with ancient Buddhist carvings for the garden, which gave the landscape a special mysterious appeal. Another tsukubai washbasin, in the typical Ueji stone gutter shape, also creates a rather remarkable accent in the garden.

The project to build the Heian-jingu Shrine was started in 1894 by architect Ito Chuta to mark the 1100th anniversary of the founding of the city of Hei'an-kyo (the ancient name of Kyoto). The main pavilion of the sanctuary was a slightly reduced copy of the ancient audience hall of the Heian-kyo Palace (Niglio & Inoue, 2015). In the same year,



Ueji, who was just working on the Murin-an garden, received an invitation from the city authorities to create a large complex of gardens behind the shrine, where it was planned to bring water from the Biwa Canal as a fire protection measure. Heian-jingu's gardens were the first such large-scale project of the master, which finally established his image as a leading creator of Japanese gardens of a new generation. Ueji worked at Heian-jingu in several stages. In 1895, he created the Central and Western Gardens with ponds, while in 1897, he connected them with a stream. And in 1916, the work was completed with the creation of the largest Eastern Garden with a pond, which resulted in a semicircle of gardens behind the sanctuary (Niglio & Inoue, 2015).

Drawing on his experience at Murin-an, Ueji incorporated the naturalistic atmosphere of ponds and streams into the composition of the Heian-jingu gardens, which in the East Garden is complemented by the natural backdrop of the Higashiyama Mountains. Water enters the ponds of the sanctuary from the Biwa Canal. In this regard, recent studies by experts from the University of Kyoto have revealed that many species of lake fish once migrated from Lake Biwa through the canal and settled in the Heian-jingu ponds, and they still do very well there, while in Lake Biwa itself, due to changes in the ecosystem, some of them began to die out (Shirahata, 2008b). Therefore, the Heian-jingu

ponds have naturally formed a kind of recreation for the endangered fauna of Lake Biwa.

The most attractive elements of the Heian-jingu gardens are the two original bridges (Fig. 5). The first one, Garyukyo, is located in the Central Garden Pond and consists of vertically mounted stone pillars from the dismantled Sanjo and Gojo bridges of Kyoto, built in the time of Toyotomi Hideyoshi (16th century). The individual supports extend only slightly above the water surface, forming steppingstones in the form of round flat platforms above the pond surface. The second wooden bridge-pavilion, Taihei-kaku, located in the East Garden, was moved here in 1916 from the Imperial Palace. The stones for the construction of Heian-jingu gardens were brought by water through a canal from the Moriyama area on Lake Biwa, as well as from the ruins of Fushimi Castle on the northern outskirts of Kyoto (Amasaki, 2008).

The entire garden complex is marked by large open areas and water features, which display a variety of plants and landscape details (islands, stones, bridges) against the backdrop of the majestic slopes of Higashiyama. The Heian-jingu Gardens are also known for the seasonal flowering of many plant species, the most representative of which are the purebred irises in the West Garden (June-July) and the weeping sakura blossoms along the banks of the East Garden Pond in early April.



Figure 5. Gardens of the Heian-jingu sanctuary: West, Central and East

Source: photos taken by the author, 2023

Another project based on the use of water from the Biwa Canal was implemented by Ueji in Maruyama-koen, the first public park in Kyoto, founded in 1886 on the site of several temples that had been damaged by fire (Amasaki, 2008). The idea of public parks came to Japan from Europe, however, despite the successful creation of a wide public space in Maruyama-koen, the basic principles of the park's landscape design are traditionally Japanese. Ueji worked on the grounds

of Maruyama-koen in 1913-1914, adding a wide stream to the fountain pond created in 1893, which begins with a three-metre artificial waterfall and flows windingly down a gentle hill into the pond (Fig. 6). On the way to the pond, the stream flows over the steps of small rock-like natural stones that are laid in the water mixed with geometrically processed stones. In several places, the stream is crossed by bridges of several types, including flat steppingstones.



