

FUTURE
SHAN SHUI
CITY

未来
山水
水城

WATER-BASED SOLUTIONS
FOR RURAL AND URBAN PROTOTYPES
IN LISHUI, ZHEJIANG

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INTRODUCTION

介绍

*WATER is the most precious vital source. Water is indispensable for humans: it allows life, it benefits the spirit, it teaches to think, it teaches to be in the world. To understand the evolution of the Chinese reality we can't ignore water; we must start from it, investigate its indissoluble bond with the Chinese population, seek in tradition the harmonious ideal of the relationship between human and nature, understand its importance in the national political and economic management and finally, analyze the climatic problems and the risk that threaten the present and the future. China has made water an inner guide that shakes the body and spirit and the regulating principle of all the territorial dynamics that have followed one another over the centuries. In fact, on the one hand, water, in Chinese culture, has been object of **veneration** to be observed, contemplated, and respected in order to achieve the balance between man and nature; on the other hand, it has been exploited beyond all limits, causing scarcity of water resources, pollution and damage to the environment and man. Today we have an increasingly anthropocentric vision of nature: man has exploited and shaped the natural environment according to his needs and ambitions, implementing interventions that have benefited the supply but have devastated the natural context, moving away from those ideals of respect and reverence. **Water-related problems** are pressing issues and ever new challenges that China must face to solve the crisis in which it pours. Inappropriate management of the water system is a limiting factor for China's sustainable development and, certainly, an increasingly serious wake-up call for the future. This thesis research is part of the context of the **Future Shan-Shui City** competition launched by the Government and set in **Lishui** Zhejiang Province, with the aim of defining specific solutions for the Chinese cities of the future, starting from the Shan-Shui tradition to achieve sustainable urban development. The Polytechnic of Turin, together with the South China University of Technology, won third place with the proposal "Prosperous Lishui. One valley, three landscapes", which identifies two faces of the city: rural in the valley and urban close to the mountains. These two aspects are considered within the thesis as two different ways of using and managing the water element, that is permanent and productive on the rural side and temporary and for leisure on the urban side. The project involves the construction of two **prototypes** of public buildings that constantly relate to the water element with the aim of managing risk and restoring human-nature relation. In the first two chapters we investigate the water element from a cultural and territorial point of view and then we propose, in the following ones, analyses that lead us to create spaces capable of **managing water** resources in unfavorable climatic situations and, at the same time, to restore the proximity and harmony between humans and the natural elements of the Chinese landscape.*

WATER AS

01

(1.1)

*The artistic expression
of Shan Shui*

12-25

(1.2)

*Spatial pattern
of Shan Shui*

26-30

(1.3)

*Lishui as Future
Shan Shui City*

31-33

SHAN SHUI SPIRIT

(1.1)

The artistic expression of Shan Shui

(1.1.1)

Human and Nature

Traditional Chinese culture is based on a system of deeply rooted spiritual values, which have remained unchanged throughout history and have constituted the key concepts of ethical and philosophical thought. At the base there is a holistic conception of the universe that aspires to a cosmic order in which there is no clear separation between mind and spirit and there is a perfect balance between man and nature: the human being, in fact, is considered on the same level as any other natural element and with it must coexist in perfect harmony. Nature is to be considered as a constant of Chinese philosophical ideology, thanks to its being an intimate and mystical reference for man. Its importance derives from the naturalistic doctrine of Taoism, according to which human existence is regulated by the very laws of nature, which must be taken care of, accepting its limits and exploiting its resources. It manifests itself as a tangible element, through the landscape, but also as an intangible force, through phenomena and processes (Yizhao, 2016).

Harmony in the relationship between human and nature is essential both for respect for the environment and the development of an ecological awareness, and for the well-being of man, who is aware of human dependence on nature and can alienate himself from the real world through the contemplation of the landscape, reuniting with his spiritual ego. The continuous search for this balance has influenced every artistic and intellectual expression of Chinese culture, developing a certain aesthetic sensitivity and investigating new forms of spirituality that consider “the unity of nature and human beings” (Gao, Harvey, Zao, 2020).

The essence of this reflection lies in the cultural concept of Shan Shui (山水) by which the landscape is understood not only as a physical space but as ‘humanized nature’ (Zhao, 2020). It is an aesthetic abstraction of nature that has application in artistic disciplines such as Shan-Shui Painting and Shan-Shui Poetry and in the design of Shan-Shui Gardens (with architecture). Literally, the term is composed of ‘**shan**’ (山) and ‘**shui**’ (水) respectively ‘**mountain**’ and ‘**water**’. As an art form, we speak of Shan-Shui painting (Shan-Shui Hua, 山水) indicating a traditional Chinese style of landscape depiction that appeared at the end of the seventh century with the Tang Empire and then had its maximum flowering with the Song Dynasty (960-1279). It is not a representation for its own sake, but a complex system of thought that provides for many levels of interpretation of nature, is based on a set of requirements of balance, composition and form and presupposes a contemplative practice (Fu, 2009).

(1.1.2)

Mountain and Water

The two natural protagonists of the scene are, therefore, mountain and water, two elements apparently in contrast but which reveal themselves in symbiosis as they complement each other and outline the ideal habitat for man. This duality, taken from the Taoist philosophy of Yin -Yang, alludes to a fluid dynamism of the landscape.

Mountain (*yin*) symbolizes space and represents stability, greatness, prosperity and verticality; they were considered sacred since they were believed to be the abode of the immortals as they were close to Heaven, both in height and spirituality. They are considered the heart of Shan-Shui paintings as they regulate space with their permanence.

Water (*yang*) symbolizes time and represents fluidity, movement and horizontality; it does not refer to oceanic vastness but to large rivers and canals. It is a rather difficult element to represent as its mutability comes from the vitality of water that cannot be reproduced realistically (Ball, 2020). Other natural elements populate the Shan-Shui paintings, including the fog that represents the “spiritual emptiness”, rocks, trees and shrubs, but also buildings (such as temples and pavilions) and human activities (fishing, leisure), manifesting that harmony, always desired, between man and nature. These elements of the landscape are charged with a strong philosophical meaning that has its roots in tradition: mountain and water represent the comfort and fear of man, who is aware that human existence depends on natural laws that cannot be fully understood by the mind. For this reason, it is necessary to contemplate the meaning of the landscape through a surrealist perspective of interpretation of space.

Mountain

山

./shān/.

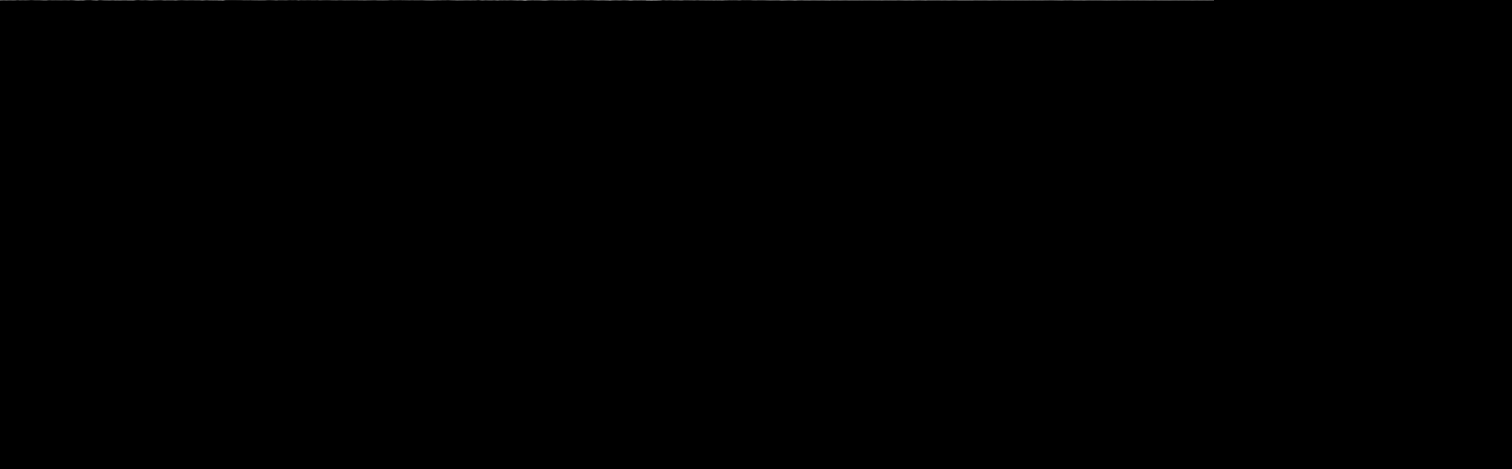
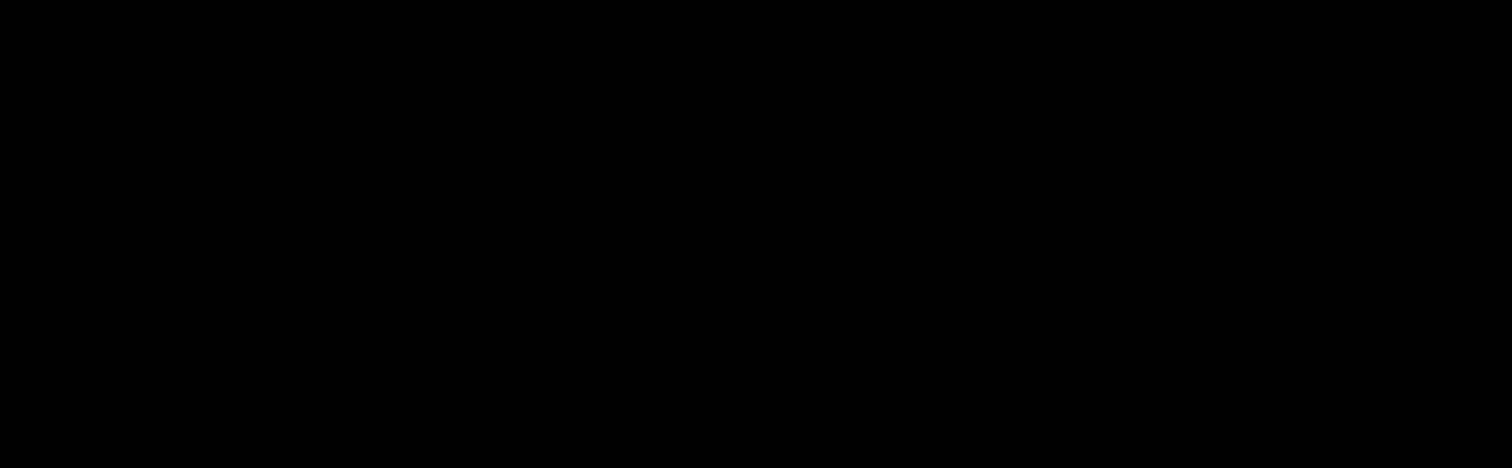


Water

水

./shuǐ/.





(1.1.2)

Characteristics

In Shan Shui landscape painting, the artist depicts the subject of his work through an intimate and spiritual approach: after careful observation of the landscape that surrounds him, he takes refuge in an unreal world that springs from the processing of the images captured through his spirit and brings back to the scroll the forms perceived during this meditative experience. He himself decides the style to be depicted, calibrating, according to his impulses, the direction of the brush on the paper and the heaviness of the ink. There are, therefore, a series of characteristics of Shan Shui painting that allow us to understand it more deeply, differentiating it from the Western artistic experience. First of all is certainly the contemplative observation that leads to the knowledge of the subject to be depicted. It is not a question of faithfully reporting the scene perceived by the human eye, but of taking an active part in it with the aim of elaborating an interpretation. The painting and photography of Western culture tend to portray static images that cancel time and movement: the artist reproduces what he sees but is estranged from the scene, he is completely outside it. Chinese painting, on the other hand, is very far from this ideal of submission to visual laws: relying only on sight represents a limit as it leads to a partial understanding of the landscape. It is impossible to depict the vastness of the mountain and water scenarios with a single glance: the Shan Shui landscape is created by the overlapping of images of different spaces that the artist observes as he moves, from different angles and with different degrees of detail. The work is conceived in motion and the viewer makes the same mental journey to understand it.

The ancient painters made real journeys away from the inhabited centers to take refuge in quiet places from which to observe and assimilate the spatiality of the landscape. For this reason, these rolls of paper can reach several meters in length and therefore must be travelled to admire the work in its entirety (Bruni, 2020). Shan Shui painting, in fact, does not have a unifocal perspective but presents a perspective multiplication, as each object is depicted from different points of view according to the depictive choices of the artist, who must harmonize all the elements that make up the painting. Moreover, this style is permeated by a strong narrative charge: the painting is like a story that must be told in a dynamic way, just as it was perceived. It is an all-round experience that involves all the senses. The observer, as well as the artist, enjoys the beauty of the natural landscape and participates in it, alienating himself from reality and elevating himself spiritually. As Guo Xi, famous painter of the Song era (as well as founder of Northern painting), argues, man, through the mind, wanders in rarefied and distant territories, while remaining physically immobile and can immerse himself in the beauty of nature becoming part of its beauty.

Shan Shui painting is not a realist painting, it does not aspire to copy nature but wants to manifest its inner spirit and its indisputable aesthetics. There are some essential compositional rules to recognize this style through the presence of some landscape components: balanced presence of vertical (mountains) and horizontal (water) elements; presence of paths, which should support the topography and never be straight; presence of elements that act as a threshold at the end of a path, which can lead to the mountain or to settlements. With the Song Dynasty, rules of depth of the natural elements in the scene were established: high distance – objects are depicted as if seen in all their height, as for mountains; deep distance – are objects that move away from the observer’s view, such as valleys, rivers, or waterfalls; level distance – it is the landscapes in the distance that fade on the horizon. Moreover, the dimensions between the various components do not faithfully reflect the real but follow the intentions of the artist based on a hierarchy of importance within the painting and the way they relate in the natural context (Bruni, 2020).

“In moments of relaxation, after having put my mind in order, emptied a glass of wine or strummed the lute, I unroll a painting and sit in front of it and without leaving the crowded houses of men I find myself wandering in solitude, in wild lands, with no trace of human beings. Mountain peaks rise above the clouds, gorges and forests extend into the distance. The wise and virtuous shine from antiquity, and all the interesting aspects of life come together in the mind. What else do I need? Being in this state I am happy and delighted, what more can I ask for?”

于是 闲居理气，拂觞鸣琴，披图幽对，坐究四荒，不 违天励之藁，独应无人之野。峰岫峣嶷，云林森 眇。圣贤暝于绝代，万趣融其神思。余复何为 哉，畅神而已。神之所 畅，熟有先焉。

Guo Xi, Hua Shan-Shui Xu, 画山水序

(1.1.4)

History

The legacy of Shan Shui hua has been gradually enriched over time, shaping itself according to different historical periods. The techniques of representation have been refined more and more from the artistic point of view, also loading themselves with implicit meanings both political and social. Through pictorial production, in fact, it is possible both to contemplate and learn the aesthetic value of the landscape, but also to reconstruct the chronology of important historical events that have marked the Chinese people.

The landscape painting style was born with the **Tang Dynasty** (618-907 CE) in the form of folk art: the painters were court artists who had the purpose of narrating and enhancing the beauty and harmony with nature, depicting mountain and water scenarios, to which they also added anthropized elements and scenes of everyday life. The two most used techniques were that of blue and green backgrounds or that of gray brushstrokes of wet ink. With the **Song Dynasty** (960 – 1279 CE) there is the recognition of Shan Shui hua as an official Chinese style, born from the union of the dramatic and defined lines of the masters of the North (mountains) and the soft colors of the masters of the South (water and hills). There is greater attention to details and the scenes become more harmonious. With the successive dynasties art became a philosophical vehicle and an instrument of political conflict with the ruling class and the mountains assumed the role of refuge from the hectic life, places of isolation and solitude where artists retreated to give vent to their interiority. The Mongol domination of the subsequent **Yuan Dynasty** (1279-1368 CE) greatly influenced the landscape paintings, which became the artist's personal tool to describe the imperial dynamics and express his most intimate spirit, sometimes in serenity, sometimes as a denunciation of political problems. The integration of new painting techniques and calligraphy tools dates to the **Ming Dynasty** (1368-1644 CE), during which the reference to tradition remained very strong but a new awareness of the landscape developed. Two different currents emerged: court painters, inspired by Song painting, and artistic writers, more focused on inner experience. There is a wiser use of color, especially brown, and a special focus on animals and plants. From the 1700s onwards, the atmosphere of Shan Shui paintings began to change due to a strong European influence in the arts. With the **Qing Dynasty** (1644-1911 CE), Eastern painting was contaminated by new techniques of representation and new artistic stimuli from the West such as the unifocal perspective, the proportionality between the elements that made up the landscape scene and the exaltation of the anthropic element. The mountain remains a place of refuge and isolation from city life, which instead is depicted near the inhabited centers through brighter colors and sharper scenes that describe the prosperity and dynamism of everyday life.

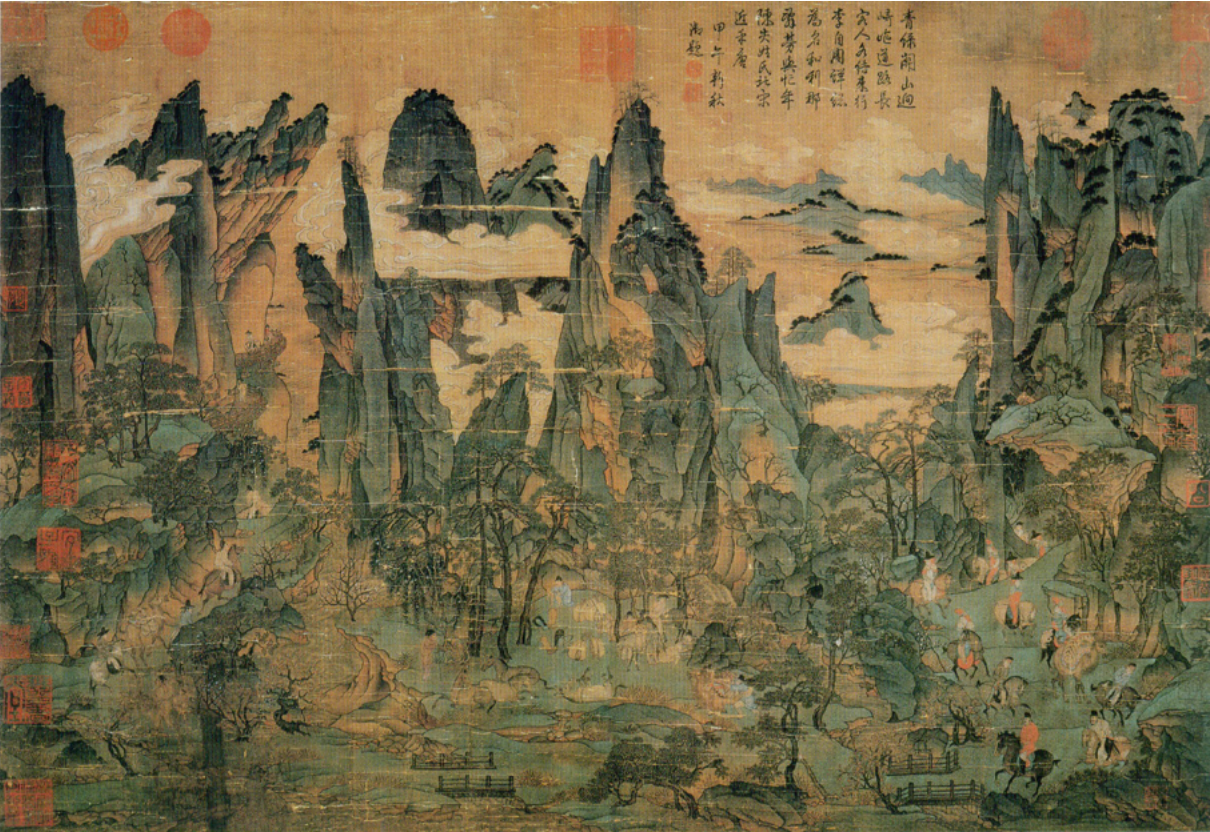
In China, the landscape is a continuous reference for human life. Even today, the Shan Shui style represents a timeless art form that embodies that universal spirituality that allows man to mystically unite with nature. Contemporary Chinese art is still influenced by Shan Shui painting: in fact, there is a need to restore a strong link with the pictorial tradition, with the aim of confronting the past and with one's own interiority to understand the dynamics of a world that changes rapidly. While traditionalist painters faithfully refer to the old masters to keep the *modus operandi* alive with supports and materials from the past, modernists seek to explore new means and new techniques to contextualize Shan Shui in the present. The search for new forms of expression represents the desire to keep alive this feeling of belonging to nature by combining the artistic philosophy of the past with the concerns and reflections of the contemporary world. The Shan Shui feeling today has become the object not only of painting but also of other forms of art that allow it to be updated and disseminated, such as photography, performance, virtual experiences.

DAI GUANGYU
Landscape, ink, ice
山水. 墨水. 冰水
(2004)

Photographic work representing the word Shan Shui, transcribed with brush and ink on a frozen lake. The metamorphosis of ink represents the passage of time: ink, as a symbol of tradition, vanishes, erased by the forces of nature, so Chinese culture risks disappearing.



TANG DYNASTY
(618-907 CE)



1.B

LI ZHAODAO

The Emperor Ming-huang's Journey to Shu

Hanging scroll, ink and color on silk, 81 x 55. 9 cm
National Palace Museum, Taipei

Painter of the dynastic court and son of General Li Sixun. The painting, made with azurite and green malachite, represents a thick natural landscape and figures of the knights escorting the emperor, fleeing to the mountain after the Anshi rebellion.

SONG DYNASTY
(960-1279 CE)



1.C

WANG XIMENG

A Thousand Li of Rivers and Mountains
千里江山图
(1113)

Handscroll, ink and color on silk, 51.5 x 1191.5 cm, The Palace Museum, Beijing

Renowned court painter of the Northern Song Dynasty. The artist depicts a scene of rural life with a natural context that includes Mount Lu 庐山, the river and the lake, in Jiangxi province. The mountains, green and blue, are shrouded in fog and are characterized by the presence of waterfalls, winding paths and trees. The painting has a strong narrative power.

YUAN DYNASTY
(1279 - 1368 CE)



1.D

HUANG GONGWANG

The Master Wuyong Scroll : Dwelling in the Fuchun Mountains

(1350)

Handscroll, ink on paper, 33 x 636.9 cm, National Palace Museum, Taipei.

He was not a court painter, but a solitary artist. The painting illustrates a rich natural scene with mountains of different shapes, gently undulating shores and scattered dwellings, hidden in the vegetation. It represents the interiority and temperament of the artist through bold tones, light shades, sometimes damp brushstrokes and lines full of ink.

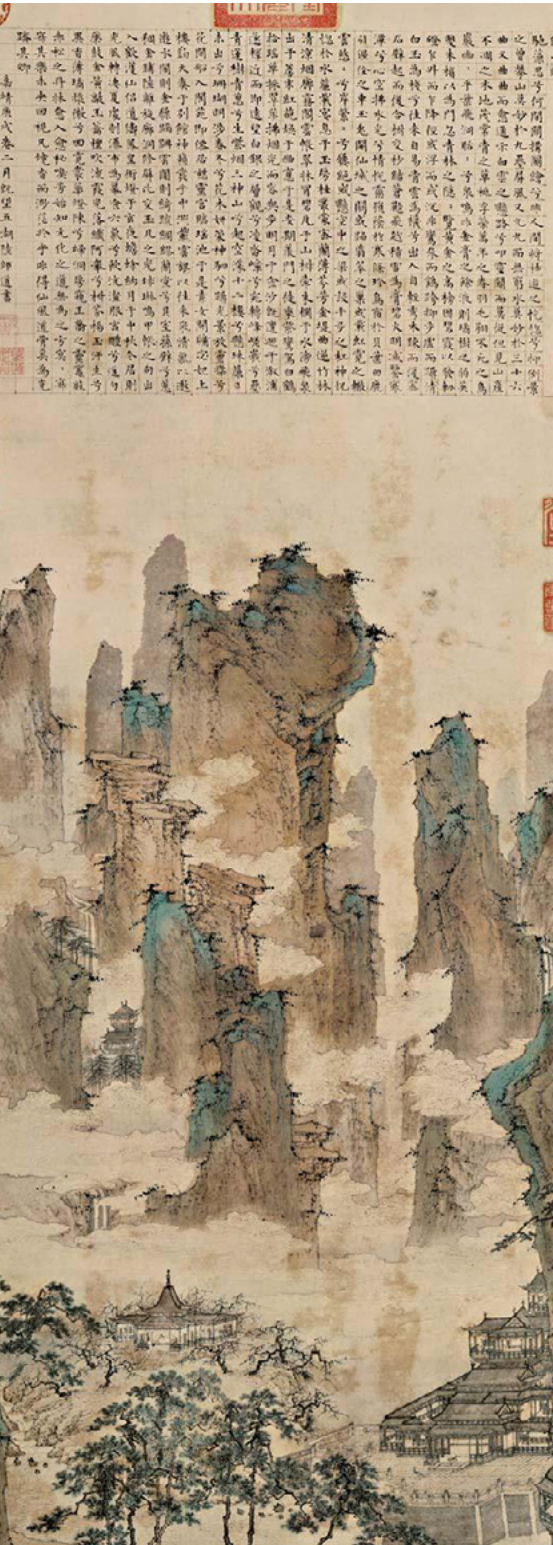
MING DYNASTY
(1368 - 1644 CE)

QIU YING

Buildings and Pavilions on the Celestial Mountains
仙山樓閣圖
(---)

Hanging scroll, ink and color on paper, 110.5 x 42.1 cm, National Palace Museum, Taipei

The painting depicts on the bottom a mountainous scenery, with color and brushstrokes of decisive ink. In the foreground there are palaces and pavilions, aimed at symbolizing the imperial presence, hidden among the vegetation full of details and plausible to reality. On top of the parchment you can see property seals and a poem of the landscape.



1.E

1.F



QUING DYNASTY
(1644 - 1911 CE)

DING GUANPENG

Peaceful Start for the New Year
畫太簇始和
(1748)

*Hanging scroll, Ink and color on paper,
179.3 x 108.4 cm,
National Palace Museum, Taipei.*

Painted with clean lines, with bright colors and with unifocal perspective. It depicts the festivities inside and outside the Forbidden City for the Lantern Festival, through decorations and festoons that wish prosperity and peace. Nature is the backdrop to the painting embracing the different scenes of public life.

1.G



CONTEMPORARY PAINTING
(since 1911 CE)

ZHANG DAQIAN

Mist and Dawn
春雲曉靄
(1968)

Splashed ink and colour on paper, 100.5 x 140 cm

Artist who has been able to blend the Chinese pictorial tradition with Western influences in technique and form. The painting is an abstract work of black, blue and malachite sprayed ink, as in traditional paintings. In the background, organic shapes hide an animated landscape of clouds and mountains. The fog is the protagonist creating an effect of visible and invisible, of full and empty between spots of color and unpainted areas.

Spatial pattern of Shan Shui City

Ancient Chinese Cities

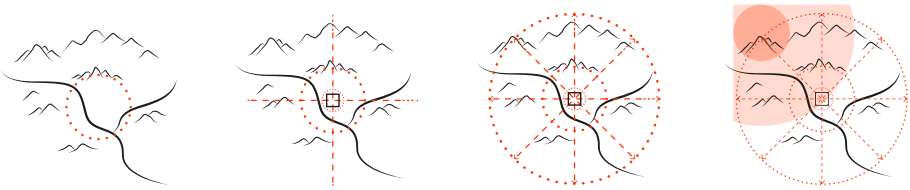
In Chinese culture, nature is always considered to be in close relationship with the human being. This mutual dependence derives from the fact that the natural environment offers man and the city defense structures and resources for his livelihood, while the human being can enjoy views of the landscape, which is loaded with cultural and cognitive meanings. In this sense, the harmony and balance of the relationship between man and nature, addressed in painting, literature and garden design, give rise to well-defined spatial characteristics. This setting is visible in ancient Chinese settlements, where the mountain-water-city spatial relationship is fundamental to obtaining and maintaining **Qi**, resulting perfectly integrated into nature. Ancient Chinese planners paid particular attention to the Shan Shui aspects of the natural landscape, respecting it and at the same time manipulating it to enhance the relationship between man and nature. The presence of the mountain and water elements was extremely important, so that, if they were not naturally present in a place, they were artificially built to create an ideal environment for human settlement (Yizhao, Jie, 2016). Shan Shui planning was based on the **Feng-Shui** method: through a careful analysis of the soil, topography, water system, climate and other aspects, it was possible to minimize the impact of the built space on the environment and to achieve certain aesthetic and functional objectives. In this way, the ancient cities, being closely linked to local characteristics, developed strong characters of uniqueness, while remaining within a spatial pattern defined by the interrelationships between the natural environment and the built environment.

