SATOYAMA 2.0.
里山 2.0.

A NEW CHAPTER IN THE CULTURALLY AND WATER-SENSITIVE SATOYAMA LANDSCAPE OF KAMEOKA

TU Delft Landscape Architecture
BK Bouwkunde

DESIGNING RESILIENT COASTAL LANDSCAPES

Satoyama2.0
A New Chapter in the Culturally and Water-Sensitive Satoyama Landscape of Kameoka

Author: Katerina Pavlou | 5852412
Research studio: Designing Resilient Coastal Landscapes

Msc Architecture, Urbanism and Building Sciences,
Landscape Architecture track

Department of Landscape Architecture
Faculty of Architecture and the Built Environment
Delft University of Technology

First mentor: Steffen Nijhuis
Faculty of Architecture and the Built Environment
Department of Urbanism
Section Landscape Architecture

Second mentor: Sophia Arbara
Faculty of Architecture and the Built Environment
Department of Urbanism
Section Environmental Technology & Design

Delegate of the Board of Examiners: Peter Koorstra

P5 report
June 17, 2024

Acknowledgements

And this journey of two years comes to an end with this beautiful graduation project. It was by far the most interesting project I worked on, having collaborated with professors, classmates, and students from Japan who provided me with strength, resources, and ideas to bring this work to life, and I could not be more grateful.

I would like to express my gratitude to my professor, Steffen Nijhuis, for the wonderful collaboration we had, for all the support he provided, and for the good vibes and warm smile that greeted us at every meeting. A big thank you to Steffen also for giving me the opportunity to travel outside of Europe for the first time, for a workshop and field trip, which offered me experiences and connections far more substantial than the project itself.

I would also like to express my gratitude to Sophia Arbara, who stood by my side from the very beginning of this research journey, feeding me with inspiration, useful information, and delightful conversations.

It is with the warmest gratitude that I thank my family and my close people, whether they are in the Netherlands or spread across the globe. It was a journey that, without the support of these dear people, would not have been undertaken with the same enthusiasm and eagerness. A journey I shared with these individuals, and I am happy to have each one of them in my life.

What's the takeaway?
I am glad that through this project, I could apply everything I learned and gained from this journey called 'Masters in Landscape Architecture' at TU Delft. I managed to implement it in an environment on another continent, such as Japan, showing that the landscape has no boundaries. Landscape architecture goes beyond borders, adapting to diverse conditions while maintaining its core principles. The essence of the landscape remains the same everywhere, though shaped by different climates, cultures, and contexts. This project highlights the universal language of landscape architecture, where each design is a testament to the harmony between humans, nature, and all forms of life.

Contents

Figure 01. Gazing upon the Katsura River's restless flow, with the timeless grace of the Togetsukyo Bridge.
Source: The Author, 2024.

Abstract

Kameoka City, situated in the southwestern part of Kyoto Prefecture and bordering Osaka Prefecture, is a significant area within the Katsura River basin. This basin shapes the city's landscape and plays a crucial role in its agricultural and environmental ecosystems. The city is known for its scenic beauty, featuring an interesting 'satoyama landscape'.

This River basin in Kameoka is highly vulnerable to flooding, especially during periods of heavy rainfall or typhoons, resulting in extensive damage to infrastructure, agricultural lands, and residential areas in Kameoka City. This flooding triggers soil erosion, further degrading agricultural lands and diminishing the productivity of rice cultivation and other crops. Additionally, floodwaters carry pollutants, debris, and sediment, leading to a decline in water quality and posing threats to the health of ecosystems within the basin.

These flooding impacts are composed of broader human activities in Japan, such as historical deforestation driven by agriculture and urbanization, rapid urban expansion in regions like the Kansai area, overexploitation of natural resources, and engineering interventions in response to seismic activity, typhoons and tsunamis. These human-induced impacts, including habitat loss, soil erosion, and biodiversity decline, threaten ecosystems and local livelihoods across Japan's landscapes.

'Satoyama 2.0.' presents an integrated approach within landscape architecture, establishing an inclusive framework for managing river landscapes, using Japan as a paradigm. The thesis proposes the integration of ecological preservation, cultural revitalization, and urban resilience into the design and management of river ecosystems. Prioritizing sustainable principles and strategies, interventions aim to understand and respect the diverse forms of existence, both human and non-human, interconnected with the river and its natural systems.

Across research through design and design through research, this project develops and implements practices that mitigate the harmful impacts of modern development and occupation while fostering environmental management and cultural continuity. Advocating for a holistic approach that prioritizes harmony between human activities and the natural landscape, the proposition aims to promote the long-term sustainability and resilience of river landscapes, with Kameoka serving as a paradigm for these efforts.

Categorizing landscapes into headwaters, hillsides, and flatlands, and employing a layer-based analysis, this design strategy interprets the dynamic interactions between humans and nature. Utilizing controlled flooding strategies and a layered approach to sustainable riverine landscape management 'Satoyama 2.0.' aims to mitigate the harmful impacts of modern development while fostering environmental management and cultural continuity. Bridging tradition and sustainability through agriculture practices intertwines cultural rituals and modern conservation efforts, ensuring the preservation of the ecological and spiritual sacredness of the satoyama forest.

Figure 02. The rural community of Kameoka, just over the mountains from Kyoto City.
Source: Kyoto Tourism Organization website, 2022.

Introduction

Entropy is the measure of disorder, and it reveals the steady impact of time effects on landscapes. As we witness the unfolding of geological time, we are confronted with the profound interconnectedness of human activities and natural processes. Our responsibility lies not only in preserving what remains but also in understanding our role within the broader narrative of Earth's history. By embracing the concept of geological time, we acknowledge the dynamic and evolving nature of landscapes, calling us to act as defenters of these complex systems. In the face of entropy, our ethical imperative is to foster renewal and resilience, harmonizing human development with the enduring rhythms of the Earth.

While this quote is an interpretation inspired by Smithson's ideas rather than a direct quote from him, it encapsulates the ethical dimensions of considering entropy and geological time within the context of landscape management, design and sustainability. Smithson's work challenges us to reflect on the long-term impacts of human actions and our role in shaping the landscapes of the Anthropocene epoch.
This thesis proposes to observe the complex relationship between human activities and natural systems, emphasizing the need for sustainable practices that preserve ecological integrity while fostering cultural revitalization. By examining the ethical implications of landscape management in the Anthropocene era, this study seeks to serve as a paradigm of harmonizing development with conservation to safeguard Japan's unique satoyama landscapes and ecosystems for future generations.

Figure 03. A Sedimentation of the Mind - Earth Projects.
Source: Rober Smithson, 2002.

Location

The Katsura River, also known as the Hozu River, is a significant tributary of the Yodo River system in Japan. It originates near Hirokawara in Sakyo-ku, Kyoto City, located in the eastern part of the Tamba Mountains. The river flows westward from its source, passing through various regions until it reaches Hiyoshi Dam. From there, it turns southward, continuing through Nantan City and Kameoka City, where it passes through and joins with several tributaries including the Sonobe River, Inukai River, Nanaya River, and Sogadani River. The Katsura River, which flows through Kameoka City, continues its journey through the scenic Hozukyo Gorge before entering Arashiyama in Kyoto City. Near Shimotoba, it joins the Kamo River, and finally, at the border between Osaka and Kyoto near Oyamazaki, it meets the Kizu and Uji Rivers to form the Yodo River. The Katsura River's discharge point is in Osaka Bay, where it contributes to the formation of the Yodo River (Kameoka City Comprehensive Environmental Conservation Plan, n.d.).

Figure 04. Japan's water connections map.
Source: The Author, 2024.

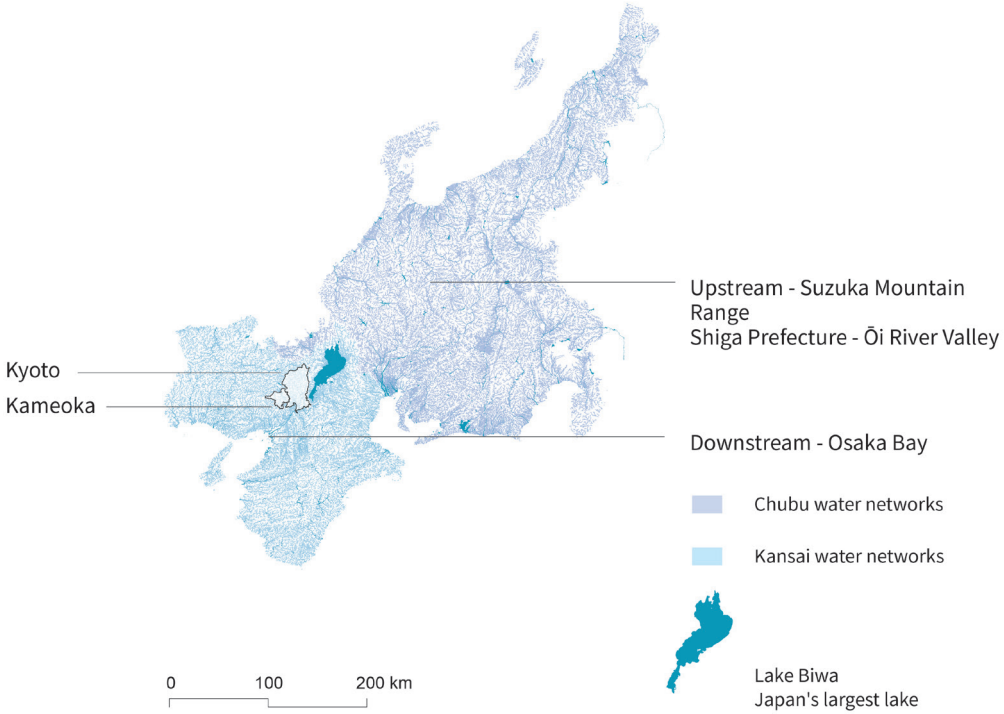


Figure 05. Chubu and Kansai region water networks, including Kameoka and Kyoto locations.
Source: The Author, 2024.

Problem

Focus
Statement
Proposition

Problem: Focus, Statement & Proposition

Problem Focus:

The river landscapes in Japan, particularly in the Kameoka and Oi River subsystem, face an overlap of complex challenges. These include frequent floods, the degradation of natural ecosystems and water quality, and the diminishing cultural significance of traditional water transportation practices. Human activities, such as deforestation, dam construction, and the transformation of riparian areas into concrete structures, exemplify interventions that disrupt natural processes and contribute to landscape and ecosystem alterations. This overcontrolled approach reflects the Anthropocene epoch, characterized by significant and lasting human influence on Earth's geology and ecosystems.

Problem Statement:

Given the pressing threats posed by floods and environmental degradation in river landscapes like Kameoka and Oi River, there is an urgent need to develop comprehensive and sustainable strategies for river landscape management. These strategies must address ecological preservation, cultural revitalization, and flood mitigation simultaneously to protect the environmental integrity and cultural heritage of these vulnerable river systems. It is essential to transition from overcontrolled interventions to more sustainable practices that restore and respect the natural balance of the environment while ensuring the resilience and vitality of local communities.

Proposition

This project suggests an integrated approach within landscape architecture that establishes an inclusive framework for managing river landscapes, using Japan as a paradigm. The thesis proposes to integrate ecological preservation, cultural revitalization, and urban resilience into the design and management of river ecosystems. By prioritizing sustainable principles and strategies, interventions will focus on understanding and respecting the diverse forms of existence—both human and non-human—interconnected with the river and its natural systems. Through interdisciplinary collaboration and community engagement, this project seeks to develop and implement practices that mitigate the harmful impacts of modern development and occupation while fostering environmental management and cultural continuity. This proposition advocates for a holistic approach that prioritizes harmony between human activities and the natural landscape, promoting the long-term sustainability and resilience of river landscapes, with Kameoka serving as a paradigm for these efforts.

Directives:
Methodology

Theoretical Foundations
Geomorphic Interactions
Research Framework
Question and Aims
Methods
Intended Outcomes
Relevance

Theoretical Foundations

The concept of landscape inherently embodies a complex and multifaceted nature. Landscape is not just about the way things look but landscape can be a synthesis of factors, a multifaceted concept that encompasses both sensory and explorative dimensions of the physical environment, interwoven with the historical and cultural narratives embedded within it. It is not merely a static physical space but rather a dynamic blend of sensory experiences, historical legacies, cultural significance, and environmental importance.

Existential Space - Genius loci

In the realm of contemporary landscape and landscape design, the integration of existential space and the concept of genius loci holds profound implications for fostering a deeper connection between individuals and their surroundings. Existential space, within a design-oriented context, is not a logico-mathematical term, but transcends into realms that evoke the basic relationships between humans and their environment. Therefore, these designed spaces become more than aesthetic landscapes; they become environments that prompt individuals to grapple with essential questions of purpose, identity, and the human condition. The notion of an existential foothold, synonymous with dwelling, (as mentioned in the book 'genius loci: Towards A Phenomenology of Architecture' by Christian Norberg-Schulz) becomes paramount. Humans truly dwell when they find orientation and meaning within an environment. Moreover, the incorporation of genius loci, or the spirit of the place, emphasizes the significance of visualizing and manifesting the unique essence inherent in a specific location. Landscape architecture, in the context of the genius of the space, becomes a means to create meaningful places that facilitate human dwelling. Acknowledging that a person's identity is complicatedly tied to their belonging to places, the design process gains a profound purpose to craft landscapes that not only enhance the aesthetic appeal but also contribute to a sense of identity, purpose, and a profound connection to the human condition.

Creating a sense of place involves an intentional choice to achieve this. Regional identity is linked to the unique qualities of a location that reveal insights into its physical and social surroundings. This essence of a place is exclusive to its specific location, making it distinct and inseparable from anywhere else. To understand regional identity, two fundamental criteria come into play: the natural processes of the region, shaped by nature, and the social processes influenced by the actions of people. Before any design begins, there is always something inherent—a history, a distinctive character, or a significant meeting place. Design is a process of building upon what already exists, embracing the history and inherent qualities of a place as a foundation for change (Hough 1990).

Landscape as a network of interconnected relationships

As we observe the landscape surrounding us, what becomes evident is a tapestry of relationships and distinct signatures etched into the land. The essence of a place finds expression through these relationships, a translation of the spirit of the locale. Geomorphic, climatic, biotic, and cultural processes emerge as the pioneers of these intricate connections within the landscape. Significantly, these processes not only influence but serve as the creators, actively shaping the landscape that unfolds before us (Woodward 1997). "When we describe the forms and features of a landscape, we are actually observing the artifacts and fingerprints of the formative processes." (Marsh 1991). In essence, the landscape serves as a canvas upon which the interplay of natural and cultural forces leaves an indelible mark, revealing the dynamic relationships that define the character of a place (Woodward 1997).

Landscape authenticity

Landscape can be understood as a living system, characterized by a complex network of interconnected relationships influenced by both natural processes and human activities. Professor Steffen Nijhuis refers to the Council of Europe's definition of landscape as 'an area, perceived by people, whose character is shaped by the action and interaction of natural and/or human factors'. To grasp the coherence and heterogeneity of landscapes over time and space, it is essential to analyze them through chronological (horizontal) and topological (vertical) relationships. This analytical approach often involves examining landscapes in layers, such as the triplex model that distinguishes abiotic (relief, water, soil), biotic (flora and fauna), and anthropogenic (human activity) layers.

Understanding landscapes also requires viewing them as history, where time plays a crucial role in authenticity. An authentic landscape acts as a biography, conveying the tangible and intangible elements that have shaped it over time. This concept aligns with the idea of the longue durée, where landscapes evolve through 'sequent occupance', representing a long-term structure undergoing continuous change.

Lastly, landscapes are experienced spatially, where perception reflects the sensory relationship between observers and the landscape, emphasizing the subjective nature of landscape experience (Nijhuis, n.d.)

Geologic time, Robert Smithson

Fernand Braudel's concept of "geographical time" refers to the timescale of environmental, climatic, and demographic changes that unfold over long periods. This perspective emphasizes the profound influence of natural processes on shaping landscapes and societies. Similarly, Smithson's notion of "geologic time" echoes Braudel's ideas by delving into the deep past, focusing on cataclysmic geological events and shifts in temperature that occurred long before human existence. Smithson's exploration of geologic time highlights the immense timescales involved in Earth's geological history, encompassing landmass movements and dramatic climate fluctuations that shaped the planet's physical features long before human presence.

Smithson aimed to reflect the concept of entropy in his art. He wanted to manipulate time, speeding it up or slowing it down, to explore the breakdown and disintegration of established beliefs and structures over historical time. Smithson envisioned his art stretching across vast periods, imagining a distant future where everything would cool down and lose distinction, becoming shapeless and indistinguishable. (Becher & Becher, 2007)

Geomorphic Interactions

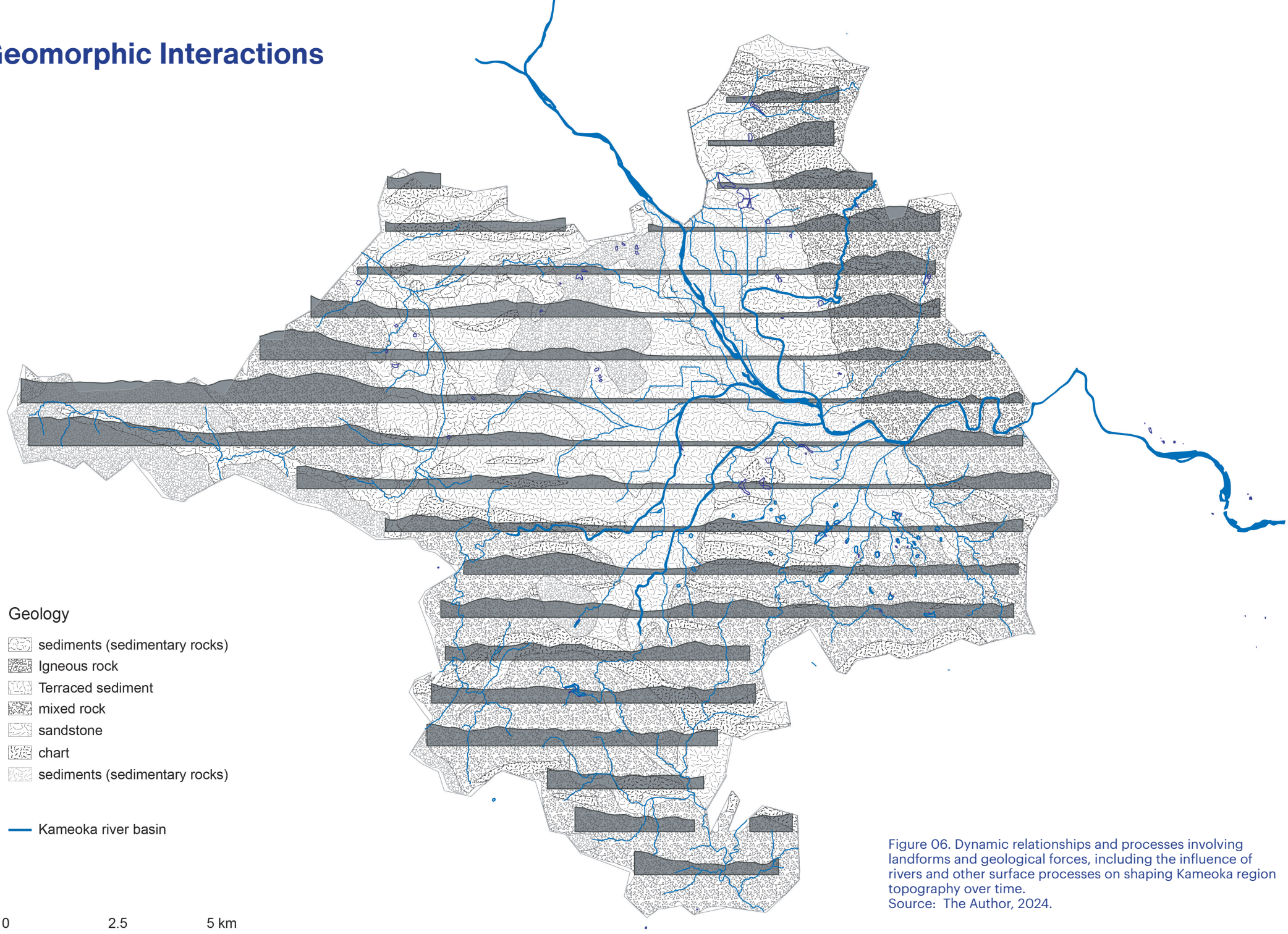


Figure 06. Dynamic relationships and processes involving landforms and geological forces, including the influence of rivers and other surface processes on shaping Kameoka region topography over time.
Source: The Author, 2024.

Research Framework

Exploration	Methodology	Approach:Analysis	Research by Design	Reflection
Personal Fascination	Theoretical Framework	Analysis	Regional Vision	Conclusion
	Landscape Authenticity	Unraveling the Landscape	Principles application	L.A Perspective
Problem Field	Genius Loci	Design Strategies	Design locations	Ethical Perspective
Problem Focus	Geologic Time	Design Principles	Site 1	
Problem Statement	Field Trip	Design Goals	Site 2	
Problem Proposition	Workshop		Site 3	
Research Questions				

Research Questions, Sub -questions

Main question

How can landscape-based approach play a fundamental role as a catalyst for comprehensive and sustainable management of the Ōi River (, Katsura River) watershed? In the context of the Kameoka riverfront community, what landscape-based design strategies and principles can be translated spatialy to address but also make use of the potentials of diverse challenges, including ecological preservation, cultural revitalization, and urban resilience?

Subquestions

01. How did the Ōi River landscape operate in terms of ecological, cultural, and urban aspects in the past, and what is its current condition in the context of ongoing expectations of floods and human interventions and alterations considering the landscape?
DIAGNOSIS

02. How do the aspects of the Anthropocene influence the overall ecological health and adaptation to seasonality in the Ōi River watershed in the context of Geologic time*?*Geologic time according to Robert Smithson is the relationship between human intervention and the natural environment.
CHALLENGES + POTENTIALS

03. What landscape-based principles and strategies rooted in working with nature/ natural and social-cultural processes are essential for mitigating flood hazards while simultaneously enhancing the cultural importance of water transportation, riparian land, and traditions associated with living in harmony with water?
DESIGN TOOLBOX: LANDSCAPE PRINCIPLES + NATURE-BASED SOLUTIONS

04. In the natural and cultural landscape of the Kameoka area, how can the landscape principles and nature-base strategies that emerged from the research, be effectively applied to specific case study areas?
SPATIAL DESIGN IMPLEMENTATION

Aims, Methods & Outcomes

Research Questions

How can landscape-based approach play a fundamental role as a catalyst for comprehensive and sustainable management of the Ōi River (, Katsura River) watershed? In the context of the Kameoka riverfront community, what landscape-based design strategies and principles can be translated spatialy to address but also make use of the potentials of diverse challenges, including ecological preservation, cultural revitalization, and urban resilience?

Subquestions

01. How did the Ōi River landscape operate in terms of ecological, cultural, and urban aspects in the past, and what is its current condition in the context of ongoing expectations of floods and human interventions and alterations considering the landscape?

02. How do the aspects of the Anthropocene influence the overall ecological health and adaptation to seasonality in the Ōi River watershed in the context of Geologic time*?*Geologic time according to Robert Smithson is the relationship between human intervention and the natural environment.

03. What landscape-based principles and strategies rooted in working with nature/ natural and social-cultural processes are essential for mitigating flood hazards while simultaneously enhancing the cultural importance of water transportation, riparian land, and traditions associated with living in harmony with water?

04. In the natural and cultural landscape of the Kameoka area, how can the landscape principles and nature-base strategies that emerged from the research, be effectively applied to specific case study areas?

Aim

R.Q01: DIAGNOSIS

R.Q02: CHALLENGES + POTENTIALS

R.Q03: DESIGN TOOLBOX: LANDSCAPE PRINCIPLES + NATURE-BASED SOLUTIONS

R.Q04: SPATIAL DESIGN IMPLEMENTATION

Methods

The graduation plan will involve various methods, including on-site research, a workshop in Japan, literature review, analytic cartography, speculative cartography (developing a vision plan for Kameoka), strategic mapping, and case studies, all within the framework of research by design.

On-site research and workshop
The workshop 'Living with Blue and Green in Kameoka' took place in Japan, Kameoka between November 19 to 22 including interviews with local citizens and on-site inspections. The primary focus was to exchange ideas regarding the direction of urban development in Kameoka City within the context of watershed management. The daily on-site visits throughout the workshop were crucial for comprehending the current functioning of the Katsura River watershed, identifying the individuals engaged with the landscape, and understanding the locals' present relationship with the river. The workshop resulted in a deeper understanding and connection to the study area, leading to individual case study research and design projects within each group. Also, we had the opportunity to delve deeply into a case study within the city of Kameoka, crafting a vision for it, and advancing the translation of our landscape design principles and strategies into the spatial context of the area itself.