Figure 6. Maruyama-koen Park

Source: photos taken by the author, 2022



Ueji's last project was the design of the Aoiden garden at the Westin Miyako Kyoto Hotel, built in 1900 next to the Biwa Canal, which also used water from Lake Biwa. Ueji worked on the hotel's garden in 1915, creating a pond on a stepped steep relief opposite the banqueting hall, to which two streams flow from the Karaku-an tea room, one with a long-stepped waterfall and a grooved tsukubai washbasin, and the other with a small waterfall over a yellow striped

decorative boulder (Fig. 7). Another garden of the same hotel, Kasui-en, which also uses water from the Biwa Canal, is located up the slope and was previously a separate villa. It was created by Ueji's son, Hakuyo, in the form of a rocky wall-like composition with water flowing down it. Later, the famous Japanese architect Togo Murano complemented this landscape design with white pebble platforms in front of the pavilion (Amasaki, 2008).

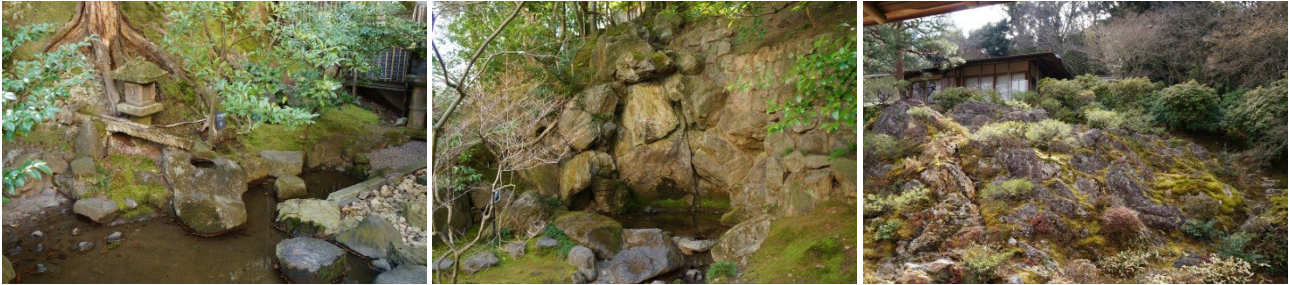


Figure 7. Gardens of the Westin Miyako Kyoto Hotel: Aoiden and Kasui-en

Source: photos taken by the author, 2022

The landscape component of the Biwa Canal in the second and third periods of its existence (from 1951 to the present). After the Second World War, the Biwa Canal gradually lost its importance as a major transport artery when the railway took over the leading role in the region's freight and passenger traffic, leading to a gradual decline in boat traffic on the canal. In 1948, the Keage Incline was closed, and in 1951, boat traffic on the Biwa Canal was finally stopped, and the waterway began to decline (Lake Biwa Canal Museum, 2018). However, in the late 1960s and early 1970s, the canal again attracted the attention of local authorities in terms of prospects for landscape

development of the territory. A small branch of the canal, which runs from Keage to the north of Kyoto towards Ginkakuji Temple, has been transformed into a city promenade, the so-called Philosopher's Path, and lined with cherry trees on both sides. At the same time, the former Keage Incline with preserved rails was also transformed into a pedestrian walkway with sakura trees, and the Higashiyama Ryokuchi Public Park was established on the land of the canal between Lake Biwa and Kyoto, in the Yamashina suburb near the Tenshi Emperor's mound, which is now rich in rare species of local flora and fauna (Fig. 8) (Shiroshita, 2006).



Figure 8. Landscape design of the canal surroundings in the mid-20th century: the Philosophical Path, the sakura blossom park on the Keage Incline and Higashiyama Ryokuchi Park

Source: photos taken by the author, 2019; 2023

Another walking area is a three-kilometre-long branch of the canal from the Keage distribution pond to the Nanzenji Temple area, which accordingly to Tanabe Sakuro design crosses the ravine near the temple on the so-called Nanzenji Suirokaku, a special bridge structure similar to an ancient Roman aqueduct (Fig. 9). In 1983, the Nanzenji Suirokaku aqueduct and Keage Incline were designated as Kyoto City Historic Sites (Shiroshita, 2006). In 1996, the Lake Biwa Canal was designated a National Historic Site

(Lake Biwa Canal Museum, 2018). In connection with this event, the Lake Biwa Canal Museum was built in the Keage area, near the lower distribution pond, which collects artefacts, archival and scientific materials of the canal's history. The surrounding area, including the Keage Incline, was designed as an original landscape park (Fig. 10). This moment can be considered the beginning of the third, modern period of the Biwa Canal existence (Shevtsova & Parkhomchuk, 2022).