It is possible to describe some general principles that seek to define the spatial configuration of ancient Chinese cities (such as the imperial city of Beijing or that of Hangzhou), which were shaped by the Shan Shui culture. First, the urban settlement must be placed in the center of the natural environment, facing the mountain from the north side and towards the river from the south side. This is because the right distance from the mountain avoids flooding phenomena thanks to the slope and helps protect the city, while the proximity to the water allows you to manage the water system, obtaining resources and controlling its flows. Second, the creation of axes that connect the city to the surrounding landscape, in particular to the mountain, gives aesthetic value to the settlement. Third, the presence of spaces from which to admire the natural environment attributes a cultural connotation to these places, supported by the presence of structures such

Qi 氣
“steam”, “water” or “breath”
Traditionally indicates “life energy” or “life force” that constitutes every living entity. It is a crucial force for the prosperity of a place; to go against it is to disobey the natural law.

Feng-Shui 風水
“wind-water”
It is a traditional practice aimed at achieving the harmony of man with the context in which he finds himself. In ancient times it was thought that the natural landscape influenced Qi.

as temples, towers or pagodas. Fourth, the mountain and the city mutually contribute to increasing their own cultural and aesthetic value (Yulin, 2010). In summary, the natural environment defined by the Shan Shui was the basis of the planning of traditional settlements, becoming the main aspect in the choice of the site both for functional and spiritual aspects.



Scheme of the four characteristics of the “Shan Shui-City” pattern (Yulin, 2010)

Ideal Shan Shui City

Beginning in 1948, during China’s post-socialist period, urban development distanced itself from the Shan-Shui approach in favor of industrialization-driven development (Yizhao, Jie, 2016). Rapid urbanization and the application of a non-local style, influenced by the Soviet model, led to the loss of cultural heritage, the destruction of historic cities’ patterns and the deterioration of the natural environment, increasingly distancing man from nature. Around the 80s, concern spread among several theorists about the loss of identity of Chinese cities, with the aim of seeking a model of sustainable development capable of integrating nature within the city. The first to define the concept of Shan Shui City was the Chinese scientist **Qian Xuesen** in 1990, who imagined an ideal model of a Chinese city that introduces the concepts of traditional garden design, poetry and Shan-Shui painting into urban planning. In this way every citizen can “live in a garden” and restore the symbiotic relationship between man and nature (Jie, 2018; Fu, 2009). According to Qian, Shan Shui City must express its identity through architectural culture and the expression of the Chinese landscape. However, it differs from the traditional Chinese city in two aspects: it is built to be at the service of the population (not to affirm a certain class of power) and uses nature to improve the quality of open spaces and public life; its development is based on scientific studies that analyze natural processes and its relationships with man, without neglecting the cultural and spiritual aspect of the humanization of nature (Yizhao, Jie, 2016). Another academic, **Wu Liang-yong**, argues that shan shui city is the model of a city with Chinese characteristics, in relation to the natural environment and a highly civilized culture. The attention to the local conditions of the site allows to obtain an organic set of different cities, with unique qualities, which follow the same spatial pattern of mountain-water in order to represent the vitality of the Shan Shui landscape. According to Liang-yong, a Shan Shui City is: integrated with nature, it has cultural significance and it is one with the Shan Shui environment. These aspects are summarized in the interactive relationship between mountain-water-city, according to the development model:

“Mountain relies on Water to be green; Water relies on Mountain to be grand; City relies on Mountains and Waters to be lively” (Jie,2018)

In order to define the essence of the Shan Shui City, was borrowed the Chinese garden design theory defined by Professor Sun Xiao-xiang and explained according to the Natural, Picturesque and Ideal states. The “Natural State” expresses the beauty of nature, which from the point of view of the city means creating environments suitable for life, work, recreation and transport according to ecological needs. The “Picturesque State” reflects the beauty of art, according to which the design must fulfill the need for artistic and scenic beauty of the cities. Finally, the “Ideal State” refers to the ideal beauty that, projected into the city, hopes for respect for culture, nature and history together with Chinese characteristics, in order to create an ideal city environment. These three states are embodied in the following aspects:

1.

respect the existing natural conditions, protect and optimize the ecological environment;
2.

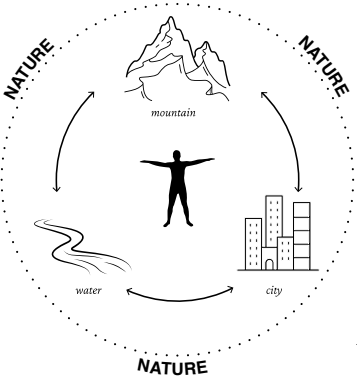
respect the history, culture and regional characteristics;
3.

make full use of modern science and technology;
4.

serve the public;
5.

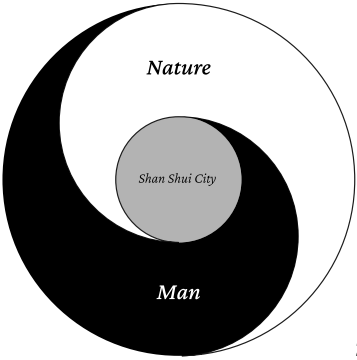
express the unique Chinese characteristics and inherit Chinese civilization.

(Jie, 2018)



1

If the traditional Shan Shui culture has represented the tool to achieve an ideal of coexistence between man and nature, in the same way, through it, it is possible to design ideal settlements - both rural and urban - that reflect the needs of man and benefit from the proximity to nature. However, contemporary Chinese cities develop in ways and at a distance from those of traditional Chinese cities, compromising the relationship between man and nature. For this reason, there is an urgency to find a new balance and a new spatial pattern of the Shan Shui City, integrating the natural environment with the urban one to provide unique spaces dedicated to citizens.



2

1
“Mountain-Water-City” Model
by Wu Liang-yong
(Jie, 2018)

2
Taiji Diagram of “Shan Shui City”
(Jie, 2018)

(1.2.3)

Future Shan Shui Cities

The contemporary debate of the 80s and 90s that saw several scholars discuss about a new model of Shan Shui City did not lead to many concrete results. This is because the achievement of such an ideal model clash with the design and ecological needs of our times. If on the one hand nature, in Chinese culture, is perceived as a spiritual element, pure, free from human interference but at the same time coexisting in harmony with it; on the other hand, the Chinese population, more than others, has exploited and manipulated it, legitimizing the interactions between the environment and man. China, in fact, following high levels of urbanization and demographic pressure, is responsible for large-scale deforestation, land degradation, water-related risks that lead to natural disasters. A situation that is not compatible with the need to adopt sustainable solutions that preserve the natural environment. **Yang Yongliang**, a contemporary artist, has expressed, through his works, a critique of urbanization and consumerism in China, investigating the relationship between man and nature. Revisiting the style of traditional Shan Shui painting through collage, Yongliang represents, in black and white, futuristic and simultaneously traditional landscapes. Seen from afar, his works seem to depict the typical Chinese landscapes with mountains and streams, but if seen up close you notice that the mountains are a set of skyscrapers, the trees are replaced by cranes and the islands are made of debris. In his works the total absence of every living being, including man, is constant, to emphasize the artificiality of the pictorial scheme and to remind us that the nature we live and perceive is conceptual, such that we attribute a certain charm to it. Yongliang, therefore, suggests not to try to defend an uncontaminated nature that no longer exists for a long time, but to make the world, now anthropized, suitable for human life (Tan, 2016).

1.H



In the 2000s, architect **Ma Yansong** began to apply the principles of Shan Shui City within urban planning, with the aim of countering the loss of identity of Chinese cities and resolving the conflict between city and nature. Inspired by Shan-Shui paintings, where the built environment, man and nature are intertwined, he tries to transfer the feelings typically related to Chinese gardens into large-scale urban projects. Using organic forms that refer to the Chinese landscape, Ma Yansong integrates, even artificially, natural elements (water, mountain) and creates open spaces for public uses. In conclusion, the model proposed by the Shan-Shui city, if not limited to the construction of landscapes or ecosystems but focused on the inclusion of the economy, culture, ecology and identity of a city, can be considered a form of eco-sustainable urban development. The Future Shan Shui City integrates the aesthetics of the relationship between man and nature of Chinese culture with the processes of urbanization, finding a new balance between artificial and natural, tradition and modernity, science and art. Considering the needs of contemporary cities (efficiency, technology, innovation, economy, transport) it is possible to respect the Shan Shui landscape and integrate it into everyday life.

“Architecture is not important, the pine trees are not important, but the emotional serenity engendered by both is what’s important.”
Ma Yansong

1.1



(1.3)

Lishui as Future Shan Shui City

Lishui is a prefecture-level city (originally named Chuzhou, later renamed Lishui county in 779 during the Tang Dynasty) located in the Zhejiang region. It is considered a Shan Shui City for the characteristics of its landscape; it is surrounded by mountains and waterways in which the urban context merges. Since ancient times, urban development has been designed according to nature, reflecting the Chinese characteristics of traditional settlements. Lishui is part of the Yangtze River Delta, one of the nation’s most developed economies, and its strong Shan Shui character increases its value.

丽 水
Li Shui
beautiful waters

1.L



In 2020, the government launched an international competition “Future Shan Shui City: International Urban Design Competition – Dwellings in Lishui Mountains” with the aim of defining a spatial framework for Chinese cities, exploring contemporary and sustainable urban strategies combining them with the Shan Shui spirit. The Polytechnic of Turin, together with the South China University of Technology, won third place with the proposal “Prosperous Lishui. One valley, three landscapes”, where the urban space, the agricultural valley and the nature reserves (mountains, rivers and wetlands) coexist as “tiles of a single territorial mosaic” in an infrastructural system that does not compromise the environment. In this conception, urban and rural are not seen as opposite and irreconcilable realities, but on the contrary are part of the same spatial network.

“The city is the landscape, and the landscape is the city”
城市在山水中 山水在城市中



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Images

1.A <https://ifa-gallery.com/artworks/landscape-ink-ice-1a/>
<https://ifa-gallery.com/artworks/landscape-ink-ice-1b/>

1.B https://leconfident.files.wordpress.com/2012/10/li_zhao_dao_tang_ming_huang_to_shu.jpg

1.C https://zh.m.wikipedia.org/wiki/File:Wang_Ximeng_-_A_Thousand_Li_of_River1.jpg

1.D <https://smarthistory.org/huang-gongwang-dwelling-in-the-fuchun-mountains/>

1.E <https://www.comuseum.com/painting/masters/qiu-ying/buildings-and-pavilions-on-the-celestial-mountains/>

1.F <http://www.artinasia.com/institutionsDetail.php?catID=4&galleryID=337&view=7&eventID=3757>
Ph: https://commons.wikimedia.org/wiki/File:Ding_Guanpeng_-_Peaceful_Start_for_the_New_Year.jpg

1.G [https://www.mutualart.com/Artwork-%E6%98%A5%E9%9B%B2%E6%9B%89%E9%9D%84-Mist-at-Dawn/FB8CEC3C74DC9D06](https://www.mutualart.com/Artwork/%E6%98%A5%E9%9B%B2%E6%9B%89%E9%9D%84-Mist-at-Dawn/FB8CEC3C74DC9D06)

1.H <https://www.lensculture.com/articles/yang-yongliang-artificial-wonderland#slideshow>

1.I <https://www.dezeen.com/2013/06/11/shanshui-city-exhibition-by-ma-yansong/>

1.L https://www.youtube.com/watch?v=6nOtQ_aXP8c&t=32s

1.M Competition Draft

(2.1)

The role of water 40-41

(2.2)

*On China's
Water Issues* 44-53

(2.3)

The case of Lishui 54-65



沸騰的水

Du Fu, 'Brimming Water'

*Under my feet the moon
Glides along the water
Near midnight, a gusty lantern
Shines in the heart of night
Along the sandbars flocks
Of white egrets roost,
Each one clenched like a fist,
In the wake of my barge
The fish leap, cut the water
And dive and splash.*

(2.1)

The role of water

Water is the indispensable element through which understand the historical and cultural evolution of China. There is no nation in the world and, besides China, which can boast such an indissoluble and at the same time contrasting connection with water, both from a philosophical point of view and regarding the management of resources. Talking about water in China is a rather complex and articulated issue since it simultaneously encompasses the political, economic, cultural and social spheres. Since ancient times it has been characterized by a double value that has distinguished it as a source of virtue and spirituality and as an instrument of state legitimacy.

From a philosophical point of view, water has been a constant guide and a spiritual means of thinking. In Chinese myth, it was depicted in the form of a dragon and was the object of veneration as it was associated with the divinity. Even the Taoist tradition, in hoping for harmony between man and nature, elevates the concept of water as supreme goodness and natural fertility and supports the need to observe and contemplate it as it teaches to live. As an artistic expression, it has been a powerful and versatile subject: its mutability has allowed artists to represent calm and stagnant waters, which enliven and aestheticize, but also wild and in turmoil, which intimidate and threaten. Water is a moral metaphor; it has led to numerous reflections of an intimate and personal nature and has stimulated the human being in the search for and respect for natural laws, against which man is powerless.

From a political point of view, water management led, in the early imperial age, to the construction of very large-scale engineering works for public irrigation and flood defense. With the development of agriculture, in fact, the government has proceeded to shape the spatial structure through interventions of the territory with the construction of ditches, canals, water basins and dams to regulate and direct water to the fields and prevent floods. Water was also used as a means for the transport of goods and people: the canalization provided not only to implement and facilitate movements but also to delineate the internal territorial boundaries and reiterate the political presence as a manipulator of social dynamics.

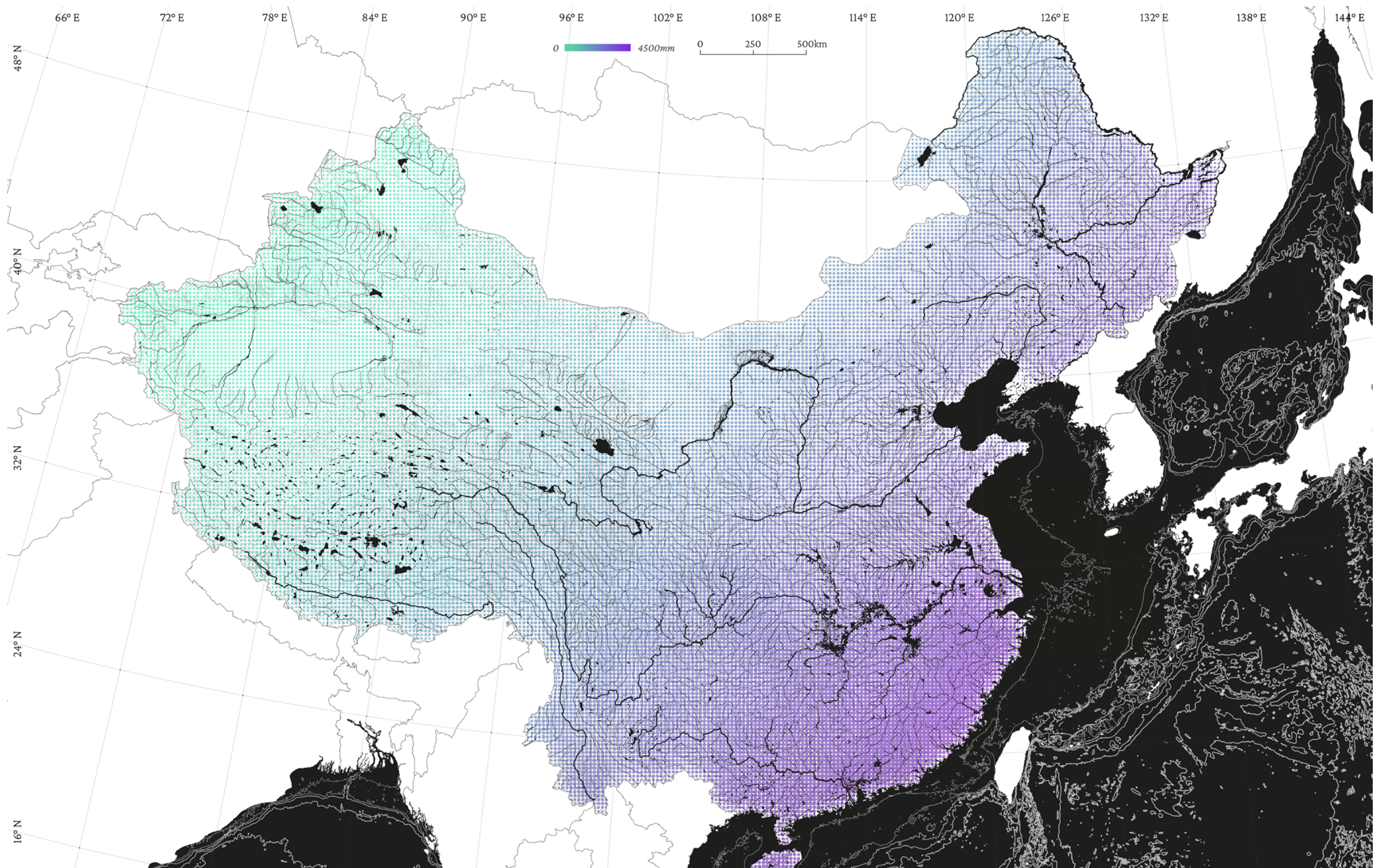
The Chinese population, in fact, has always lived in direct contact with water and was heavily dependent on it; for this reason, responsible water management by the State corresponded to a general well-being of the population that could benefit from it. The environmental problems resulting from economic growth pose a major challenge to the Chinese government. There are currently twenty of the thirty most polluted cities in the world in China, groundwater pollution does not guarantee sufficient amounts of drinking water, and desertification and soil erosion are severely challenging the environment. The issue of water has become rather delicate and will

soon become irreversible if we do not intervene with adequate timing and methods. The government is adopting a top-down approach to landscape management, through green policies for environmental sustainability and measures to deal with pollution, which do not, however, have an equal response in reality: the laws are numerous and drafted in an approximate way, so that there is no strong legislative basis and everything is left in the hands of local authorities who do not have precise guidelines to intervene. The distribution and access to water, uneven and fragmented, reflect a façade political situation that ignores the real needs of the population. Water management in China is a wake-up call for the future and for this reason it is necessary to start from the roots of the cultural tradition of water to develop a new awareness and new sensitivity towards nature.

2.B



Zhang Huan
To Raise the Water Level in a Fishpond
1997



(2.2)

On China’s Water Issues

(2.2.1)

Water Resource

China owns 6% of global water resources (2.8 trillion m3), compared to 1/5 of the population, ranking 6th in the world ranking. Resources per capita amount to 2,300 m3 (28% of the world average), making it one of the countries with the greatest problems of water scarcity. In addition, water resources are unevenly distributed across China, both in terms of time, with annual variations that concentrate 60%-80% of precipitation in the flood season, and in terms of space, which make the North of China poor in water resources while the South has plenty of them. In China there are 45203 rivers, with an area of 50 km2 and a length of 1.5 million km. There are over 2800 lakes for a total of 78000 km2 of water (MWR, 2018).

(2.2.2)

Climate

The climate is mainly monsoon (in the South), with hot and humid summers and cold and dry inverses. The alternation between dry and wet periods, over the years, leads China to face floods, droughts and typhoons, which consist of the main climatic events that characterize the country. As well as resources, the distribution of precipitation is also uneven, where the South receives more water during the rainy season, which however often causes flooding (MWR, 2018).

(2.2.3)

Water Risks

The management of water resources and water-related natural disasters is a very complicated issue in China, due to rapid urbanization, demographic problems, economic growth, climate change and high living standards. Economic growth, following the “open door policy” of 1978, has led China to be part of the world’s largest economies. The resulting population growth (30% since 1978) and industrial expansion have caused enormous damage to the environment and natural resources. Cities, to meet their water needs (industrial, agricultural, domestic use), have begun to over-extracting groundwater, worsening the environmental situation. In summary, urbanization and climate change have led China to face several challenges in water management, namely: water scarcity, water pollution and flood management (Jiang, Holden, 2013) that affect food security and vulnerability to extreme weather events, putting cities and the population at risk.

1

WATER SCARCITY

水资源短缺

The need for water has increased, since the 80s, with the increase in population, economic development, urbanization and agricultural production. The mismatch between demand and availability of water resources make water scarcity one of China’s main problems. Almost all metropolitan cities struggle to meet water needs (Jiang, Holden, 2013).

While water scarcity is due to a lack of water resources in Northern China – whose landscape is predominantly made up of mountains and desert – in the South it is linked to pollution issues that make resources unusable. This has led to the overexploitation of surface water resources, resulting in decreased inflows and damage to aquatic ecosystems, and massive groundwater extraction that causes subsidence and seawater intrusion phenomena, further reducing the availability of freshwater (Jiang, 2009).

Drought in southeastern Zhejiang Province, Feb.8, 2021.



2

WATER
POLLUTION

水污染

Land use change, increased volume of untreated wastewater, and runoff of industries and agriculture has led to serious water pollution problems and consequently decreased the amount of usable water and caused environmental damage (Ma, Sun, Fu, 2020). Chinese water bodies, due to eutrophication phenomena (high presence of nutrients from wastewater), reach high levels of pollution and lead to frequent supply crises. More than half of the population must deal with polluted water resources. The provinces of the South, despite having a greater amount of water resources at their disposal, suffer from water scarcity in relation to pollution. According to the 2018 Statistic Bulletin on China Water Activities, 81.6% of rivers meet class I and III quality standards.

Man walks by a pipe discharging waste water into the Yangtze River



2.D

3

FLOODING

洪水

China is facing strong floods both for natural factors (type of climate, topography, etc.) and for man-induced factors (urbanization, demography). As mentioned earlier, the monsoon climate - which characterizes the center and south of China - and the non-regularity of precipitation over time lead to a release of large amounts of water in a short period of time. Most natural disasters are caused by flash flooding, long-lasting rains and typhoons, also causing landslides. For example, in the Yangtze River Delta there was more than 1100 mm of rain in the summer season alone. In addition, after the economic boom of the 80s, coastal cities became “special economic zones” to attract foreign investment, leading to the formation of megacities (80% of the population occupies 10% of the land). As a result, urbanized soil has increased dramatically, reducing water storage capacity and exacerbating flood risk (Jiang, Holden, 2013).

Shantou, in southeastern Guangdong Province, Aug.19, 2013.



2.E

(2.2.4)

Zhejiang

The Zhejiang Province, where the city of Lishui is located, is one of the eastern coastal provinces of China. More than 90% of the soil is mountainous, with an increasing inclination that goes from the South-West to the North-East, and for this reason it is known as “*nine mountains and half water and half fields*”. The spatial distribution of resources is uneven, in fact most (80%) are concentrated in the western part of Zhejiang – mainly mountainous area – while the remaining part should meet the needs of the eastern part, which is densely inhabited (Liu, Shao, Zhang, 2005). The climate is mainly monsoon, and the rains follow an irregular temporal and spatial distribution. 70% of precipitation is concentrated in the months from April to September (plum rainy season) and varies from 1200mm to 2000mm per year. Although there is abundant rainfall and resources, there are problems of water scarcity which are closely related to pollution. In particular, water resources per capita are 2,118 m³ (lower than the Chinese average) and this is due to severe water pollution (only 30% of resources can be used and 74% are polluted) and a high population density. These climatic features, together with a high rate of urbanization, cause serious flood problems.