Literature review
Delve into the scientific discourse surrounding theories and conceptual methods in several key areas. Firstly, it will explore landscape-based urbanism, investigating how urban planning and design can harmonize with natural elements. The examination will then extend to landscape authenticity, focusing on preserving genuine character and cultural significance among development efforts. Additionally, the review will investigate the concept of Genius Loci, exploring how design can capture and enhance the unique spirit of a place. Lastly, the discourse will touch upon rebalancing human impact and the natural environment, seeking insights into approaches that mitigate the environmental footprint of human activities.

Analytic cartography
Construction of maps that provide a deep understanding of the current spatial dynamics.

Speculative cartography - A vision plan for Kameoka
Create maps that explore potential future scenarios or visions for the city. Visualize and communicate future landscapes and urban configurations.

Strategic mapping
Developing a tangible strategy to reshape the territory, informed by an understanding of the local context, encompassing both challenges and potentials.

Case studies
Choosing particular sites that can exemplify current exploitation practices and might be suitable for potential interventions.

Prospect outcomes

Research question 01:
Understanding how the Ōi River watershed used to function before and what is its current condition according to human interventions and alterations. The outcome would be maps and diagrammatic landpieces. These visual representations serve as effective tools to communicate and highlight the identified patterns, challenges, and complexities of the landscape findings.

Research question 02:
Identify the challenges and potentials of the Anthropocene influence and understand how the current situation of the landscape evolves with season changes. The consequence would be small-scale sections of the landscape explaining the human influence and larger-scale sections visualizing the current landscape response to seasonality and water fluctuation.
Research question 03:
Develop a collection of landscape architecture principles and strategies applicable at both basin scale and within specific case studies of the landscape. Begin by constructing a toolbox based on the research problematization and create the first application by creating a vision for the city of Kameoka.

Research question 04:
Identify areas of interest emerging from the initial phase of the landscape diagnosis, and subsequently, translate the insights from research question 03 into spatial interactions. Two sites have been chosen to demonstrate these principles within diverse and inclusive contexts. The first site includes a tributary (Nanatani River), known for its cultural sensitivity, which includes historically significant villages vulnerable to water-related challenges. The second area is situated along the main river stream (Katsura River) and the surrounding floodplains and riparian land.

Relevance

Societal

In the face of climatic change and the consequential challenges faced by vulnerable communities, the graduation project takes on profound societal relevance. By establishing an inclusive framework within landscape architecture, the project actively engages communities through workshops and university program activities to address pressing issues. This comprehensive framework seamlessly integrates ecological preservation, cultural revitalization, and urban resilience, presenting a holistic approach to explore multifaceted challenges. Moreover, the project extends its societal impact through educational initiatives and participatory design and thinking, playing a crucial role in raising awareness within communities about the delicate balance between economic activities, river ecosystems, and cultural heritage.

Scientific

The project exhibits strong professional and scientific relevance by addressing current challenges in landscape architecture, contributing to advancements in design methodologies, and offering practical solutions for sustainable and culturally sensitive urban development. Section Along the River' delves into the historical operations and considers the influences of the Anthropocene. Furthermore, the project examines integrating academic research into site-specific practical design solutions in Kameoka, Japan. This in-depth exploration not only addresses current challenges but also places them in a broader historical context, enhancing our understanding over time.

Ethical

This graduation project holds significant ethical relevance through its multifaceted approach to environmental protection, cultural preservation, community engagement, sustainability, and social equity. By advocating for ecological preservation and nature-based solutions, the project emphasizes the ethical responsibility of protecting natural resources for future generations. Additionally, the integration of traditional practices and cultural heritage into landscape design underscores the ethical imperative of respecting and preserving diverse cultural identities. The participatory approach, by being involved into community workshops and engagement activities, promotes inclusivity, transparency, and community ownership, aligning with principles of social equity and justice. Moreover, the focus on sustainable design principles and urban resilience addresses ethical obligations to minimize ecological impact and enhance well-being.This project serves as a paradigm of a strong commitment to ethical values in landscape architecture, aiming to make a positive impact on both present and future generations.

Context

Kameoka:
Middle River Basin
Satoyama Typology:
Landscape diversity along the Hozu River
Satoyama Typology:
Ecosystem diversity along the Hozu River
Typhoon Impacts
Human Impacts
Flood Challenges and Ongoing risks
Water Flow Dynamics

Kameoka - Middle River Basin

The river journey begins from the Tamba Mountains, situated in the upper course where the river originates. This area is characterized by steep slopes, which can accelerate the river's velocity during periods of high discharge, such as heavy rainfall. In the upper course, the river channel is narrow and shallow, carrying a significant load of unbroken-down sediments due to minimal erosion. Vertical erosion occurs during high discharge, transporting larger sediments through traction.

Moving downstream through the mid-course, the river flows through the study area of Kameoka. Here, the gradient becomes less steep, allowing the river to deepen and widen its channel as it erodes the bed and banks. The sediment load decreases in size, and small meanders and floodplains start to develop.

Continuing further downstream towards its mouth at Osaka Bay in the lower course, the landscape becomes flatter. The river's sediment load primarily consists of fine particles resulting from extensive erosion upstream. The river channel reaches its widest and deepest point in this region, and deposition becomes the primary process, forming extensive floodplains and deltas at the river's terminus ("Inheritance and Variation of Traits - Revision 5 - KS3 Biology").

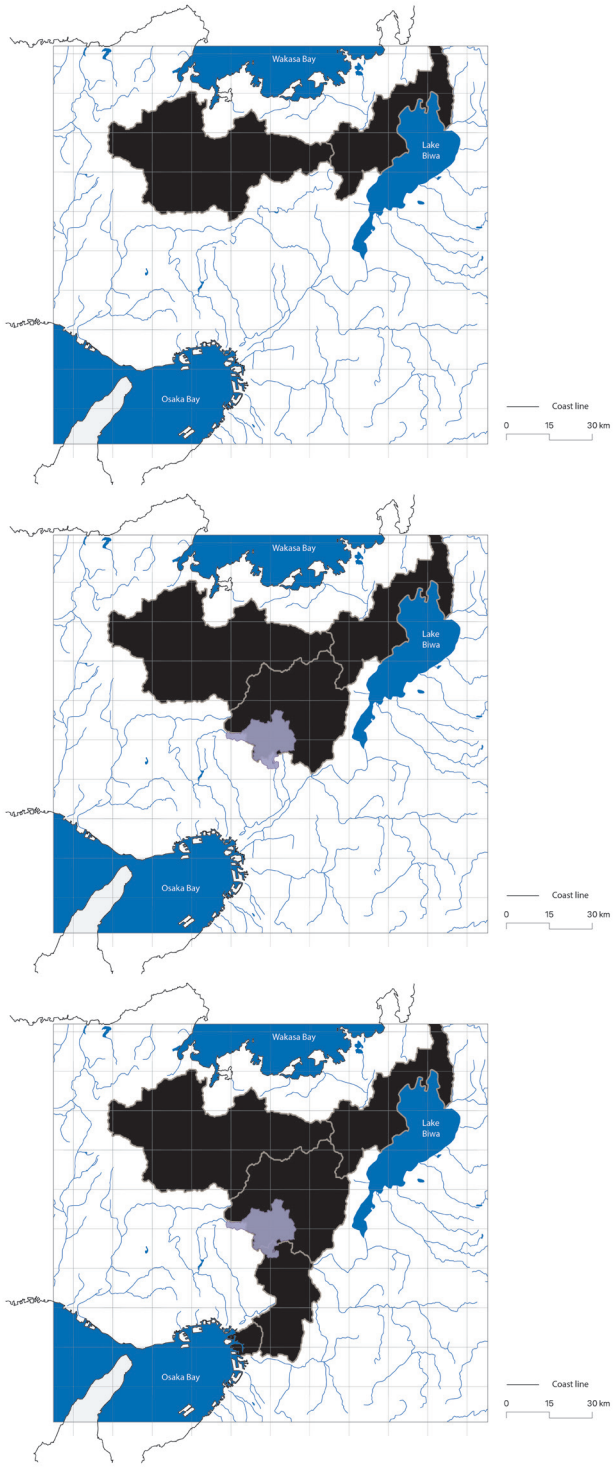


Figure 07. Sequence of cartographies showing the upper, middle, and discharge areas of the river basin, with Kameoka located in the middle basin. Source: The Author, 2024.

Satoyama typology

Landscape diversity of the Hozu River

The term “satoyama” is a keyword for the graduation project and encapsulates the landscape typology that integrates mountain foothills with arable flat land, representing a mosaic of mixed forests, rice paddy fields, dry rice fields, grasslands, streams, ponds, and reservoirs for irrigation, as originated by the Japanese. The river space along the Hozu River encompasses a diverse range of environments, including waterfront areas, sand and gravel riverbeds, grasslands, riparian forests, and elevated water beds, each fostering unique vegetation communities ranging from herbaceous colonies like vine reeds to expansive tree forests such as willow and bamboo groves. This rich ecological diversity supports various bird species like herons, ducks, snipes, and plovers across different habitats (Kyoto Prefecture, n.d.).

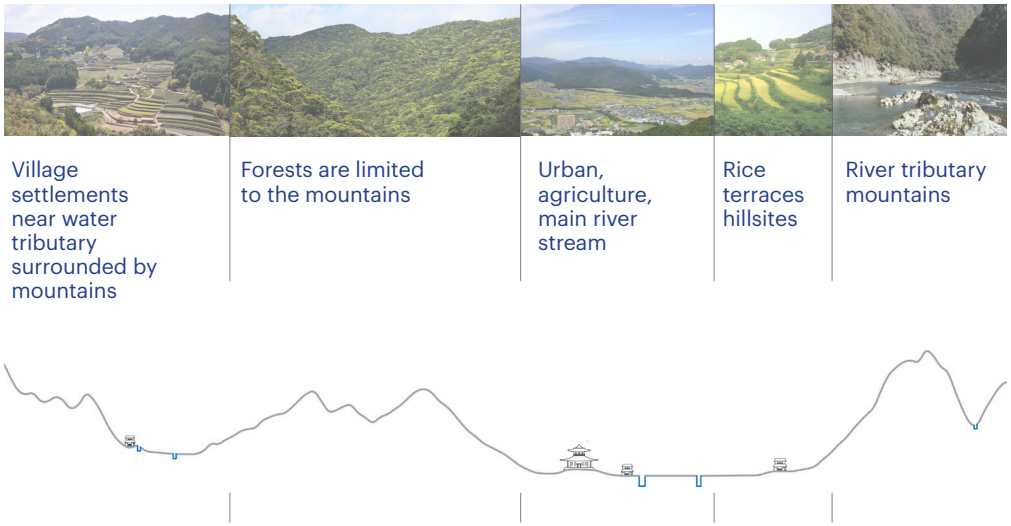


Figure 08. Schematic section illustrating the satoyama landscape typology in Kameoka. Source: The Author, 2024.

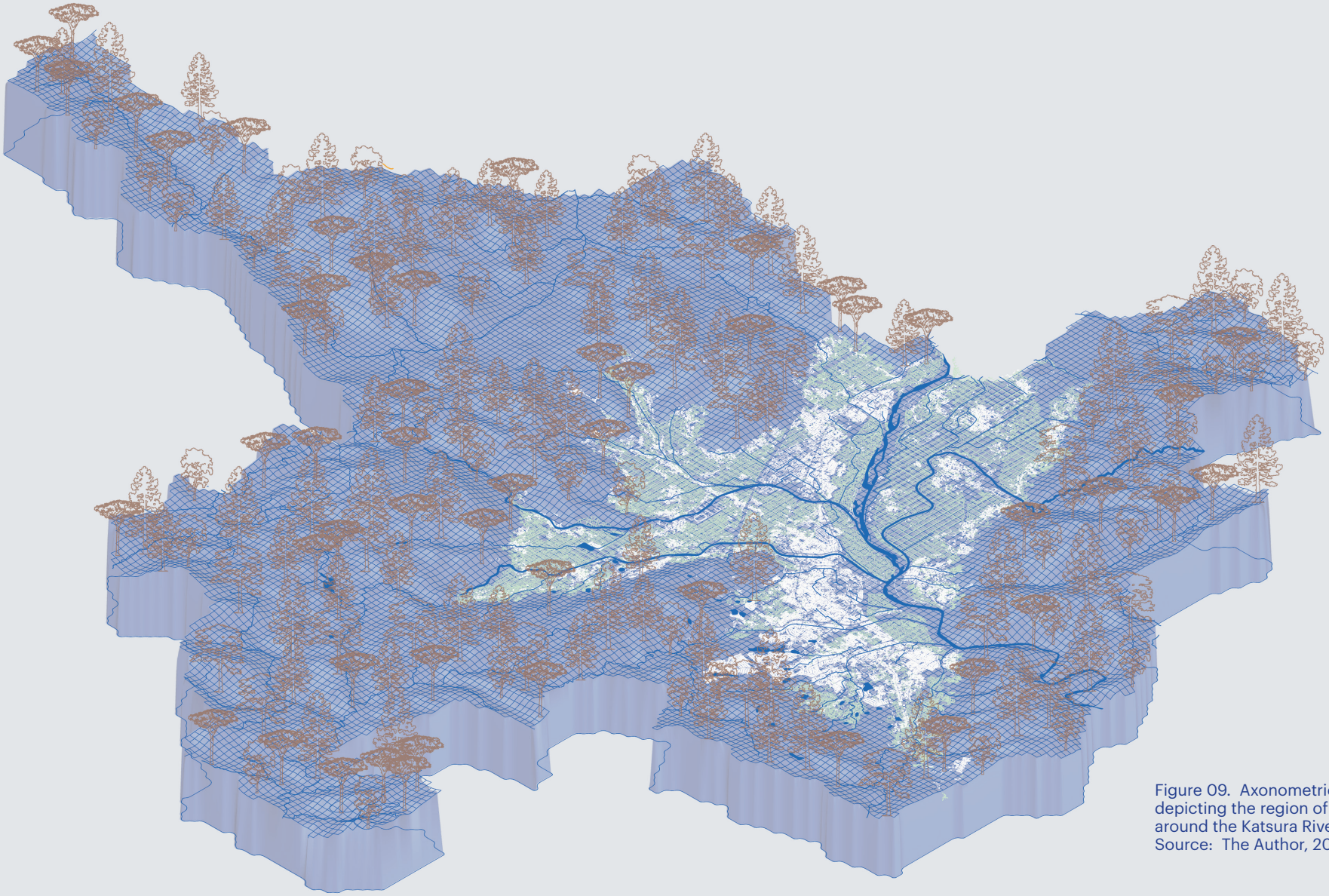


Figure 09. Axonometric drawing depicting the region of Kameoka around the Katsura River.
Source: The Author, 2024.

Satoyama typology

Ecosystem diversity of the Hozu River

Furthermore, within the river body, there are flat and fast water sections, characterized by pools and rapid flows, as well as warm water areas and “wando” zones, which harbor a wide array of fish species adapted to the diverse aquatic environments. This complex tapestry of habitats and water conditions emphasizes the ecological significance and biodiversity of the Hozu River’s riparian landscape, highlighting its importance for conservation and environmental coherence (Kyoto Prefecture, n.d.).

The Hozu River and its tributary, the Sogadani River, are home to the “ayumodoki,” a species recognized as a national natural treasure and a significant element of the local natural environment. The “ayumodoki” is scientifically important, with its habitat confirmed exclusively within the Lake Biwa-Yodo River system in Japan and a few rivers in Okayama Prefecture. Collaborative efforts with relevant organizations and local communities are underway to preserve and restore the habitat of this unique species (Kyoto Prefecture, n.d.).

Figure 10. Ayumodoki fish species photo.

Typhoon impacts

Typhoon No. 13, September 25, 1953, caused widespread flooding in the Katsura River basin, leading to devastating impacts on communities downstream. In Yagi Town, downstream from the confluence of the Sonobe River, floodwaters rose to the second floor of houses, indicating the severity of the inundation (figure—). Additionally, approximately 800 hectares of land around Kameoka City were flooded due to backwater from the Hozukyo narrow area and the collapse of the left bank of the upper Uzune Bridge. These events underscored the vulnerability of the region to intense typhoon-related flooding before the construction of infrastructure like the Hiyoshi Dam. (MLIT, n.d.)

Typhoon No. 18 in 2013 brought heavy and prolonged rainfall to the Katsura River basin, marking the most recent typhoon disaster in the area. Despite the completion of the Hiyoshi Dam in 1998, certain areas still experienced significant flooding impacts. Near Kugabashi in Fushimi Ward, Kyoto City, the embankment overflowed, flooding approximately 20 hectares of land. The water level near the iconic Togetsukyo Bridge in the Arashiyama area rose dangerously close to the bridge deck (figure—), resulting in substantial damage to nearby properties and establishments. These events highlight the ongoing challenges and risks associated with managing floodwaters in the region, despite the implementation of flood control measures such as the Hiyoshi Dam. (MLIT, n.d.)

Figure 11. Heavy rain in Kyoto Arashiyama Togetsukyo Bridge, flooding of Katsura River and Kamo River.
Source: Kyoto Wind Mill website, 2018.

Figure 12. Flooding situation in Yagi-cho, Typhoon No. 13 in 1953.
Source: MLIT Japan, 2008.

Human Impacts and Loss of Traditional Agriculture Practises

Japan's landscape has experienced significant negative impacts due to human activities over time. Historical deforestation, driven by agriculture, timber harvesting, and urbanization, has greatly diminished Japan's forest cover. This loss of forests has disrupted ecosystems, leading to increased soil erosion and reduced habitats for native wildlife. Rapid urbanization and extensive infrastructure development, particularly evident in the studied area of the Kansai region (Osaka-Kyoto-Kobe), have transformed natural landscapes into urban areas, industrial zones, and transportation networks. This expansion has fragmented habitats, altered water flow patterns, heightened issues like urban heat islands, and disrupted hydrology.

Additionally, Japan's steep, narrow terraced fields, historically vital for rice cultivation, are increasingly being abandoned, further exacerbating the challenges of land degradation and loss of traditional agricultural practices. This abandonment also extends to traditional forestry practices, which have historically played a crucial role in maintaining forest health and biodiversity.

Figure 13. Japan's steep, narrow terraced fields are being abandoned.
Source: Kit Takenaga, 2014.

Human Impacts and Loss of Traditional Agriculture Practises

Traditional agricultural practices in Japan, such as the maintenance of satoyama landscapes, tanada rice terraces, and polyculture systems, have historically contributed to sustainable land use and biodiversity conservation. Satoyama, the mosaic of woodlands and agricultural fields, supported a rich diversity of plant and animal life while providing resources like firewood, timber, and food for local communities. The tanada rice terraces, with their intricate irrigation systems, not only enabled efficient rice production on steep slopes but also played a crucial role in water management and soil conservation.

Moreover, traditional forestry practices, such as selective logging, regular tending (Ueki), and Shiiba-style forestry, were essential in maintaining forest health and ensuring continuous regeneration. These practices involved careful selection of trees for logging, periodic thinning to reduce competition among young trees, and integrating cultural and religious practices that fostered respect and stewardship for forests. The abandonment of these practices due to urban migration, modernization, and changing economic conditions has led to the degradation of these landscapes, loss of biodiversity, and erosion of cultural heritage.

Figure 14. Many of those responsible for heavy farm work are elderly, but they do not treat it as a hardship.
Source: Kit Takenaga, 2014.

Human Impacts and Loss of Traditional Agriculture Practises

Furthermore, in response to Japan's high seismic activity and history of devastating tsunamis, engineering solutions such as sea walls and reinforced structures have been implemented along coastlines and river basins. While these measures are often necessary for development and adaptation, they have had significant impacts on the natural landscape and its aesthetics. These human-induced interventions have contributed to habitat loss, altered water flow patterns, increased soil erosion, and exacerbated biodiversity decline. Balancing the need for infrastructure to protect against natural disasters with the imperative to preserve Japan's unique satoyama landscape and ecosystems is a central challenge this thesis aims to address.

Figure 15. Nanatani River banks-soft edges are transformed into concrete hard edges.
Source: The Author, 2024.

Flood challenges and ongoing risks

The Kameoka Basin, through which the Katsura River flows, has historically faced significant flood risks associated to downstream restriction at the Hozukyo Gorge. The narrowing of the river channel at the Hozukyo Gorge during floods restricts the downstream flow of water, creating a ‘bottleneck’ phenomenon that heightens flood damage and poses risks to lives and property along the river. Recognizing these challenges, people in the past showed impressive foresight by constructing numerous levees (dikes) and dam systems within the basin. The purpose of these structures is to mitigate flood flows by allowing water to enter designated flooded areas through openings, facilitating the natural return of floodwaters to the river channel as water levels move back (KKR, 2009).

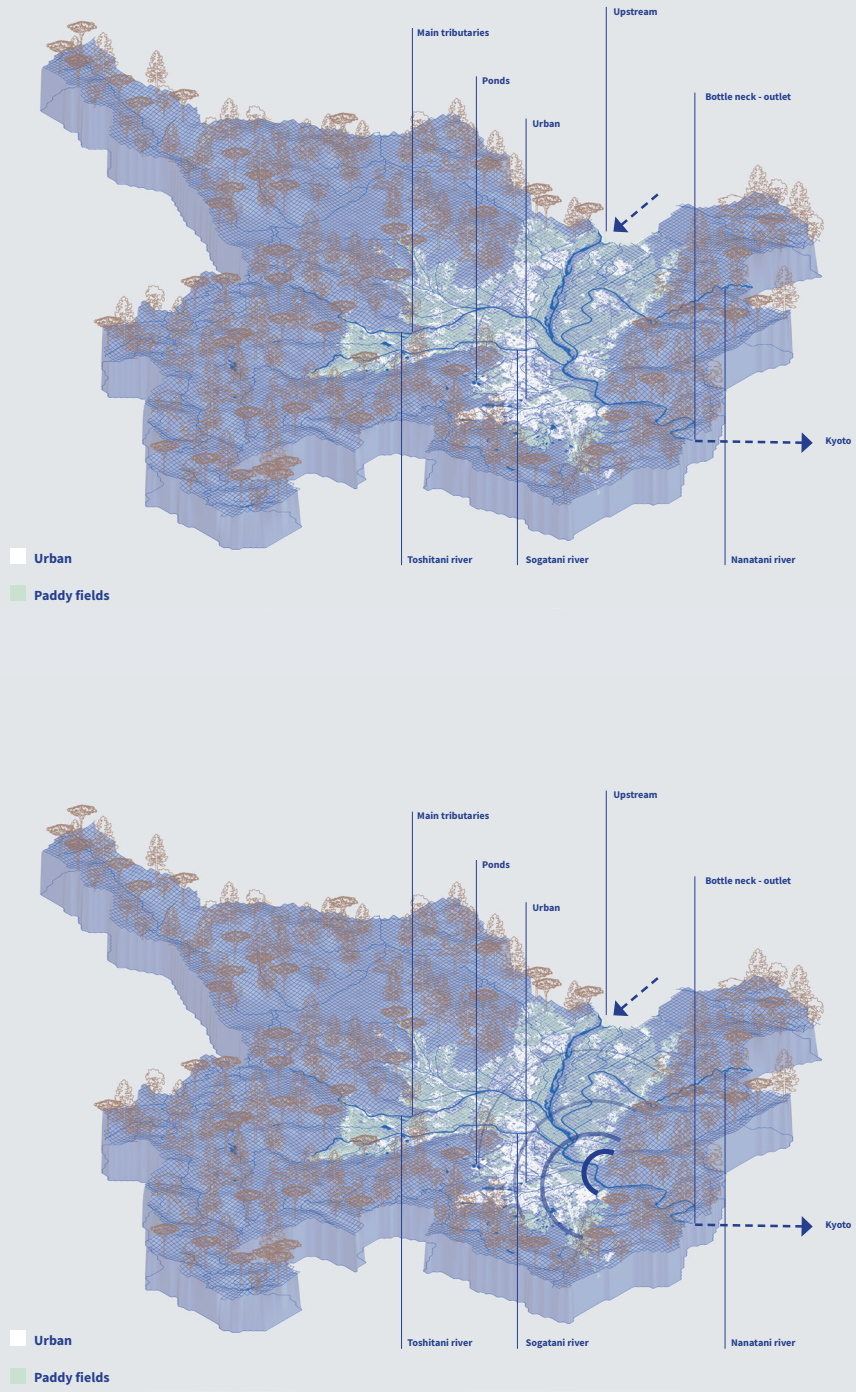


Figure 16. Axonometric drawings depict the bottleneck phenomenon at Hozukyo Gorge, amplifying flood risks downstream.
Source: The Author, 2024.