Figure 9. Nanzenji Suirokaku aqueduct, the walking path on its top and a small park at the walking path beginning near Keage Pond

Source: photos taken by the author, 2023



Figure 10. A pond near the Biwa Canal Museum, extension of the canal to the Heian-jingu area

Source: photos taken by the author, 2019

In 2015, an agreement between the mayors of Kyoto and Otsu launched the “Biwa Canal Boat Traffic Restoration Pilot Project”, which later grew into the “Biwa Canal Boat Traffic Project”. Thus, in 2018, after a 67-year hiatus, shipping on the Biwa Canal was resumed, this time for purely

tourist purposes (The Lake Biwa Canal cruise Kyoto-Otsu, n.d.). Currently, navigation is active only in spring and autumn, during the sakura and red maple blossom seasons along the canal, which allows for a full appreciation of its landscape attractiveness (Fig. 11).



Figure 11. Modern tourist navigation on the canal

Source: photos taken by the author, 2019

The Keage Filtration Plant is also part of the Biwa Canal landscape and park ensemble, with azalea bushes blooming in May on its terraced slopes. It is during the

azalea bloom that the Keage Filtration Plant organises a kind of “Open House” with tours, quests and tasting of filtered water (Yamazaki, 2021) (Fig. 12).

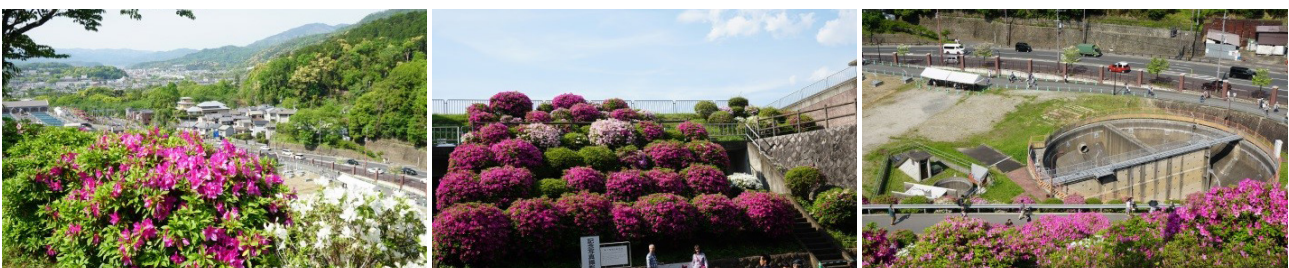


Figure 12. Landscapes and engineering infrastructure at the Keage Filtration Plant

Source: photos taken by the author, 2019



Another feature of the canal's recent history is the development of landscape lighting effects, namely seasonal design illuminations held in the gardens of Heian-jingu, Nanzenji, Eikando temples and Maruyama-koen public park during the cherry blossom season. In Heian-jingu, the weeping

sakura trees around the East Garden Pond are illuminated and light shows are held. Every year, Maruyama-koen hosts an elegant aesthetic composition of candle lanterns installed in groups directly in the stream flow of Ueji's work, which emphasises and deepens the master's composition (Fig. 13).