2.H
People walk through flood water in Lanxi
20.06.2011



2.G
Farmers in a flooded field in Kaihua county
15.06.2011



2.F
Depleted Zhongqian Water Reservoir in Yueqing
06.02.2021



2.P
Villagers dry their laundry on the riverbed in Yueqing
06.02.2021



2.N
Water tanks on the roof in Yueqing
06.02.2021



2.Q
A flooded village in Sanjiangkou village
18.06.2011



2.L
A man looks at a polluted river in Cangnan county
24.07.2014

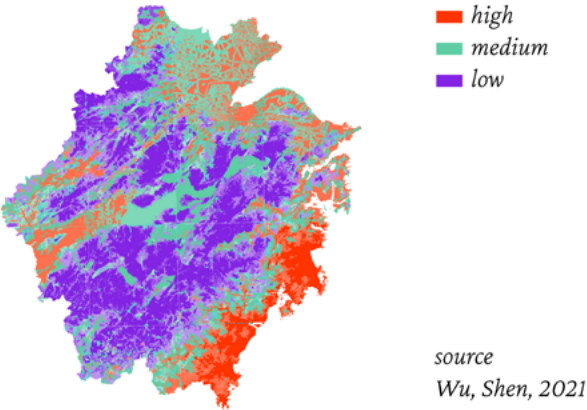


2.M
A worker looks at polluted river in Jiaxing
15.03.2012

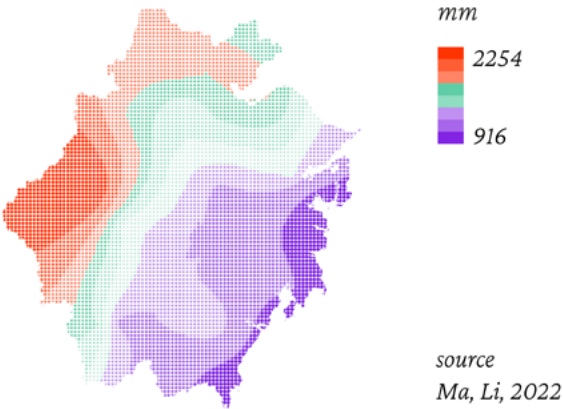


2.I
A man paddles a boat through a flooded area in Banshan Cun
17.06.2011

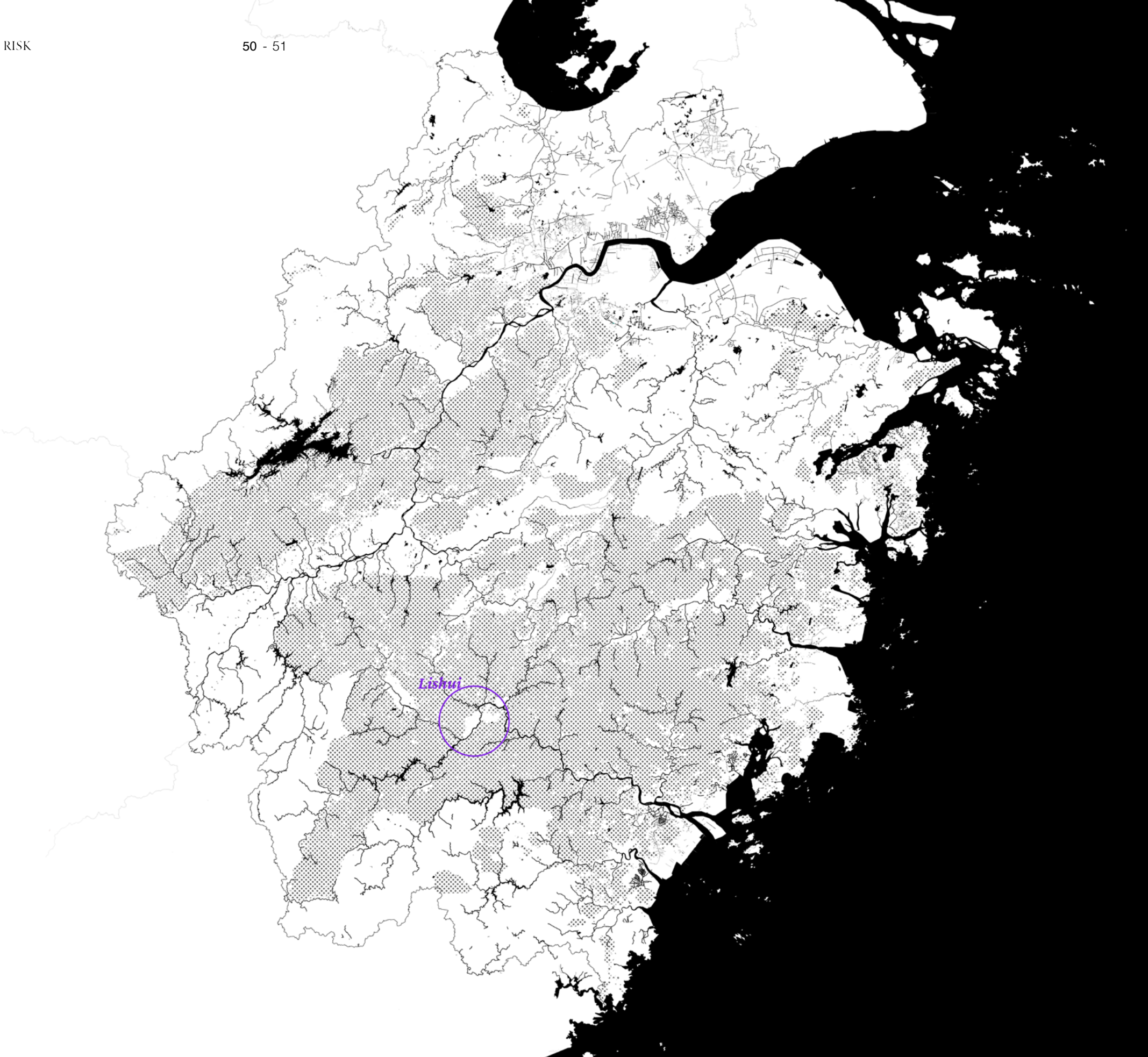
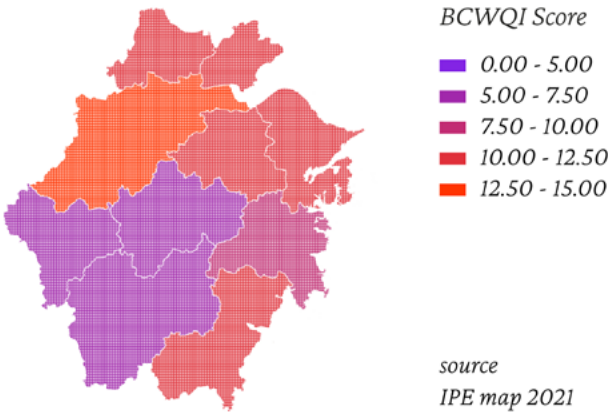
flooding - flood risk



climate - annual precipitation

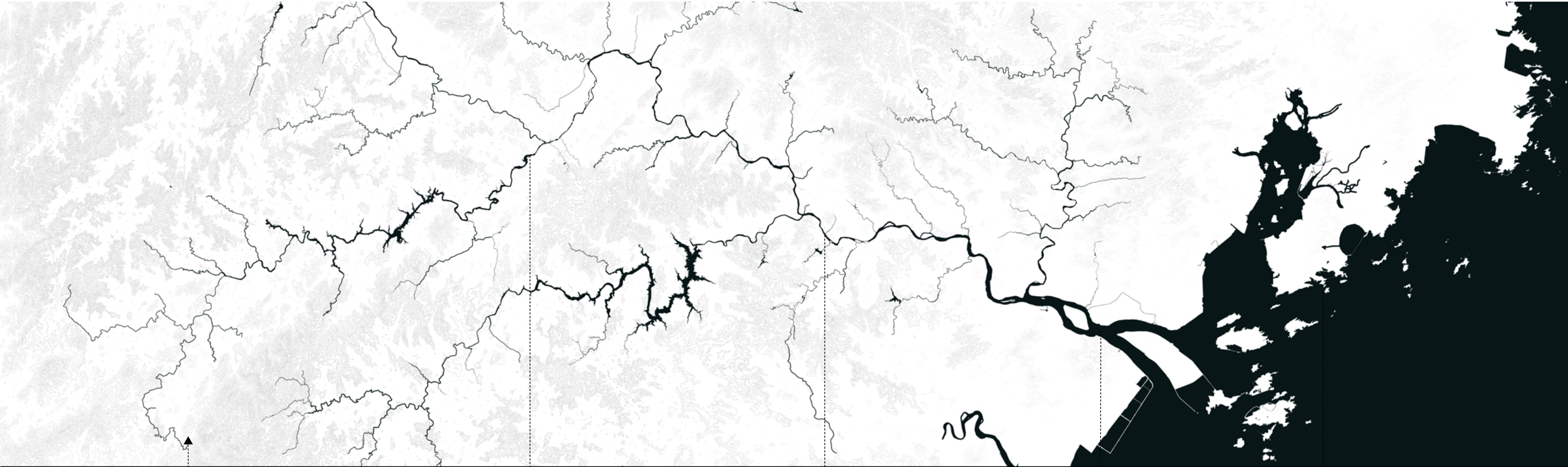


water pollution - surface water quality



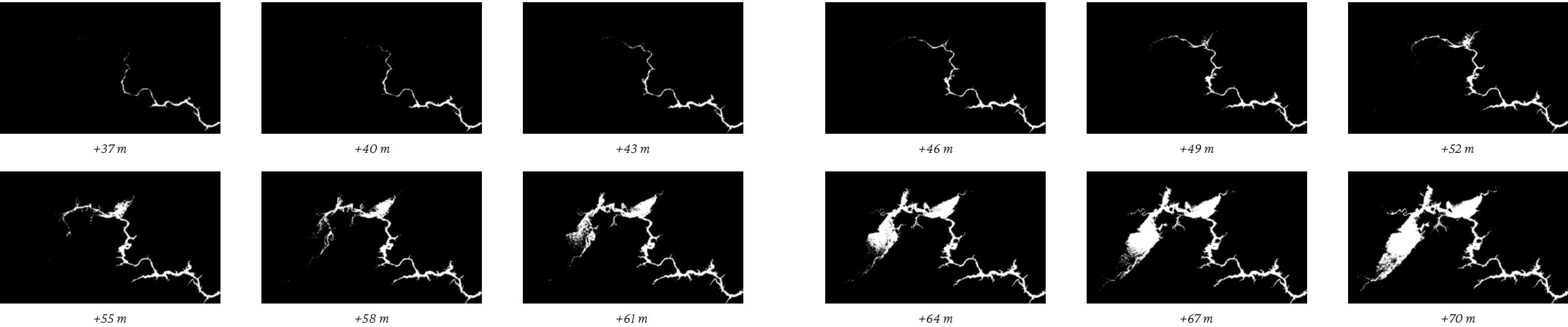
OUJIANG RIVER FLOW

Total lenght: 384 km Drainage Area:18.100 km2 Medium Height Difference: 390 m Medium Slope: 2.08 ‰



Baishanzu Mountain *Longquan Brook*
197,5 km *Daxi Brook*
92,5 km *Ou River*
98 km **Wenzhou River Delta** **East China Sea**

SEA LEVEL RISE source: USGS, GIS river elevation level: 44 m



+37 m +40 m +43 m +46 m +49 m +52 m

+55 m +58 m +61 m +64 m +67 m +70 m

(2.3)

The case of Lishui

The prefecture-level city of Lishui is located in the South-West of Zhejiang Province. It is the only flatland, together with the valley of Songyang, in the south of the region since most of the landscape is characterised by forested mountains. The Lishui Valley is crossed by the Oujiang River and is surrounded by the highest mountains of Zhejiang, making the natural character of the area evident. Lishui has a subtropical monsoon climate that makes it warm and humid, with rainfall concentrated in the summer months – or the so called plum rainy season – with precipitation around 1300-1900mm per year. Due to its climatic and topographical characteristics, the city is prone to weather disasters such as flash floodings and landslides (Lishui City Government, 2021).

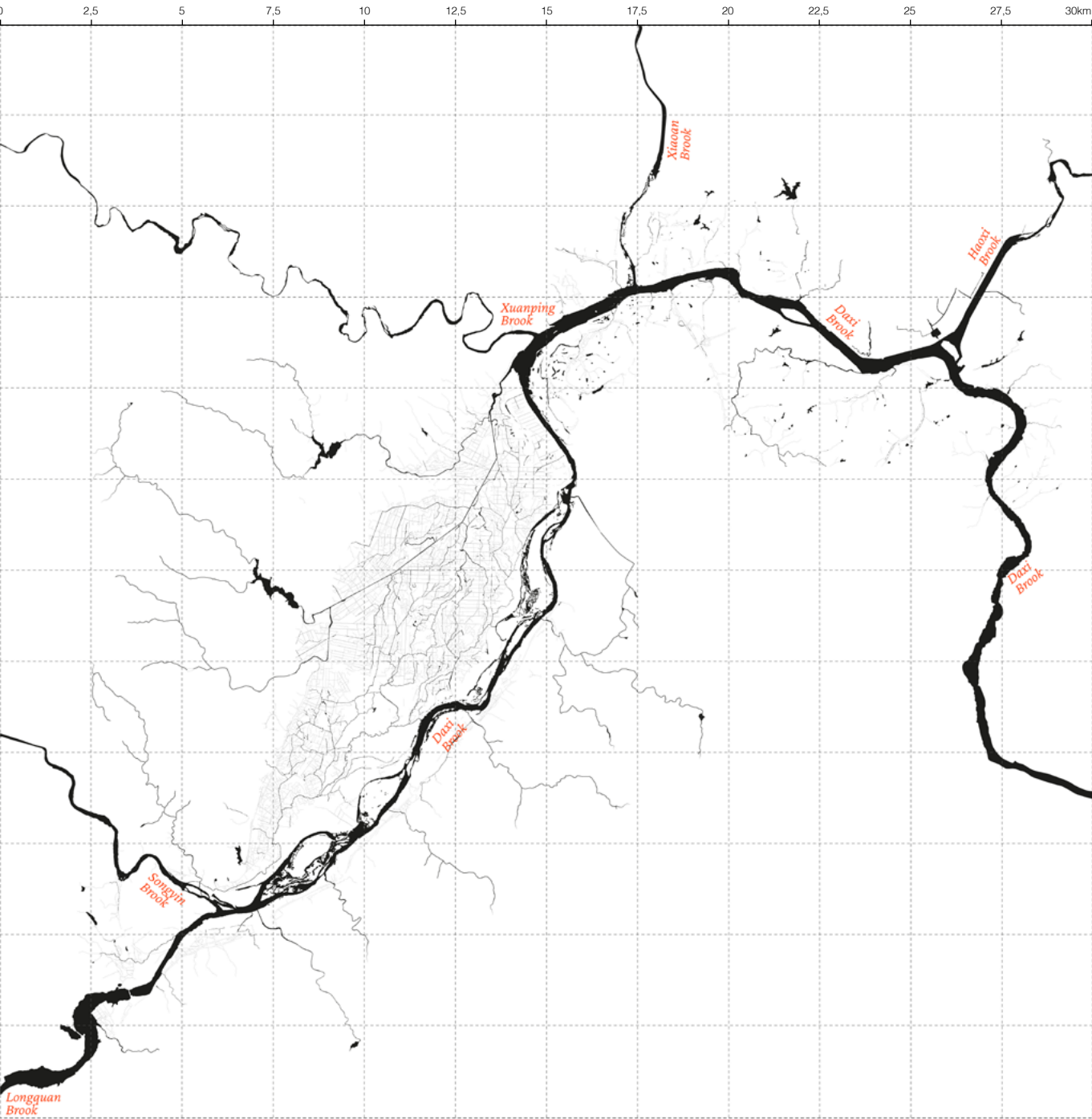
(2.3.1)

Mapping Lishui

As part of this research, the study related to the Lishui project area, and more generally the water situation of Zhejiang and China, were conducted remotely, since, given the current condition, it was not possible to go to the site. Therefore, the information for drawing up the maps comes from CAD materials provided by the competition, satellite images, GIS data and newspaper articles, which were joined together and then graphically reworked by the authors. Most of the data found fits into a rather large territorial scale, which includes the city of Lishui and its ecological surroundings; for this reason the information relating to the project site has been reworked starting from general data, implemented with local research, which have allowed us to outline a rather exhaustive profile of the project site. Below is a roundup of analyses illustrating the topography, hydrography, climate, and water risk situation. In particular, the method of analysis related to the risk of flooding derives both from an overlap of the climatic effects with the topographic characteristics, and from a forecast of a future rise in the water level

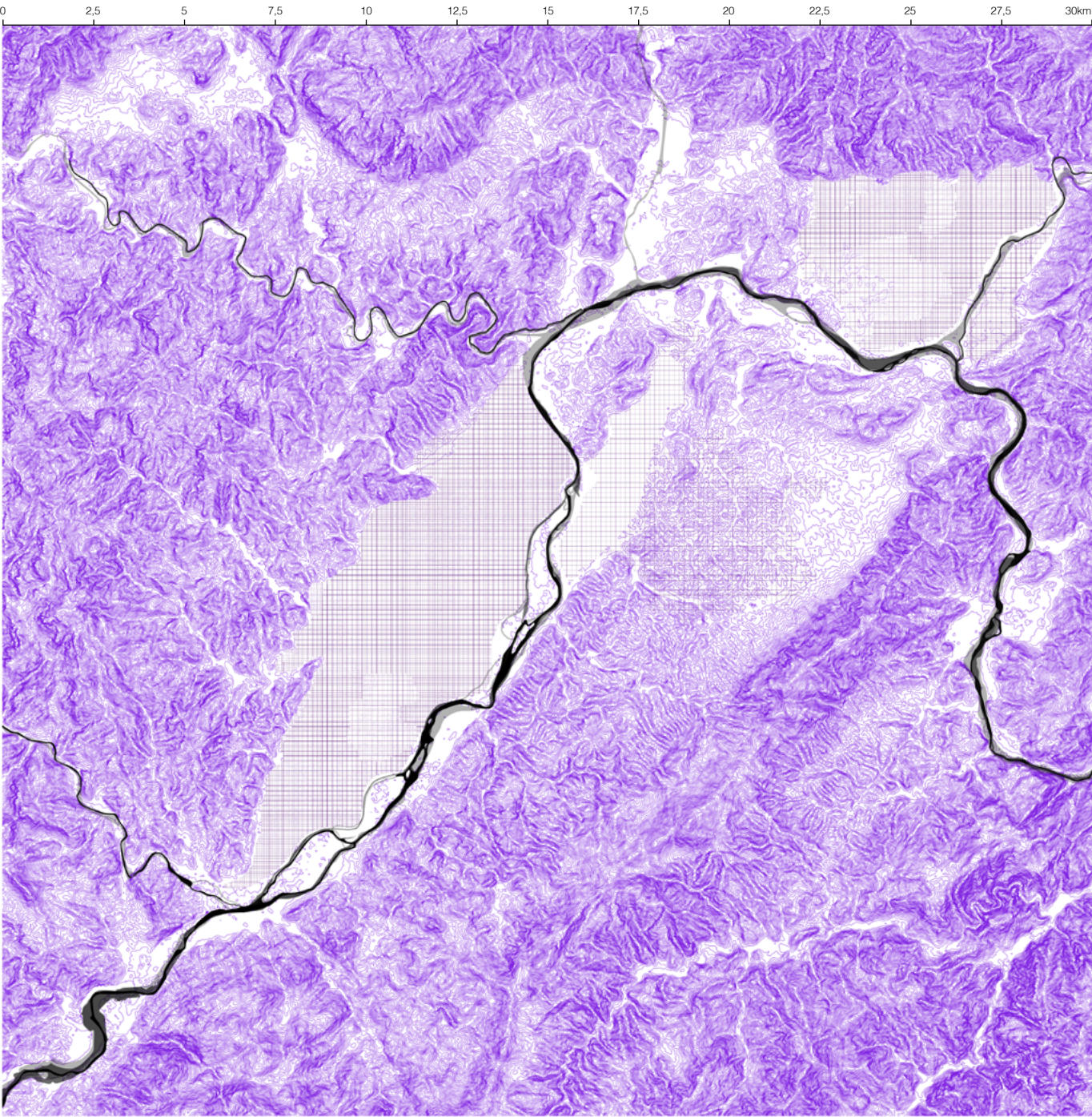


HYDROGRAPHY



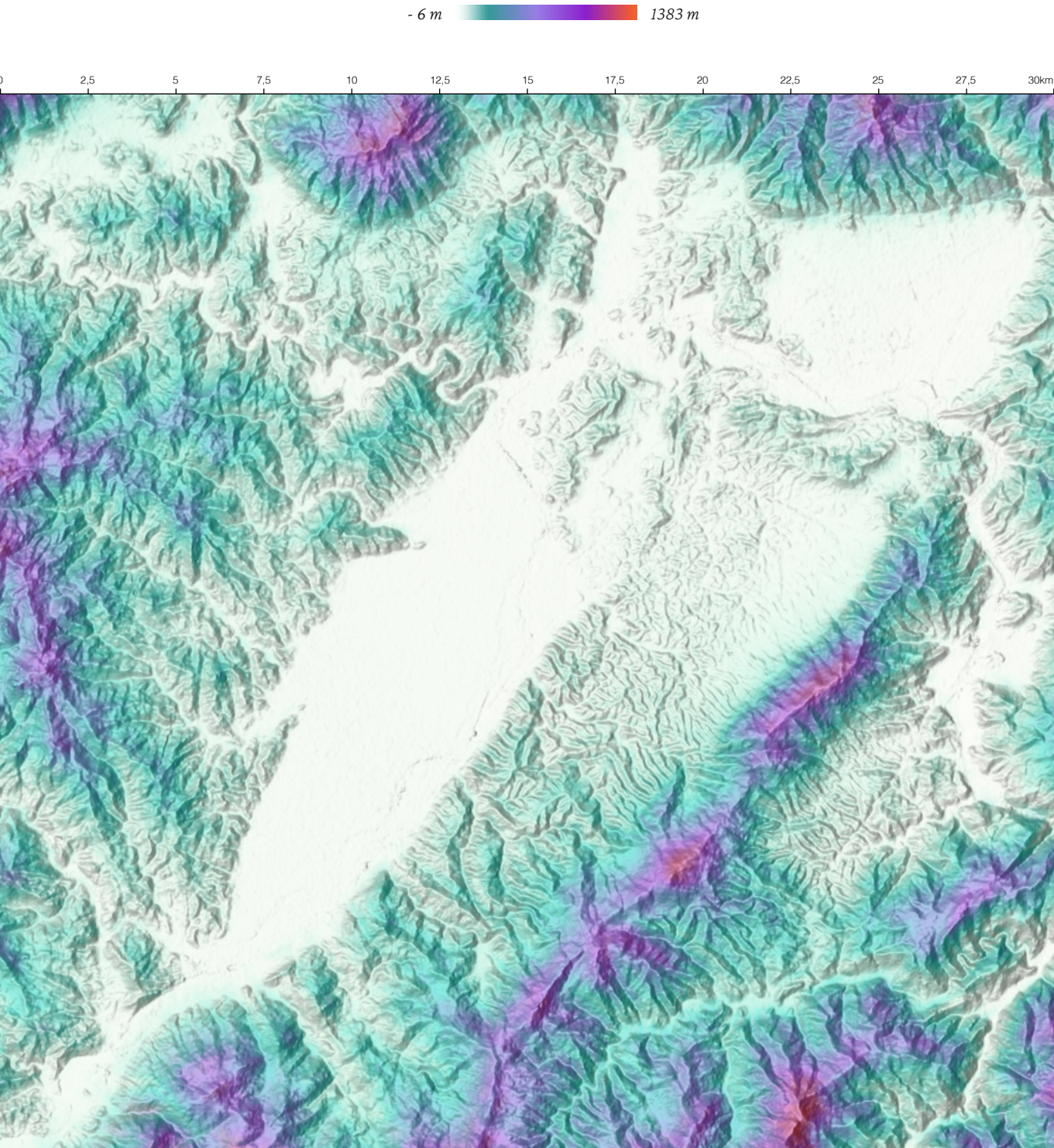
RIVER CHANGES

1984 - 2004 - 2020



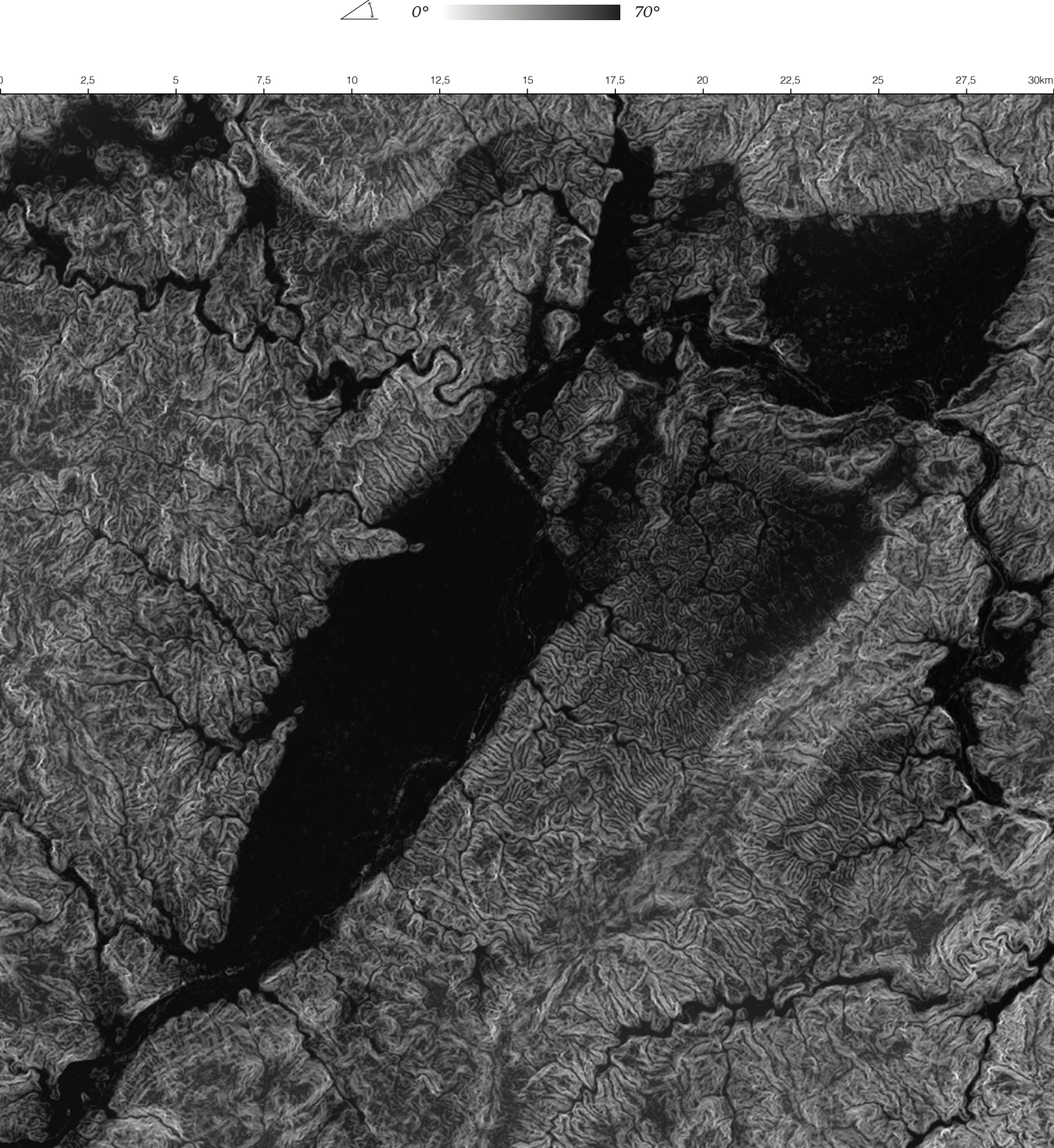
ELEVATION

Source: USGS



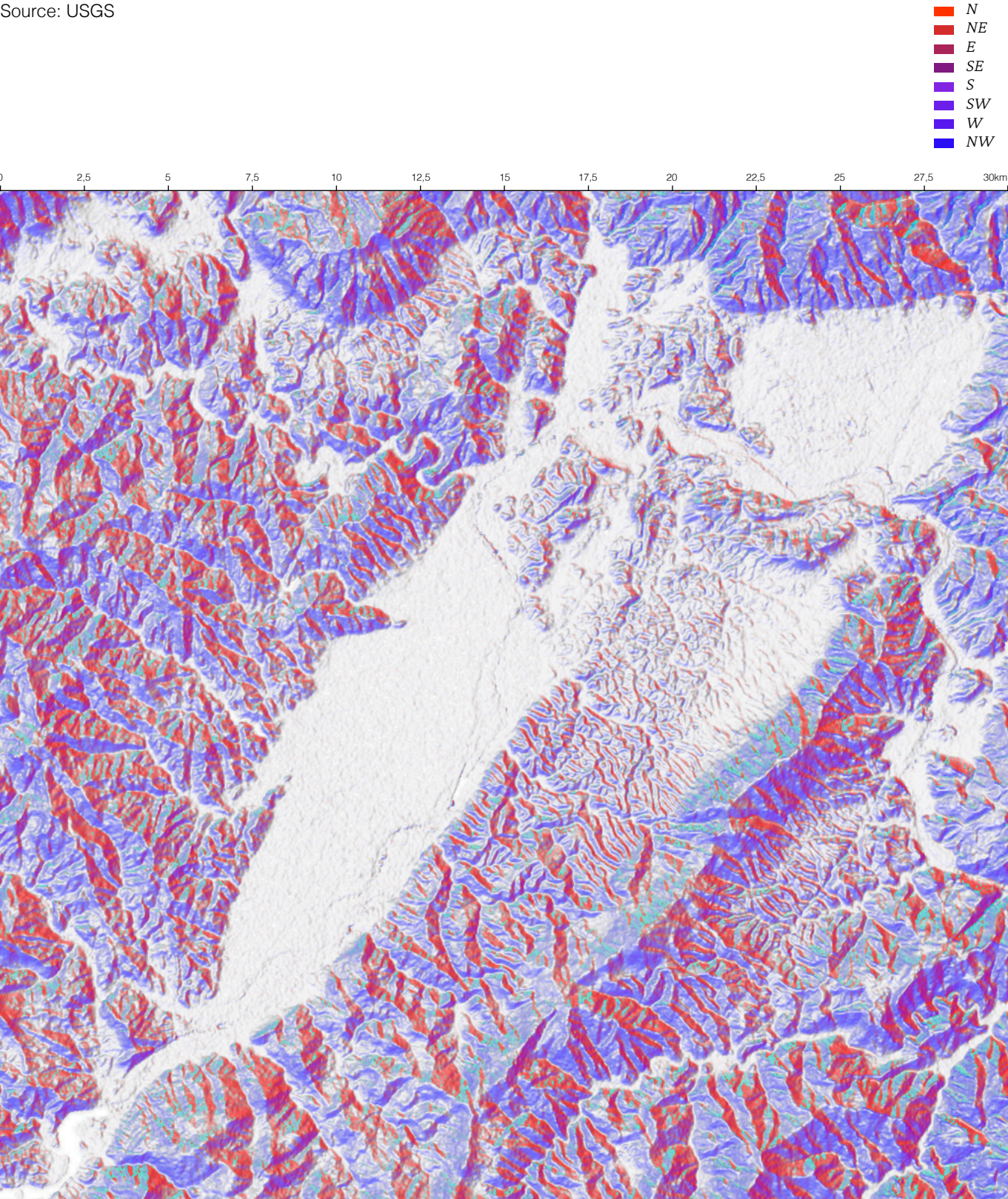
SLOPE

Source: USGS



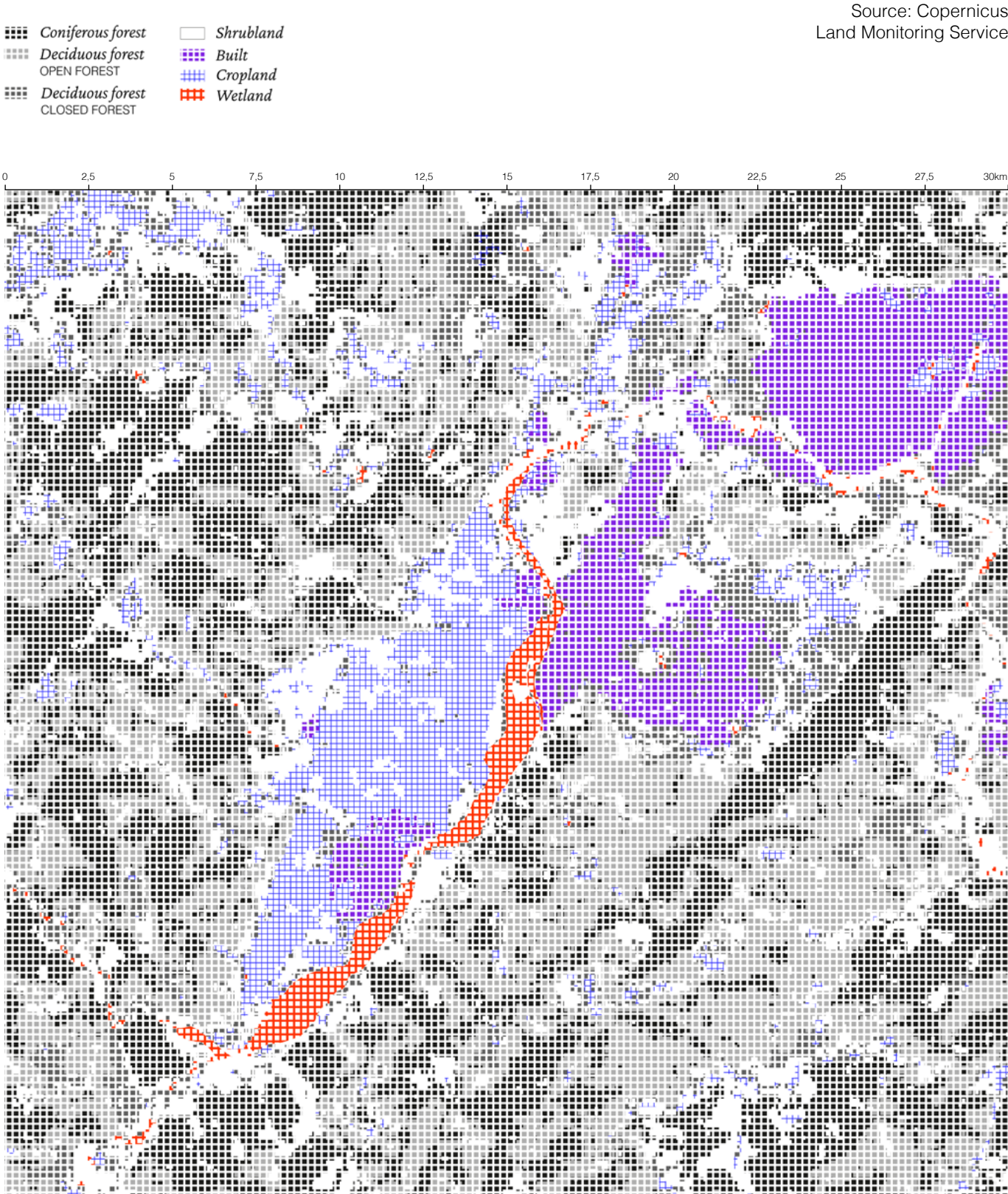
EXPOSITION

Source: USGS



LAND USE

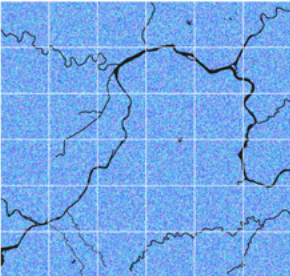
Source: Copernicus
Land Monitoring Service