Flood challenges and ongoing risks

Efforts to mitigate flood risks in the Katsura River basin included the Hiyoshi Dam project in 1998, located north of Kameoka. This project aimed to lower the water level of the river and reduce flood damage. Specifically, measures were implemented to lower the water level downstream of the Katsura River, addressing previous embankment breaches. The Hiyoshi Dam project successfully reduced the water level of the Katsura River by approximately 50 cm near Arashiyama downstream of the dam. However, despite these efforts, the basin remains vulnerable to flooding, emphasizing the ongoing need for strategies to manage and minimize flood risks for the safety and well-being of residents (KKR, n.d.).

Figure 17. Katsura River flooded after Tropical storm Man-yi.
Source: Sky News UK, 2013.

Water flow dynamics

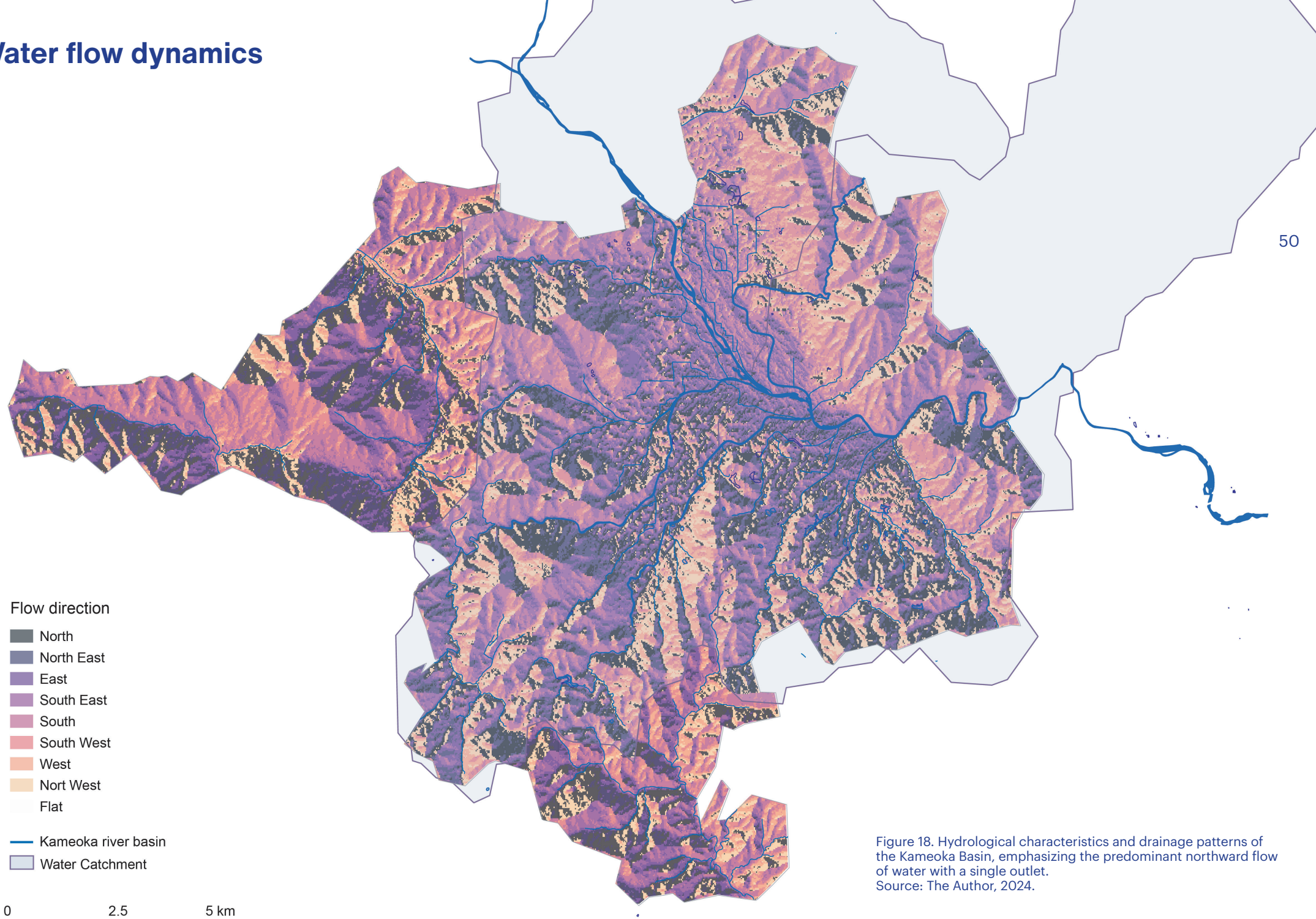


Figure 18. Hydrological characteristics and drainage patterns of the Kameoka Basin, emphasizing the predominant northward flow of water with a single outlet.
Source: The Author, 2024.

Approach: Analysis

Kameoka Landscape Prior:

Cultural relationship

Spiritual - Sacred relationship

A sense of place

Current Land Use:

Inundation Zones

Sediment Erosion

Kameoka Landscape Categories:

Headwaters and foothills

Hillsites

Flatlands

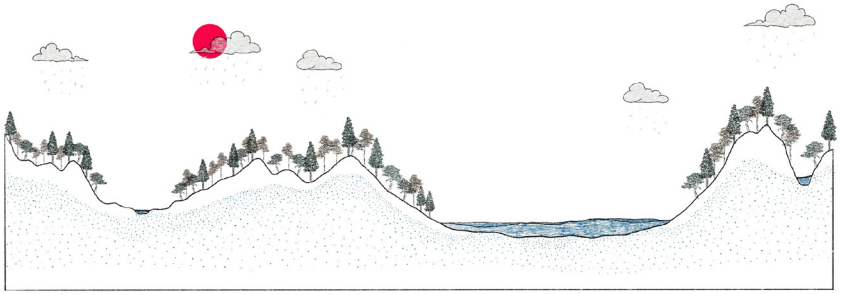
Conclusions:

Kameoka andscape past/present

Kameoka landscape prior

Kameoka was once a lake, as justified by its distinctive landscape shape. Before the Edo period, this basin area retained water, forming a natural lake. The transformation began with the creation of a waterway connecting Kameoka to Kyoto during the Edo period. This development facilitated the first human settlements in Kameoka, establishing a foundational relationship between humans and the landscape. The waterway provided a crucial link to Kyoto, fostering trade, agriculture, and communication. The stability brought by the Edo period saw further development in agriculture and trade in Kameoka, with significant infrastructure projects such as the construction of riverbanks and canals for irrigation and flood control in the Ōi River Basin (Soloppo, 2023).

Kameoka Basin was a big lake in the past - Jōmon period



Landscape dynamics - Edo period 1600-1868

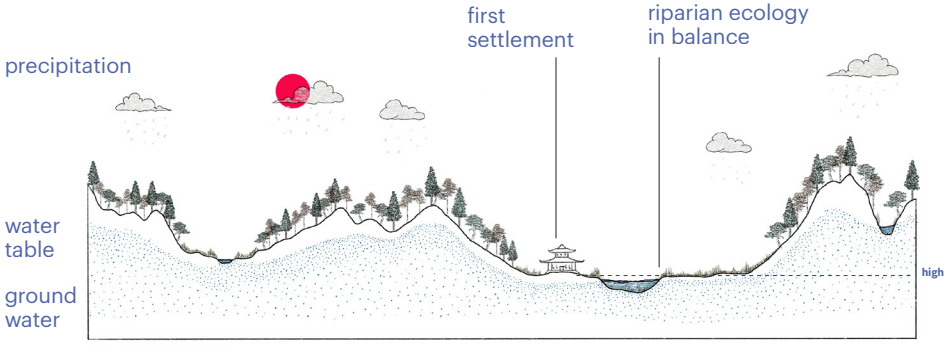


Figure 19. Sections of Kameoka's Evolution:
From Lake to Lifeline.
Source: The Author, 2024.

Cultural relationship

With the Meiji Restoration in the late 19th century, Japan underwent modernization and political changes. The construction of railroads, including the Keihan Main Line, connected Kameoka to nearby cities, increasing its accessibility and contributing to economic growth. In the 20th century, Kameoka continued to evolve as an industrial and agricultural center. Conservation efforts in the Ōi River Basin focused on protecting natural resources and water quality (Soloppo, 2023).

For centuries, rice cultivation has been a fundamental aspect of life in Kameoka. The region has a long history of agriculture, with rice being the primary crop. The fertile lands along the banks of the Katsura River provided an ideal environment for rice cultivation, leading to the development of sophisticated irrigation systems and agricultural techniques. Historically, rice cultivation in Kameoka was carried out using traditional methods such as terrace farming and flood irrigation. Terrace farming, in particular, allowed farmers to cultivate rice on steep slopes by creating flat platforms supported by retaining walls. Flood irrigation involved diverting water from the Katsura River into rice paddies to provide the necessary moisture for the crops.

Figure 20. Japanese Women Planting Rice Field Paddy Japan.
Source: Unknown, 1930.

Spiritual - sacret relationship

Furthermore, cultural and religious practices deeply embedded in Japanese traditions have significantly influenced the landscape. In Shintoism, forests are considered sacred and are believed to be inhabited by spirits. Numerous shrines are situated within these forests, where rituals are conducted to honor the spirits dwelling in the trees. These traditions instill a deep respect and sense of stewardship for the forest, emphasizing the importance of preserving its ecological integrity for future generations.

Figure 21. A shrine, a sacred space within the forest of Kameoka.
Source: The Author, 2024.

Figure 22. Sculptures of local school children's faces placed alongside a forest path.
Source: The Author, 2024.

Current land use

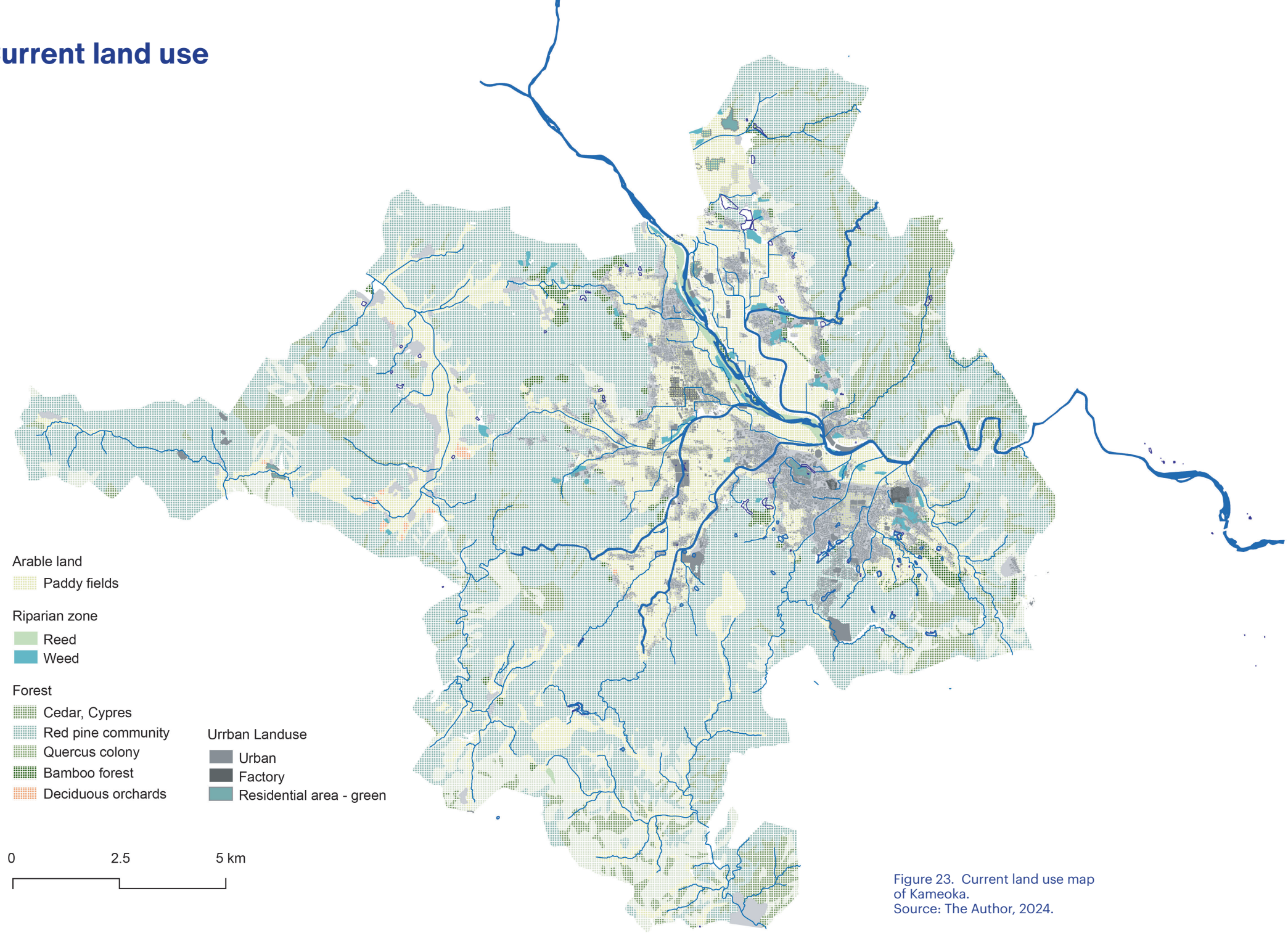


Figure 23. Current land use map of Kameoka.
Source: The Author, 2024.

High-risk flooding areas

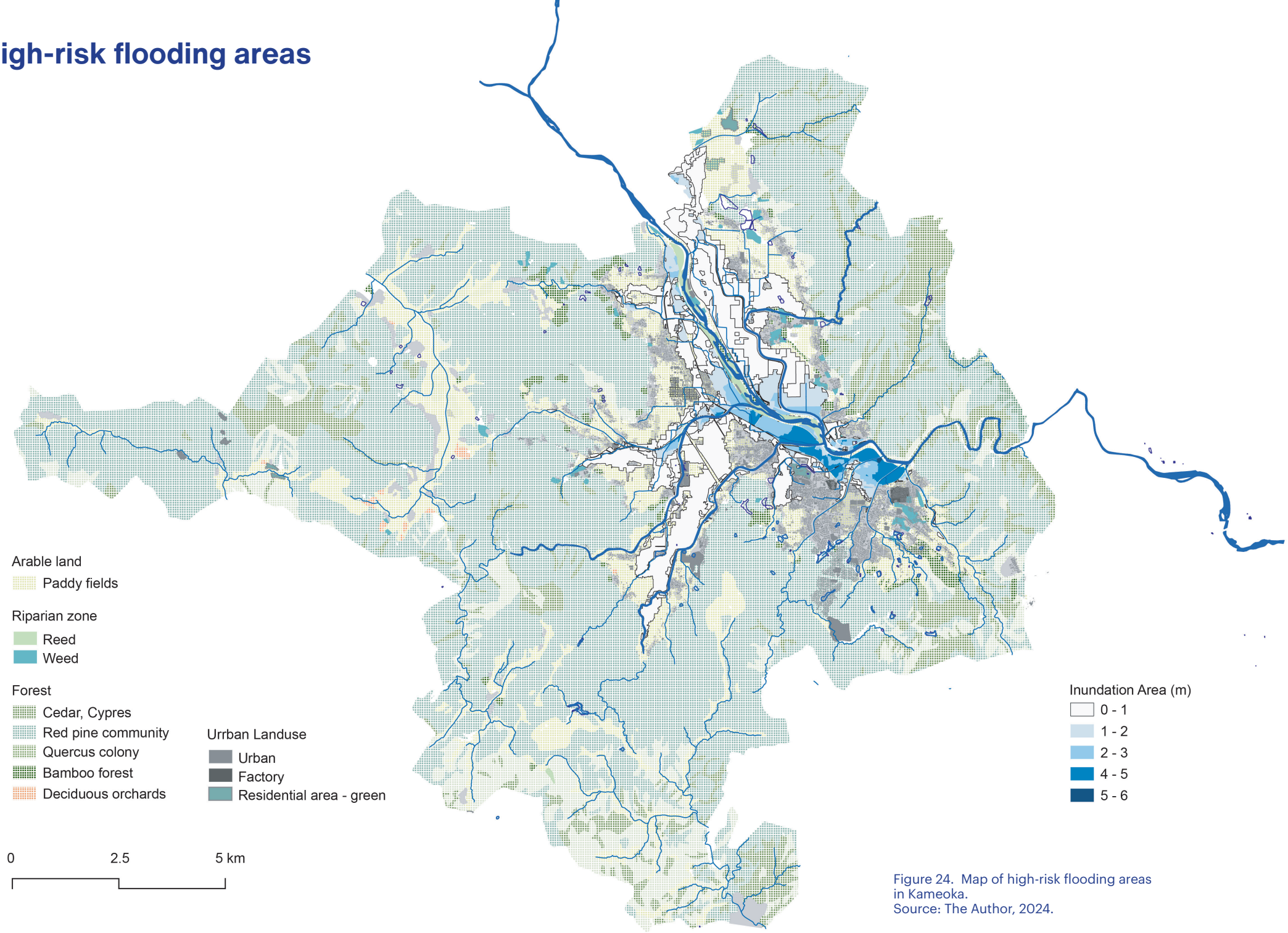


Figure 24. Map of high-risk flooding areas in Kameoka.
Source: The Author, 2024.

High-risk flooding areas

High-risk flooding areas in river basins, such as the Ōi River Basin, present significant vulnerabilities to historical settlements and local ecosystems. These vulnerabilities can manifest in various ways:

Vulnerability of Historical Settlements
Historical settlements in high-risk flooding areas are particularly vulnerable due to their age and the fact that they were often established in flat, fertile areas that are now prone to flooding. The construction techniques and materials used in these settlements may not be as resilient to flooding as modern infrastructure.

Ecological Impact: Reduction in Pool Volumes and Depth
The lack of water flow, combined with extensive water extraction, has led to a significant reduction in pool volumes and depth in the river basin. This alteration impacts the natural hydrology and reduces the availability of habitats for aquatic species. Reduced water volumes mean that wetlands, which act as natural buffers against floods, lose their capacity to absorb excess water, exacerbating flood risks. This ecological degradation diminishes the ability of the river basin to support a diverse range of species and maintain its ecological functions.

Biodiversity Decline
The decline in biodiversity is a direct consequence of the changes in the river basin's hydrology and ecology. Species such as the ayu modoki, a fish native to Japanese rivers, are particularly affected. Aquatic organisms, including fish, invertebrates, and plant species, face habitat loss and reduced reproductive success.

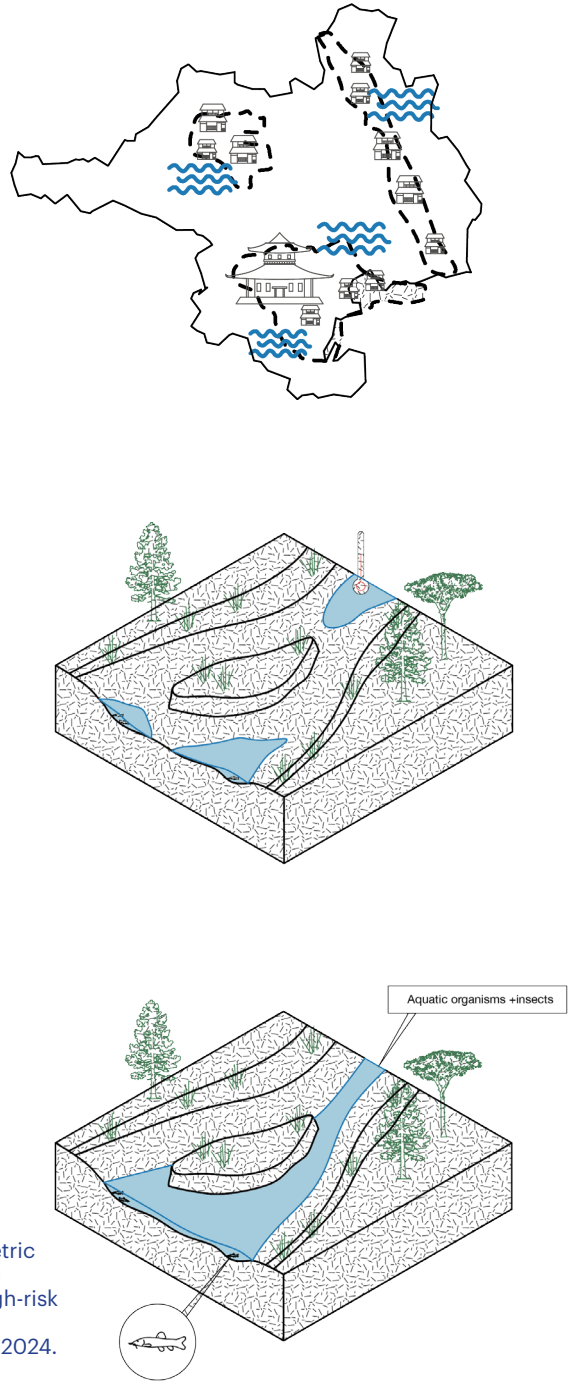


Figure 25. Axonometric diagrams illustrating issues caused by high-risk flooding areas.
Source: The Author, 2024.

Sediment Erosion

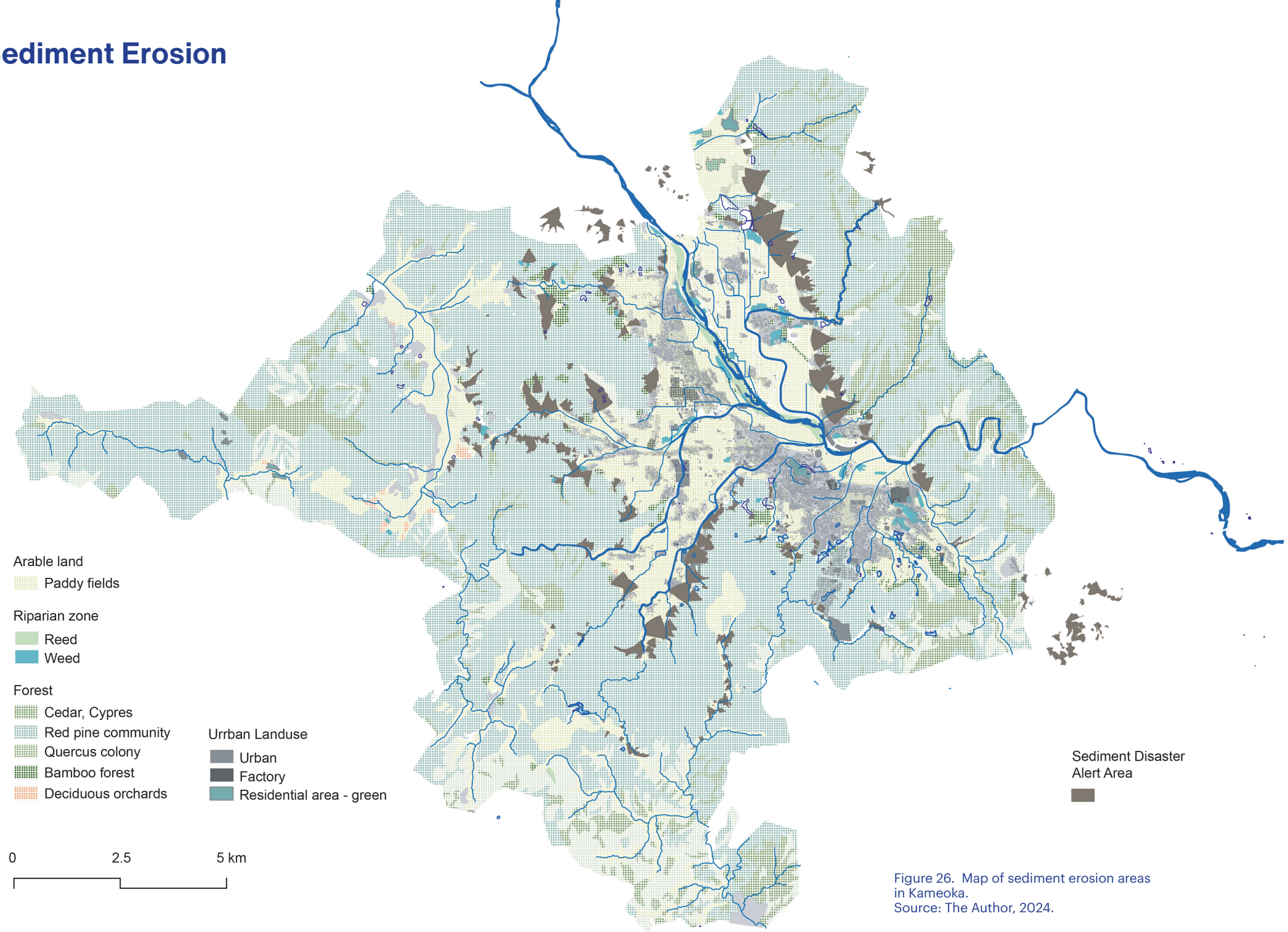


Figure 26. Map of sediment erosion areas in Kameoka.
Source: The Author, 2024.