Figure 13. April lighting of Nanzenji, Eikando temples and Maruyama-koen park

Source: photos taken by the author, 2012; 2019

Landscape function of the Biwa Canal: innovative character and changes over time. The present study attempted to specify the landscape component of the development and historical existence of the Biwa Canal based on the periodisation adopted by G. Shevtsova & M. Parkhomchuk (2022) periodisation. During the first period of the canal's existence (1890-1951), the most powerful landscape design component of the territory was formed, which emerged on the surrounding lands solely due to the canal, and initially consisted mainly in the Keage area of a cluster of manor gardens (Murin-an, etc.) and temple gardens (Hei'an-jingu, etc.), and to some extent included an aspect of public space organisation (Maruyama-koen Park, gardens of the Western Miyako Kyoto Hotel). Notably, Keage was historically home to several large temples that included traditional gardens by prominent landscape designers of the 16th and 17th centuries, such as Kobori Enshu and others (Young & Young, 2005). The most famous of these is the Hojo Garden of Nanzenji Temple. Some of the traditional gardens of Nanzenji, as well as the garden of Eikando Temple, and others, have been reorganised and enriched thanks to the water from the Biwa Canal.

Master Ueji (Ogawa Jihei VII) played a leading role in the organisation of the latest landscape and park design. Ueji completely departed from the Chinese allegorical tradition of the "garden-picture", or garden as an imitation of a literary, poetic or pictorial ideal image. Ueji also departs from the idea of a symbolic-religious garden, inspired by the Chinese tradition, which was typical for medieval Japan (the Kamakura and Muromachi periods). He turns to the integration of the garden with the natural environment, which was an influence of the Western tradition. At the same time, Ueji gardens are a direct development of the purely Japanese gardening tradition, primarily the large promenade gardens of the Heian (Byodoin Temple garden, etc.) and Edo (Kenrokuen Garden in Kanazawa, etc.)

eras. The borrowing of traditional methods is felt in Ueji's works both in terms of aesthetics and technical means of execution. He also creatively reworked and expanded the idea of Shakkei, the so-called borrowed scenery, which implies the involvement of the surrounding large landscape (distant mountains or other large-scale natural scenes) in the chamber composition of a garden (Shirahata, 2008a). However, in contrast to the Japanese Shakkei of the 16th-17th centuries, where the outer landscape was only a distant background for the garden composition and did not combine with it in any way, in Ueji's works the surrounding landscape of the Higashiyama Mountains is compositional with the garden landscape through the use of visual transitional links: stepped artificial rocks, powerful water streams that seem to flow down from the mountains (but in fact come from the water of the Biwa Canal), large trees characteristic of mountain vegetation (fir, cypress), thus creating a kind of unifying 3D effect between the garden composition and the surrounding landscape. This is in harmony with the open and bright spaces of the gardens themselves, filled with air, sunlight and the pulsating sound of the murmuring water of streams and waterfalls. Instead of the moss traditional for a Japanese medieval garden, Ueji uses large open lawns, and the wide, calm water surfaces of the ponds create additional compositional effects due to reflections.

One of the characteristic features of Ueji's style is the idea of integrating elements of the artificial and natural, which manifests itself in quite different ways, and can be, e.g., the visual inclusion of architectural objects of the surrounding landscape, such as pagodas or gates of temples on Mount Higashiyama, in the composition of the garden. Another way of expressing the same idea is to combine artificially processed stones, often taken from dismantled ancient buildings such as bridges or castle ruins, with naturally shaped stones in the design of Ueji's gardens. The





viewer's impression is also reinforced by the immersion of tsukubai washbasin of unusual, semi-natural and semi-geometric shapes into the pond water, and a series of flat, processed "steppingstones" that serve as water crossings.

The second period of the canal's existence began in 1951, along with the closure of shipping, and lasted almost until the end of the 20th century. During this period, the Biwa Canal was in some decline. However, this does not apply to the development of its landscape component, which at this stage was quite intensive and, moreover, received a new direction. At that time, the canal served as the basis for the establishment of many public parks, pedestrian and recreational areas, often combining aspects of industrial and landscape (turning the Keage Incline into a sakura garden, creating walking trails near the Nanzenji Suirokaku aqueduct and the Philosophical Path) or ecological and landscape (Higashiyama Ryokuchi Park) influence on the development of the surrounding areas.