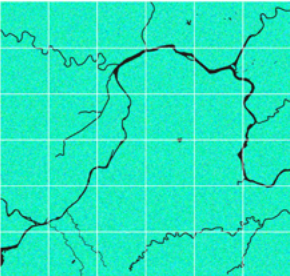
PRECIPITATION

Source: USDA
Foreign Agricultural Service

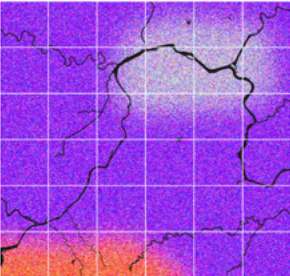
2020



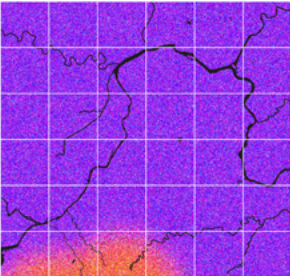
January



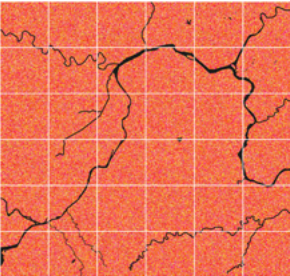
February



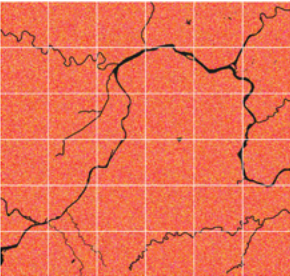
March



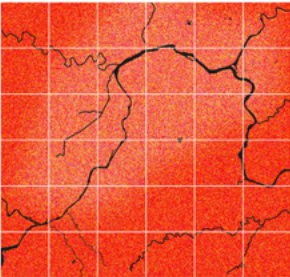
April



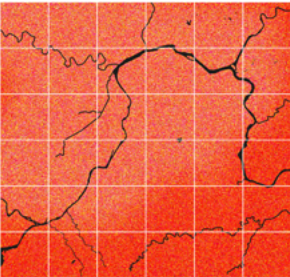
May



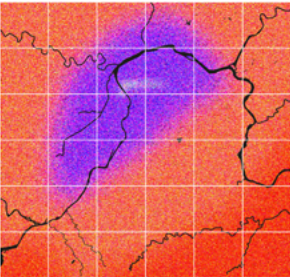
June



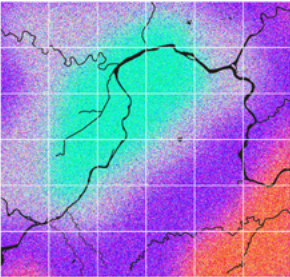
July



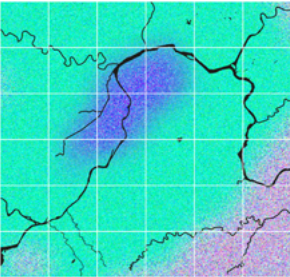
August



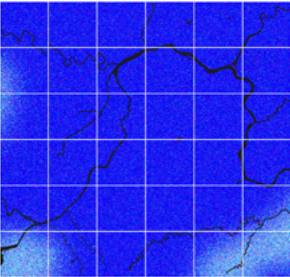
September



October



November



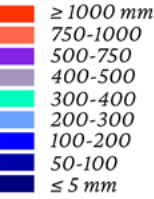
December

WET SEASON

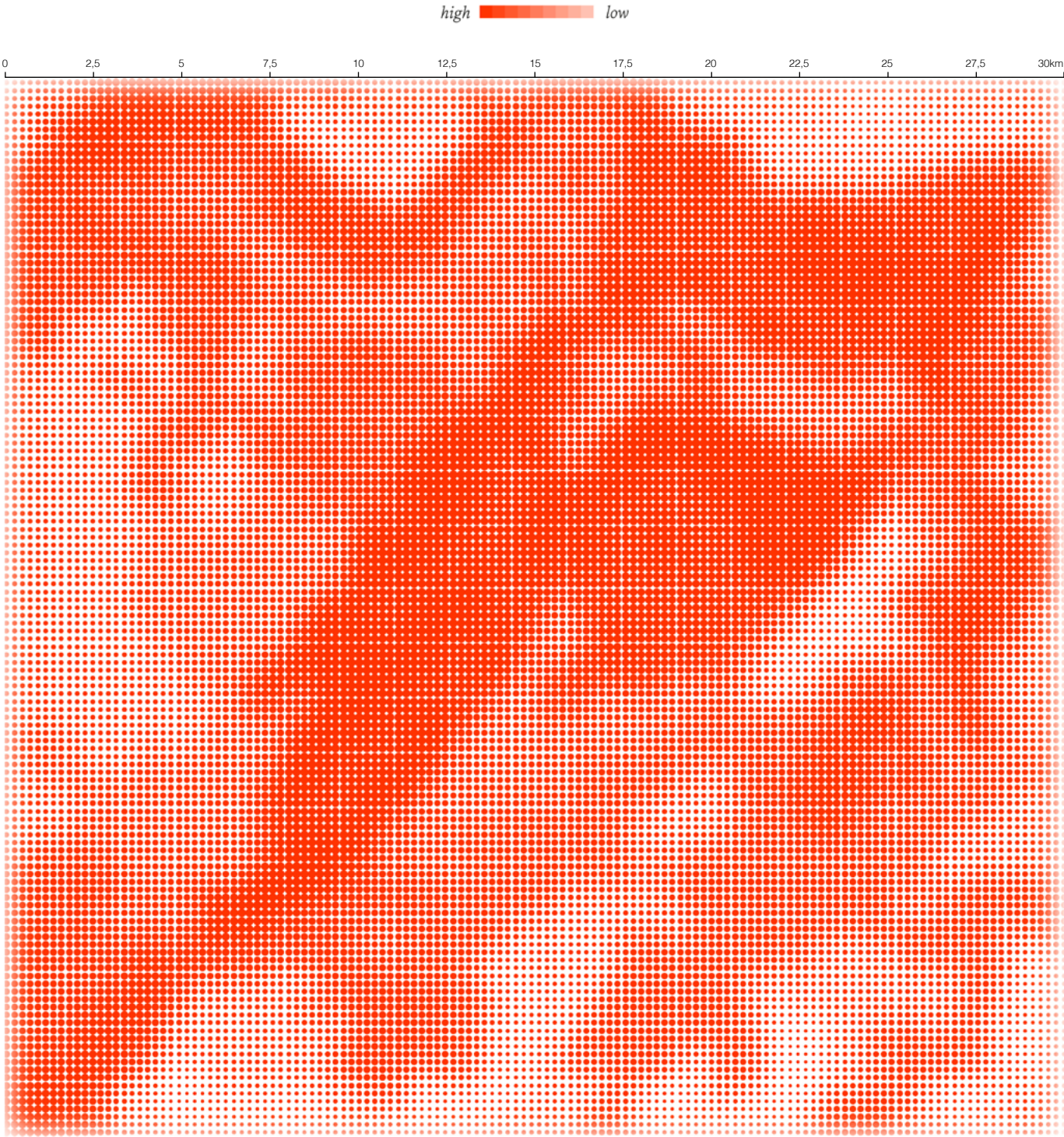
Spring
PLUM RAINY SEASON
mid April - mid July
/ heavy rainfall
/ flood risk
/ high humidity

Summer
TYPHOON RAINY SEASON
mid July- mid October
/ heavy rainfall
/ strong winds

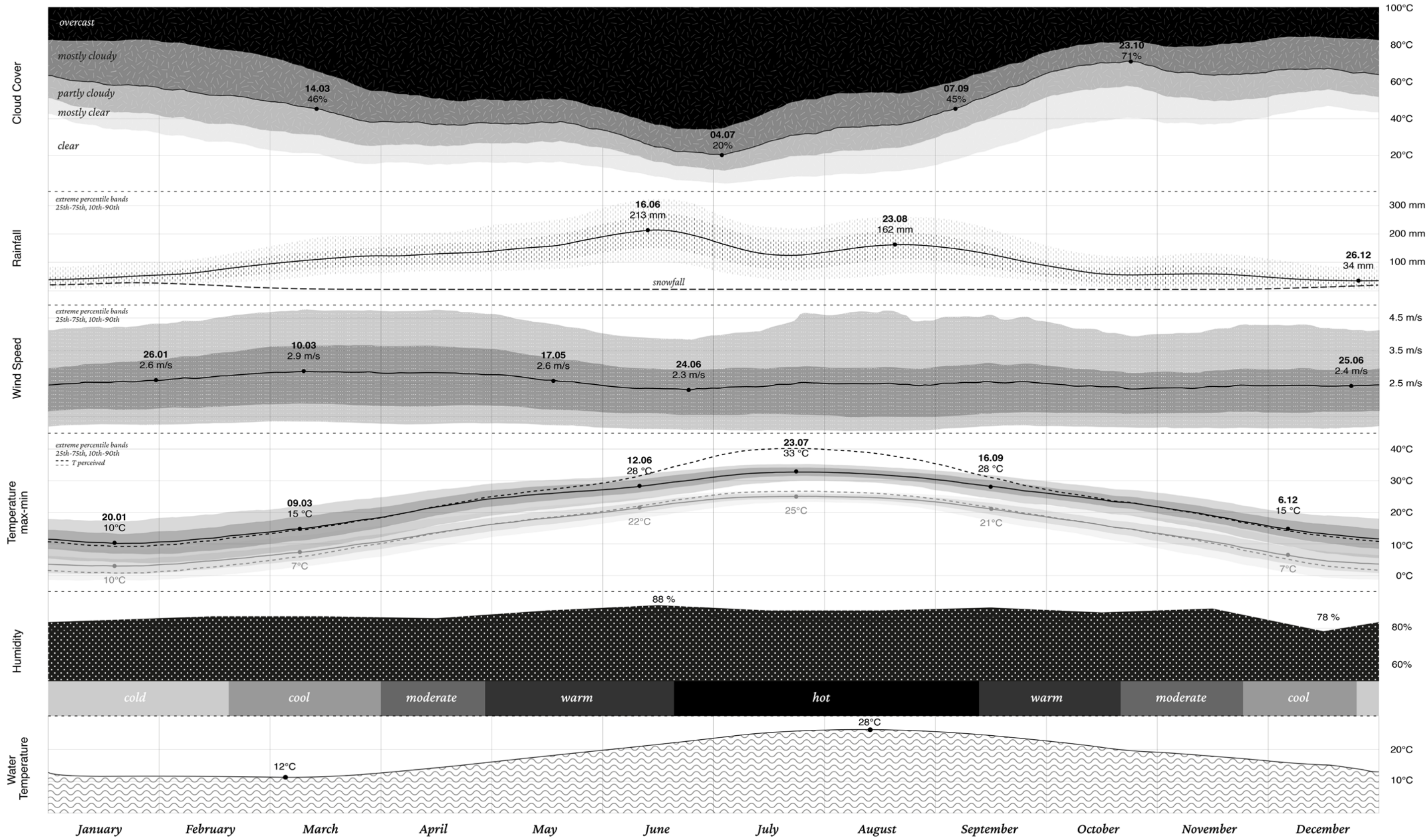
DRY SEASON
Winter, Autumn
mid October - mid April



FLOOD RISK



CLIMATE TABLE



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Websites

<http://www.lishui.gov.cn>

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Images

2.A 2.R	Competition Draft
2.B	https://philamuseum.org/collection/object/93178
2.C 2.F 2.N 2.P	https://www.sixthtone.com/news/1006812/the-weather-has-changed-historic-drought-hits-coastal-china
2.D 2.L 2.M	https://www.theatlantic.com/photo/2012/03/world-water-day/100267/
2.E	https://www.ilpost.it/2013/08/20/foto-alluvioni-cina-2/china-weather-floods-2/
2.G 2.H 2.I 2.O 2.Q	https://www.theatlantic.com/photo/2011/06/floods-follow-drought-in-china/100090/

(3.1)

Prosperous Lishui

The search for a harmonious relationship between man and nature has always permeated Chinese culture, becoming a constant element that allows us to investigate from the philosophical tradition of the past to the present day. Today, this relationship seems to be rather compromised: nature is increasingly seen as an inexhaustible resource that man exploits out of all proportion and there is a lack of ecological awareness to act in respect of the natural environment. In this logic is inserted the competition “Future Shan Shui City” which has as its protagonist the city of Lishui, destined to become a model of sustainable city where there is a harmonious balance between natural landscape and urban landscape. The aim is to create a new shan shui lifestyle where there is a strong sense of belonging to the landscape and to develop urban strategies and innovative practices that can preserve ecological values. “Prosperous Lishui”, a project presented by the Polytechnic of Turin and the South China University of Technology, focuses on the need to re-establish the relationship between urban space and rural space, starting from the agricultural roots of Chinese civilization and integrating a resilient development of the city. The project proposal involves the mixing of three complementary spaces, which, together, contribute to shaping the city of the future: the urbanized countryside, the city on the slopes and the ecological reserve. On the one hand there is the valley, the only plain in southern Zhejiang, destined to become a smart pole of intensive agricultural production integrated with innovative and highly technological systems; on the other, there is the mountain it houses, the linear city and the infrastructure in the foothills, while on the slopes, the new residential settlements. The preservation of the surrounding ecology is the prerogative of this spatial organization that has as its first objective to protect the environmental system by making it dialogue with the new urban forms.

Valley
Prosperous Lishui is agricultural production

It is the heart of Lishui, a complex high-tech agricultural system that forms the centerpiece of production. It looks like an overlap of patterns, which have integrated the existing to the new, with the aim of forming a very precise territorial mosaic that rises to consume as little soil as possible and to increase production. This spatial organization consists of: **1.** agricultural fields, of extensive type, which occupy most of the soil and are divided orthogonally; **2.** a canalization system that follows a geometric grid and represents the most important means of transport; **3.** existing villages, located on platforms next to facilities that benefit from close contact with the water system; **4.** new agro-industrial clusters composed of research centers, logistics hubs, greenhouses and vertical farms; **5.** air transportation mobility that represents the logistical connection of the whole valley through an efficient system of movement of production goods

while preserving the soil; it consists of wind turbines that produce energy for the valley itself; **6.** system of three elevated roads that intercept the logistics hubs and connect to a system of secondary roads for villages and facilities scattered throughout the area.

Mountain
Prosperous Lishui is agricultural production

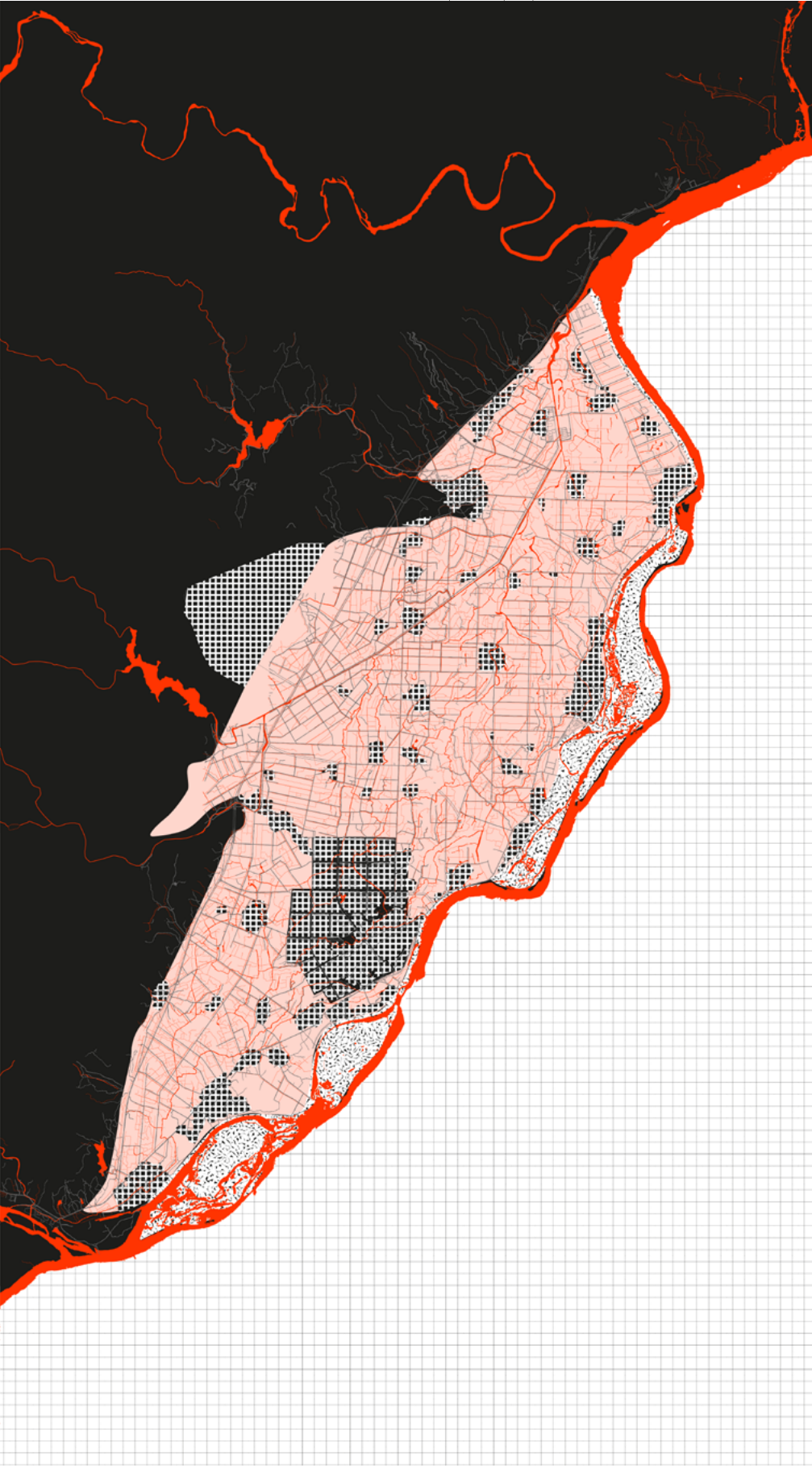
The urban part is moved to the mountains in order to exploit all the space of the valley solely for production. In order to preserve the ecology of the river and the mountain, the most densely urban part of the city is positioned at the bottom of the valley and gradually extends on the slopes, with increasingly isolated elements up to the summit. The urban layout of the city is formed by: **1.** a linear city of densely urban buildings positioned along the main mobility infrastructures and facilities, which creates a sort of belt that preserves the mountain element; **2.** residential settlements along the mountain slopes from which it is possible to admire the whole panorama of the landscape, integrated with a scattered system of amenities; **3.** big facilities as large architectural objects with functions for the city (sports, recreation, health); **3.** infrastructural mobility line with subways and motorways.

Ecology
Prosperous Lishui is preservation and environment

The natural landscape in which Lishui stands is vast and heterogeneous and permeates the whole city. The water system is present as riverbanks, with a natural wetland to protect the ecosystem and enhance biodiversity, as a canalization, which runs through the valley, and as reservoirs scattered over the mountains. On the slopes the vegetation is composed of extensive portions of unspoiled vegetation with wild forests and natural parks.

Water system

The water system is a key theme for the Lishui landscape. In addition to being an invaluable resource for ecology, water becomes the generating principle of the project as it defines spatial textures based on land uses. For this reason, it is necessary to study the water system of the landscape not only to ensure the protection of the river habitat but above all for a conscious management of the waters according to the risk and their productivity. In Prosperous Lishui the water project is treated from three different points of view according to its location: in the valley, on the riverbanks and towards the mountain. **VALLEY** - water treatment consists of a capillary system that provides for the regularization of existing canals and the implementation of the latter through a dense network of new canals for agriculture. The water, which organizes the whole valley, is used for agricultural production through irrigation and regulation systems that reach the fields. In addition, it is a navigable infrastructure that allows workers and tourists to reach the various structures scattered in the valley. **RIVERBANKS** - the banks of the Ou River have not been artificially regularized but have remained natural to preserve the habitat of the wetland. **MOUNTAINS** - the water is present in relation to the main attractions located in the valley floor. The existing system of reservoirs and natural waterways can be gently integrated with other streams to create new spaces within the urban park belt.



72 - 73

- water
- mountain
- wetland
- built area
- roads

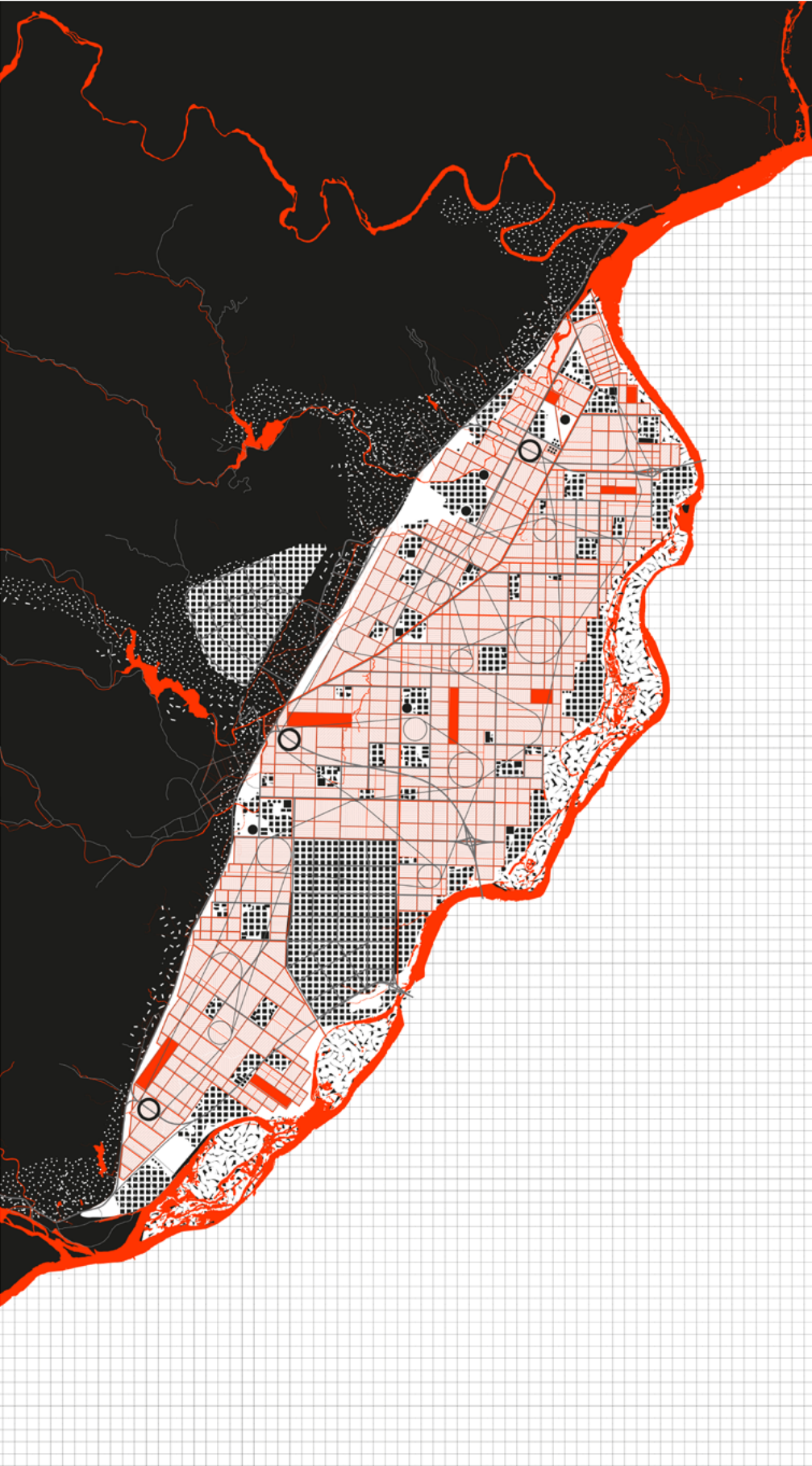
RURAL

URBAN

- water
- cropland
- mountain
- park
- dwellings
- wetland
- built area
- roads

existing





74 - 75

- water
- mountain
- park
- dwellings
- wetland
- existing built area
- facilities
- roads

RURAL

URBAN

- water
- cropland
- mountain
- park
- dwellings
- wetland
- existing built area
- facilities
- roads

competition



(3.2)

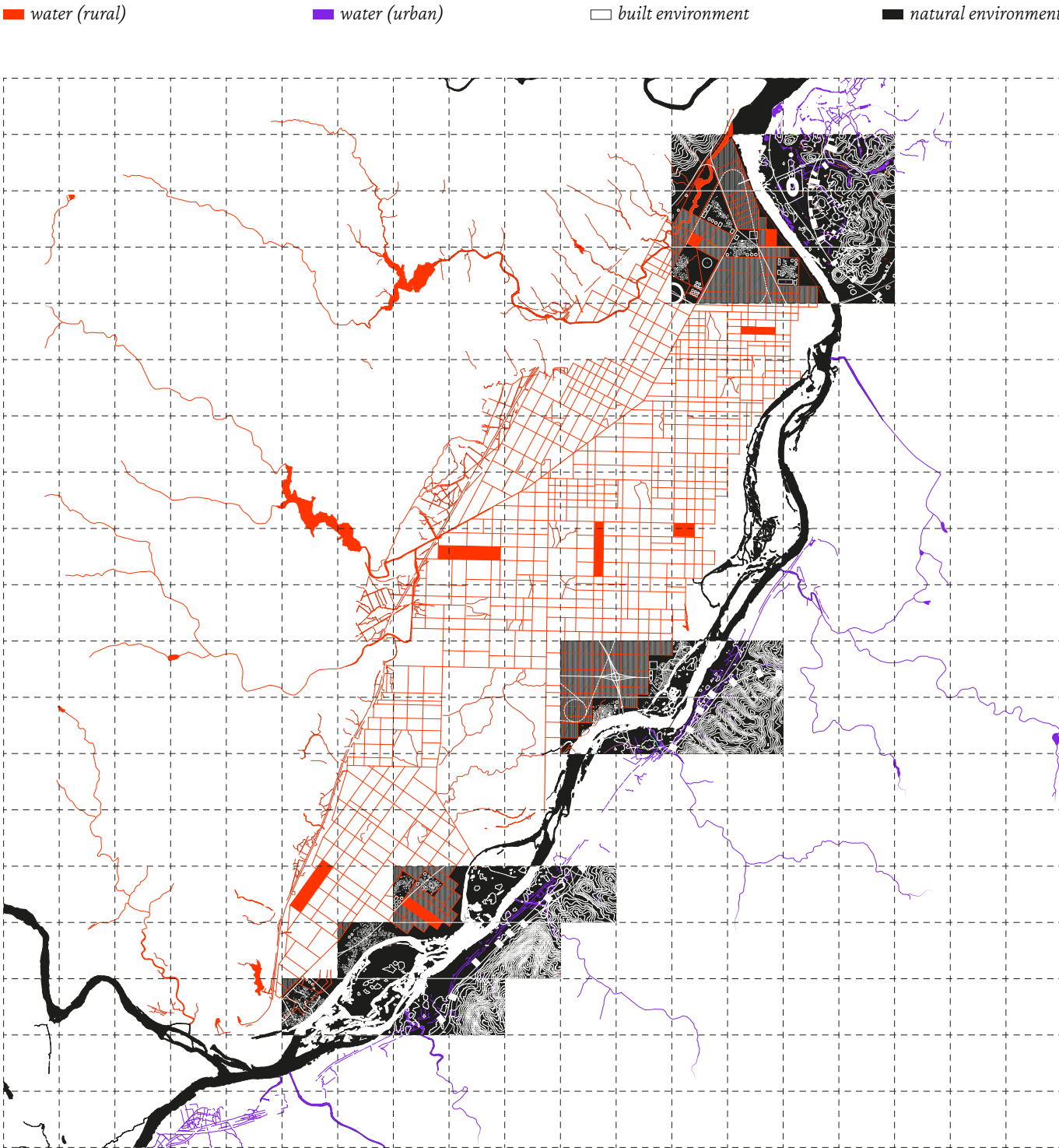
Two different scenarios: rural - urban transept

The Lishui competition presents itself as an opportunity to imagine new relationships between rural and urban space in China. In line with the new national policies, the aim is to find the balance between the city and the countryside not only in landscape design but also from an economic, social, cultural and environmental protection point of view. In Prosperous Lishui, in fact, the valley is an “urbanized countryside”, highly efficient and technological, where the agricultural reality and the urban condition merge together to constitute the city of the future.