Sediment Erosion

No Water Flow and Water Extraction
The Kameoka River Basin suffers from significant sediment erosion due to disrupted water flow and extensive water extraction for agriculture and urban use. This lack of flow reduces the river's ability to transport sediments naturally, leading to build-up in some areas and erosion in others. Poor vegetation exacerbates this, as there are fewer roots to stabilize the soil and riverbanks, further leading to a reduction in pool volumes and depths, impacting aquatic habitats.

Conversion to Concrete Surfaces and Loss of Riparian Ecosystems
Urbanization has converted permeable surfaces to impervious concrete, preventing water infiltration and increasing runoff. This increased runoff accelerates erosion and reduces groundwater recharge, essential for maintaining river levels.

Agricultural Practices and Soil Health
Monoculture plantations and deforestation for agriculture weaken soil stability, making the land more prone to erosion. These practices reduce the biodiversity needed for healthy soil composition and diminish the soil's ability to absorb and retain water. Poor soil health prevents effective groundwater recharge, leading to lower river base flows and increased bank erosion during heavy rains.

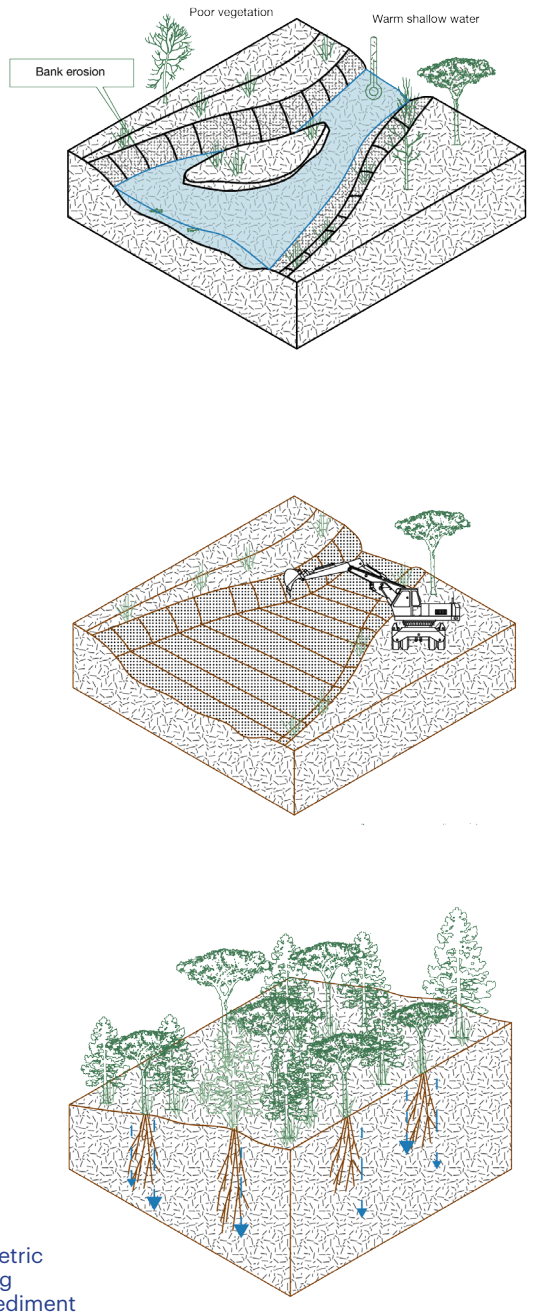
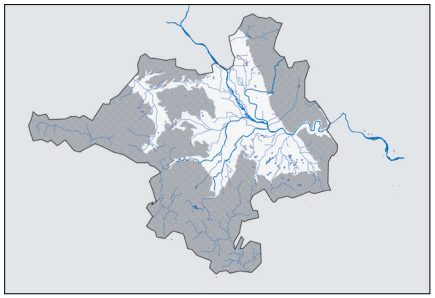


Figure 27. Axonometric diagrams illustrating issues caused by sediment erosion.
Source: The Author, 2024.

Kameoka landscape categories: Headwaters and foothills



This landscape category features a remarkable terracing system that serves multifaceted purposes crucial for sustainable agriculture and environmental resilience. These terraces are designed to maximize arable land by transforming steep slopes into flat platforms suitable for cultivation. Moreover, they play a pivotal role in preventing soil erosion, acting as effective barriers against the forces of runoff and wind erosion. Alongside this erosion control, the terraces facilitate a constant water supply, reinforcing water management practices crucial for agricultural sustainability. This water management system capitalizes on the unique topography of the region, where water naturally moves from mountains to rivers to streams, fostering natural irrigation. As a result, the terracing system in Kameoka not only optimizes land use but also embodies a harmonious coexistence with nature, ensuring the long-term viability of agriculture in the region.

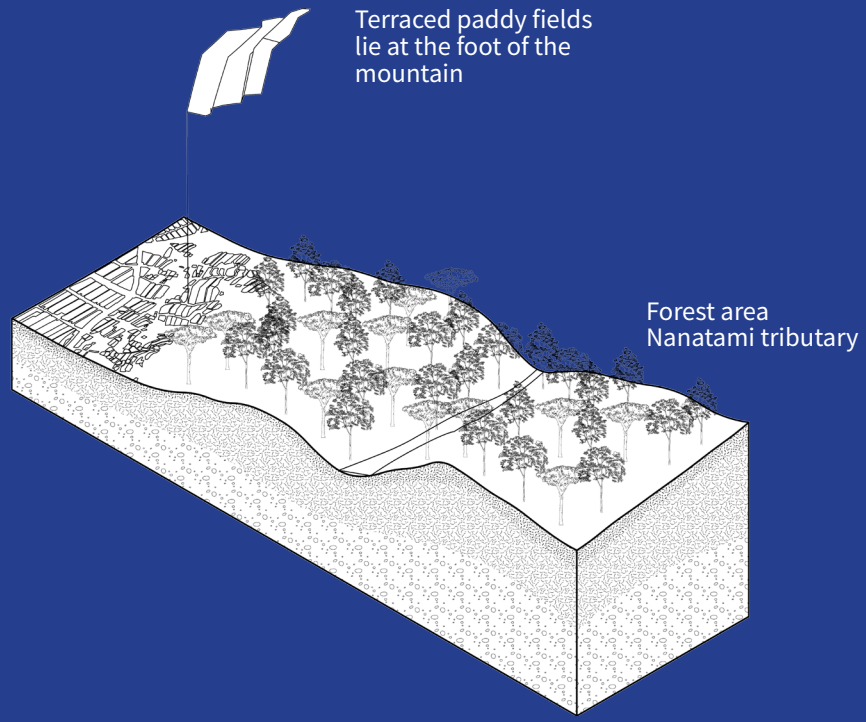
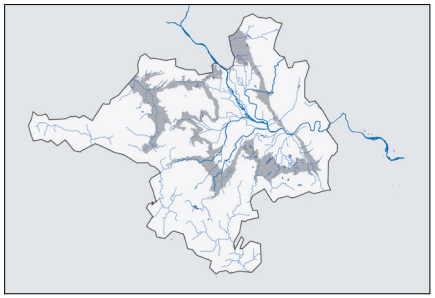


Figure 28. Axonometric drawing of the headwaters and foothills.
Source: The Author, 2024.

Figure 29. Rice terraces in the foothills of the mountains surrounding Kameoka.
Source: The Author, 2024.

Figure 30. Forest area of the Kameoka region, specifically highlighting a significant sediment erosion area affecting the landscape.
Source: The Author, 2024.

Kameoka landscape categories: Hillsides



The Kameoka landscape, characterized by its hillsites and settlement fences, exemplifies a unique interplay between natural processes and human intervention. These settlement fences are not mere boundaries but are ingeniously crafted from sediment transported through the river. This sediment, far from being a waste product, serves as a valuable building material, simultaneously providing infrastructure for flood protection of the cultural-historical layer. The flow of sediment, guided by the river's course, shapes the landscape and forms the foundation for human habitation. Riparian agriculture thrives in this environment, with most paddy fields situated in the floodplains, strategically utilizing the fertile soil derived from alluvial deposits. Thus, the Kameoka landscape stands as a testament to the symbiotic relationship between humans and nature, where sediment becomes both a resource and a protector, nurturing both livelihoods and heritage.

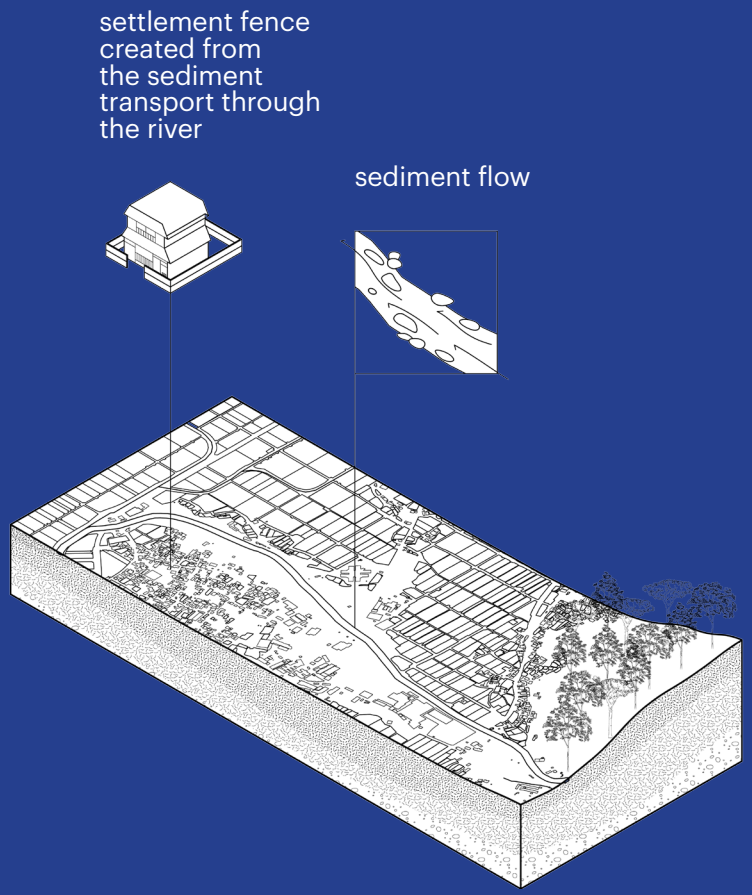


Figure 31. Axonometric drawing of the hillsides.
Source: The Author, 2024.

Figure 32. Rocks, originally used as sediment deposits to build flood protection for houses, in the upper stream of the Nanatani River tributary.
Source: The Author, 2024.

Figure 33. Historical dam in the Nanatani River tributary.
Source: The Author, 2024.

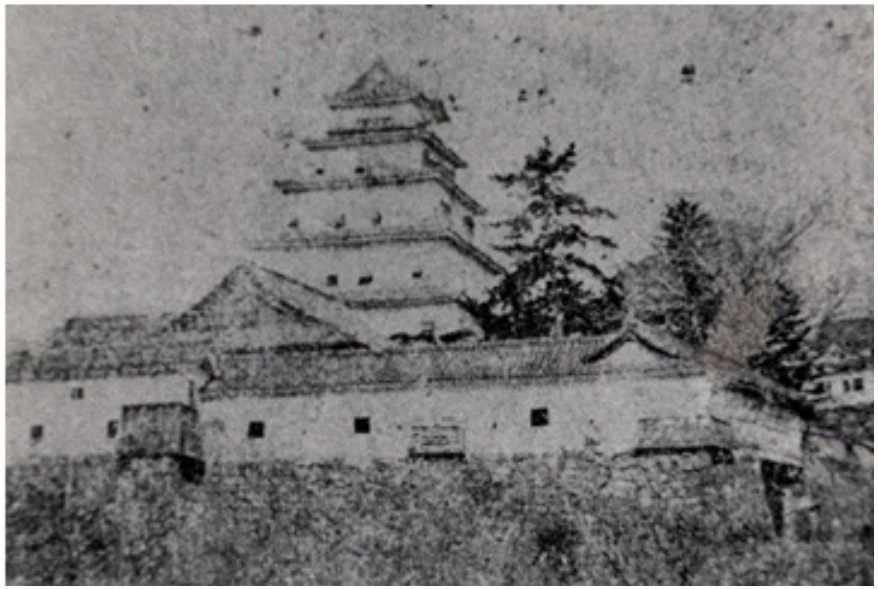


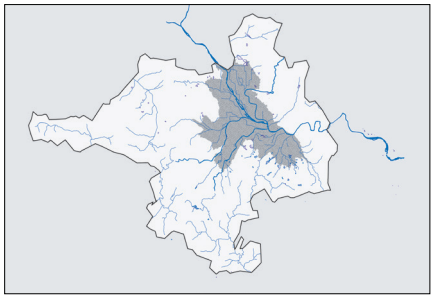
Figure 34. Historical photo of Kameyama Castle.
Source: JREF, 2021.

Figure 35. Kameyama Castle ruins area.
Source: The Author, 2024.

Figure 36. Historical settlement fence formed by sediment captured by the river to safeguard against flooding.
Source: The Author, 2024.

Figure 37. Historical village roads fenced by sediment captured by the river to be protected by the floods.
Source: The Author, 2024.

Kameoka landscape categories: Flatlands



In the flatlands of the river basin in Kameoka, agriculture thrives in the fertile floodplains, where the periodic flooding of the river brings a vital infusion of minerals and nutrients. This natural process, driven by sediment flow carried by the river stream, deposits rich layers of alluvium onto the land. These alluvial deposits are far more than mere silt; they serve as the lifeblood of the soil, contributing essential nutrients and organic matter that enhance its fertility. As the floodwaters recede, they leave behind a nutrient-rich substrate, ready to support robust plant growth. This symbiotic relationship between the river and the land ensures a continuous cycle of replenishment, where each flood brings renewal and revitalization to the agricultural landscape. Thus, in the flatlands of Kameoka, the confluence of natural forces and human cultivation yields generous harvests, sustained by the timeless rhythm of the river's flow.

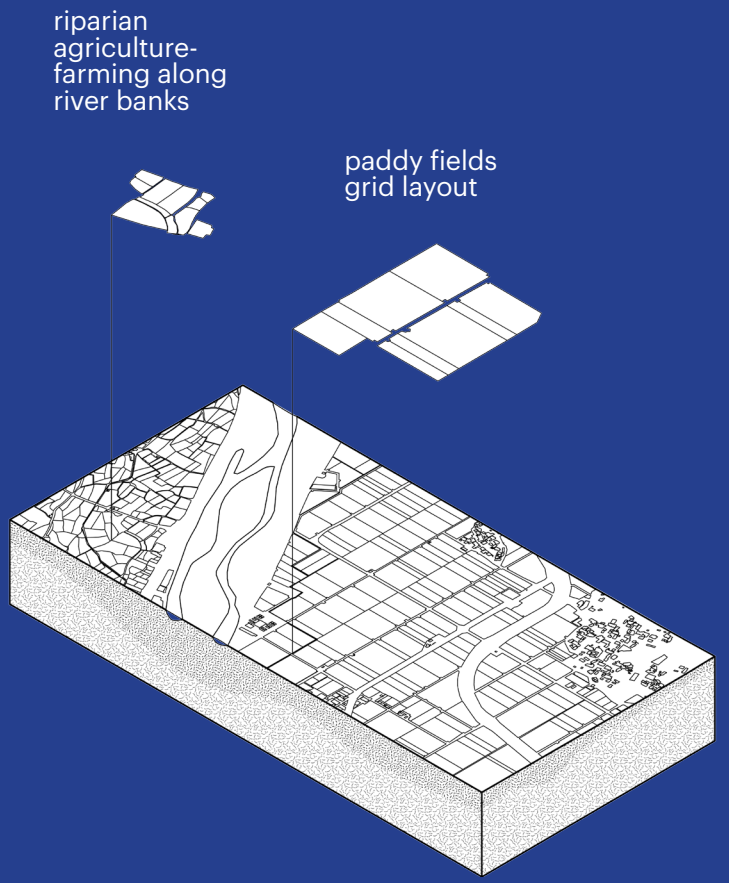


Figure 38. Axonometric drawing of the flatlands.
Source: The Author, 2024.

Figure 39. The floodplain next to Oi River main stream used as a football field.
Source: The Author, 2024.

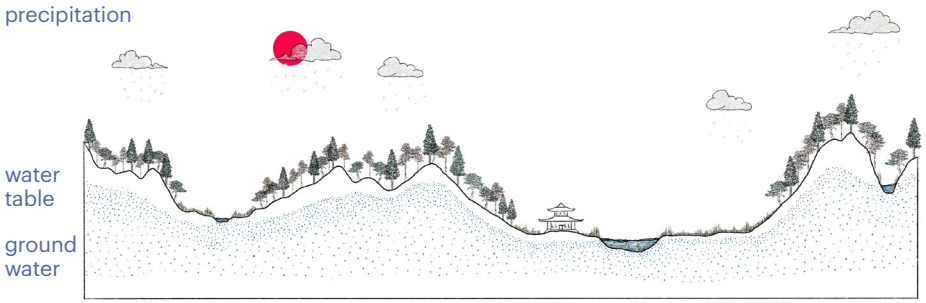
Figure 40. The scale of the Oi River main stream and its floodplains.
Source: The Author, 2024.

Conclusion: Kameoka landscape past/ present

The Kameoka River landscape has undergone significant transformations throughout history, evolving from a natural lake into a structured, inhabited landscape shaped by human creativity and environmental dynamics. From its origins, “Satoyama 0.0,” as a vital waterway connecting Kameoka to Kyoto during the Edo period, to its modernization, “Satoyama 1.0,” through the construction of railroads and urbanization in the Meiji era, the landscape has continually adapted to meet the needs of its inhabitants. These changes have brought both benefits and challenges.

Urbanization has increased pressures on groundwater resources and altered natural ecosystems. Concurrently, agricultural practices have evolved to maximize productivity, facing issues such as soil erosion and biodiversity decline. Despite these challenges, the Kameoka River landscape remains resilient, with ongoing conservation efforts aimed at protecting its natural resources and cultural heritage. As the landscape continues to evolve, it serves as a reminder of the interconnectedness between humans and the environment, highlighting the importance of sustainable management practices for the future.

Satoyama 0.0
Landscape dynamics - Edo period 1600-1868



Satoyama 1.0
Landscape dynamics - Reiwa period 2024 -

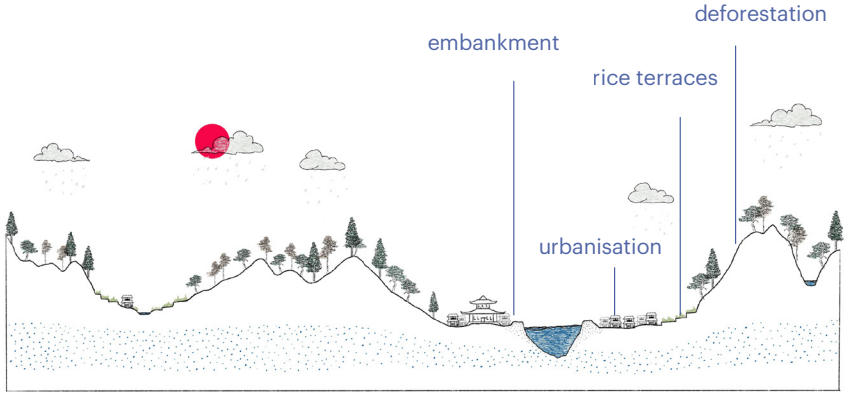


Figure 41. Sections of Kameoka’s Evolution: From Satoyama 0.0 to Satoyama 1.0. Source: The Author, 2024.

Descent: Projection

Design Goals

Design Strategies

Design Principles:

Headwaters and foothills

Hillsites

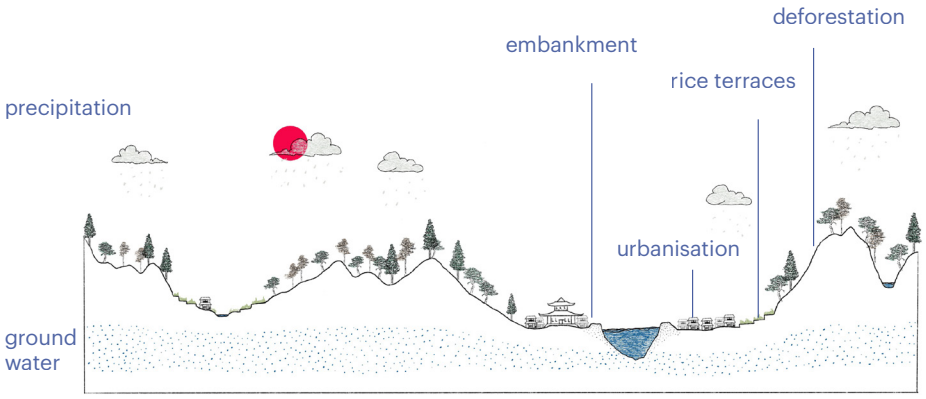
Flatlands

Regional Planning

Design Goals:

Taking the natural landscape as the basis, Satoyama 2.0 will work with natural processes to create socially and ecologically inclusive, thriving urban landscapes. “Landscape first” approach draws from traditional ecological knowledge, which has long demonstrated how people can be agents of landscape renewal, enhancing biodiversity and allowing both cultural and biological diversity to flourish. Societies worldwide have shown that understanding and working with the logic of natural landscapes through trial and error, and with diverse, developed practices can positively contribute to both wild and domestic diversity. This approach aligns with a landscape-based regional design strategy, a future-oriented method that enhances spatial development by applying bioregional planning and design principles. Viewing the urban landscape as a social-ecological, inclusive, dynamic, and complex system is key, supported by the notion of the landscape as a long-term structure that changes over time. This “Landscape-Based Approach to Urbanism” will be central to achieving a resilient and sustainable future for the Satoyama landscape of Kameoka. Through these efforts, Kameoka can serve as a model for similar initiatives in Japan and beyond, demonstrating the profound benefits of integrating ecological, cultural, and urban considerations into the management of natural resources (Nijhuis, 2022).

Satoyama 1.0
Landscape dynamics - Reiwa period 2024



Satoyama 2.0
Landscape dynamics - Design with Nature 2070

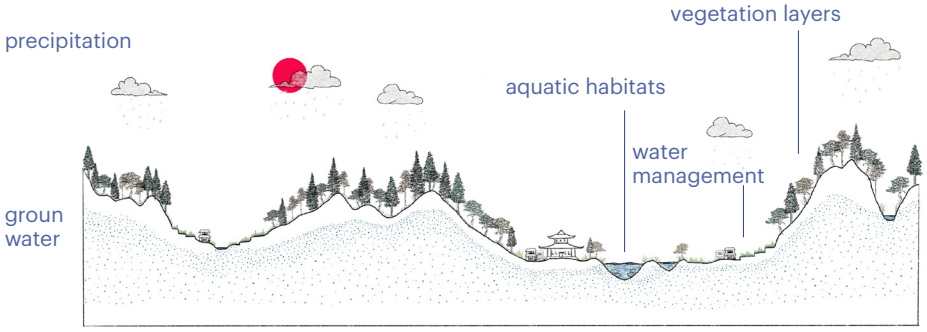
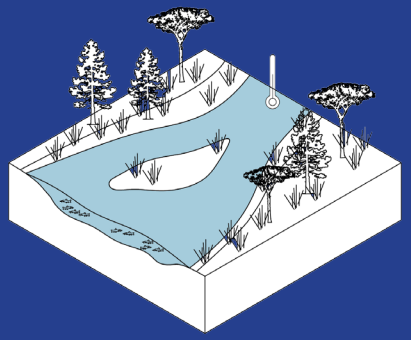


Figure 42. Sections of Kameoka’s Evolution Goals: From Satoyama 1.0 to Satoyama 2.0. Source: The Author, 2024.