The third period of the canal's existence began in the late 1990s with the inclusion of the canal in the list of National Historic Sites and the creation of the Lake

Biwa Canal Museum. At that time, local authorities and residents of the city reassessed the attractiveness and potential of this unique monument of industrial and landscape construction and began to consciously develop this resource as a place of ecological and industrial tourism by restoring seasonal tourist navigation along the canal. This period also introduced the latest trends in the design landscape of the industrial parts of the canal in the traditional Japanese spirit (Fig. 10). Special attention should be paid to the development of an original modern phenomenon of temporary technological landscape design in the canal area – seasonal illumination and light shows (gardens of the Heian-jingu, Nanzenji and Eikando temples, Maruyama-koen park (Fig. 13)).

All of the above made it possible to build a visual diagram of the historical development and changes in the role of the Biwa Canal in the organisation of the landscape design of the surrounding area, which shows that, following different historical periods of the canal's existence, the functional nature of its landscape-organising component has changed substantially (Fig. 14).

Main landscaping functions of Biwa Canal at Kyoto

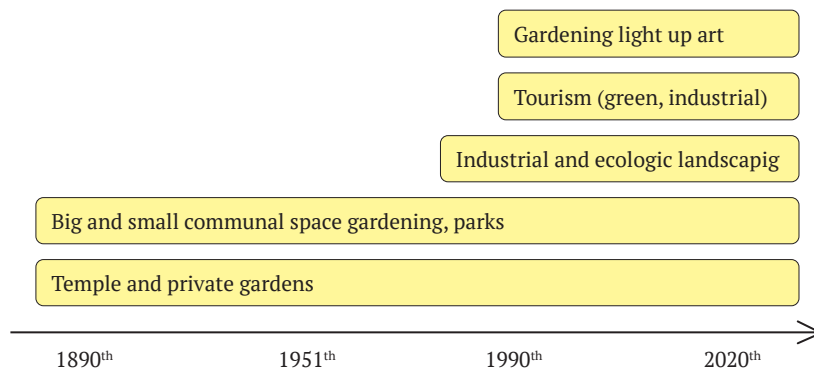


Figure 14. The landscape-organisational function of the Biwa Canal and its changes over time

Source: developed by the author

Thus, it can be summarised that in the first period of the canal's existence, its landscape and organisational impact on the surrounding areas mostly resulted in the local creation of private and temple gardens. In the second period, the tendency to create public landscape spaces, including recreational and environmental ones, intensified. The third period adds aspects of green and industrial tourism and technological landscape art design.

DISCUSSION

Analysing the study results, it should be noted that it has taken its place among the recent scholarly works on the cultural landscapes of Japan. These studies examine the synthetic elements of the Japanese cultural landscape in their sustainable development and interaction with the natural environment and the socio-cultural environment of the settlements. The study by N. Koike *et al.* (2021) explores

the cultural landscape and modern ways of revitalising the ancient reed plantations near Omi-hachiman in Shiga Prefecture, Japan, which exist on canals diverted from Lake Biwa and provide material for the production of Japanese sudare curtains. In the mid-20th century, this traditional local trade began to decline, and since the end of the 20th century, local authorities together with the community have been taking measures to revitalise it. As a result, the authors state that the preservation of the Omi-hachiman cultural landscape is more effective when communal rather than individual management of reed plantations is applied. The development of local tourism is now providing as much impetus for the preservation of this cultural landscape as the production of curtains.

The subject matter of Ye.-Ch. Chiang *et al.* (2013), which deals with the revitalisation and sustainable development of the cultural landscape of traditional terraced rice fields



in the Warabino area in Saga Prefecture (Japan). The study examines how Warabino fields affect the local environment, economy, and social fabric. At the time of writing, the cultural landscape of Warabino was being actively revived by local activists and NGOs. This has led to the creation of a local eco-friendly rice brand, tourism development, the return of young people and the revitalisation of local life. The conclusions of the study emphasise the importance of the cultural landscape's influence on the development and preservation of the local identity of society.

The study by C. Ochiai (2022) examines the protective wind walls of the mountain village of Tsuchigoya in Tanabe, Wakayama Prefecture (Japan) in relation to the layout of the village and its individual estates. The findings highlight the processes of shaping local building practices and cultural traditions as a response to the specifics of geography and climate and emphasise the major influence of the cultural landscape on the nature of the social structure of a settlement.