Within the framework of this thesis project, the use of urban and rural terminology should not be misunderstood. The contrast of the rural scenario of the agricultural valley to the urban scenario on the mountain does not want to allude to a clear distinction between the two realities, on the contrary. Aware of the value of the urbanized countryside, we use this differentiation as a simplification, that is, as a way to identify the different connotation of the two banks of the Ou River. On the one hand, the smart valley pushes from the production point of view and leads to reflections on the theme of water that most refer to the agricultural sector; on the other hand, the linear city focuses on a certain urban densification that leads to think about the different uses that water can have in public space.

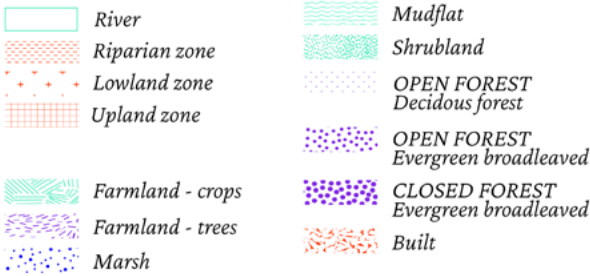
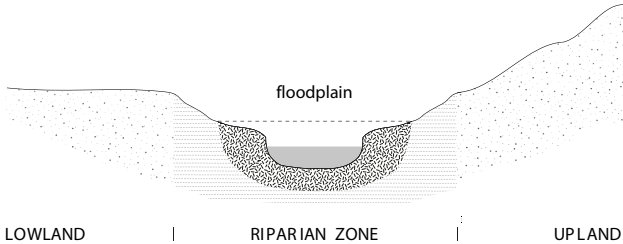
With this thesis research, the analysis of the water element and the relationships it establishes with the surrounding landscape has allowed some reflections on the transverse runoff of the water that descends from the mountain to the valley and then pours into the river. For this reason, rural-urban transepts have been identified where it is possible to make a unique discourse on water, that is, to analyze how, both on the agricultural side and on the urban side, the descent of water can be managed both in relation to risk and as an element of public space.

Isolating the transept allowed us to see more closely what are the relationships that the water establishes with the elements of the project before flowing into the river: in the valley, the canals define the spatiality of the fields, villages and new manufacturing clusters ensuring close contact with the human daily life and with the uncontaminated nature of the wetland; in the foothills, the water is close to facilities and confirms the quality of both public space and the natural dunes of the wet banks. Studying water through the transept is a way to control the overall cycle through a management that considers water both as a resource and as a risk.



LAND COVER CLASSIFICATION

There are different types of natural soil based on altitude and proximity to the river: at greater heights vegetation is denser and more compact; downstream prevails an heterogeneous vegetation, mainly due to the agricultural use.



WATER DIFFERENCES

The map shows how water relates to the elements of the landscape, in particular with agriculture, buildings and wetland on the banks, creating different scenarios.

valley

/ agricultural canalization with almost regular subdivision of fields for harvesting and breeding

/ villages near natural and artificial reservoirs

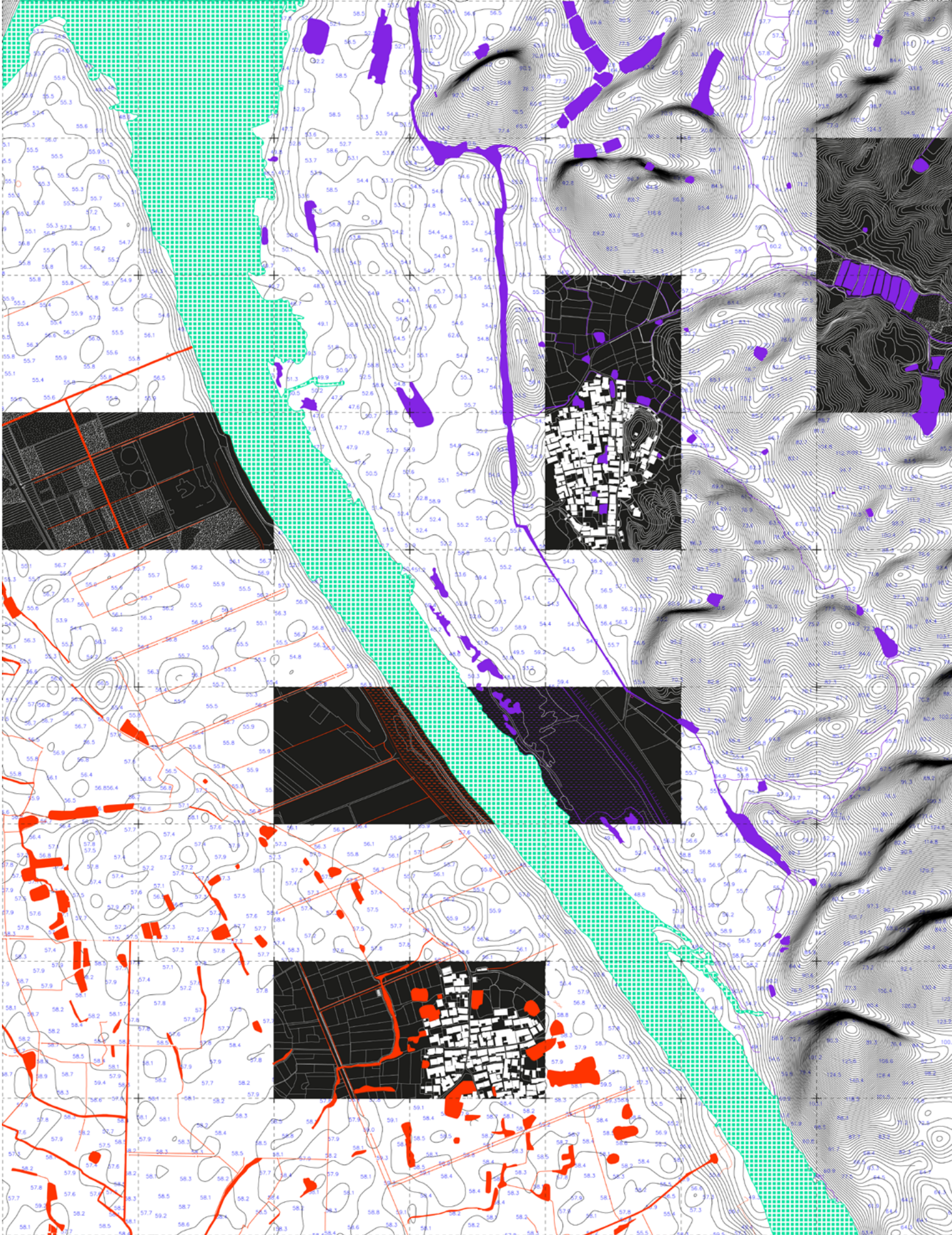
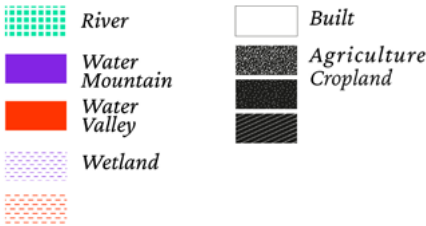
/ small portion of banks with considerable inclination

mountain

/ Irregular subdivision of fields on slopes

/ villages at the foot of the hills

/ Large portion of slightly inclined banks



SEA LEVEL RISE

The map shows the possible rise in the water level, in relation to the topographical characteristics of the area. The riverbank on the right side, characterized by a lower inclination than the left, will be flooded sooner than the other one.

60m 70m

300m

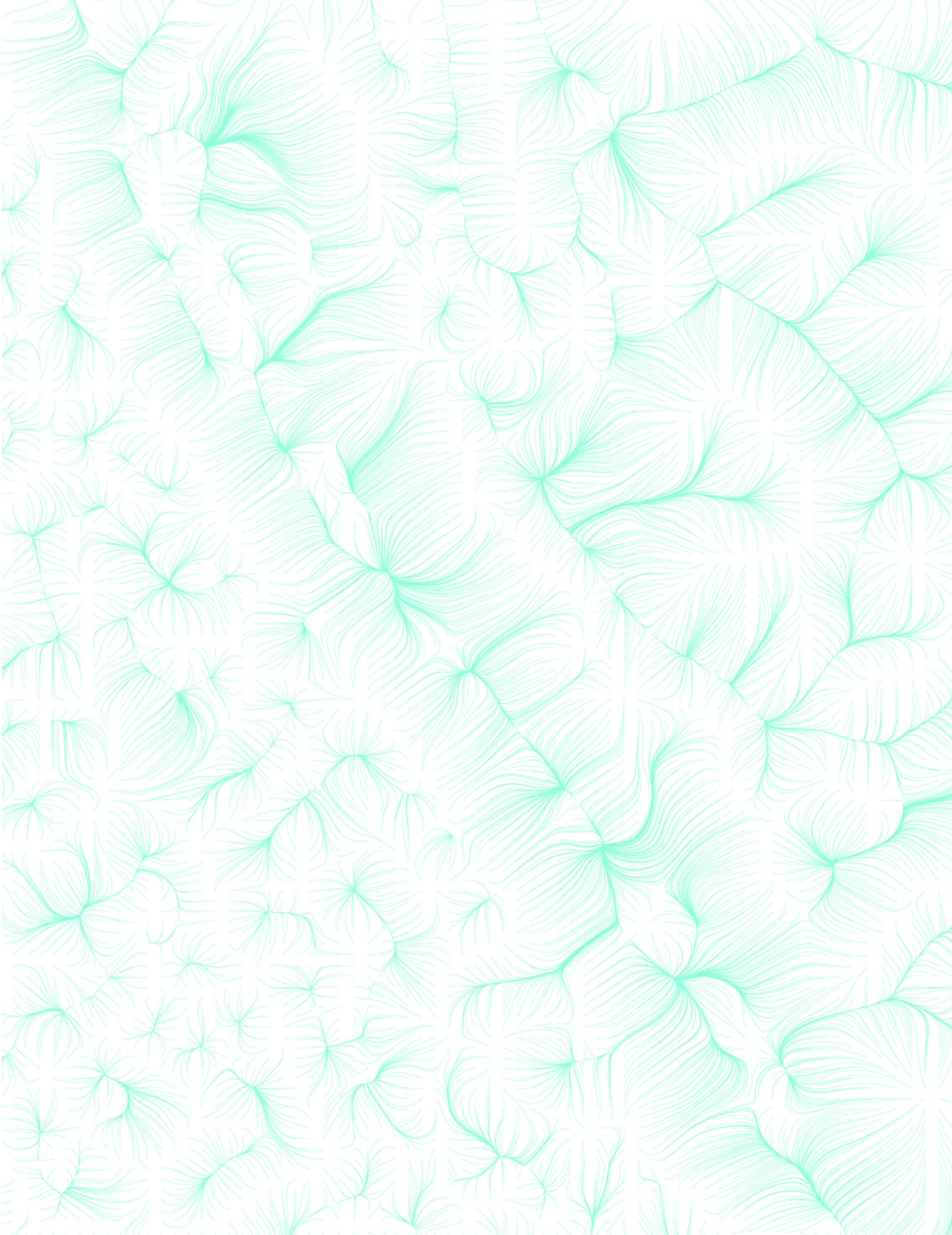


WATER DRAINAGE SYSTEM

The image is a water flow simulation in relation to the topography, through the descent paths and accumulation points. Is visible how in the mountainous area the runoff follows longer paths due to greater slopes, while on the valley there are small accumulations.



300m

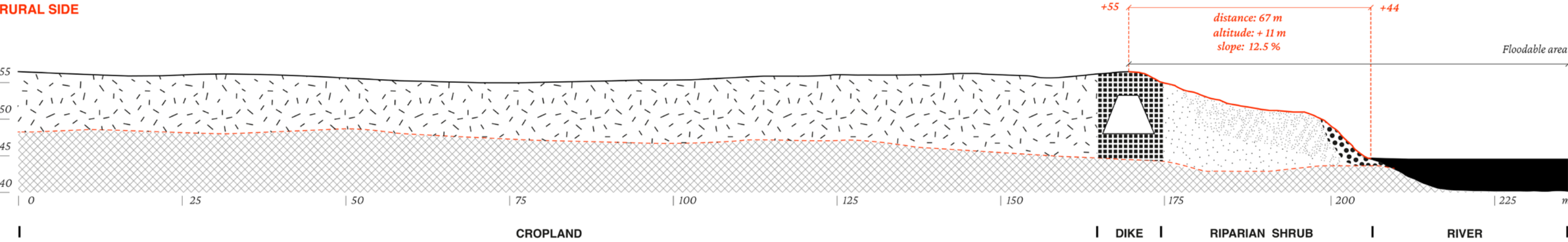




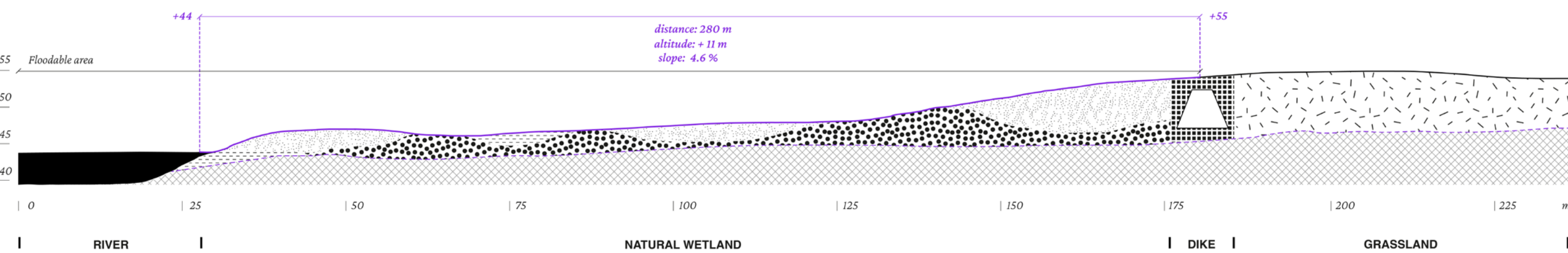
TRANSEPT TOPOGRAPHY



RURAL SIDE



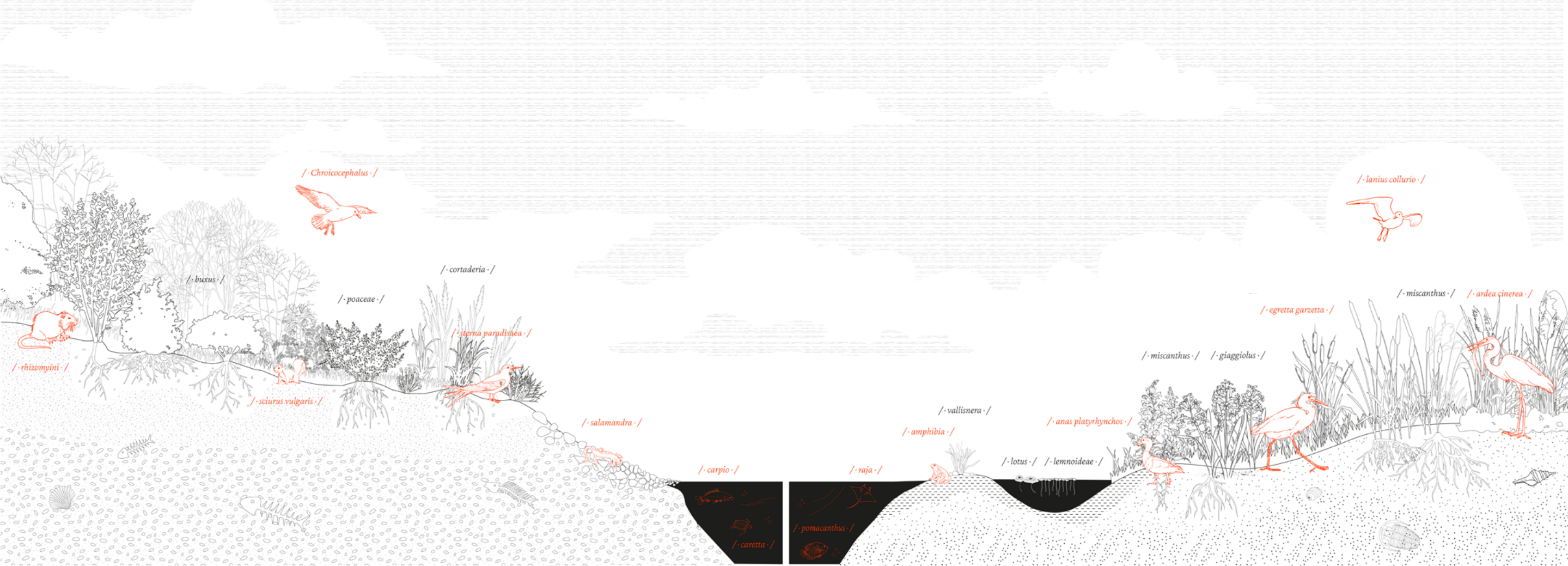
URBAN SIDE



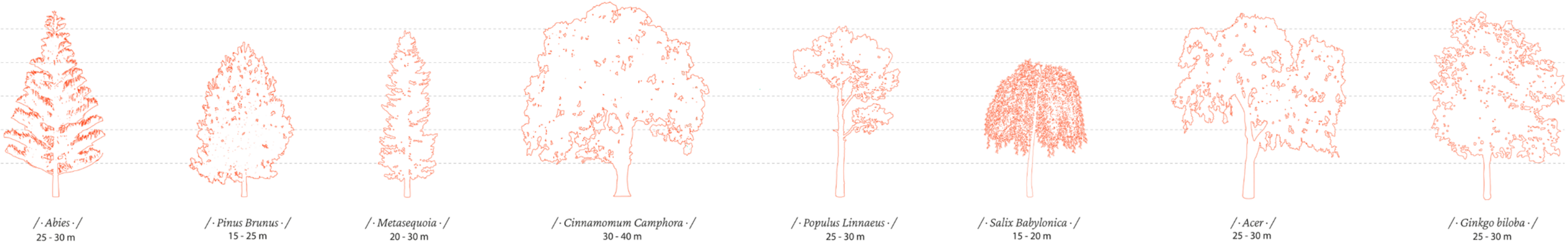
RIVERBANK STUDY - riparian habitat

SHRUBLAND
Soil with sand, clay and stones.

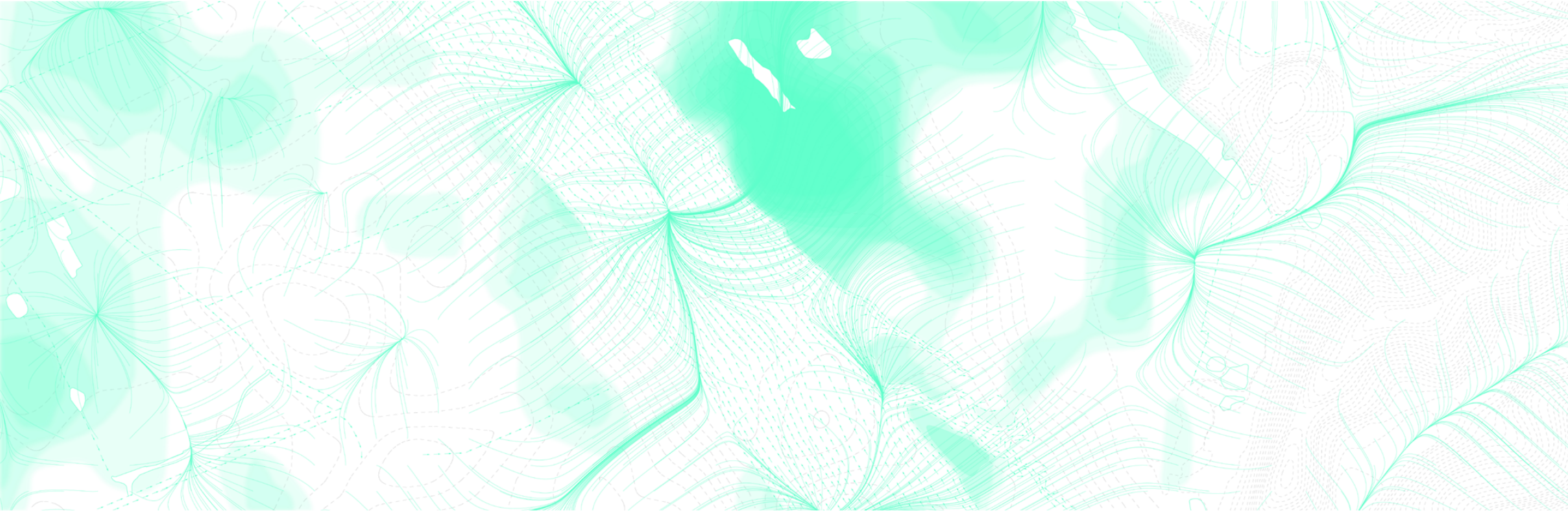
NATURAL WETLAND
Fluvial terrain with mudflat, tidal plan,
sand and alluvial sediments.



TREE SPECIES

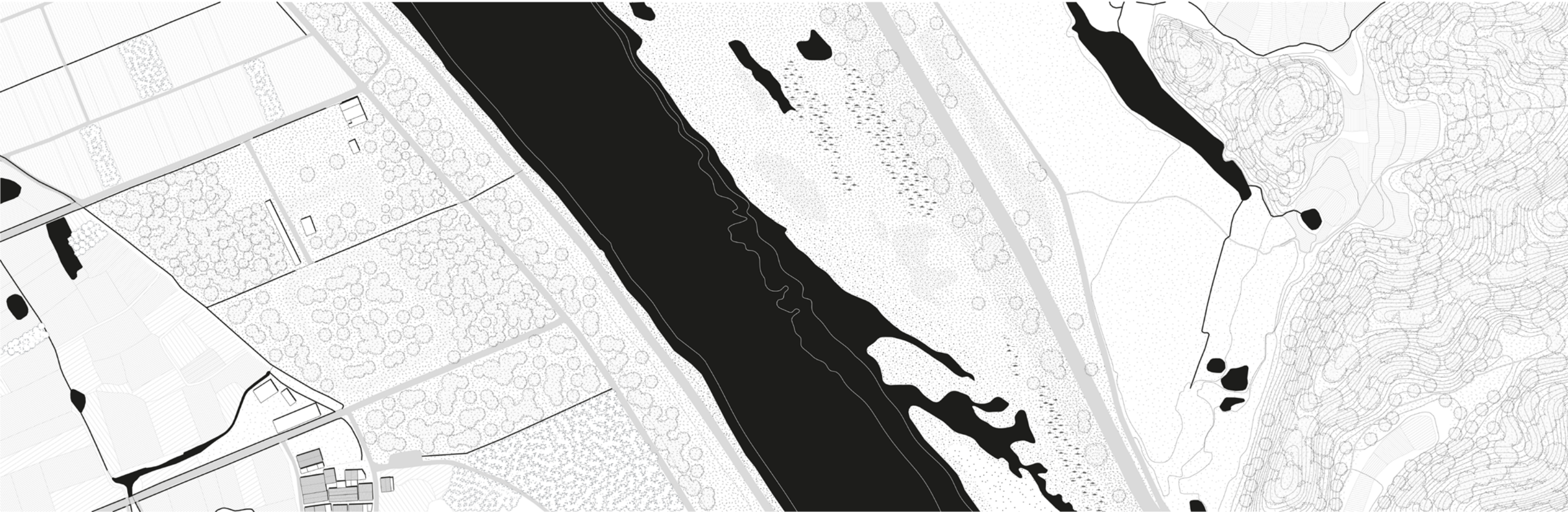


WATER RISK
water level rise + runoff



The map shows the combined effect of the water level rise and the runoff. This study was used for soil design on both sides of the river.

STRIP IDENTIFICATION



The buffer zones identified have a dual purpose: to preserve the soil and manage water-related risks. Therefore they are strategic areas in which to place the prototype buildings, which will have to manage water as a resource and as a risk.

(3.3)

Water for production: Agriculture & Innovation Research Center

In Prosperous Lishui, the left riverbank of the Ou River is characterized by the presence of the smart valley, a highly innovative and technological agricultural system that represents the productive heart of the new Shan Shui City. The flat landscape, treated with the aim of consuming as little soil as possible, is dense with agricultural fields, greenhouses, and vertical farms, connected by a dense infrastructural network of navigable canals and air mobility for the transport of goods. Existing villages are preserved and integrated with facilities and public spaces such as research centers, logistic hubs and parks.