Design strategies

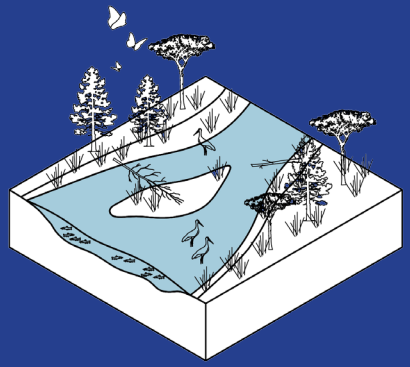
Flood-Resilient Design and Floodplain Management



Increase water volumes and depth and flow

Restore wetlands

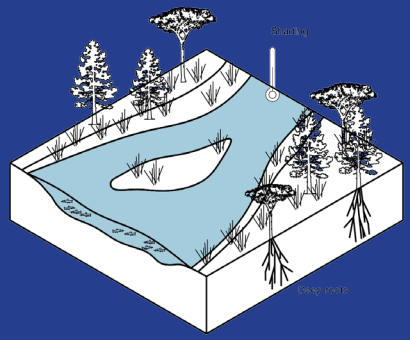
Preservation of Natural Habitats



Wood debris - provides habitat shading

Increase aquatic organisms

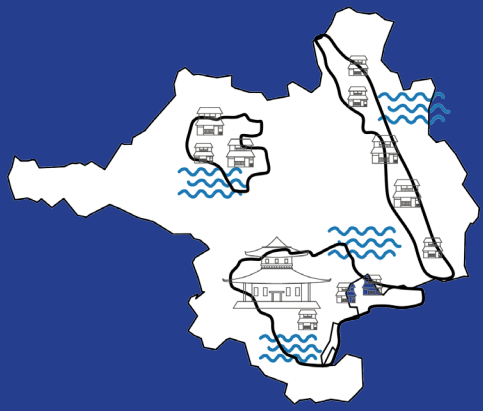
Natural processes Riparian Restoration



Deep roots to maintain bank structure and reduce erosion

Native vegetation

Urban adaptive management



Protect urban layer

Flood mitigation

Figure 43. Axonometric drawing of the landscape design strategies.
Source: The Author, 2024.

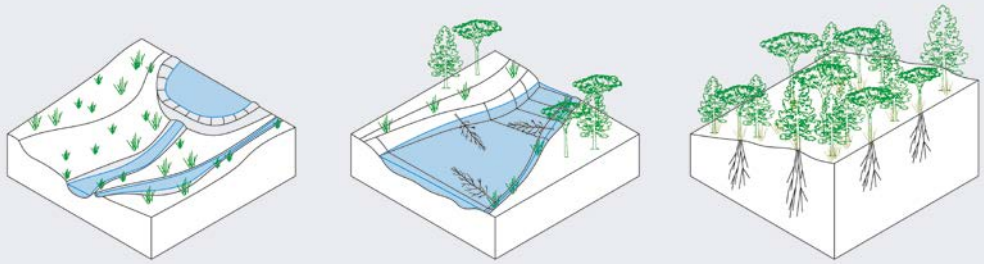
Design Principles: Headwaters and Foothills

In designing landscape Principles with a focus on headwaters and foothills, several key principles come into play to ensure ecological health and sustainability.

The management of headwaters involves the strategic placement of dams and bypasses. These structures serve to regulate water flow, ensuring that downstream areas receive a consistent supply while also minimizing the risk of flooding. Additionally, the careful preservation and restoration of tributaries are essential. These smaller streams not only contribute to the overall flow diversity of the watershed but also serve as vital habitats for various aquatic species.

Implementation of measures to reduce bank erosion. By employing techniques such as natural vegetation buffers and engineered stabilization methods, the integrity of stream banks can be preserved, preventing sedimentation and habitat degradation. Furthermore, adopting a multilayered cultivation approach within these landscapes can have significant benefits. By incorporating diverse vegetation types, including trees, shrubs, and groundcover plants, soil erosion can be minimized, and ecosystem resilience enhanced.

Reduction of runoff and the promotion of groundwater recharge. This can be achieved through the implementation of various strategies, such as the creation of permeable surfaces and the restoration of wetlands and riparian zones. These measures help to slow the movement of water across the landscape, allowing it to infiltrate into the soil and recharge underground aquifers.



Dams bypasses

Tributaries
flow diversity
reduce bank erosion

Multilayered cultivation
Reduce runoff, and
contribute to groundwater
recharge

Figure 44. Axonometric drawings of headwater and foothills landscape principles.
Source: The Author, 2024.

Application of Design Principles in : Headwaters adn Foothills

Figure 45. Keymap of the location of the principles.
Source: The Author, 2024.

Design Principles: Hillsides

Paddy terraces and slopes play a pivotal role in this landscape typology, serving as integral features for water management. These terraced fields not only store water effectively but also create a visually striking mosaic across the hillsides. Additionally, the creation of retention areas within agricultural land is essential. By strategically incorporating retention ponds or reservoirs and utilizing sluices to regulate water flow during dry periods, these areas can serve as vital water storage and distribution points, ensuring consistent irrigation for crops. Furthermore, a principle of 'sacrifice' is employed, wherein certain paddy fields are designated for temporary inundation or rotation. This practice not only enhances irrigation efficiency but also fosters biodiversity by providing sporadic wetland habitats. By integrating these design principles, hillsides landscapes can be managed in a sustainable and resilient manner, balancing the needs of agriculture with the preservation of natural ecosystems.

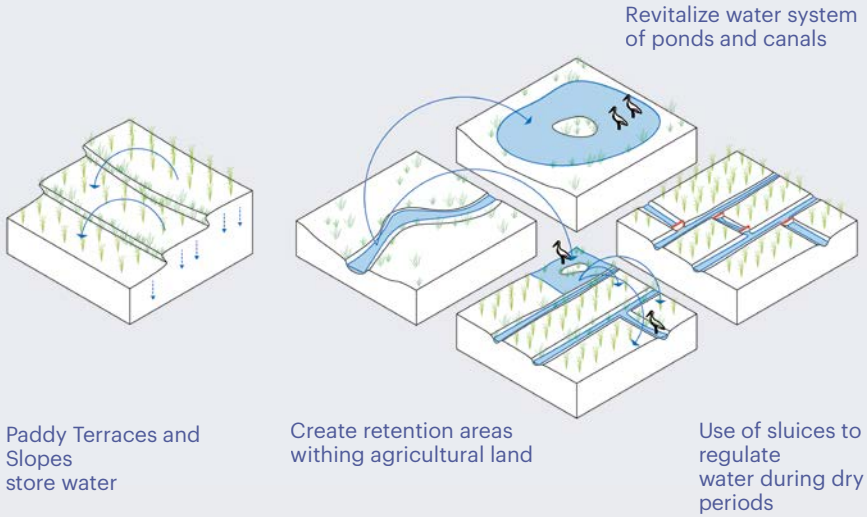


Figure 46. Axonometric drawings of hillsites and agriculture landscape principles.
Source: The Author, 2024.

Application of Design Principles in : Hillsides

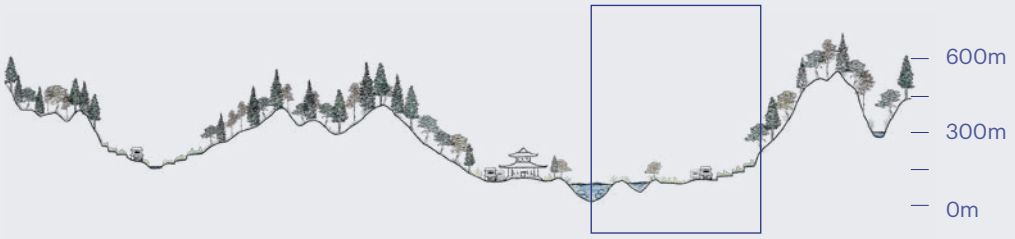


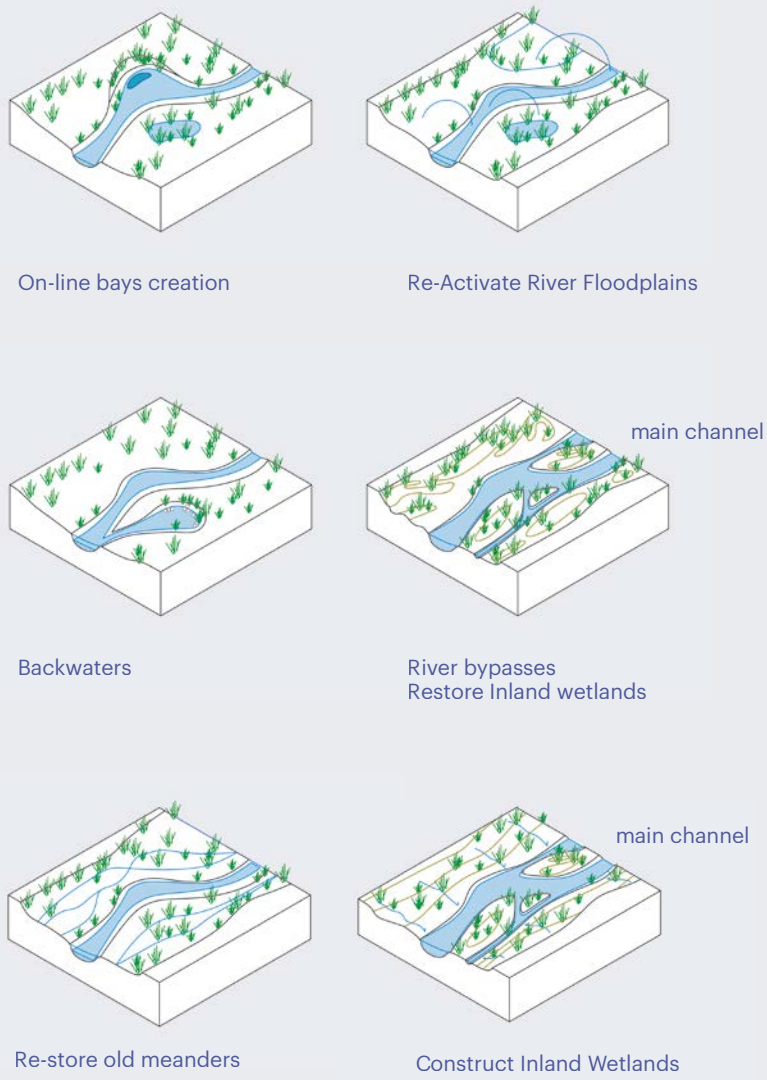
Figure 47. Keymap of the location of the principles.
Source: The Author, 2024.

Design Principles: Flatlands

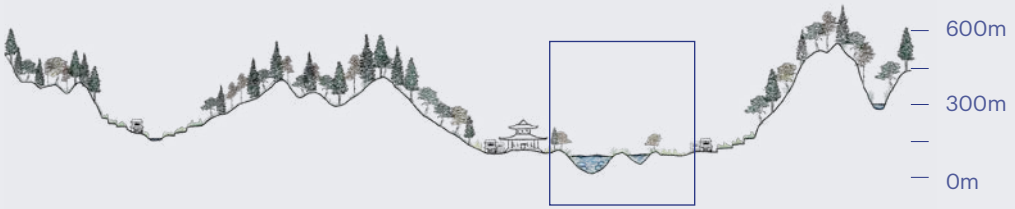
In the context of flatlands landscape typology, specific design principles are employed to tackle the ecological potential of these expansive terrains. One crucial strategy involves the creation of on-line bays, strategically placed along riverbanks or coastlines. These bays serve multiple functions, acting as buffer zones against erosion, providing habitat for aquatic species, and offering recreational opportunities for nearby communities. Furthermore, efforts to re-activate river floodplains play a vital role in restoring natural hydrological processes and mitigating flood risks. By allowing rivers to periodically overflow into their floodplains, these areas not only replenish soil nutrients but also create essential habitats for a diverse range of flora and fauna. Additionally, the construction of backwaters and river bypasses helps to enhance water circulation and promote sediment deposition, contributing to overall ecosystem health. Moreover, restoring inland wetlands and old meanders further enriches the landscape's biodiversity and water retention capacity. By creating and restoring these dynamic aquatic habitats, flatlands can be transformed into resilient ecosystems that provide valuable ecosystem services while supporting sustainable development practices.

Figure 48. Axonometric drawings of flatlands and river restoration landscape principles.
Source: The Author, 2024.

Figure 49. Keymap of the location of the principles.
Source: The Author, 2024.



Application of Design Principles in : Flatlands



Regional planning

Regional planning, the vision of Kameoka city in 50 years, and subsequent local designs follow a layer-based approach. This approach emphasizes the importance of understanding the relationship between the physical environment (hardware), human activities (software), and cultural, institutional, and conceptual ideas (orgware) in comprehending the landscape and its development (Braudel, 1966; Dobrov, 1979; Tvedt & Oestigaard, 2014). Accordingly, this layer-based analysis aims to interpret the landscape as a dynamic interaction between humans and nature (Nijhuis, 2020).
Natural Context (Layer 1): The natural context encompasses the relief, water, soil, geological substructure, and climate, along with the associated ecosystems. This fundamental component significantly influences how the landscape can be utilized. The dynamics of this foundational condition are characterized by slow, often nearly imperceptible processes of change, repetition, and natural cycles. Human Modifications and Interventions (Layer 2): Human activity is integral to utilizing the natural context for living, working, and recreation. Culture, Organization, and Politics (Layer 3): This layer includes the cultural, spiritual, and religious perceptions of the natural context and our interaction with it.
It also encompasses the state of science and technology, organizational structures, political movements, design concepts, and aesthetic ideals(Nijhuis, 2022).

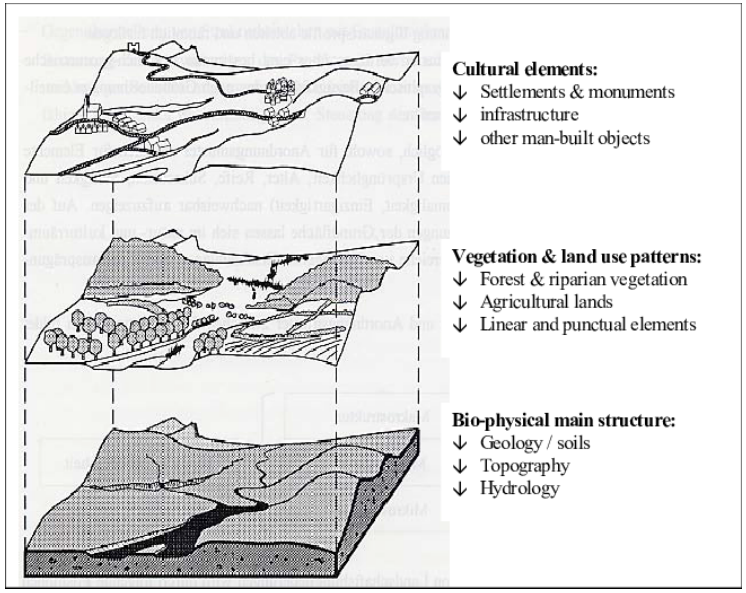
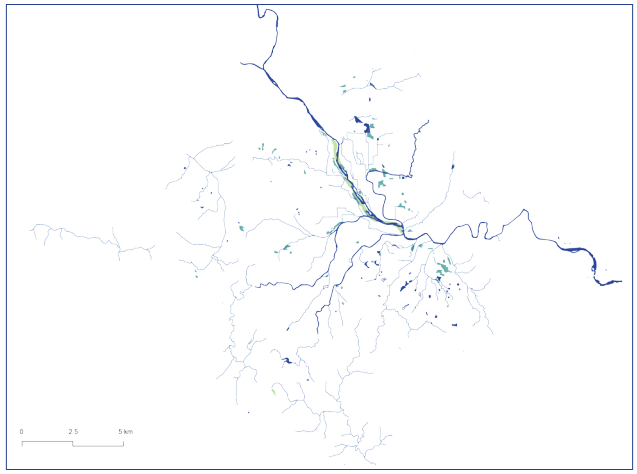


Figure 50. Landscape character consisting of three main layers: biophysical main structure, vegetation and land-use patterns and cultural elements
Source: Wascher and Jongman in press; after Krause and Klöppel, 1996.

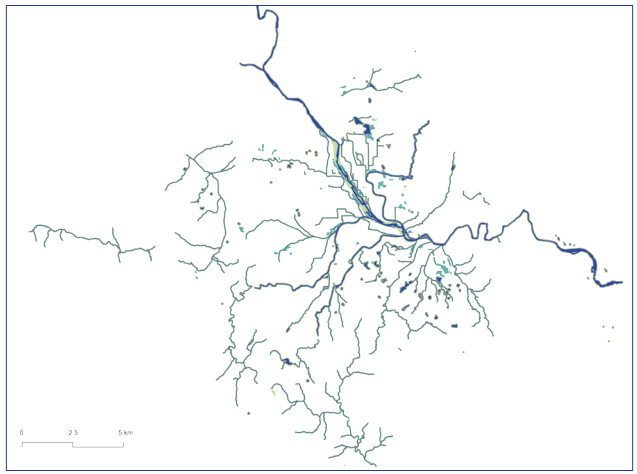
Regional planning

The foundation of this vision lies in the natural context (layer 1), which encompasses the physical environment, including relief, water, soil, geological substructure, and climate. This natural context serves as the essential basis upon which all other layers are built. Recognizing the importance of natural processes, riparian restoration and the creation of green-blue corridors (layer 2) are prioritized to enhance biodiversity, manage water resources, and connect various ecosystems. These corridors facilitate the movement of species and the flow of natural elements, thereby reinforcing ecological resilience. Green edges are also introduced to define urban and rural areas, promoting sustainable transitions between different land uses. These green edges serve as buffers that protect natural habitats while providing recreational spaces for residents.

1.



2.

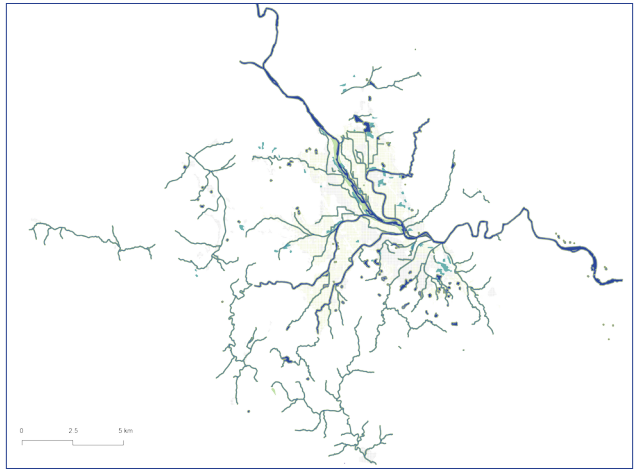


Regional planning

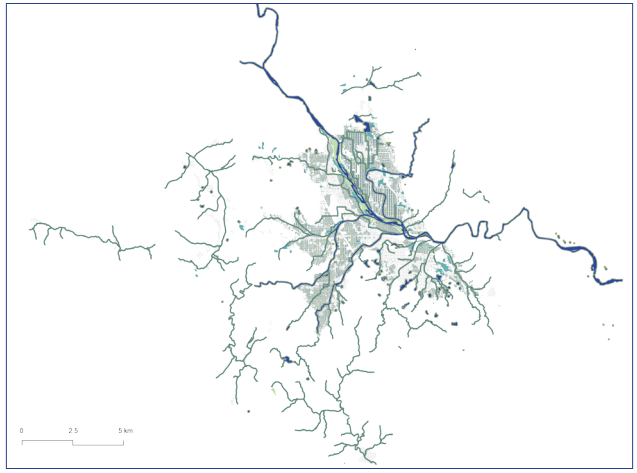
The integration of paddy fields (layer 3) within the urban layer is another crucial aspect. Paddy fields not only contribute to local food production but also play a vital role in water management by storing rainwater and reducing soil erosion (layer 4). This multifunctional approach ensures that agricultural practices are harmoniously knitted into the urban fabric. To further optimize land use, activating the slopes through the implementation of terraced paddy fields is proposed (layer 5). These terraces not only enhance agricultural productivity but also prevent landslides and soil erosion, making effective use of the hilly terrain.

The vision is ultimately fulfilled with the forest layer (layer 6), where maintaining the satoyama forest using local traditional practices ensures the conservation of biodiversity and cultural heritage. This involves sustainable forestry techniques that balance human needs with ecological preservation, fostering a symbiotic relationship between the community and the natural environment.

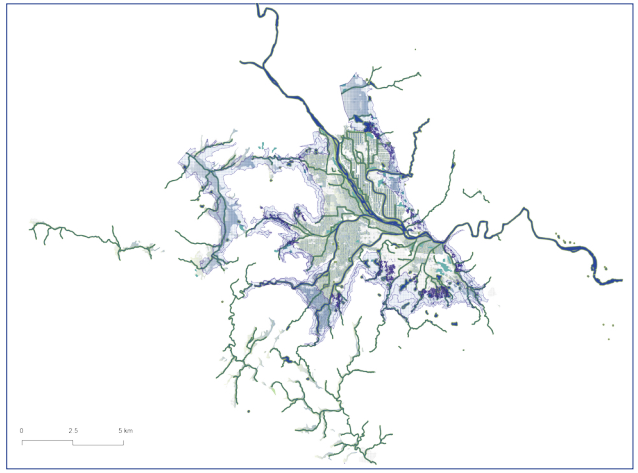
3.



4.



5.



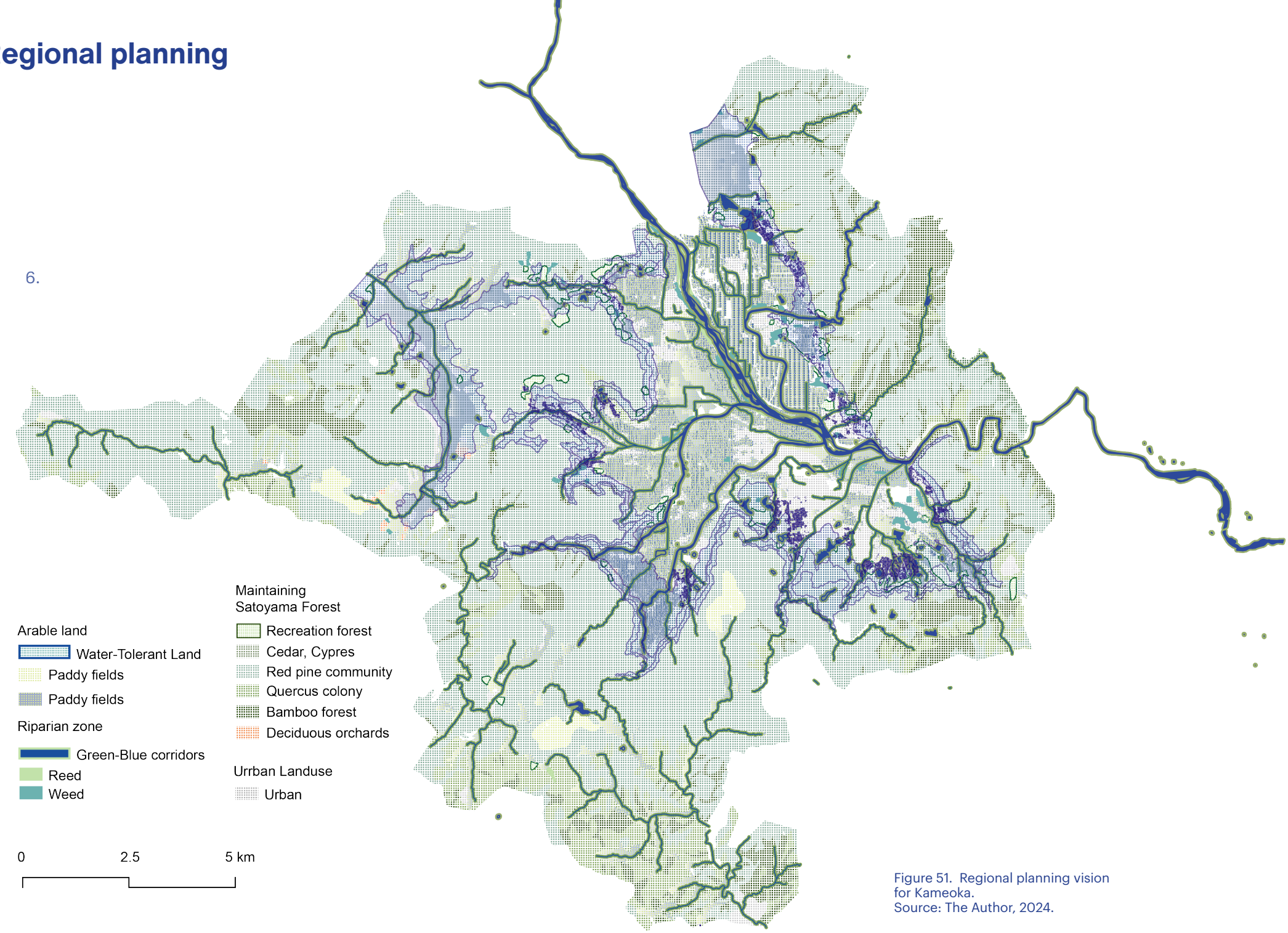


Figure 51. Regional planning vision for Kameoka.
Source: The Author, 2024.