N. Rezig & G. Shevtsova (2022) compare the cultural specificity of traditional medieval water supply systems of the settlements of the M'zab Valley in Algeria and the Miyakojima Islands in Japan. The focus is on comparing these two cases in terms of history and engineering structure, functional diversification, and cultural role as factors in the formation of local identity. The study analyses the current problems of preservation, revitalisation, and sustainable development of historical water supply systems in their relationship with the local culture and natural environment.

All studies of this kind rightly focus on the relevant problems of sustainable development of cultural landscapes in their interaction with the surrounding natural, architectural, and socio-cultural environment. Considerable attention is paid to environmental issues, revitalisation and preservation of local identity, and the development of the tourism component. However, in contrast to the rural cultural landscapes considered in the studies of previous researchers, whose industrial component is traditional and technically simple, the object of the present study is of a somewhat different nature and represents a complex and rather innovative engineering structure. The Biwa Canal was created in the fully formed historical urban environment of the large metropolitan city of Kyoto thanks to the conscious efforts of the local authorities, and therefore has many specific aspects in its development. At the time of its emergence, it was itself a factor in the revitalisation of the decaying capital (Shevtsova & Parkhomchuk, 2022), and later played an increasingly vital role, provoking rapid development and qualitative changes in the surrounding area.

As for the direct study of the canal, previous studies on this topic mainly concerned its structure, planning, and industrial development (Tanaka & Kawasaki, 2001; Tanaka, 2002). The studies by Yo. Ono *et al.* (2012; 2014) cover the legal aspects of canal construction and the legal issues of water diversion from the canal to the surrounding gardens in the Keage area. S. Shiroshita (2006) investigated the emergence of industrial and landscape tourism on the

Biwa Canal in the second half of the 20th century. Only a small period of the canal's existence is considered, covering the last third of the 20th century.

Another group of related studies was devoted to the landscape development of the surrounding areas. H. Amasaki (2008), Yo. Shirahata (2008b) and K. Ono (2008) do not pay special attention to the role of the canal in the development of the surrounding landscape, although they do point out that the canal water was used to create park ponds. O. Niglio & N. Inoue (2015) consider the historical development of the urban landscape of the Okazaki area in Kyoto, and therefore, a small and purely informative section is devoted to its part – the Keage district and the Biwa Canal. G. Shevtsova & M. Parkhomchuk (2022) covered the general issues of the historical development and modern revitalisation of the canal. The authors develop a historical periodisation and describes the time changes in the functions of the Biwa Canal. However, even here, the canal's landscape-organising role is considered briefly and in passing, only as one component of its functional diversification.

The present study, in turn, provides a general chronological picture of the coexistence of the canal and the surrounding area in its cultural, urban and social aspects. This study is the first to highlight and chronologically detail the catalytic role of the Biwa Canal in the development of the architectural and cultural landscape and garden design of Kyoto, revealing the specifics of development of an outstanding artistic personality against the backdrop of the modern industrial era. Ueji's talent would not have been able to fully develop without the canal, as the possibility of using this water for his parks and gardens directly contributed to the master's creative growth. Thus, the canal provoked a qualitative leap in the approach to the organisation of the cultural landscape and led to the emergence of Ueji's innovative breakthrough in garden design, coordinating and mutually harmonizing tradition and innovation, influences of the East and West in the mind of the master. This phenomenon can be considered as an example of the involvement of an industrial facility in the main path of development of culture and great art in Japan, which was conditioned by the unique historical conditions, place and time of the Biwa Canal formation.

CONCLUSIONS

The great historical project of building the Biwa Canal in Kyoto defined the character of the city's urban development at the end of the 19th century, gaining extraordinary industrial, economic, and cultural significance. At the same time, the Biwa Canal has taken on the role of a powerful lever for revitalising and aesthetising its neighbourhood and the city as a whole. This also applies to the landscape development of the surrounding areas, especially the Keage district, which, thanks to the water from the Biwa Canal, received a developed cluster of private and public garden and park areas in the late 19th and early 20th centuries (the first period of the canal existence).