The territorial reflection of the rural side starts from the desire to combine the ecological preservation of the valley, one of the few plains present in the area, and the riverbank, with the need to manage the water element both as an essential resource for production and as a problem during climatic alteration events. In order to manage the water cycle appropriately, have been identified territorial strips that trace different land uses and a different treatment of the water system:

Agriculture - water for production and mobility through large-scale water management to make production efficient, and the regularization and implementation of navigable canals, irrigation systems, drainage, storage and purification.

Park - permeable soil due to the presence of dense vegetation that allows the rapid absorption of water during risk events such as flash floods. It is a strategic buffer zone between the production area and the floodplain.

Shrubland - natural sloped shores that preserve the ecological ecosystem and increase biodiversity.

The project is an **Agriculture and Innovation Research Center**, in which the main function of research is implemented with an indoor production part and educational activities. The aim is to create a building focused on the water element as a resource for production, through the adoption of water-based devices that become an opportunity to create new public spaces linked with water. The building manage the water risk, by letting itself be crossed by rainwater, in two ways: it is stored for indoor production and is collected both to make it gradually absorb by the soil and to support the irrigation of external fields.

The architectural form recalls that of the *tulou*, a traditional rural defensive fortress of southeast China, with a circular configuration and concentric rings around a central public court. In the same way, the project of the Research Center is configured as a circular and concentric architecture that, in the lower part rests on an underground basement that acts as a barrier for water

while in the upper one, unlike the *tulou*, it opens towards the external context and establishes relationships with it in terms of continuity of the landscape and production activities. The spaces, divided by function, work as a single element through transversal connections in the building, which consists of: **Rain harvesting pool** - rainwater collection and phytodepuration tank that is configured as a central public square where to establish a direct relationship with water.

Research Core - core of laboratories, both collective and private, focused on advanced agricultural research using innovative and smart technologies.

Productive ring - area reserved for production through indoor and underground farming methods such as aquaponics and hydroponics, plant nursery and seed library, interspersed with educational workshops.

Wet retention pond - a ditch with a level of permanent water around the building that treats stormwater runoff, reduce runoff peak and provides local flood control.

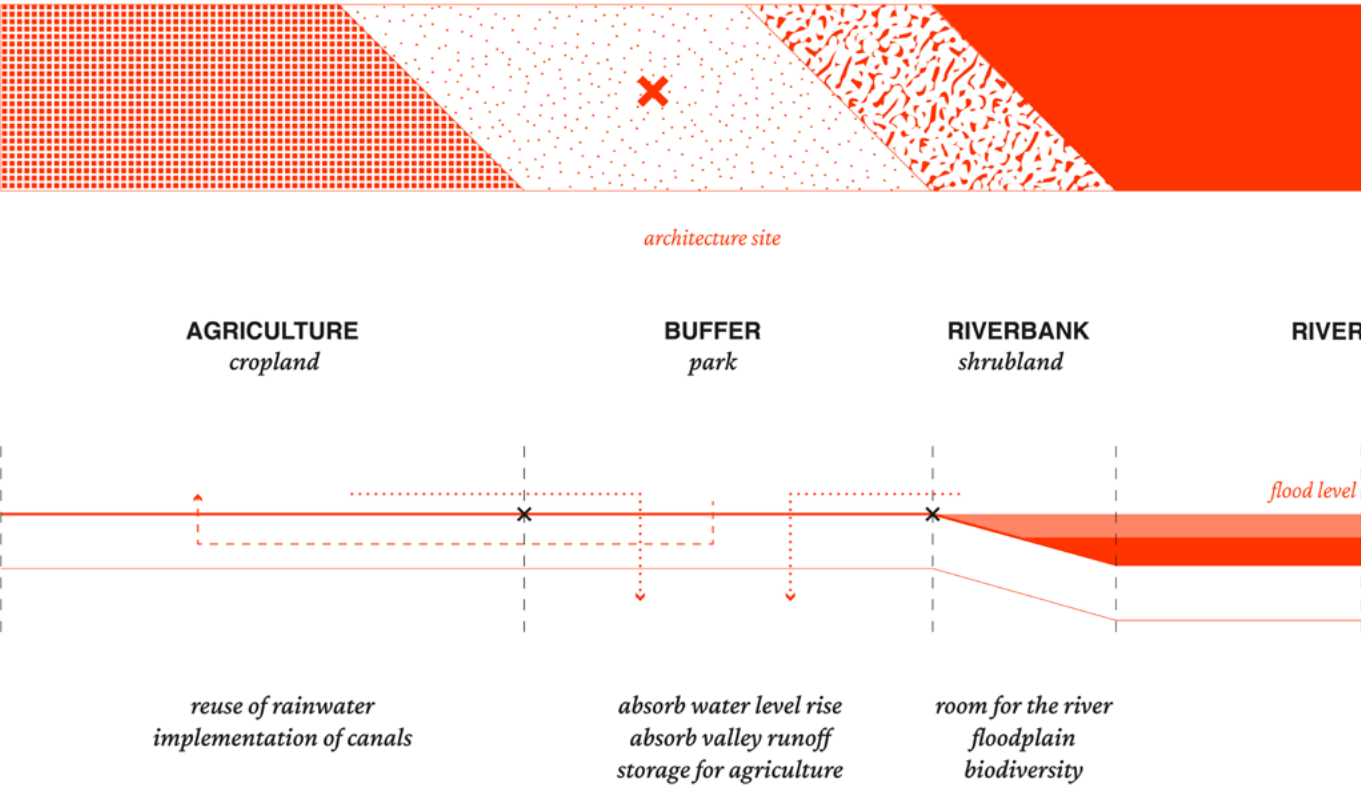
Even the circulation inside the building follows a circular design with the presence of a ramp that winds around the square and through which it is possible to walk through the entire building.

The Research Center behaves like a **rainwater collector**: the roof, curved and grooved, allows a controlled descent of rainwater that is channeled inside a rain harvesting water pool; the collected water is purified here, first in a natural way, through a process of phytodepuration and decantation, and then subjected to a mechanical treatment that makes it convey in a system of water tanks in the underground. These tanks are the main reservoir of purified water of the building and from them the water is distributed both in the research ring and in the production ring for purposes related to the supply and irrigation of the greenhouse. Outside, the wet retetion pond increase its water level in case of heavy rains with stormwater runoff. This collected water partly infiltrates the groundwater, and partly is passed through a system of mechanical filters and water pumps that allow its reuse for irrigation of the fields and regulation of the water level of the canals. The intercepted devices for the management of the stormwater also have a value of public space where the changes in water level is visible: both the rain harvesting water pool, which is the central square of the research center, and the wet retention pond, with platforms that extend from the building, are in direct contact with water which increases the quality of space and restores man’s relationship with nature.

In the agricultural valley, the presence of water must be constant to ensure effective production, therefore the building adopts stormwater management devices that on the one hand always guarantee a permanent water level, useful in case of drought periods, and on the other raise the level in case of flood risk, regulating, through controlled systems, the maximum achievable limit.

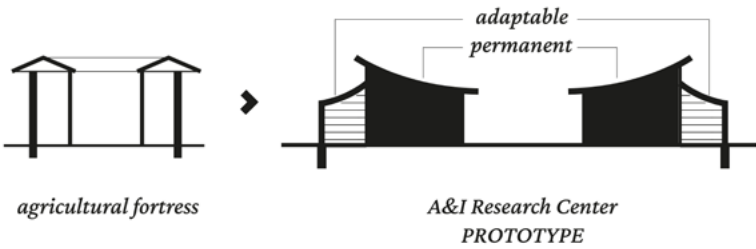
The Agriculture and Innovation Research Center represents a **rural prototype** that can be replicated within the valley and adaptable according to the context in which it is located: in fact, if the research core remains a constant element as it represents the main function of the building, the production ring, on the other hand, can change and open up to establish dynamic relationships with the outside.

LANDSCAPE

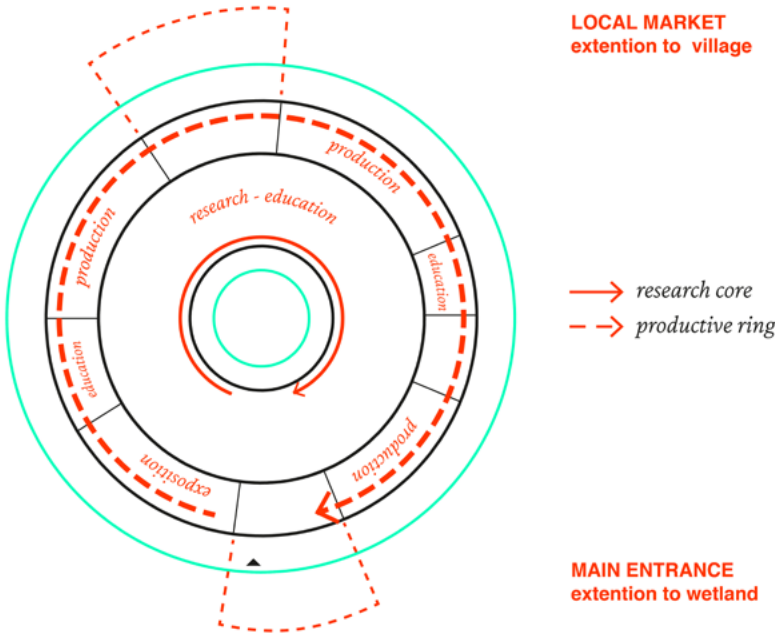


ARCHITECTURE

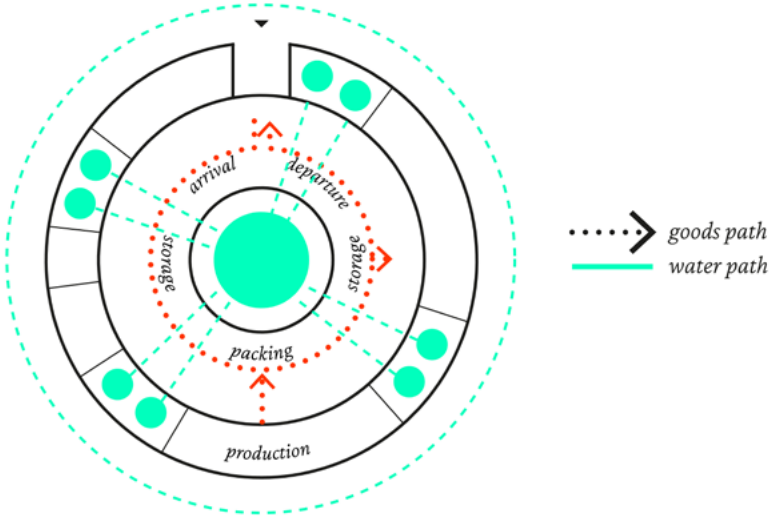
INSPIRATION

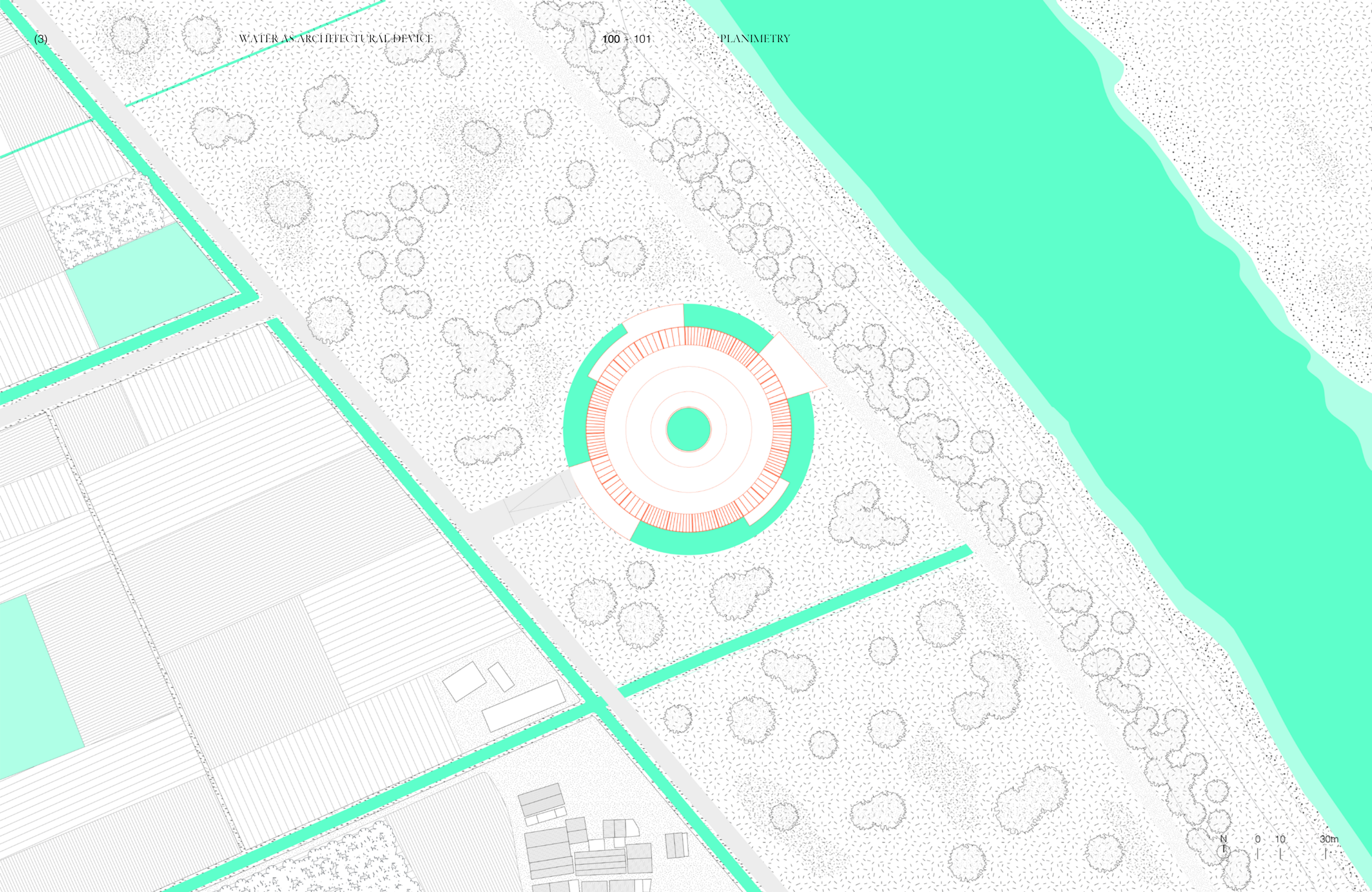


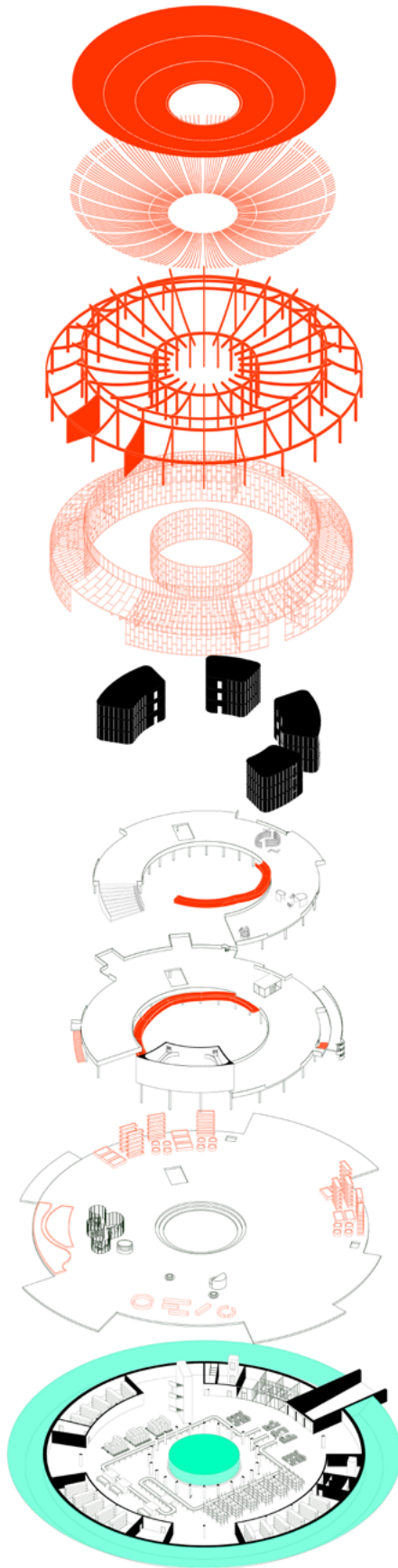
COMPOSITION



WATER SYSTEM







structure

*timber structure
curtain wall facade
concrete curved roof*

circulation

*staircase and elevators
circular ramps
freight elevators*

distribution

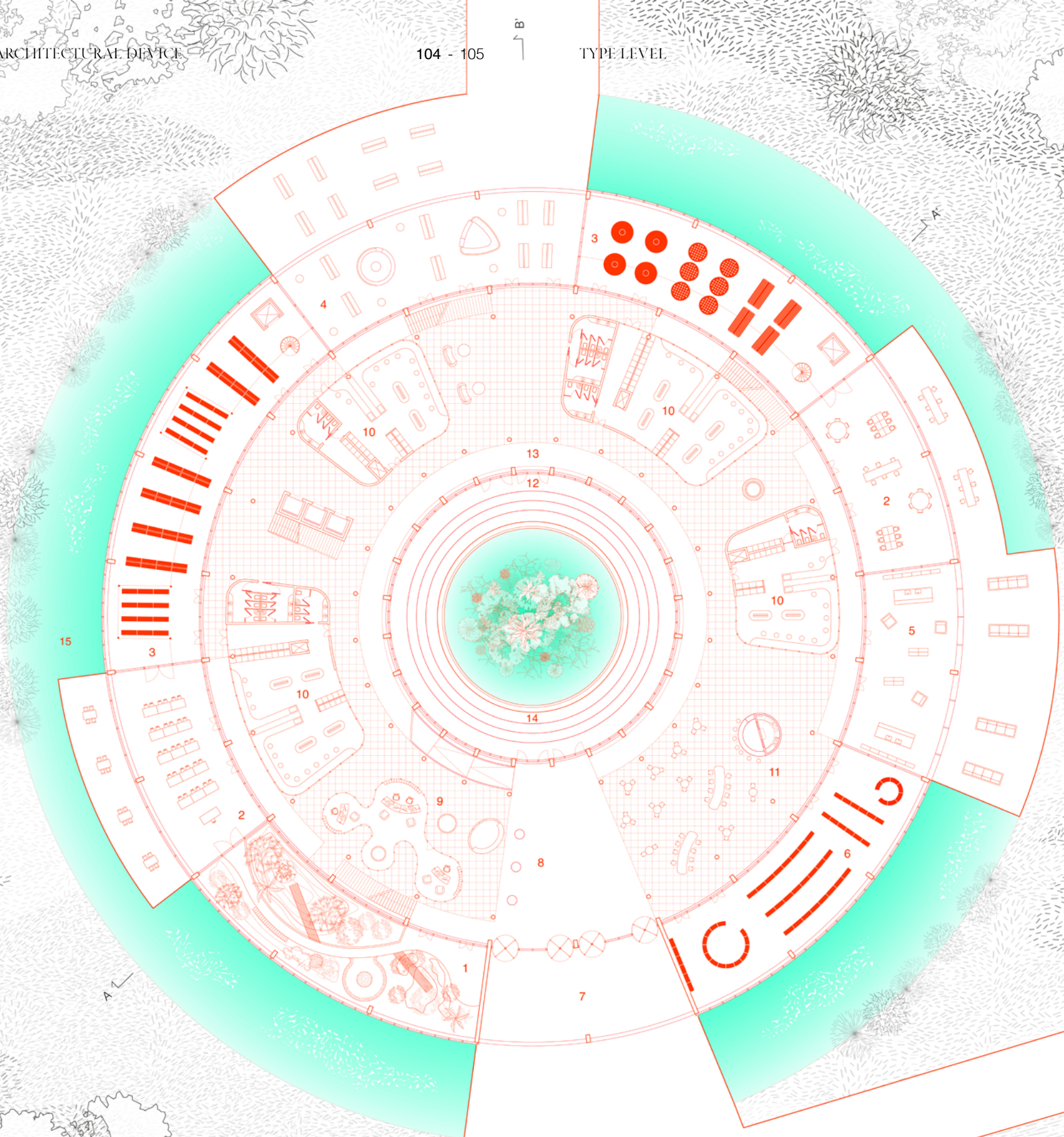
*2nd floor - research / education
1st floor - research / education / rest
ground floor - productive ring / research / education / public path
underground floor - production and logistics*

activities

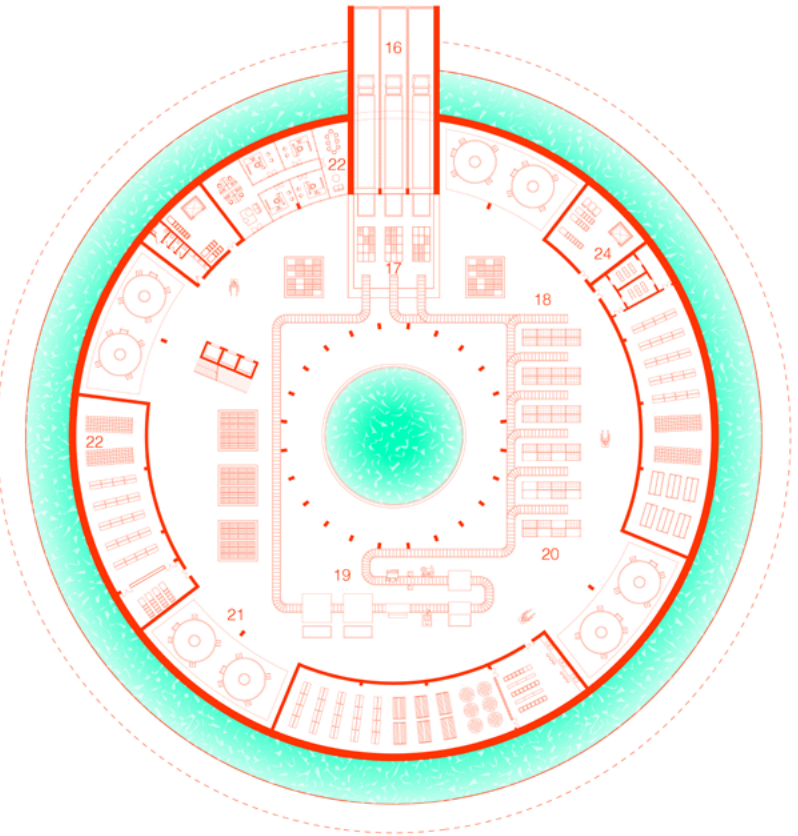
*research laboratory / library / auditorium / rest area / stair hall /
administration offices / multimedia / meeting spaces / restaurant /
workshop classroom / bothanical garden / idroponic - aquaponic
production / nursery / seed library/ tea house / local market /
underground farm / logistics.*

water

*water tank
rainwater harvest pool
stormwater management pond*



- 1. Botanical garden
- 2. Workshops
- 3. Hydroponics /Aquaponics culture
- 4. Local market
- 5. Tea house
- 6. Plant and seed nursery
- 7. Main entrance
- 8. Authentication totem
- 9. Administration
- 10. Research laboratory
- 11. Restaurant
- 12. Water plaza
- 13. Circular ramp
- 14. Rainwater pool
- 15. Stormwater pond

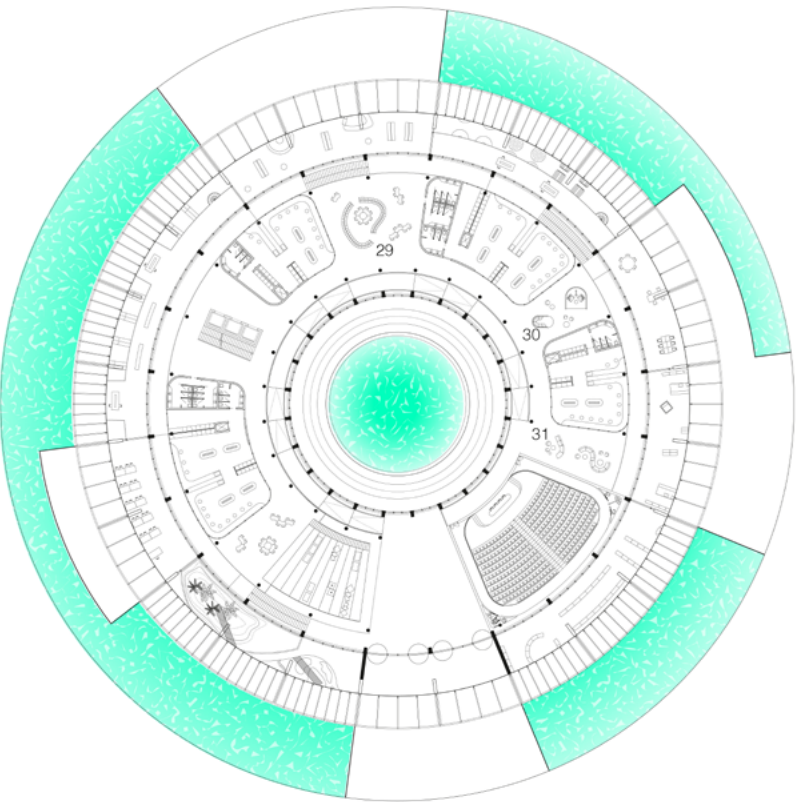


-1_Level
production and logistic

- 16. shipping area
- 17. staging area
- 18. conveyor belt
- 19. packing area
- 20. storage area
- 21. water tanks
- 22. underground farm
- 23. offices
- 24. warehouse

2_Level
research and education

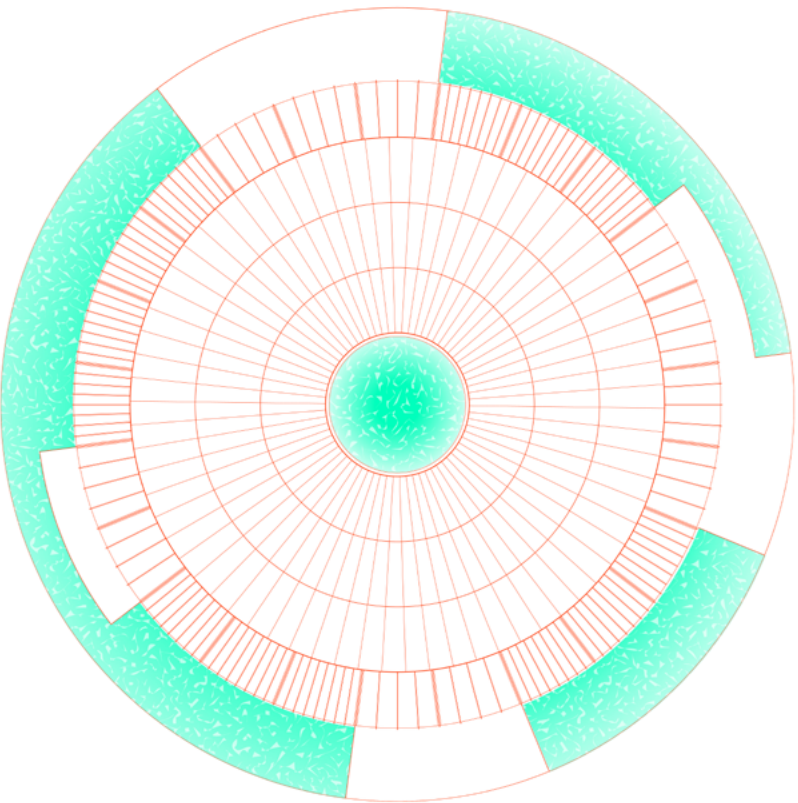
- 29. library
- 30. rest rooms
- 31. rest area