Landing

Strategic Interfaces

Site 1: Flatlands

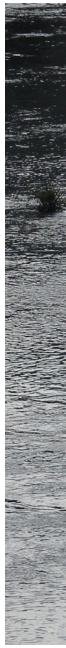
Main river stream

Site 2: Hillsites

Paddy fields

Site 3: Headwaters

Forest



Flatlands:
Main river stream

Layer 01:
Natural Context as the Basis
The foundation of this plan is the natural context, encompassing the physical environment. This layer is the basis for all other layers, ensuring that all interventions are grounded in an in-depth understanding of the natural landscape and its fundamental processes.

Layer 2:
On-line Bays, Backwater, Old Meanders Restoration, Braided Streams, Floodplain Activation
In this layer, the focus is on enhancing the natural features of the river system. On-line bays, backwaters, and old meanders restoration are prioritized to create diverse habitats and improve water quality. Braided streams are encouraged to support dynamic river processes and enhance ecosystem resilience. Floodplain activation involves utilizing floodplains for ecological functions such as groundwater recharge, nutrient cycling, and flood mittigation, while also providing habitat for wildlife.

Layer 3:
Softened River Edges, Restore Riparian-Bio Defenses
The emphasis in this layer is on softening the edges of the river to promote habitat diversity and improve water flow dynamics. Riparian-bio defenses, including vegetation buffers and natural barriers, are restored to protect against erosion and floods. These measures not only enhance ecological stability but also provide aesthetic benefits and recreational opportunities for the community.

1.

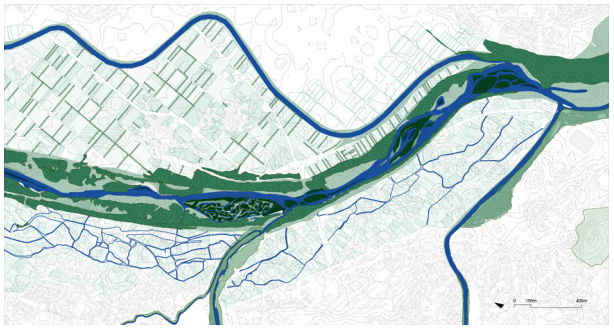
2.

3.

Layer 4:
Revitalize Vegetation Layer: Productive Islands, Trees, Wetlands, Tree Lines in the Pasture
This layer focuses on revitalizing the vegetation layer along the riverbanks and surrounding areas. Productive islands are created to support diverse plant communities and provide nesting sites for birds. Trees are planted to stabilize the soil, provide shade, and enhance habitat diversity. Wetlands are restored to improve water quality, provide flood storage, and support unique plant and animal species. Additionally, tree lines in pastures are established to create natural corridors and enhance connectivity between habitats.

Layer 5:
Cultural Layer: Camping Spaces, Bird Habitats, Platforms for Recreation, Wayfinding Paths
The cultural layer integrates human activities and recreational opportunities within the riverine landscape. Camping spaces are designated to allow visitors to connect with nature and experience the beauty of the river environment. Bird habitats are created to attract and support diverse bird species, enhancing the area's biodiversity and providing opportunities for birdwatching. Platforms for recreation, such as observation decks and fishing piers, are installed to offer accessible and enjoyable experiences for visitors. Wayfinding paths are developed to guide people through the landscape, interpret its ecological significance, and promote environmental awareness and management.

4.



5.

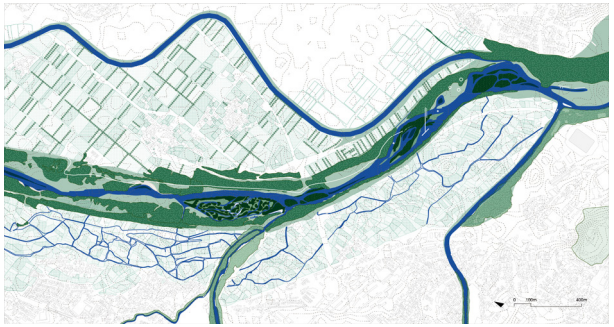


Figure 52. Sequential layers of the flood safety and ecology plan along the Ōi River Mainstream.
Source: The Author, 2024.

Flatlands:
Main river stream

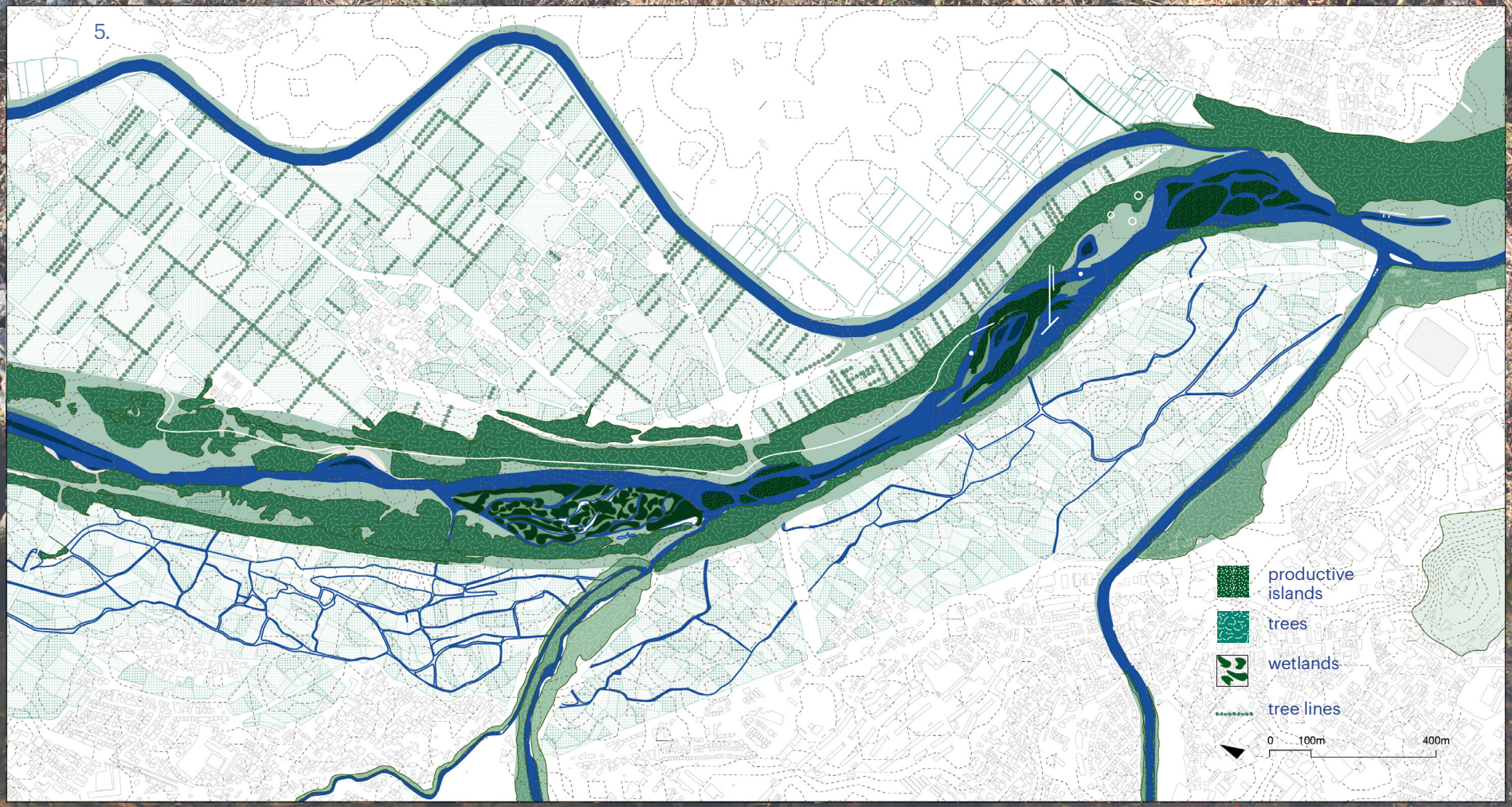


Figure 53. Design plan for flood safety and ecology along the Ōi River Mainstream.
Source: The Author, 2024.

Flatlands:
Flood control

The first keymap of the study area highlights the inundation zones, identifying regions most susceptible to flooding. This detailed analysis informs the subsequent plan, which envisions a controlled flooding scenario occurring every 6-10 years, typically following a typhoon. Controlled flooding is an intentional strategy designed to manage excess water, mitigate damage, and utilise the natural floodplain functions. By allowing the river to overflow into designated zones, we can reduce the risk to urban areas, promote groundwater recharge, and support the regeneration of riparian ecosystems. This approach not only enhances flood resilience but also contributes to the ecological and hydrological health of the landscape, ensuring a balanced interaction between human activities and natural processes.

Inundation depth

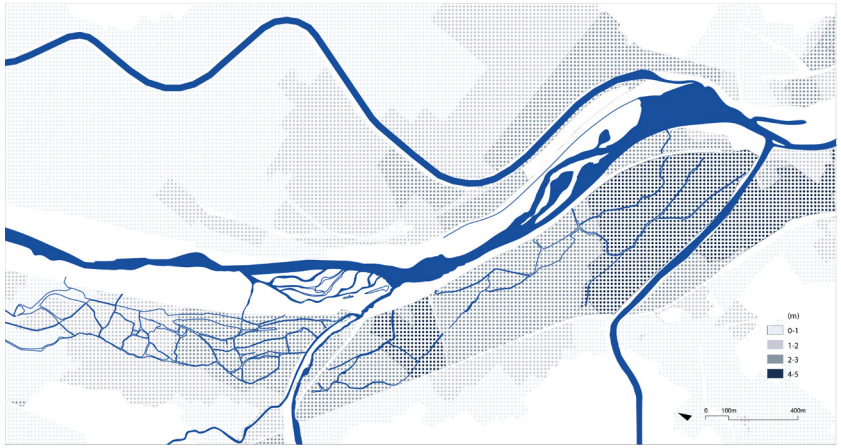


Figure 54. Keymap of the inundation depth along the Ōi River Mainstream. Source: The Author, 2024.

Landscape state during a controlled flood event:
Occurring every 10 years

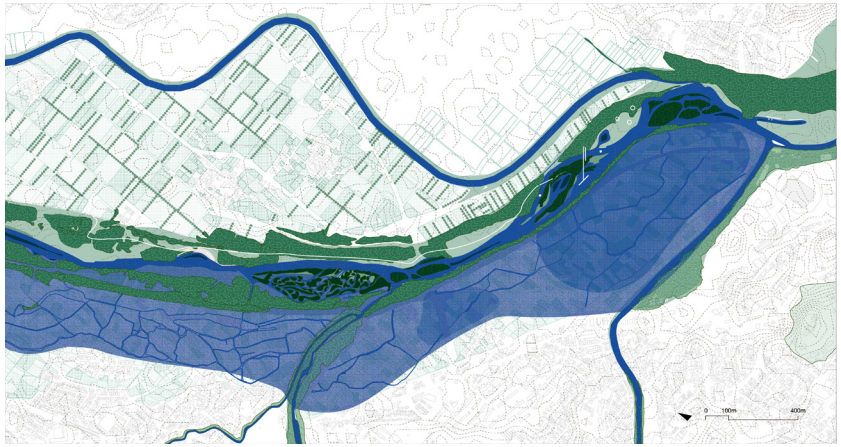


Figure 55. Landscape state during a controlled flood event along the Ōi River Mainstream. Source: The Author, 2024.

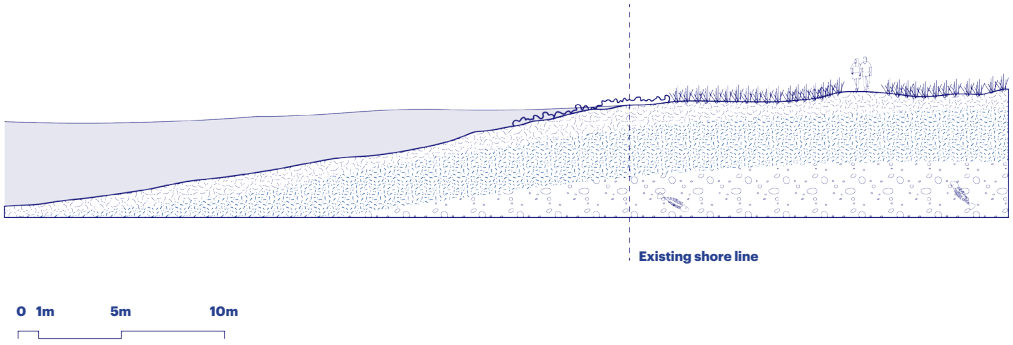
Flatlands:
Renaturalizing river edges
Ecology

Zoomed-in sections focus on the renaturalization of river edges and the enhancement of local ecology. These sections contrast the current state of the river edge with the planned expanded version, showcasing the transformation through illustrative materials and pictures of native flora and fauna species. The renaturalization efforts aim to soften the riverbanks, reintroduce native vegetation, and create habitats that support local wildlife. By expanding and naturalizing the river edges, the project promotes biodiversity, stabilizes the banks to prevent erosion, and improves water quality, while fostering a deeper connection with the natural environment.

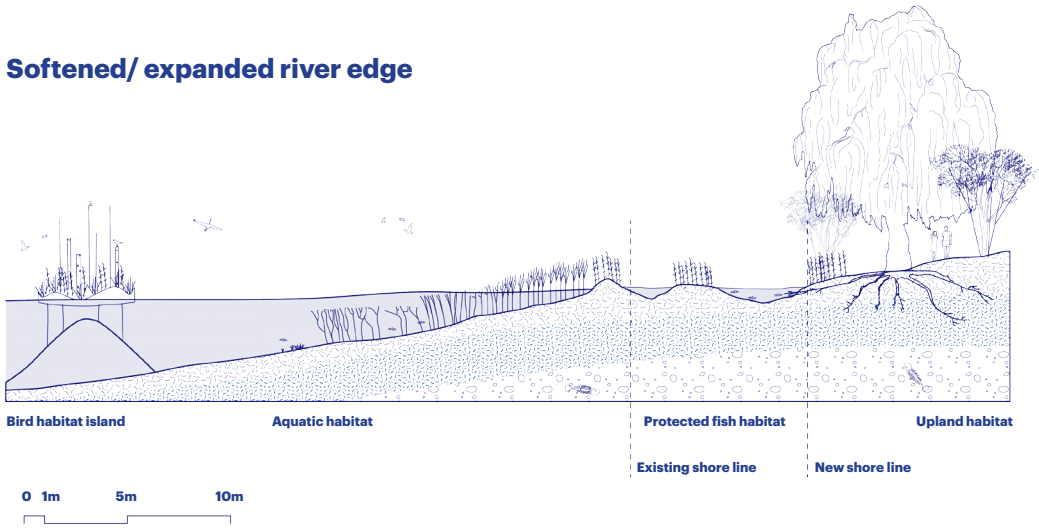
Figure 57. Section of the expanded riverbank.
Source: The Author, 2024.

Figure 56. Section of the current riverbank..
Source: The Author, 2024.

Exisitng river edge



Softened/ expanded river edge



Flatlands:
Renaturalizing river edges
Ecology

Aquatic species:

Cyprinidae

Loachidae

Goby

Bird species:

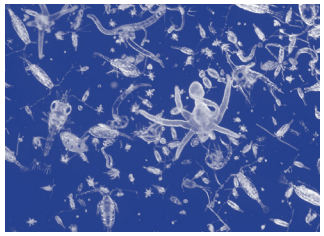
Kingfisher

Oriental stork

Cormoran

Aquatic organisms:

Ishigakigai

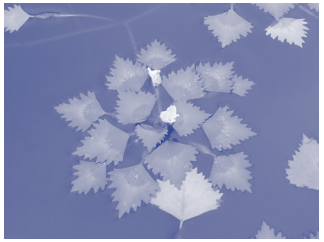


Plankton

Insects

Figure 57. Section of the expanded riverbank. Source: The Author, 2024.

Wetlands



Water chestnut
Trapa natans

Common reed
Phragmites australis

Trillium
Trillium grandiflorum

Common reed
Typha latifolia

Sediment deposition areas

Liverwort
Marchantiophyta

Common ragweed
Ambrosia artemisiifolia

Japanese stiltgrass
Microstegium vimineum

Annual bluegrass
Poa annua

Water edges

Common bulrush
Juncus effusus

Japanese parsley
Oenanthe javanica

Japanese knotweed
Fallopia japonica

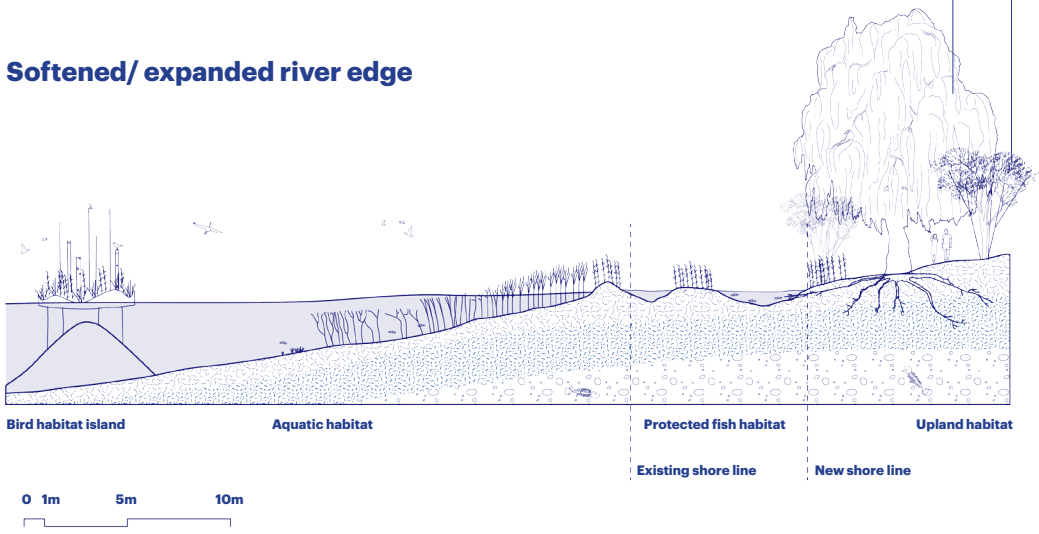
Peppermint
Mentha × piperita

Trees

Euphorbiaceae
Neoshirakia Japonika

Willow
Salix alba

Softened/ expanded river edge



Flatlands:
Ōi River in the past

Remember the sky that you were born
under, know each of the star's stories.
Remember the moon, know who she is.
Remember the sun's birth at dawn,
that is the strongest point of time.
Remember sundown and the giving
away to night.
Remember your birth, how your mother
struggled
to give you form and breath. You are
evidence of her life, and her mother's,
and hers.
Remember your father. He is your life,
also.

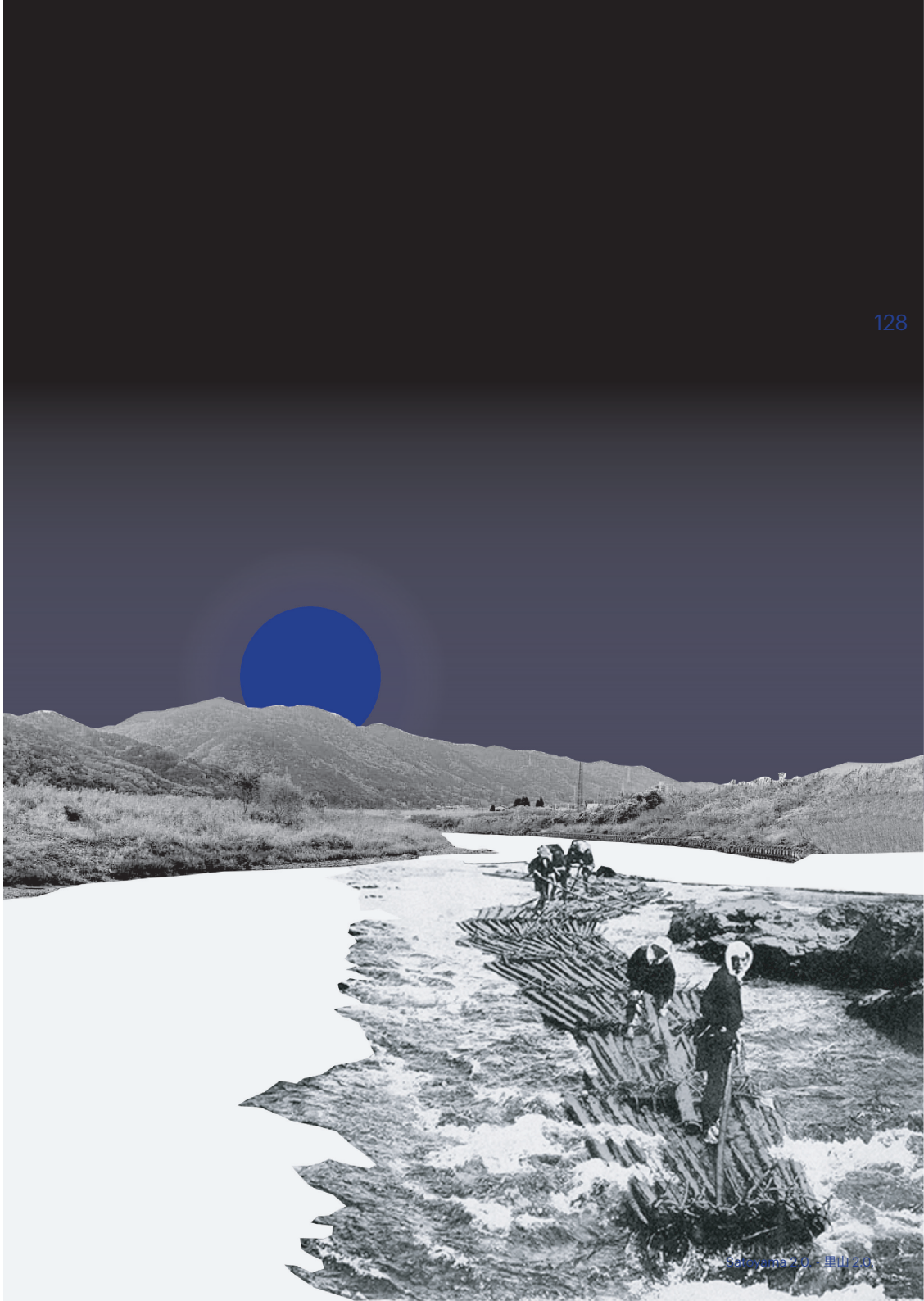


Figure 58. Collage of the Oi river and water transportation traditions. Source: The Author, 2024.

Flatlands:
Ōi River present

Remember the earth whose skin you are:
red earth, black earth, yellow earth,
white earth brown earth, we are earth.
Remember the plants, trees, animal life
who all have their tribes, their families,
their histories, too. Talk to them,
listen to them. They are alive poems.