The gardens and parks of the Keage district, thanks to the talent of their creator, Master Ueji (Ogawa Jihei VII), have become an outstanding milestone in the development of the national idea and practice of landscape design in Japan. In general, Ueji's work met the needs of his era – enlightenment and industrialisation, equally aware of both Japanese tradition and Western trends. This led to the creation of a fundamentally new type of garden that incorporated both, in harmony with the spirit of the new society. This is an example of a qualitative leap forward in the development of the national gardening tradition, made possible by the personal talent of Master Ueji and by the involvement of and integration with new Western technologies and industrial capabilities of the modern era, primarily water from the Biwa Canal.

Since the mid-20th century (the second and third periods of the Biwa Canal existence), the landscape-organising role of the Biwa Canal has not diminished, but has changed its nature since the second period, it has increased the diversification of functions and acquired important public recreational, environmental, and tourist significance. This direction of landscape development of the canal's surrounding areas, considering current trends and changes, continues as of 2023. Modern design of master

Ueji's manner easily adapts to new and changing developments, but nevertheless is still in the creative mainstream of the national tradition. The Biwa Canal has been supplying Kyoto with drinking and industrial water for more than 130 years and is constantly adding new nuances of meaning to the historical heritage and development of Kyoto's urban landscape. The adaptation of the landscape-organising function of the Biwa Canal to the needs of the present, as well as the experience of its preservation, revitalisation, and popularisation, is a fruitful topic, and its further development over time encourages further research in the future. It is also promising to look at other extraordinary examples of the revitalisation and preservation of historic waterways in the world, and specifically in Japan.

ACKNOWLEDGEMENTS

The author would like to express the sincere gratitude to the HAKUHO FOUNDATION for grant funding for this research. The author is also grateful for the fruitful cooperation and support of the researchers at the Biwa Canal Museum, local volunteers, and citizens.

CONFLICT OF INTEREST

None.

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Історичний канал озера Біва як постійний каталізатор розвитку ландшафтної архітектури Кіото

Анотація. Історичний канал озера Біва, штучний водний шлях, що постачає воду з озера Біва до Кіото, було споруджено з метою пожвавлення Кіото після перенесення столиці до Токіо у 1868. Окрім основної функції, канал відіграє значну роль у організації культурного ландшафту навколишніх територій. Дослідження піднімає актуальні питання сталого розвитку, збереження та ревіталізації історичних інженерних споруд. Штучний водний шлях розглядається в аспекті його тяглових впливів на навколишнє оточення, як урбаністичне, так і ландшафтне. Метою роботи є виявлення характеристик ландшафтно-організуючої ролі каналу Біва та її трансформації у часі, зокрема, з пристосуванням до актуальних проблем сучасності. Робота велася переважно методами польових досліджень *in situ*. В результаті була окреслена вагома роль каналу як постійного каталізатора розвитку ландшафтної архітектури Кіото, що істотно видозмінювалася в часі, але не послаблювалася і завжди носила новаторський характер, органічно поєднуючи сучасні індустріальні досягнення з місцевими традиціями. Зокрема, у першому періоді існування (до 1951) фокус ландшафтно організуючої діяльності на прилеглих до каналу територіях припадав на створення приватних та храмових садів, але з другого періоду існування (1951-початок 1990х), фокус ландшафтної діяльності навколо каналу змістився на громадсько-рекреаційний та парковий аспекти. У часи третього періоду (з початку 1990х), коли канал було визнано Національним історичним надбанням, спостерігаються також і тенденції розвитку індустріально-ландшафтного туризму. Досвід збереження, ревіталізації, популяризації та пристосування ландшафтної ролі каналу Біва до нових потреб сучасності може бути використаний як приклад напрямку проведення аналогічних заходів для історичних водних шляхів у світі

Ключові слова: культурний ландшафт; історичні водні шляхи; ландшафтні сади Кіото; промисловий туризм