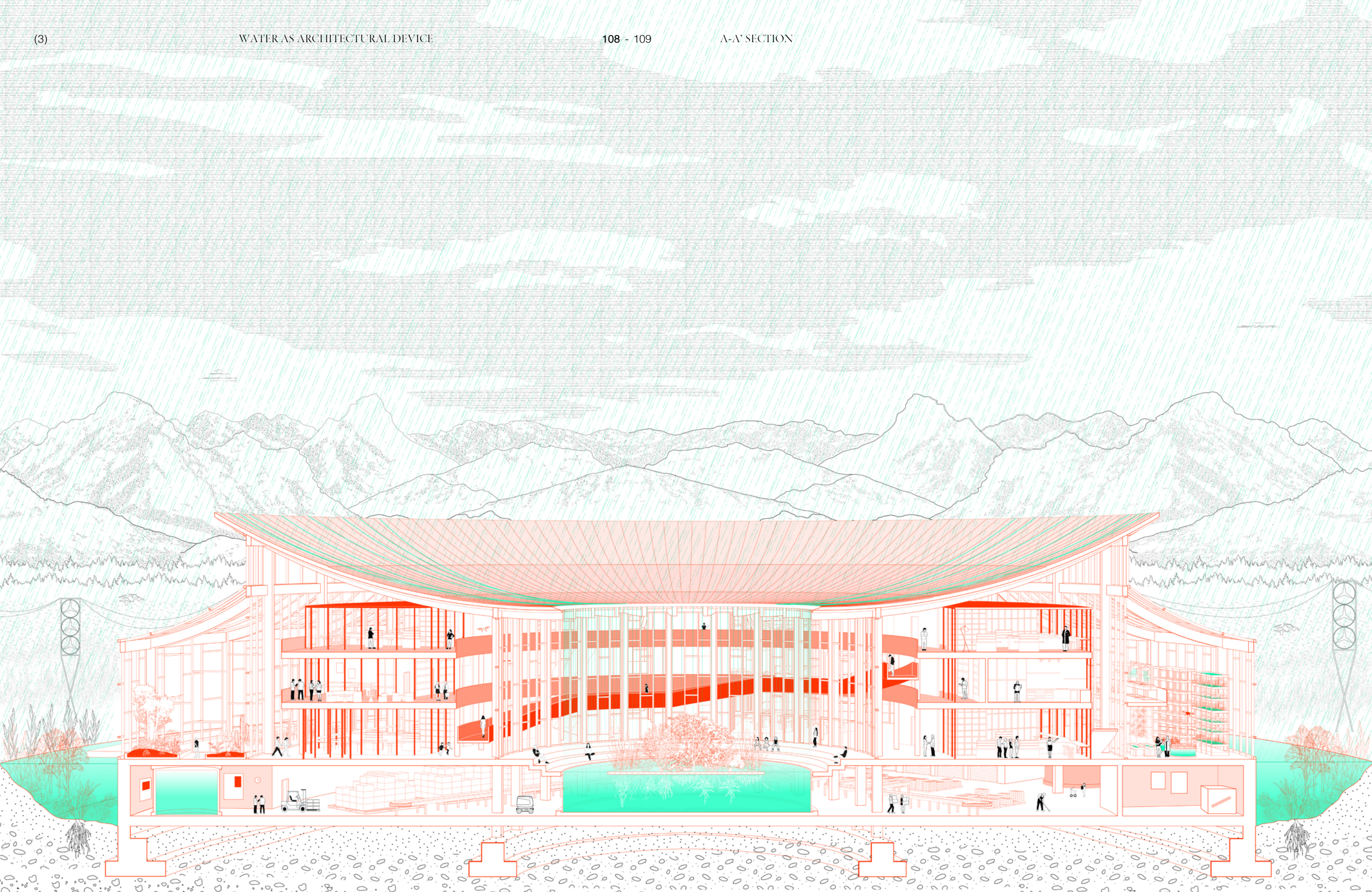
1_Level
research and education

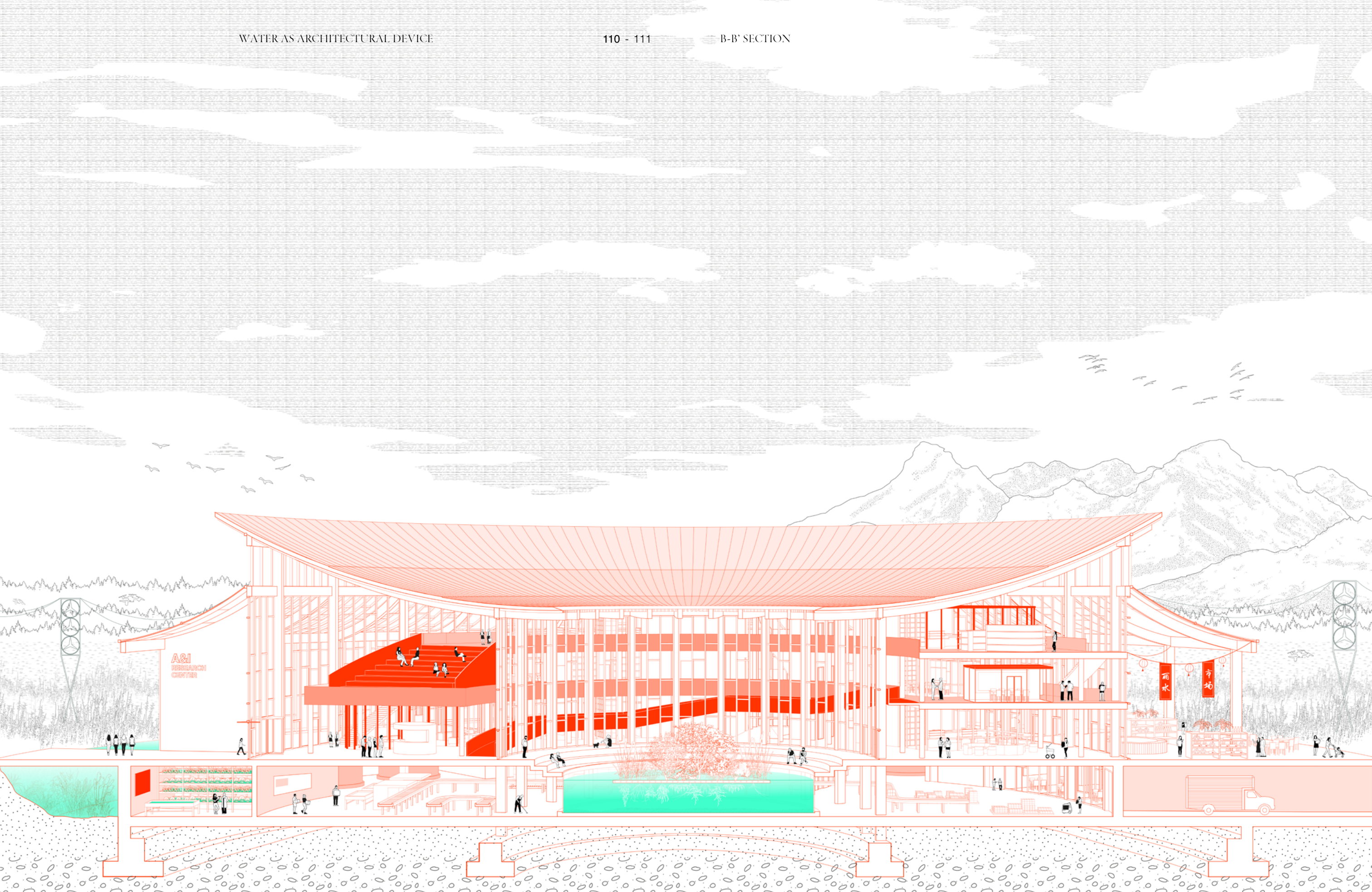
- 25. stair hall
- 26. meeting room
- 27. rest area
- 28. a uditorium

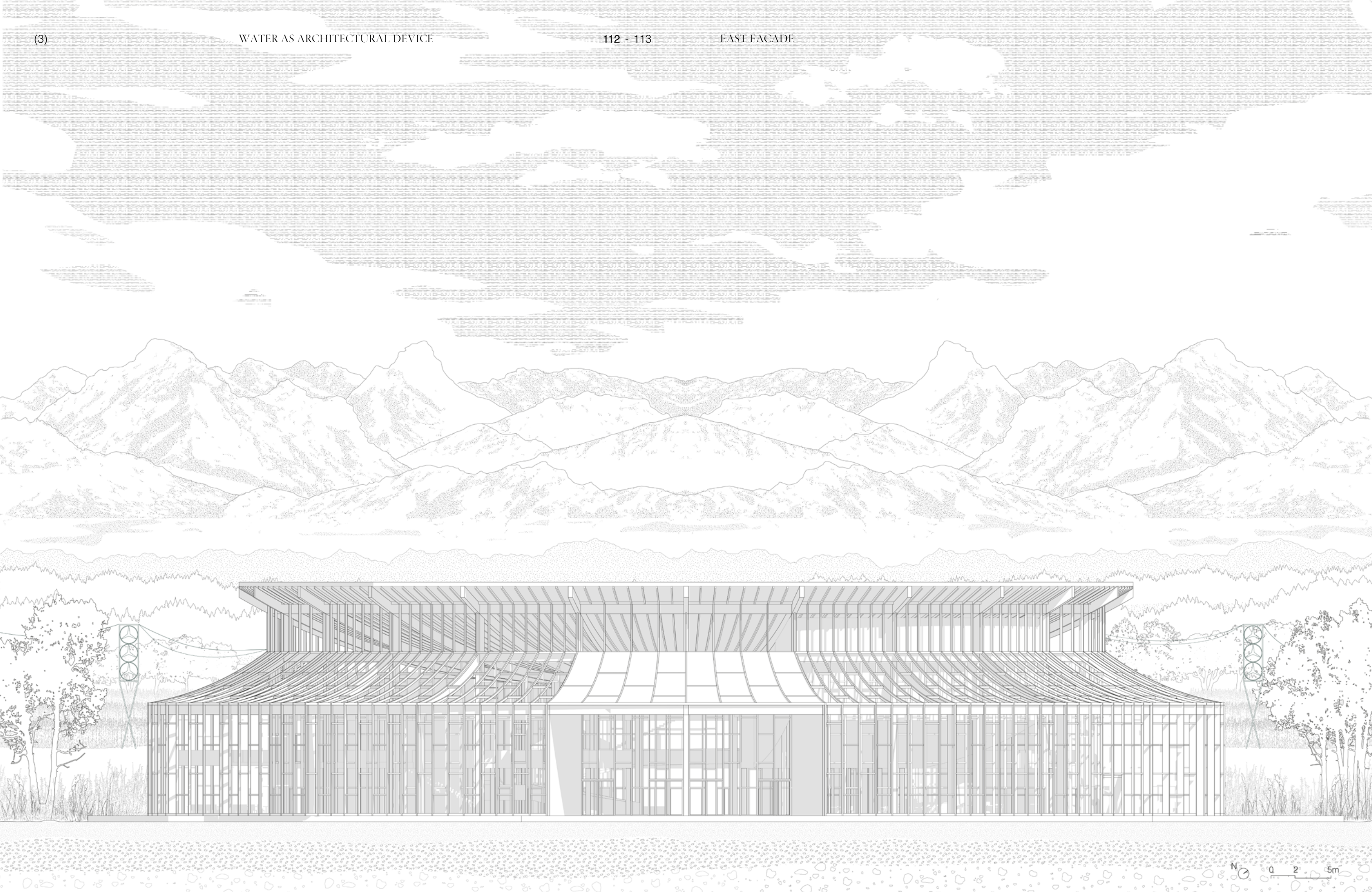
Roof
curved timber structure

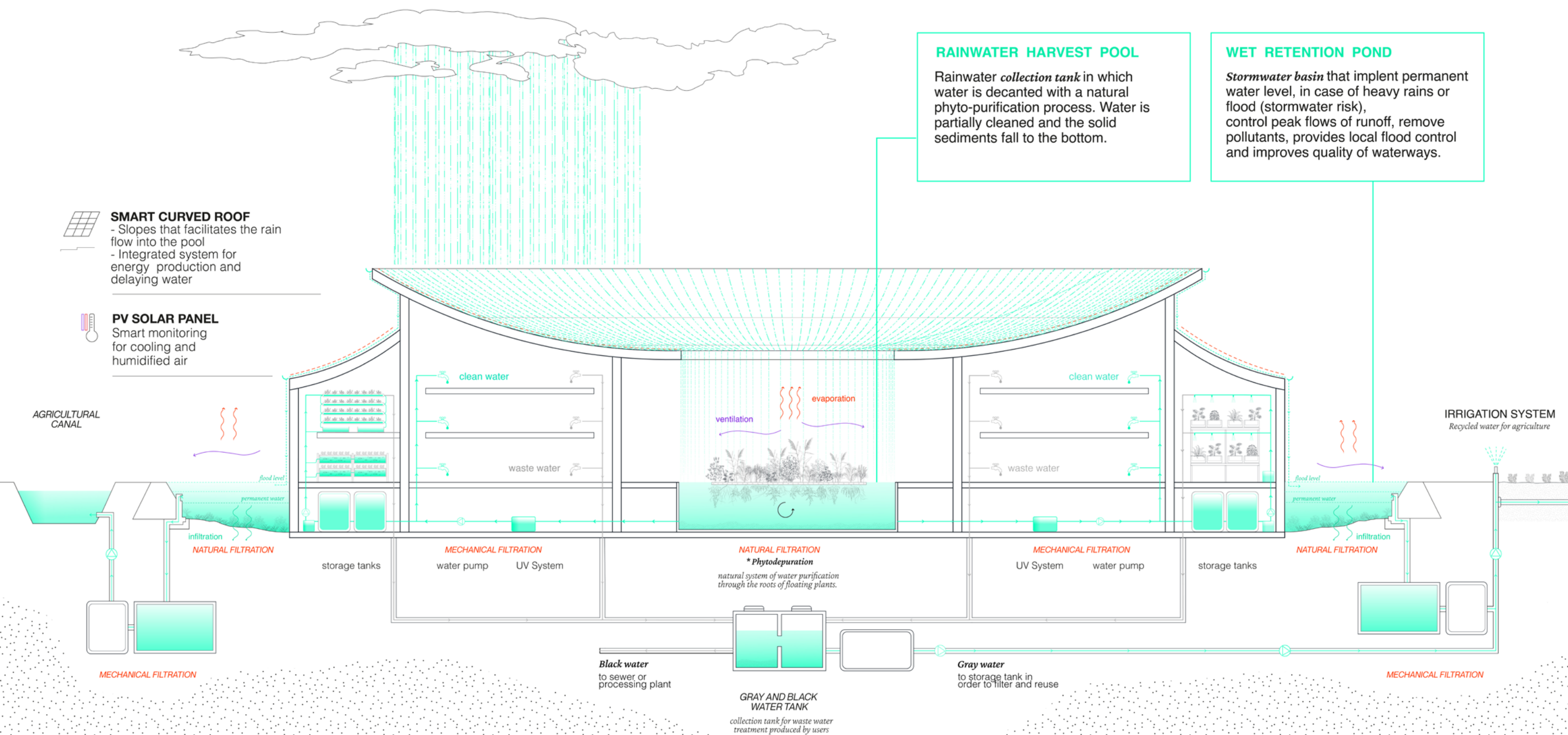


0 5 10m









(3.4)

Water for leisure: Mixed use Transit Hub

The area to the right of the river Ou provides for the extension of a linear city, which develops along an important elevated infrastructural axis of subways and motorways that intercepts mixed used buildings; the new residential settlements and the larger facilities, in fact, are positioned at the foot of the mountains with the aim of preserving the ecology and are integrated with small amenities scattered among the slopes.

As in the rural side, the aim of the project is to affect as little as possible the soil related to the ecological reserves of the mountains and manage the flooding of the river in the wetland during risk events. The problems related to water, in fact, derive both from the surface runoff, which descends quickly and uncontrollably from the slopes, and from the flooding due to the water level rise that fills the entire extension of the floodplain.

To better address the overlap of these problems in a joint way, a scan of strips has been identified, which, as in the rural case, are crossed by water in different ways, in fact:

Mountain - water in the form of streams and basins; the high slopes of the reliefs cause violent descents of water on the soil during climate risk events.

Park - strategic strip of land with vegetation that, despite the more urban connotation given by the presence of important architectural elements, remains mainly natural to allow the absorption of rainwater and the slowing downhill flow.

Wetland - large portion of natural shores characterized by mudflat and tidal soil in which there is a rich proliferation of local flora and fauna. This area remains natural to allow the river to swell in case of heavy rains.

The building is a **Mixed use Transit Hub**, to which at the main function of intermodal exchange between subways and motorways is added a separate volume of facilities for citizens and passengers. The aim is to create an architecture that is elevated so as not to obstruct the path of the water downhill, leaving the natural soil as free as possible to promote absorption into the ground. From a water point of view, the building has the task of absorbing rainwater through the roof and reusing a part of the excess water for leisure spaces inside. In fact, the goal is to delay the descent of water to the ground: the water enters the building through a natural layer of vegetation that retains a part of it, and directs the remaining in a system of cisterns that self-regulate and feed public spaces.

The compositional setting of the building recalls that of a traditional *Chinese bridge*, where in addition to the pedestrian crossing are added covered upper levels. Similarly, the Mixed use Transit Hub, develops above the

infrastructural element with a tiered volume that houses accommodation and tourist functions. Both volumes, transportation platform and facilities block, are intersected by two vertical elements that act as the main structure and vertical distribution, both from the point of view of circulation and water system. The spaces intercepted by these volumes use water for the purpose of leisure but with different treatments. In particular, there is:

Wetland park - constructed roof with bio-retention soil made by depressions of aquatic vegetation flooded by water during risk event, becoming a panoramic park in contact with water.

Facilities volume - block of six floors with different public functions (temporary hotel, culture, technology, sport, business and commercial), three of which use water through a system of water plazas in which different activities can be carried out that adapt to the presence or absence of water.

Transportation platform - elevated infrastructural element that is configured as an independent block in which there are the subway, motorways and parking service; the roof of the platform is a square with floating pavement that collects rainwater in the substrate and makes it convey in vertical cores before infiltrating the soil.

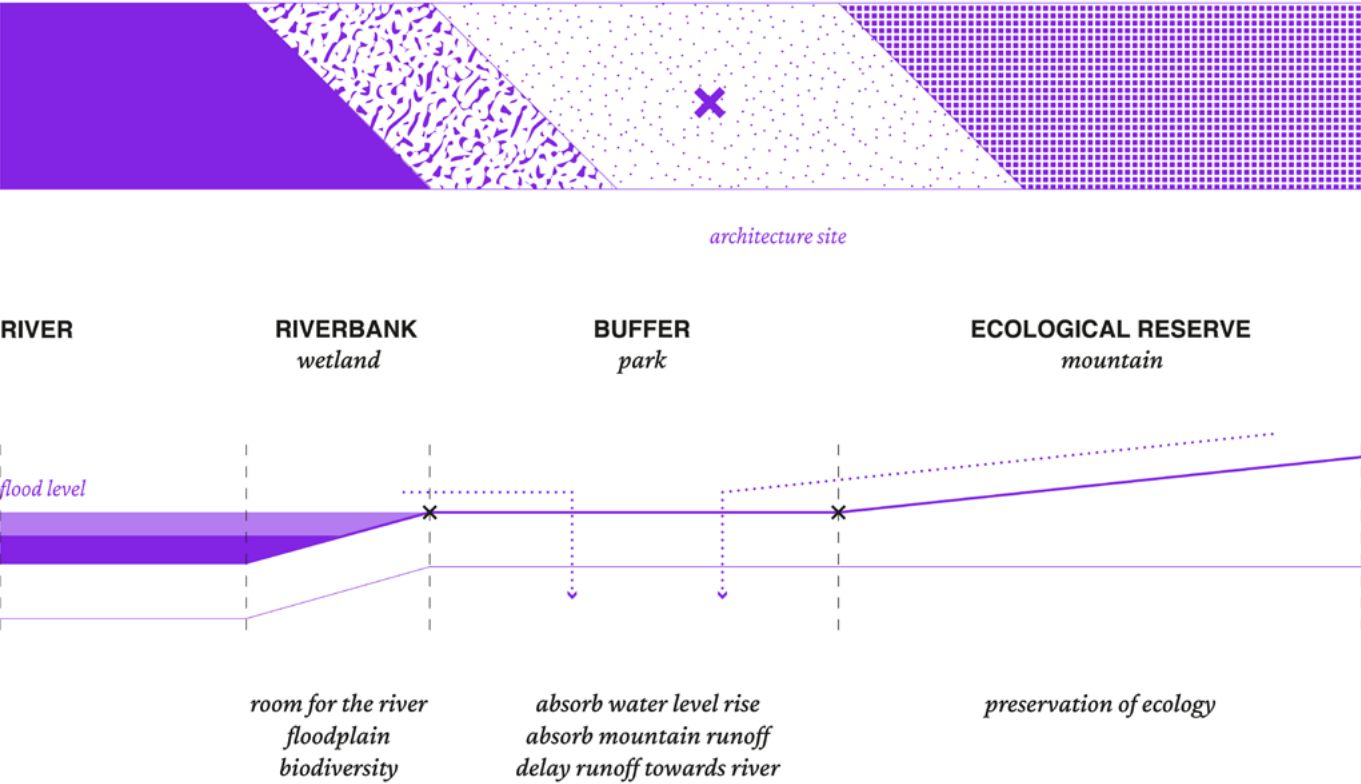
Towers - within them the water system of the building is managed and directs the water collected and purified by the wetland park in the different public floors. They are configured as a set of technical chubs composed of purified water and drainage tanks, which regulate the levels of water to be supplied to the various functions.

Dry detention pond - the natural soil has been shaped with a ditch of permeable soil that connects the mountain to the wetland and is intended to intercept the surface runoff downhill. It fills up temporarily in case of water risk and allows the gradual absorption of water into the soil.

Under real conditions, in the urban context, public spaces are subject to the temporary presence of water in relation to situations of climate risk. These problems can be solved by designing resilient public spaces that, in addition to their basic function, integrate and manage the water element with the aim of absolving the risk and ensuring a better quality of urban space. This reflection on the mutability of space in relation to water was the basis of the design of the entire building, which shows how the spaces provided inside can adapt to the presence of water, modifying their function, confirming it with a new one that establishes a direct relationship with water.

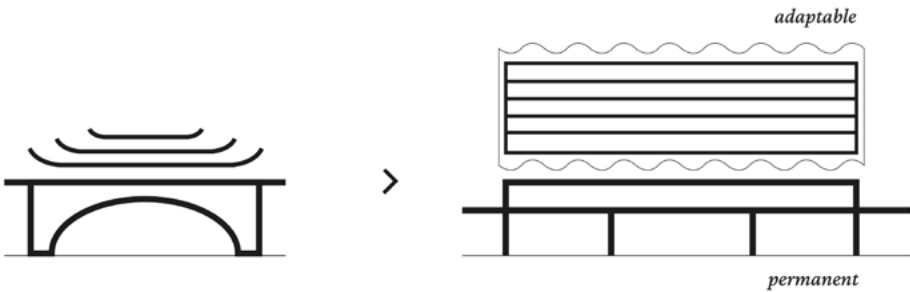
As in the rural case, the mixed-use transit hub also looks like an **urban prototype**, that is a type of building with intermodal exchange that can be replicated along the main infrastructure line. If the transporation platform represents the function that remains constant, the upper volume can modify its intended use by adapting to the surrounding context and relating to the other facilities present in the urban park