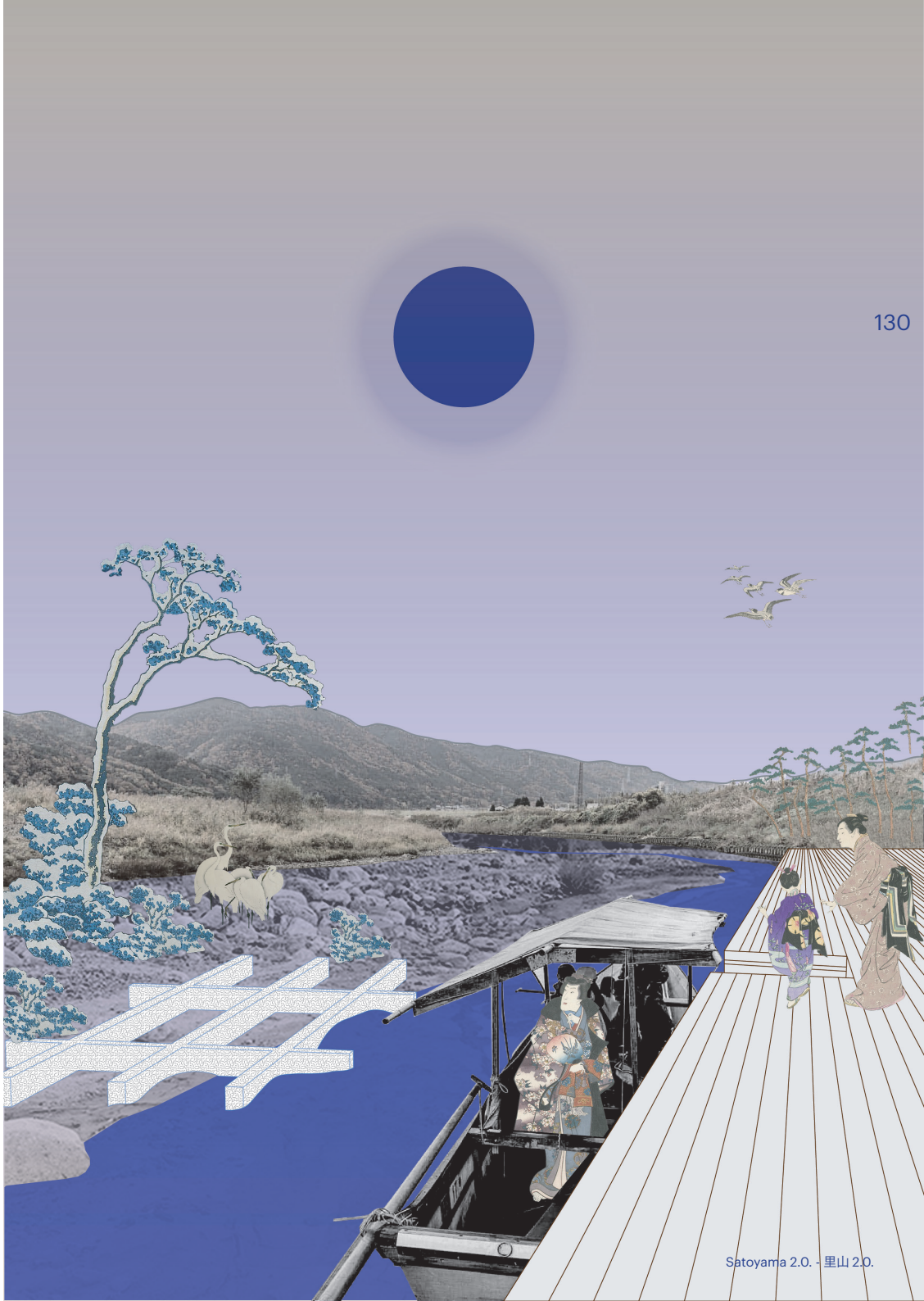


Figure 59. Collage of the application of Satoyama 2.0 principles along the Ōi River.
Source: The Author, 2024.

Flatlands:
Ōi River in 15 years

Remember the wind. Remember her voice. She knows the origin of this universe.
Remember you are all people and all people are you.
Remember you are this universe and this universe is you.

Figure 60. Collage of the transformation along the Ōi River after 15 years of implementing the principles
Source: The Author, 2024.

Flatlands:
Ōi River during typhoon

Remember all is in motion, is growing,
is you.
Remember language comes from this.
Remember the dance language is, that
life is.

Harjo, J. (1983). Remember. In She Had Some Horses (pp. 15-16). Thunder's Mouth Press.

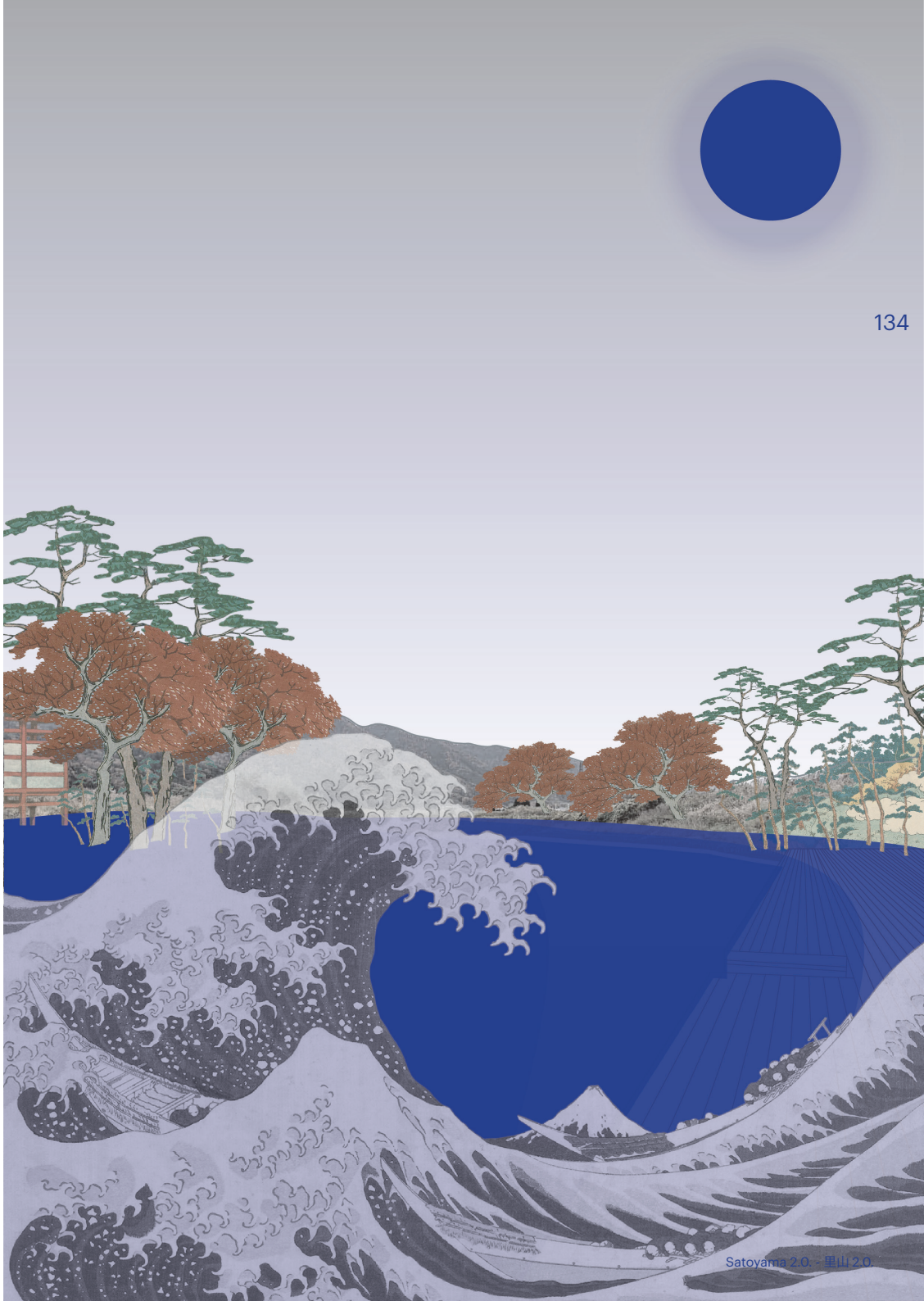
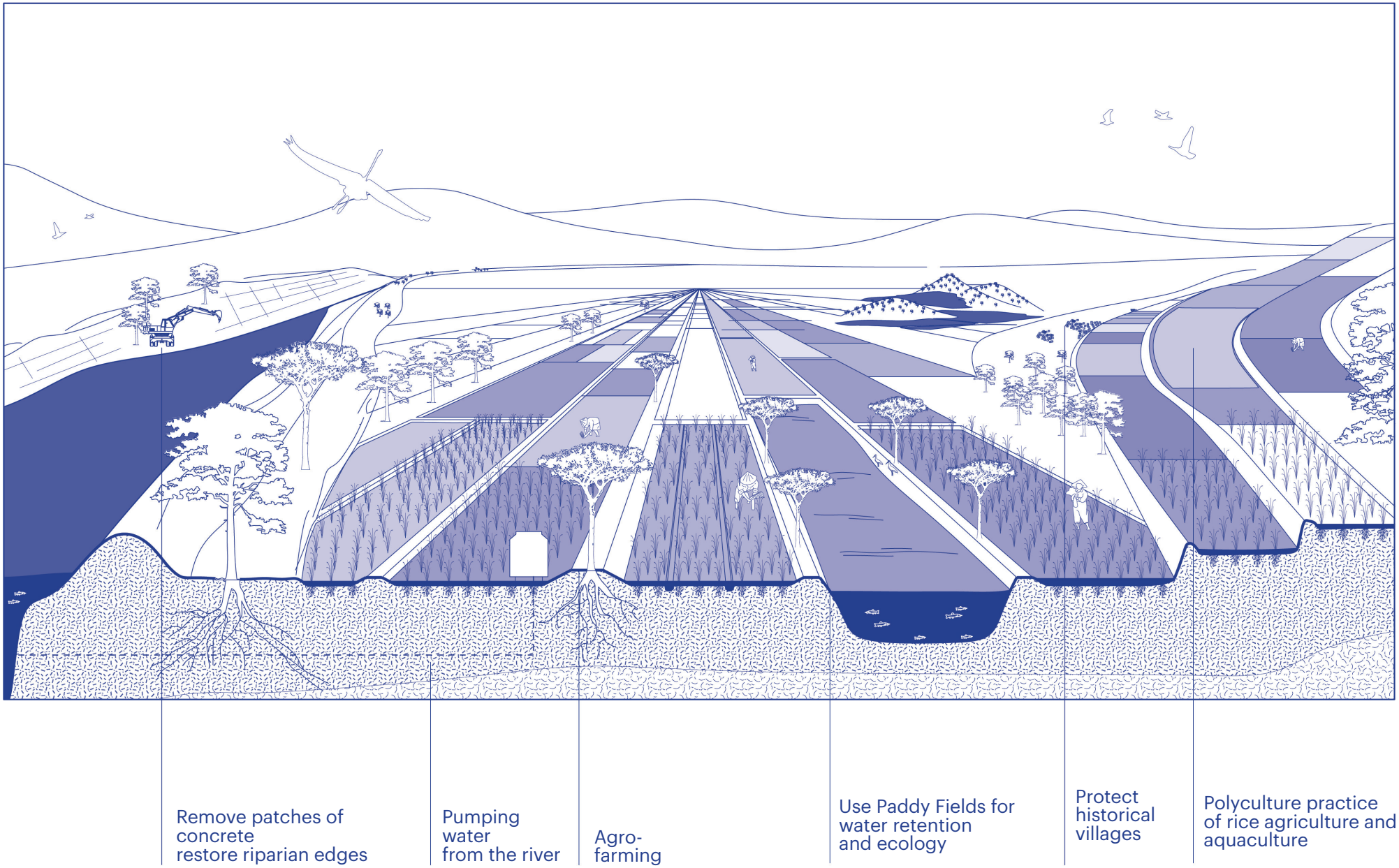


Figure 61. Collage of a controlled flood event along the Ōi River during a typhoon.
Source: The Author, 2024.

Flatlands -Hillsides:
Paddy fields - Wet season

Figure 62. Effect of paddy fields design principles on the landscape during the wet season.
Source: The Author, 2024.



Flatlands - Hillsides:
Paddy fields - Dry season

Figure 63. Effect of paddy fields design principles on the landscape during the dry season.
Source: The Author, 2024.

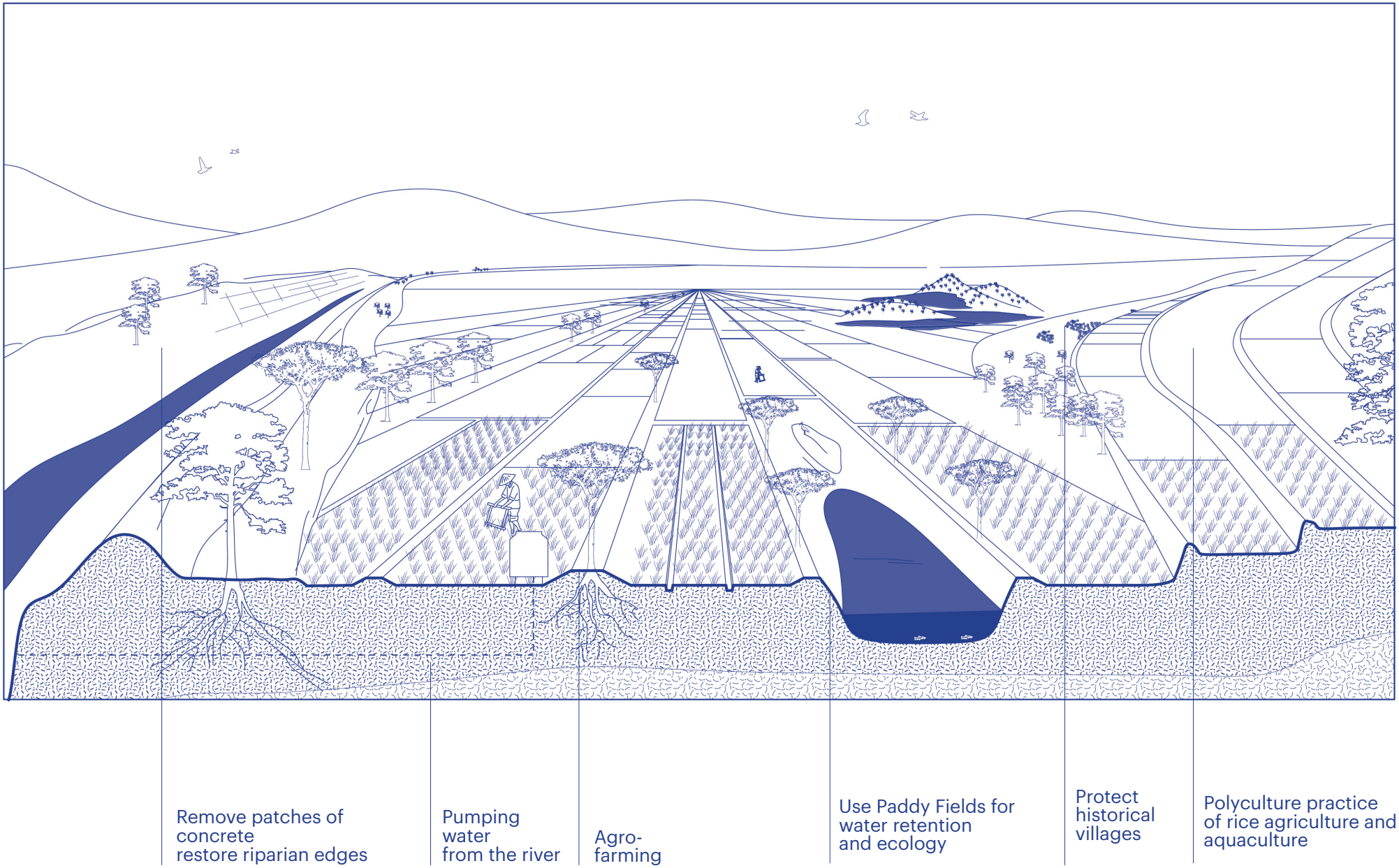


Figure 64. Terraced rice fields in Japan, demonstrating the traditional agricultural technique of tanada, which supports sustainable farming and water management.

May: Genkai, Saga Prefecture
Source: Kit Takenaga, 2014.

Flatlands - Hillsides: Paddy fields in the past

This design location focuses on the interface between hillsides and flatlands, aiming to restore riparian edges and promote sustainable land use practices inspired by traditional Japanese techniques.

One key aspect involves the removal of patches of concrete edges to restore natural riparian zones along the riverbanks. This restoration enhances biodiversity, stabilizes soil, and improves water quality, drawing inspiration from Japan's long-standing respect for natural landscapes.

Additionally, the design incorporates the traditional Japanese practice of pumping water from the river for agricultural purposes. This sustainable water management technique ensures efficient irrigation while minimizing the use of groundwater resources.

Figure 65. Collage of two women engaged in traditional agriculture activities in the paddy fields.
Source: The Author, 2024.

Flatlands - Hillsides: Paddy fields in 15 years

Agro-farming is another vital component, combining traditional Japanese agricultural methods with modern practices. By utilizing the principles of polyculture and rotation cropping, the design promotes biodiversity, soil health, and resilience to pests and diseases. This approach draws upon Japan's rich agricultural heritage, where diverse crops are cultivated in harmony with nature.

Furthermore, the design integrates the use of paddy fields for water retention and ecological enhancement. Paddy fields act as natural reservoirs, storing water during periods of excess rainfall and releasing it gradually during droughts. This practice not only supports rice cultivation but also provides habitat for aquatic species and helps regulate water flow in the surrounding ecosystem.

Lastly, the design prioritizes the protection of historical villages nestled within the landscape. Measures are implemented to safeguard these villages from development pressures while promoting sustainable tourism and community engagement.

Figure 66. Collage of harmonious Agro-Farming: Tradition Meets Innovation.
Source: The Author, 2024.

Headwaters:
Knitting Together- Restoring the Satoyama Forest

The third design location focuses on the headwaters and the preservation of the satoyama forest, employing a contour planting design inspired by traditional Japanese forest practices. Selected for its historical significance, this area has transformed since 2010, with the arrival of a road leading to partial deforestation that has never been fully restored to its original condition. In response, this design aims to revitalize the degraded areas and restore the forest to its former condition.

Drawing upon centuries-old wisdom, the design integrates Shiiba-Style Forestry, a method originating from Miyazaki Prefecture. This approach emphasizes selective logging and planting to maintain forest health, ensuring continuous regeneration and biodiversity. Additionally, regular tending (Ueki) practices are implemented, involving the thinning out of young forests to reduce competition among trees and promote the growth of stronger and healthier specimens. These practices not only ensure a sustainable timber supply but also contribute to the overall health and resilience of the forest ecosystem.

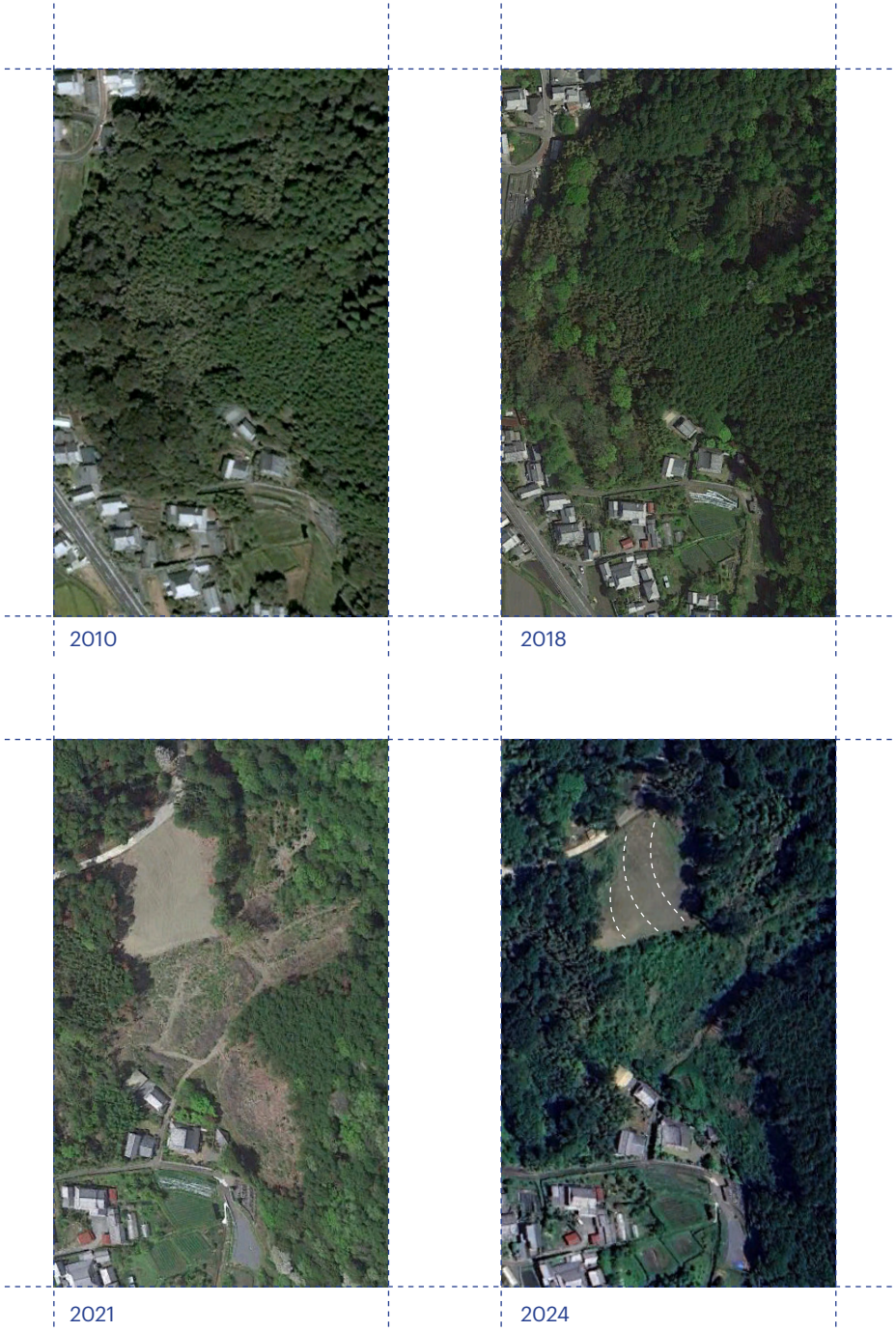


Figure 67. Google Earth screenshots showing deforestation in the same area from 2010 to 2024. Source: Google Earth.

Figure 68. The logging scenery at the end of the Taisho period.

Source: Saitama Prefectural Museum of Rivers, 2020.

Figure 69. Utilizing tree trunks for wood transportation.

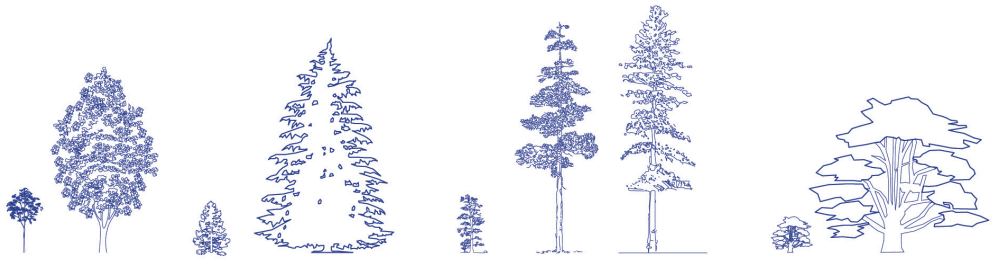
Forestry in Saitama Prefecture.
Source: Saitama Prefectural Museum of Rivers, 2020.

Headwaters:
Knitting Together- Restoring the Satoyama Forest

Furthermore, the design embraces cultural and religious practices deeply rooted in Japanese traditions. Forests hold sacred significance in Shintoism, where they are revered as sacred spaces (shinrin) inhabited by kami (spirits). Many shrines are nestled within forests, and rituals are performed to honor the spirits residing in trees. These cultural practices foster a deep sense of respect and stewardship for the forest, reinforcing the importance of maintaining its ecological integrity for future generations. Overall, the design seeks to harmonize modern conservation efforts with time-honored Japanese forest practices, ensuring the preservation of the satoyama forest as a cherished cultural and ecological heritage.

Figure 71. (Right)
Sequence of sections illustrating the contour planning process.
Source: The Author, 2024.

Figure 70. (Left) Pioneer tree species in their youth and at maturity.
Source: The Author, 2024.



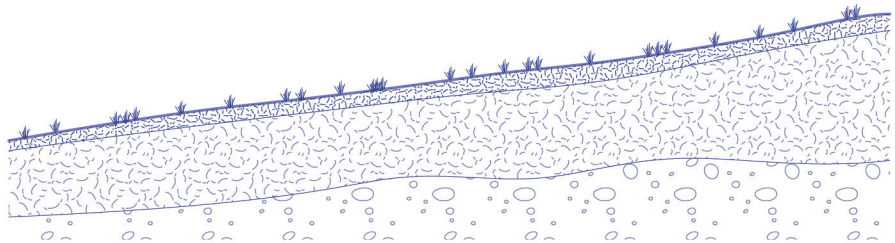
Sawtooth Oak
Quercus acutissima

Hinoki Cypress
Chamaecyparis obtusa

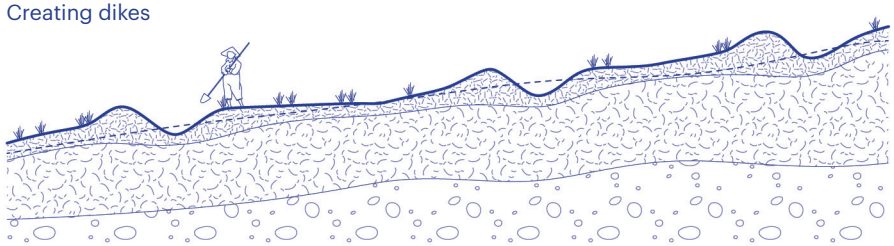
Japanese Red Pine
Pinus densiflora

Japanese Black Pine
Pinus thunbergii

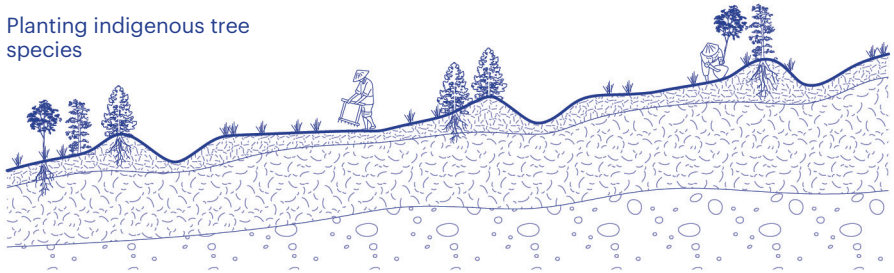
Current situation



Creating dikes



Planting indigenous tree species



Wet season
Collecting runoff water & infiltration

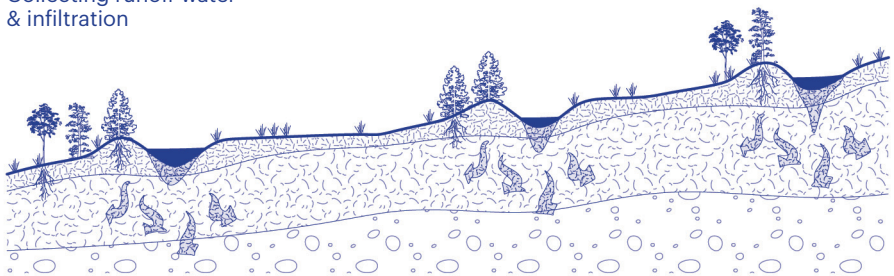


Figure 72. In Shintoism, forests hold sacred significance (shinrin), serving as spaces for rituals honoring kami (spirits) dwelling within trees. This cultural reverence fosters respect and stewardship for forests.

Kamishikimi Kumanoza Shrine in Kumamoto Prefecture
Source: Ageo Akaihana, 2012.

Headwaters:
Knitting Together- Restoring the Satoyama Forest

Figure 73.Section showing how the planting process knitted the landscape together and evolved over time.
Source: The Author, 2024.

Forest Garden

Loquat
Eriobotrya japonica

Asian Pear
Pyrus pyrifolia

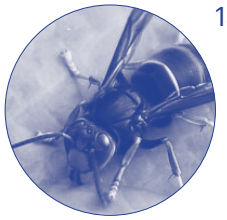
Citrus Trees
Yuzu, Mikan, Sudachi

Ecology

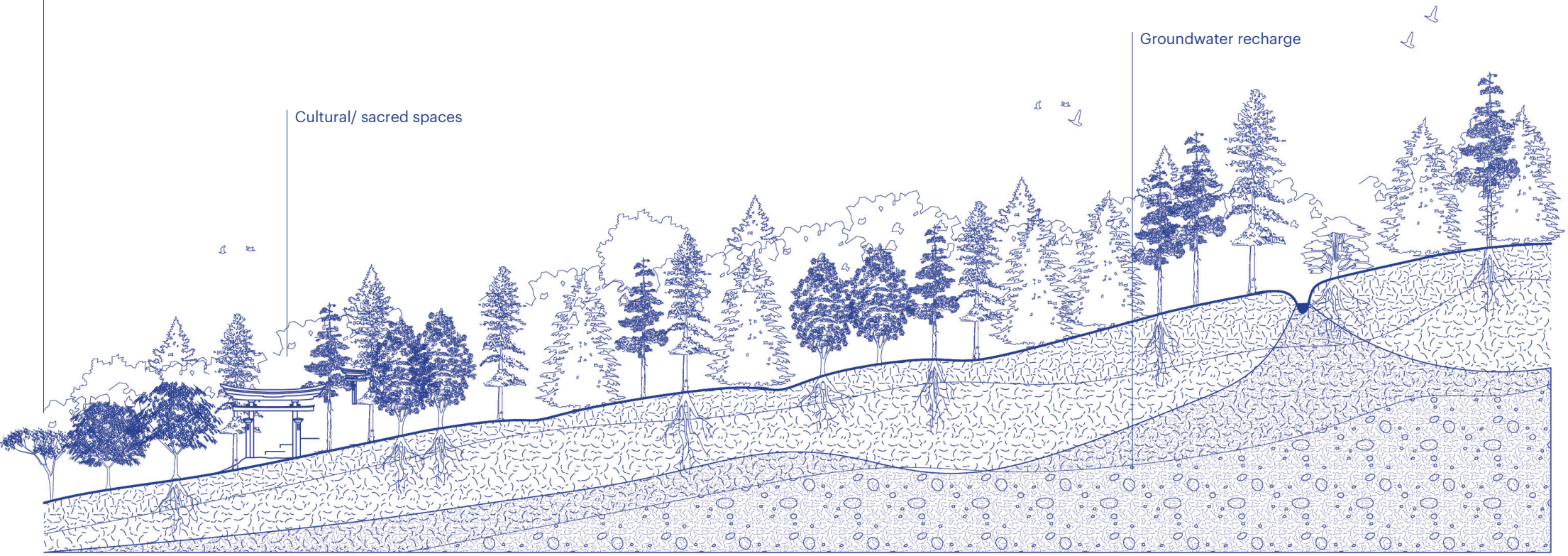
Mammals:
Japanese Marten

Birds:
Japanese Pheasant

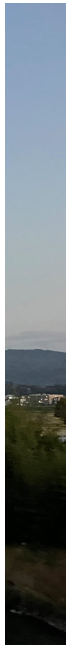
Reptiles:
Japanese Rat Snake



Insects:
Giant Japanese Hornet



Distill



Satoyama 2.0. design principles

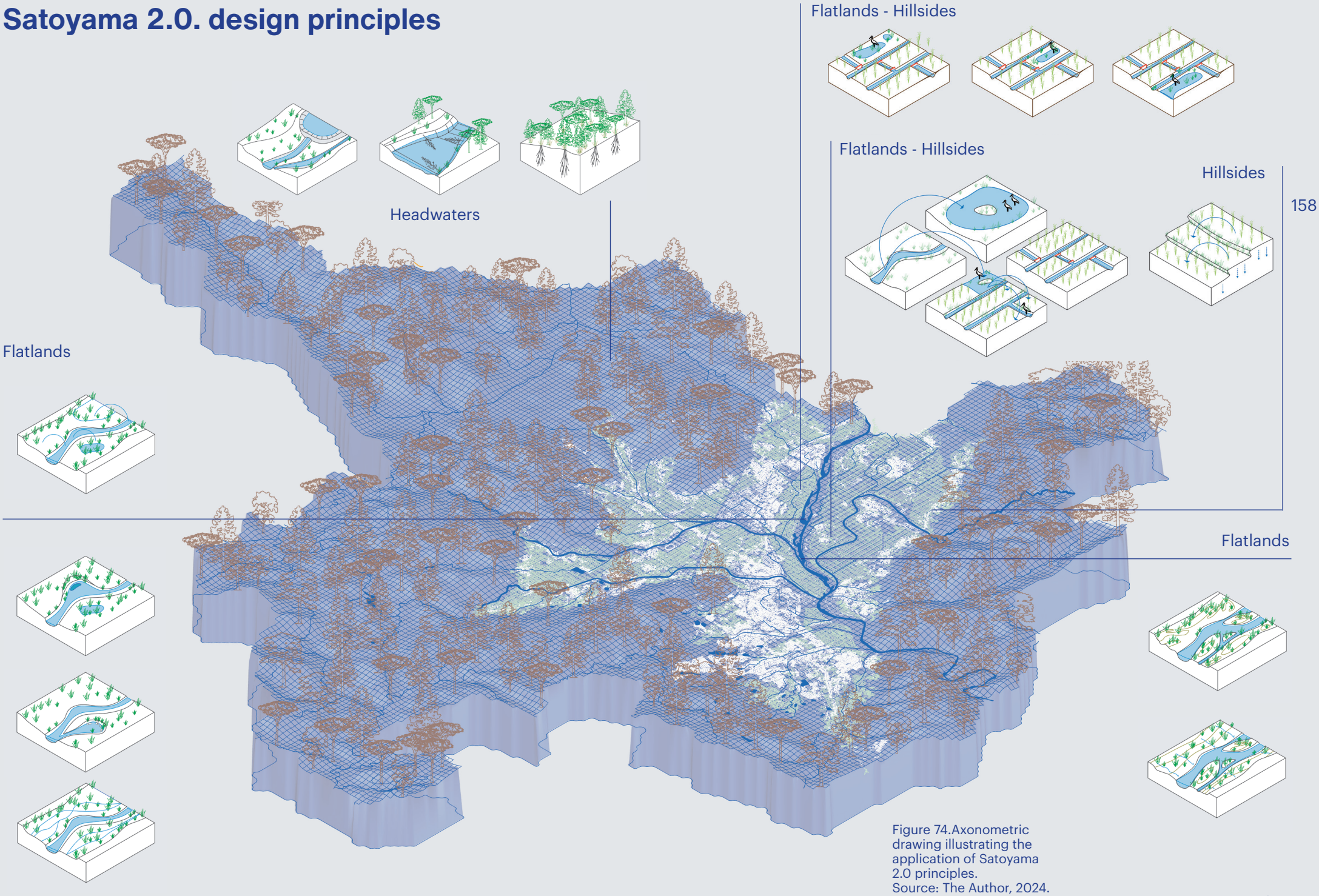


Figure 74.Axonometric drawing illustrating the application of Satoyama 2.0 principles.
Source: The Author, 2024.

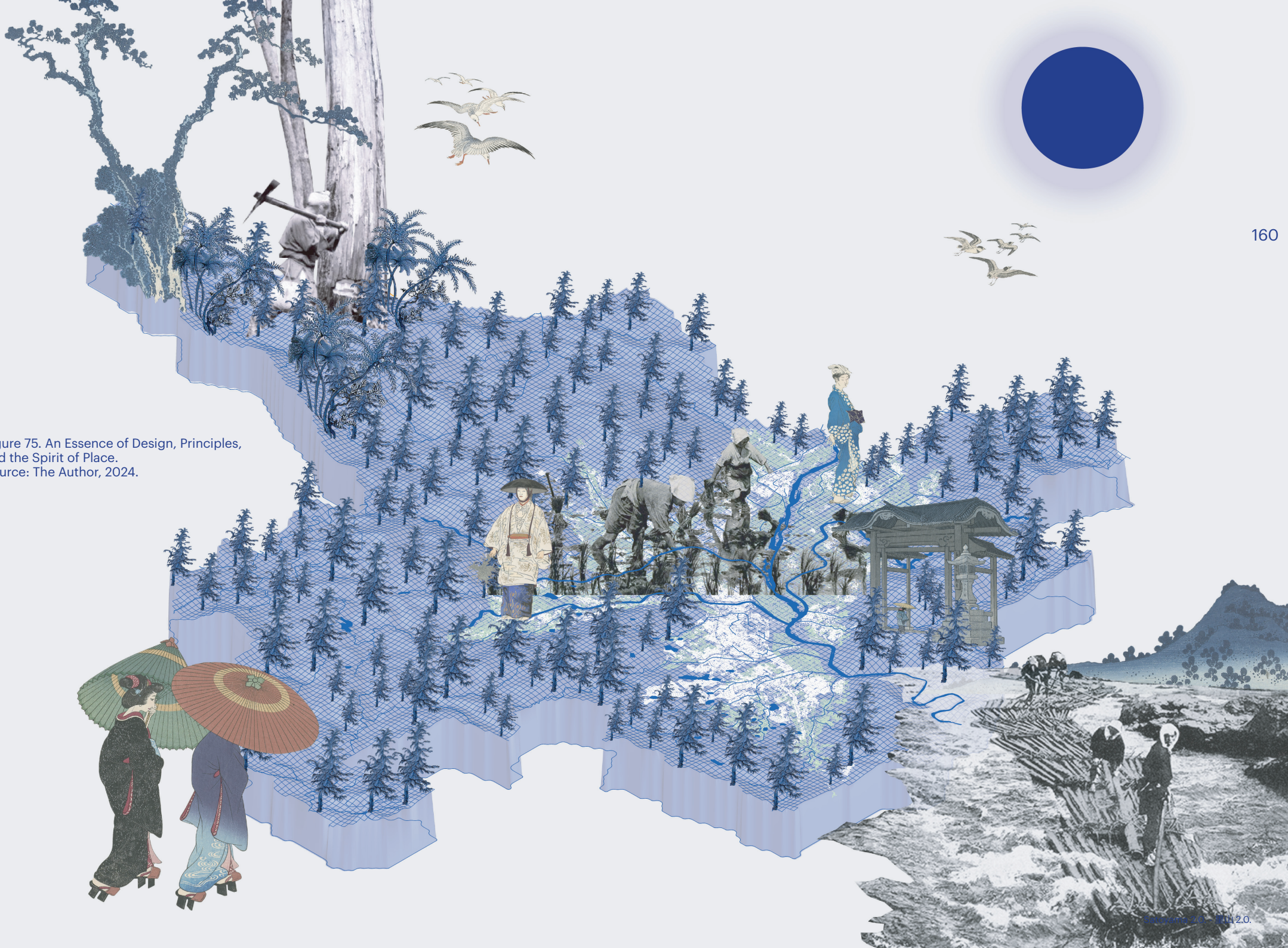


Figure 75. An Essence of Design, Principles, and the Spirit of Place.
Source: The Author, 2024.

Conclusion

Conclusion

Introduction - Methodology overview - Critical analysis of findings

The thesis explored ecological preservation, cultural revitalization, and flood mitigation as interconnected challenges, advocating for a shift towards sustainable practices that restore the natural balance of the environment while safeguarding cultural heritage and community resilience. It addressed the urgent need for comprehensive and sustainable strategies to manage river landscapes in water-sensitive territories such as Kameoka and the Oi River watershed in Japan. The central challenges included frequent floods, environmental degradation, and diminishing cultural significance, stemming from the Anthropocene era and human interventions like deforestation and urbanization. The objectives included diagnosing historical landscape operations, analyzing Anthropocene influences, and developing landscape principles for flood mitigation and cultural enhancement. The study was an exercise to devise a methodology that attempted to align these findings by proposing actionable design strategies for specific case study areas within the Kameoka riverfront community. The project existed only based on existing circumstances and attempted to work through the identified problems utilizing the landscape-based urbanism approach to develop integrated strategies for river landscape management. Nevertheless, all efforts to propose nature-based solutions could not fully address the enormity of the river watershed problems caused by ongoing human influence on the landscape. The project did not position itself within a critical landscape with a revolutionary design approach but rather as an exercise proposing conditions for systemic change.

Limitations of planning and design field - Paradigm shift and reevaluation

Planning and design fields are limited when addressing complex river landscape challenges, such as those in Kameoka and the Oi River watershed. The interdisciplinary nature of river landscape management necessitates collaboration across diverse fields such as landscape architecture, urban planning, hydrology, ecology, sociology, and cultural studies, posing challenges in achieving seamless integration and coordination among these disciplines. Design and planning often exhibit inherent biases favoring modernization and infrastructure-centric solutions, potentially overlooking the cultural and ecological values inherent in traditional landscape practices. This phenomenon is evident in Japan as well, where the introduction of modernization and infrastructure-centric solutions, such as concrete and alien materials, can threaten the preservation of delicate landscape features and soft surfaces that hold cultural and ecological significance. To advocate for a paradigm shift in landscape and design professions towards acknowledging and respecting plurality in design actions, it is crucial to embrace indigenous knowledge, prioritize ecosystem services, engage communities meaningfully, and promote adaptive management. This paradigm shift calls for recognizing and integrating diverse perspectives and cultural narratives within landscapes, advocating for the inclusion of indigenous and traditional knowledge systems, prioritizing ecological integrity alongside human-centric needs, and fostering participatory and adaptive approaches that empower communities and promote landscape resilience. If our field is unable to move beyond the paradigms that continue to exist within the limits of modernization and infrastructure-centric solutions, we risk further marginalizing traditional landscape practices and undermining the resilience of ecosystems and communities.

Unanswered questions and future Directions -Final reflection and importance of Landscape Architecture role

The thesis recognizes that the questions posed are complex and cannot be fully answered using current tools and approaches in landscape and design. Important unanswered questions include how to incorporate diverse cultural and ecological values into landscape management and how to balance modernization with the preservation of traditional landscapes. It is crucial to keep asking critical questions that challenge our assumptions and consider different perspectives and worldviews in landscape and design practices. Emphasizing adaptive and context-sensitive approaches to understanding and responding to complex landscape conditions, which can evolve over time and accommodate diverse perspectives and values, holds significant importance and impact. For this reason, Landscape Architecture must go beyond the restrictive ideas influenced by dominant views and modernist principles in landscape design. It is necessary to embrace ongoing reflection and adaptation to address evolving challenges, ensuring that designs remain relevant, responsive, and resilient in an ever-changing world.

Reflection

Reflection

Relationship between Research and Design

Design through research
Design through research played a crucial role in establishing clear design objectives based on research insights. By understanding the ecological, cultural, and urban aspects of the Ōi River watershed, the thesis was able to define specific design goals, such us enhancing flood resilience, revitalizing cultural water practices, and preserving biodiversity. Design decisions were directly shaped by research findings, incorporating knowledge from studying historical landscape operations, current conditions, and human interventions. This approach made sure that design strategies were based on a deep understanding of landscape's dynamics and challenges. Throughout the design process, the project engaged in continuous refinement, integrating new research inputs simultaneously. This process allowed for flexibility and adaptation, ensuring that our design solutions remained responsive to the challenges identified through research.

Research through design
The design itself became a method of research and exploration. Through designing interventions for the Ōi River watershed, the project generated new knowledge and understanding. Design proposals served as experiments that tested hypotheses derived from research, helping to challenge the initial assumptions. This involved observing how proposed interventions interacted with the landscape and community. Research through design allowed the project to gather empirical data and insights that contributed to the research process, informing further iterations. During the design process, new questions and research directions often arose due to unexpected challenges or opportunities encountered during implementation. This prompted further exploration into specific areas, cultivating a cyclical relationship between design and research that continuously promoted learning and discovery.

Relationship between the graduation project topic and the topic of the Design Resilient Coastal Landscapes (DRCL) lab

The graduation topic 'Satoyama 2.0: A New Chapter in the Culturally and Water- Sensitive Satoyama Landscape of Kameoka' aligns with the DRCL lab focus on landscape-based urbanism utilizing landscape timeline diagnosis and nature-based solutions. Specifically, the graduation project examines the Ōi River watershed, focusing on the intersection of ecological, cultural, and urban dynamics. In the first phase, an in-depth investigation uncovers the historical operation of the Ōi River basin subsystem, exploring its ecological, cultural, and urban aspects before flood disasters. Simultaneously, the project explores the current condition post-flood disasters, analyzing the impact on the system's functionality. This assessment also considers Anthropocene influences, providing insights into the Ōi River's overall well-being. The second phase of the project centers on Nature-Based Design for Flood Mitigation, a method used under the scope of DRCL lab. It involves identifying and analyzing design principles rooted in nature-based approaches crucial for mitigating flood hazards. This exploration will extend to understanding how these strategies can enhance the cultural significance of water transportation, riparian land, and traditions associated with harmonizing with river water fluctuations. Following this, the project transitions to urban landscape design for resilience, evaluating the potential contribution of urban landscape design principles to enhance the overall resilience of the entire river system.

Relation between the graduation project topic and the master track of landscape architecture

The graduation project integrates within the expansive realm of landscape architecture, as its primary focus on ecological, cultural, and urban dynamics perfectly aligns with the fundamental principles and objectives of the discipline.By delving into the historical and current facets of the Ōi River watershed, the project inherently embodies the core of landscape architecture. It emphasizes the discipline's pivotal role in not only understanding but actively shaping urban environments to be both sustainable and culturally sensitive. Through a lens that considers the interconnectedness of ecological health, cultural significance, and urban functionality, the project contributes to the broader mission of landscape architecture—to cultivate urban landscapes that are not only aesthetically pleasing but also environmentally resilient and culturally enriching.

Bibliography

Harjo, J. (1983). Remember. In M. Smith (Ed.), Poems of nature (2nd ed., pp. 45-46). ABC Publishers.

Hough, M. (1990). Principles for regional design: Theory in landscape architecture.

Hunt, J. D. (1992). Reading and writing the site: Theory in landscape architecture.

Japanese Institute of Irrigation & Drainage. (2003). Title of the document [Pamphlet/PDF]. Retrieved from http://www.maff.go.jp/www/counsil/counsil_cont/nouson_sinkou/nogyo_noson_seibibukai/kikaku_syoiinkai/mizusigen.htm

Marsh, W. M. (1991). Landscape planning: Environmental applications.

Norberg-Schulz, C. (1979). Genius loci: Towards a phenomenology of architecture.

Nijhuis, S. (2020). Landscape authenticity. The Landscape as Living System, History and Spatial Experience, 119(4), 32-37. https://doi.org/10.48003/knob.119.2020.4.702

Nijhuis, S. (2022). Landscape-based urbanism: Cultivating urban landscapes through design. In R. Roggema (Ed.), Design for Regenerative Cities and Landscapes. Contemporary Urban Design Thinking (pp. 249–277). Springer Nature. https://doi.org/10.1007/978-3-030-97023-9_11

Smithson, R., Becher, B., & Becher, H. (2002). Field trips.

Steenbergen, C. (2008). Composing landscapes: Analysis, typology and experiments for design.

Steiner, F., Weller, R., M'Closkey, K., & Fleming, B. (2019). Design with nature now.

Woodward, J. (1997). Signature-based landscape design: Theory in landscape architecture.

Wascher, D. M. (2000). From colonization to globalization: A history of globalization in the Nile Valley [Doctoral dissertation, Wageningen University]. https://library.wur.nl/WebQuery/edepot/43246

Flatlands and River restoration sources

The River Restoration Centre. (2020). Manual of River Restoration Techniques. Retrieved from https://www.therrc.co.uk/manual-river-restoration-techniques

Paddy fields agriculture local practices and design sources

Japanese Institute of Irrigation & Drainage. (2003). Title of the document [Pamphlet/PDF]. Retrieved from http://www.maff.go.jp/www/counsil/counsil_cont/nouson_sinkou/nogyo_noson_seibibukai/kikaku_syoiinkai/mizusigen.htm

Nippon.com. (2014). An Agricultural Wonder: Japan's Vanishing Terraced Rice Fields. Retrieved from https://www.nippon.com/en/images/i00027/

Omusubi Gonbei. (n.d.). Rice fields as eco-existence. Retrieved from https://www.omusubi-gonbei.com/en/particular/environment/

Wageningen University & Research. (2015). Threatened landscapes unite rural and urban communities. Retrieved from https://edepot.wur.nl/408620

Forestry practices and design sources

Mainichi Shimbun. (n.d.). The history of forestry seen in old photos: People in Kiso facing huge trees / Nagano. Retrieved from https://mainichi.jp/articles/20210802/ddl/k20/040/059000c

Ministry of Land, Infrastructure, Transport and Tourism. (n.d.). Water management and national land conservation. Retrieved from https://www.mlit.go.jp/mizukokudo/sabo/gakekuzure_taisaku.html

Mori-naka. (2022). What are the challenges faced by forestry? Introducing solutions and initiatives to address challenges. Retrieved from https://mori-naka.jp/article/2956/

Takachiho-Go-Shiibayama GIAHS. (n.d.). What is the World Agricultural Heritage Gao Qiansui Township? Shiba Mountain Region. Retrieved from https://takachihogo-shiibayama-giahs.com/about-ch

Figures

TU Delft
BK Bouwkunde
Landscape Architecture

DESIGNING RESILIENT
COASTAL LANDSCAPES