LANDSCAPE

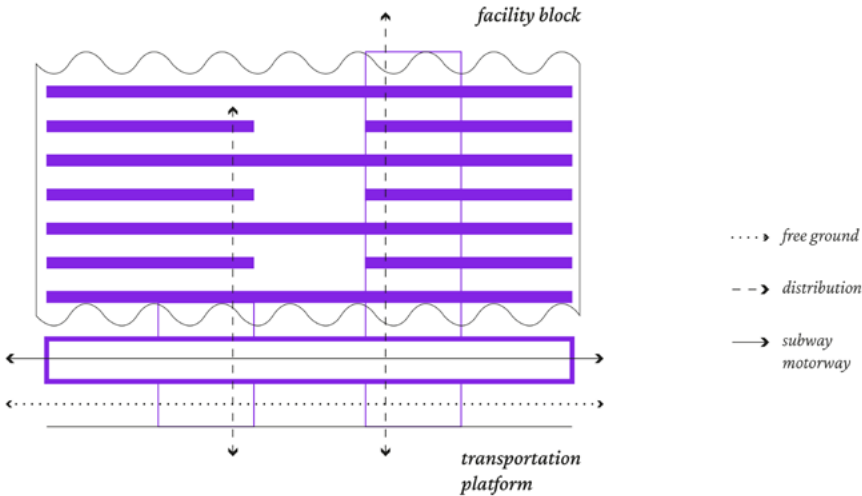


ARCHITECTURE

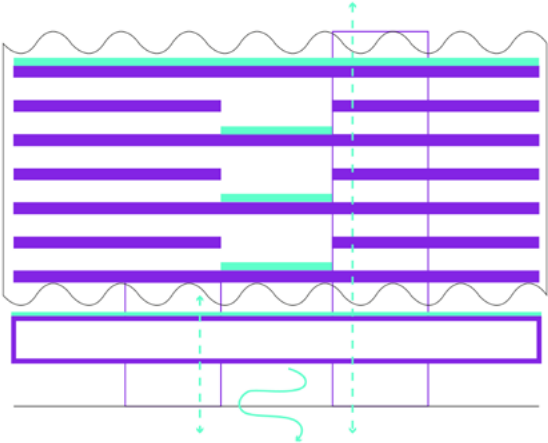
INSPIRATION



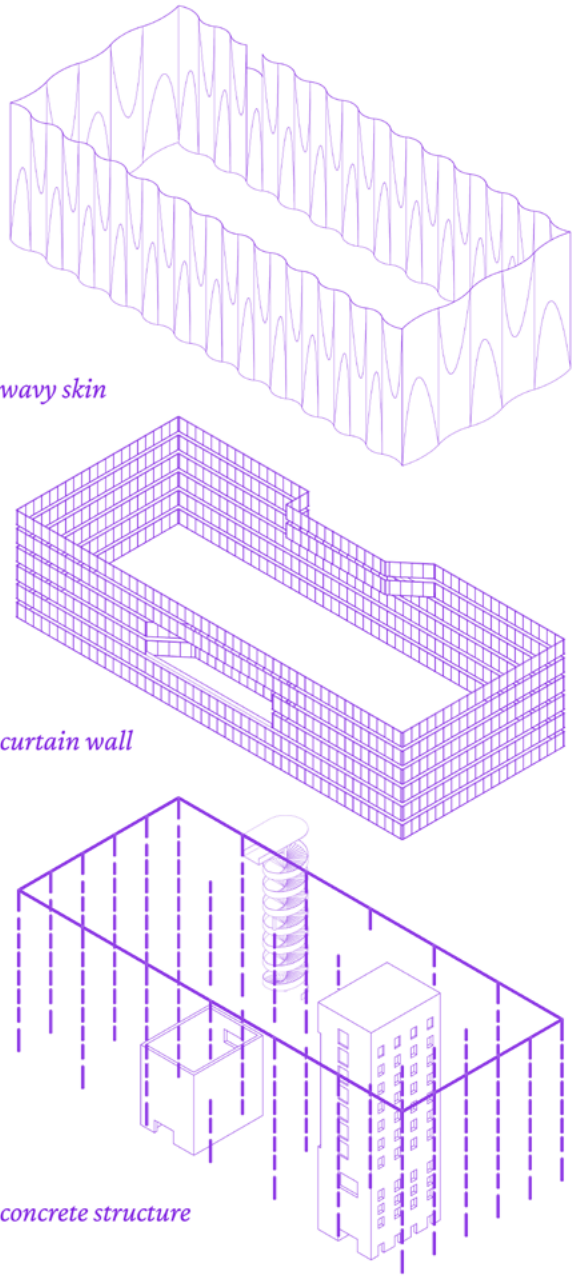
COMPOSITION



WATER SYSTEM





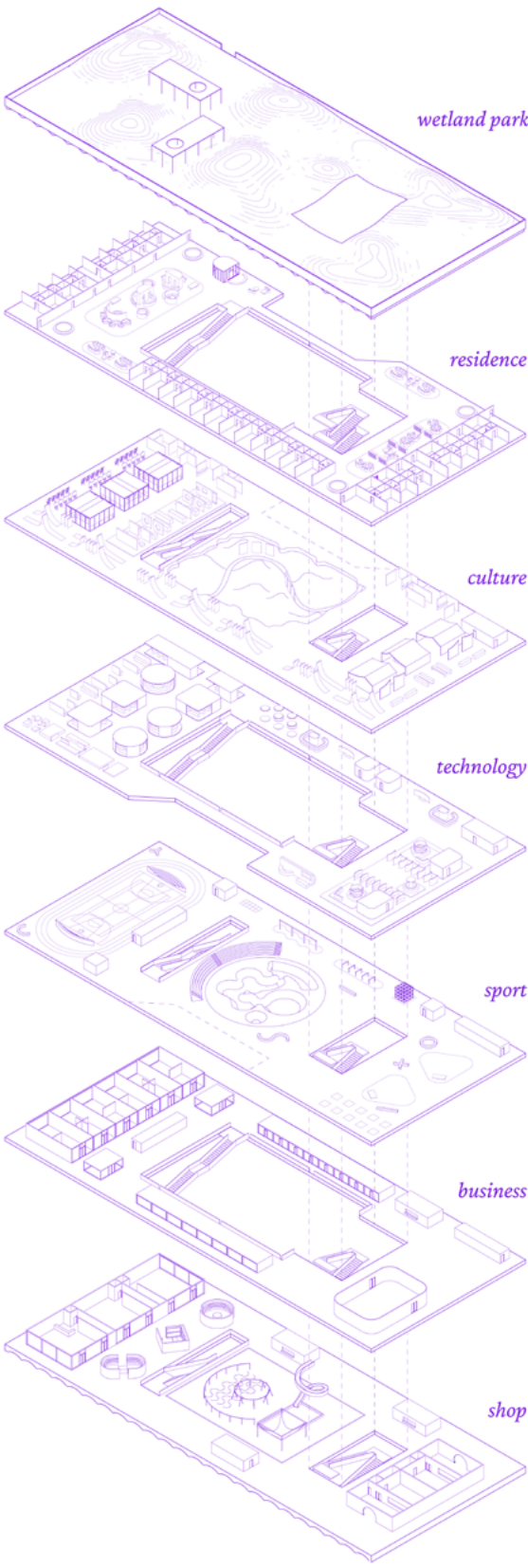


wavy skin

curtain wall

concrete structure

ENVELOPE & STRUCTURE



wetland park

residence

culture

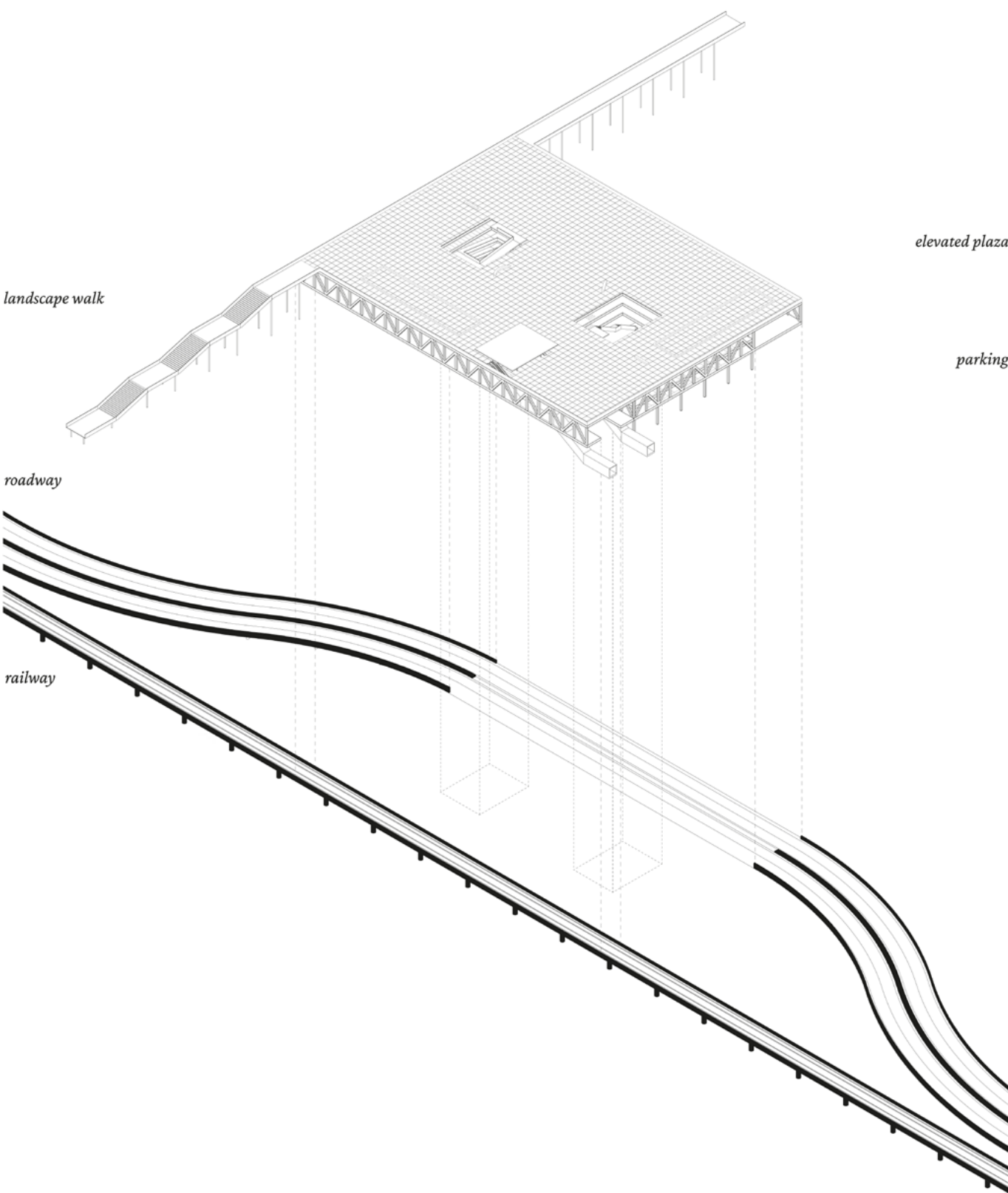
technology

sport

business

shop

LAYERS



landscape walk

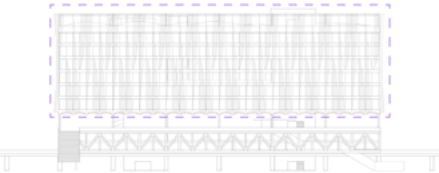
roadway

railway

elevated plaza

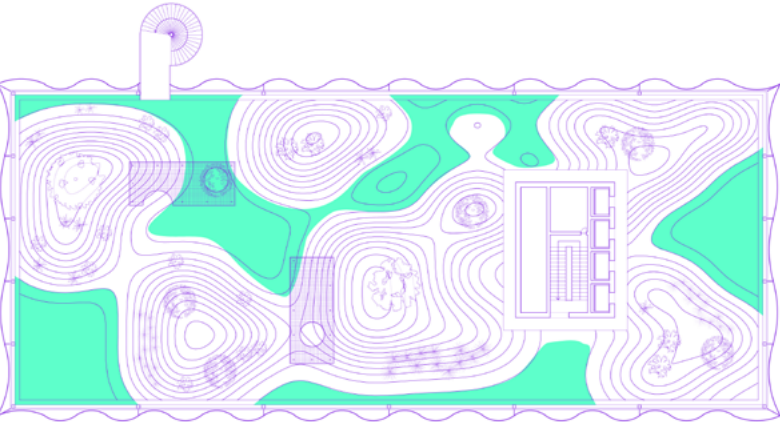
parking

BASEMENT & INFRASTRUCTURE



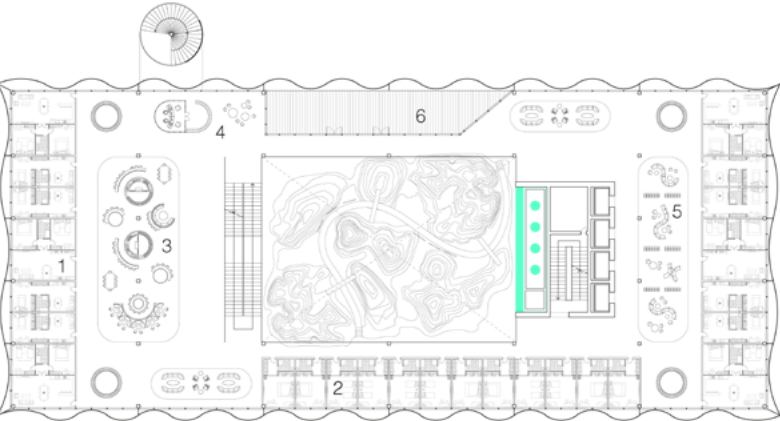
UPPER VOLUME

facilities



10_ROOF

wetland park



9_LEVEL

residence

1. temporary apartment

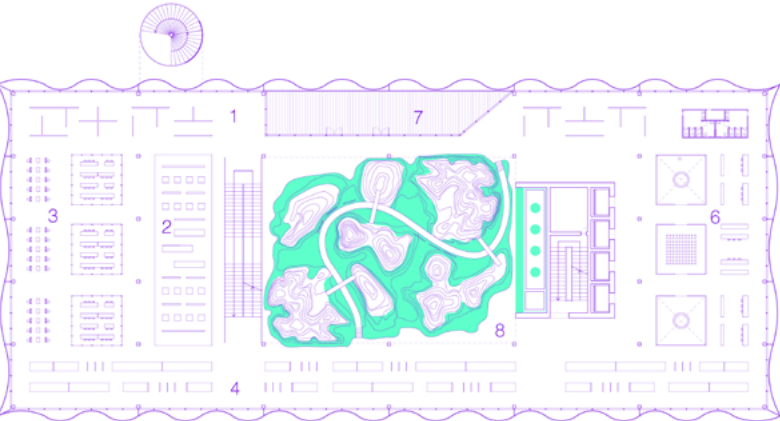
2. temporary room

3. restaurant

4. reception

5. library

6. belvedere



8_LEVEL

culture

1. photography exhibition

2. ceramics expo

3. painting workshop

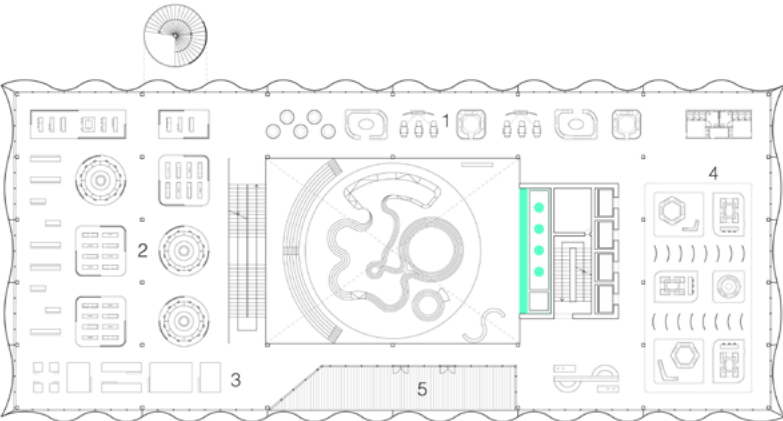
4. painting exhibition

5. artistic lab

6. virtual experience

7. belvedere

8. Shan Shui museum



7_LEVEL

technology

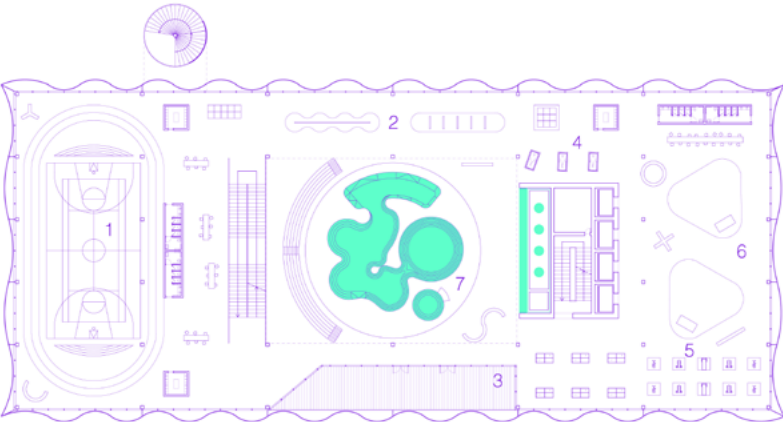
1. VR experience

2. innovation incubator

3. robot expo

4. big data workspace

5. belvedere



6_LEVEL

sport

1. field

2. free body

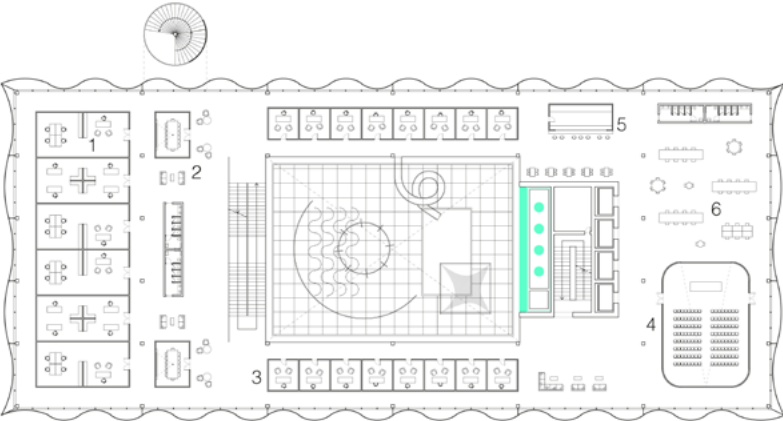
3. belvedere

4. play area

5. weights

6. tai chi

7. skate plaza



5_LEVEL

business

1. shared office

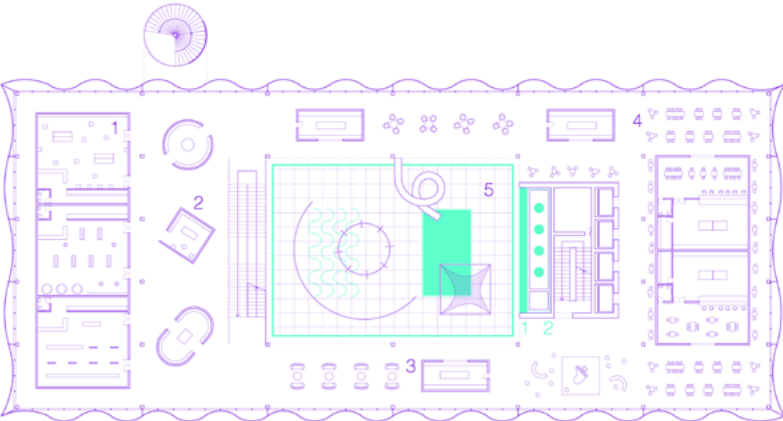
2. meeting room

3. private office

4. auditorium

5. cafe

6. coworking



4_LEVEL

shop

1. shop

2. pop-up store

3. cafe

4. restaurant

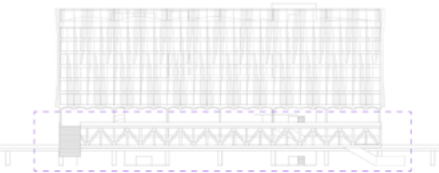
5. fun plaza

1. water wall

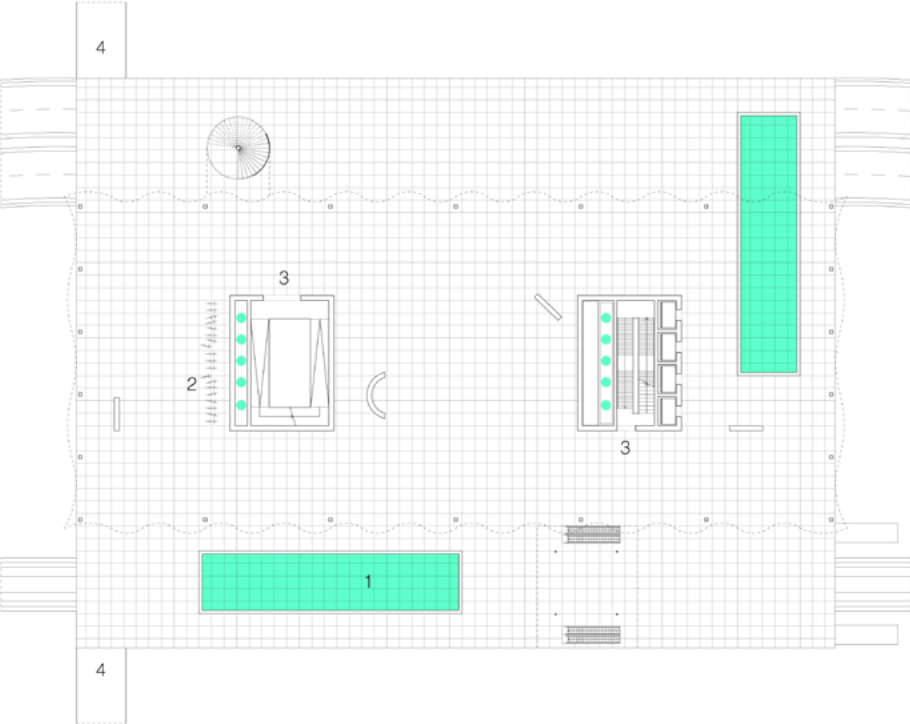
2. water distribution



0 5 10m

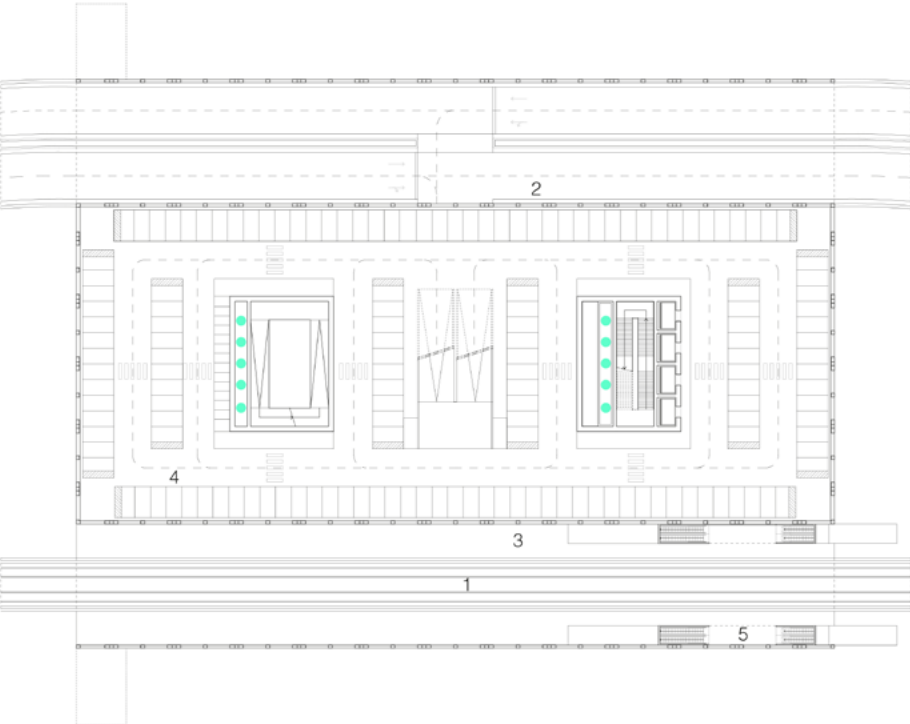


LOWER VOLUME
infrastructure



3_LEVEL
elevated plaza

- 1. water basin
- 2. bike parking
- 3. entrance
- 4. landscape walk

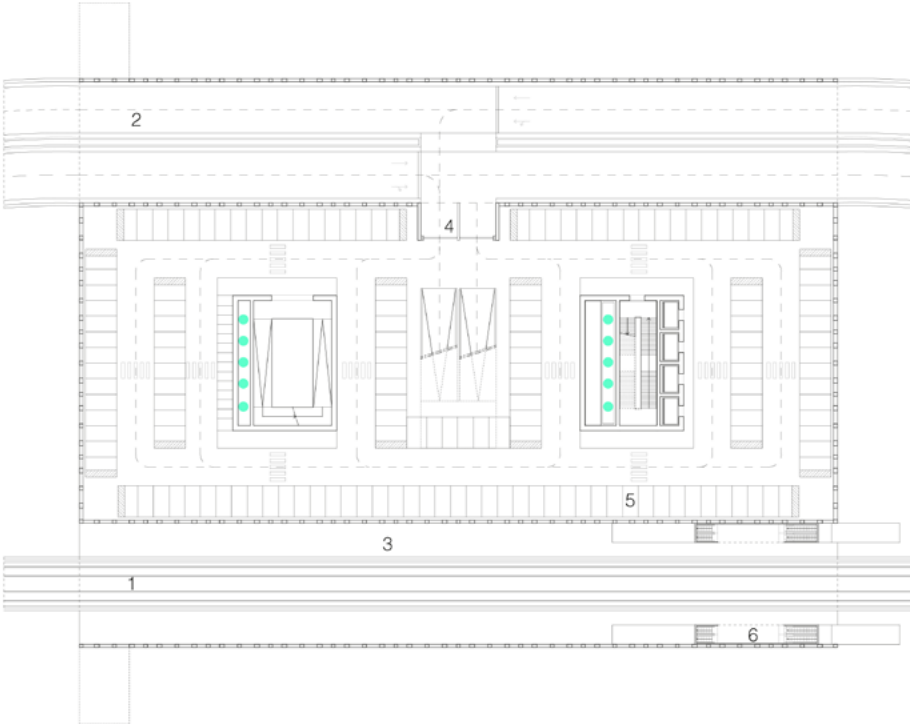


2_LEVEL
parking

- 1. railway
- 2. roadway
- 3. station
- 4. car parking
- 5. escalator

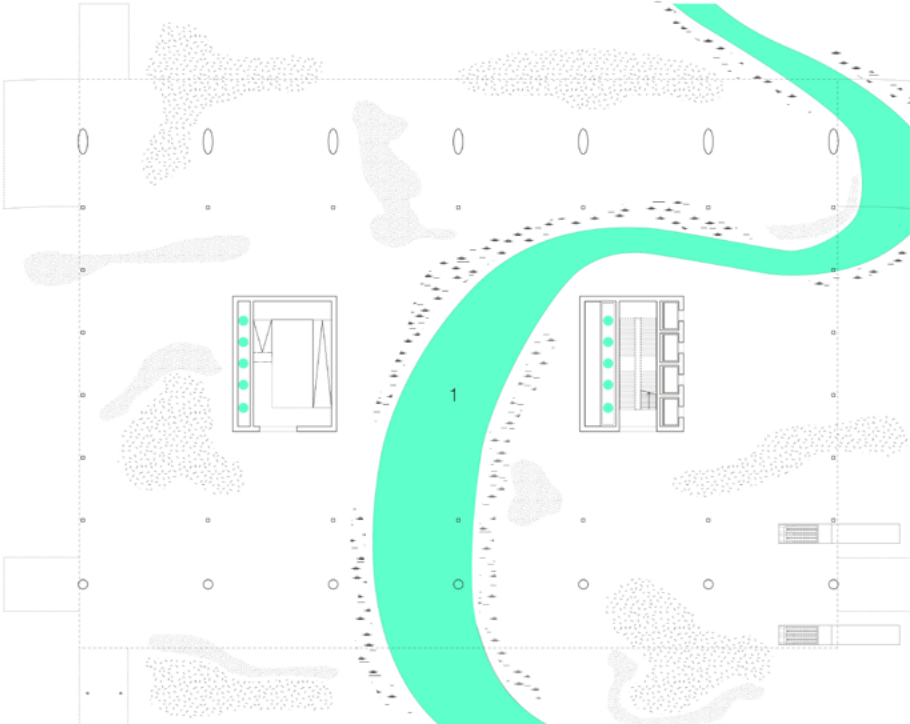
1_LEVEL
parking

- 1. railway
- 2. roadway
- 3. station
- 4. entrance
- 5. car parking
- 6. escalator

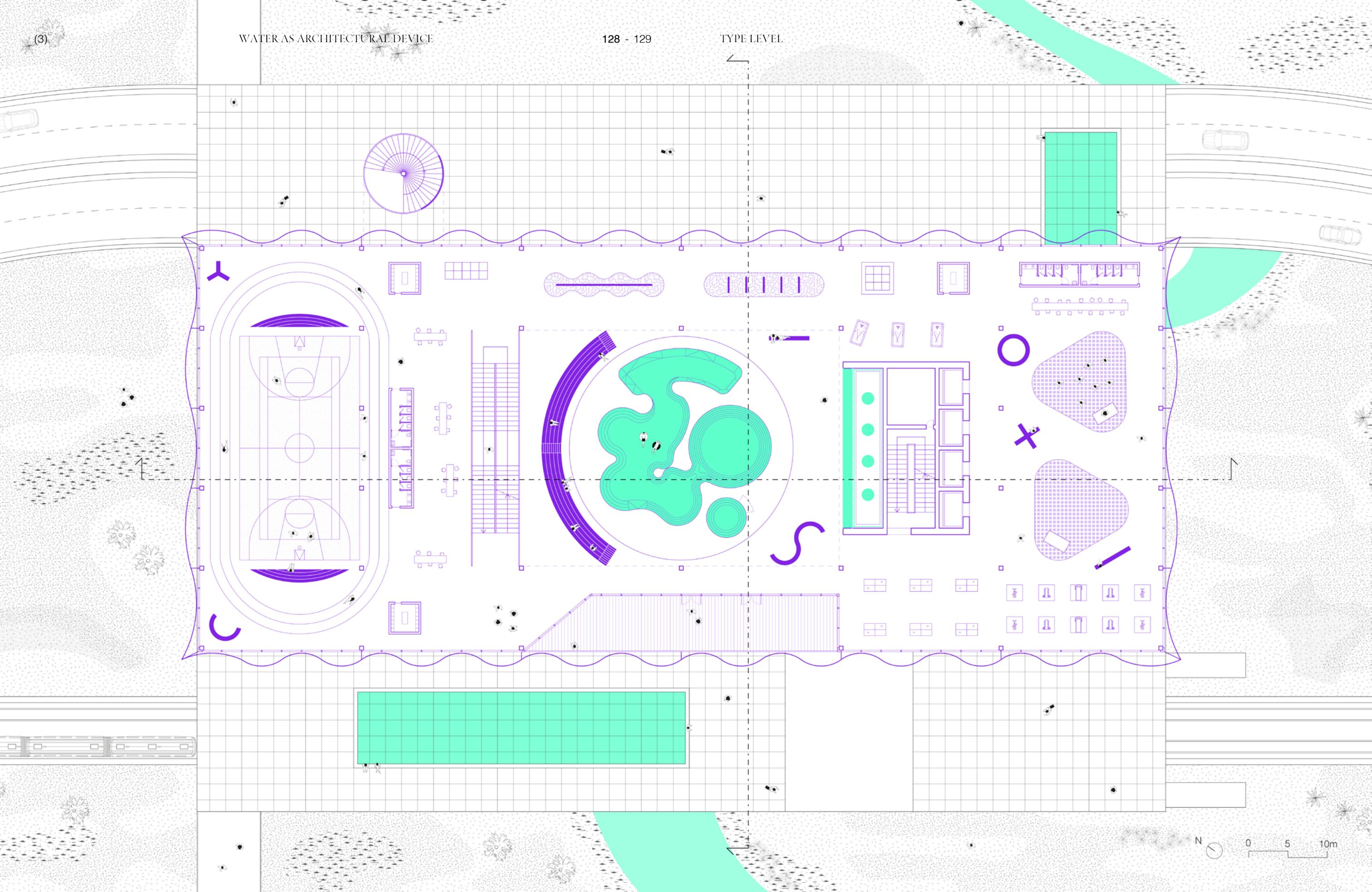


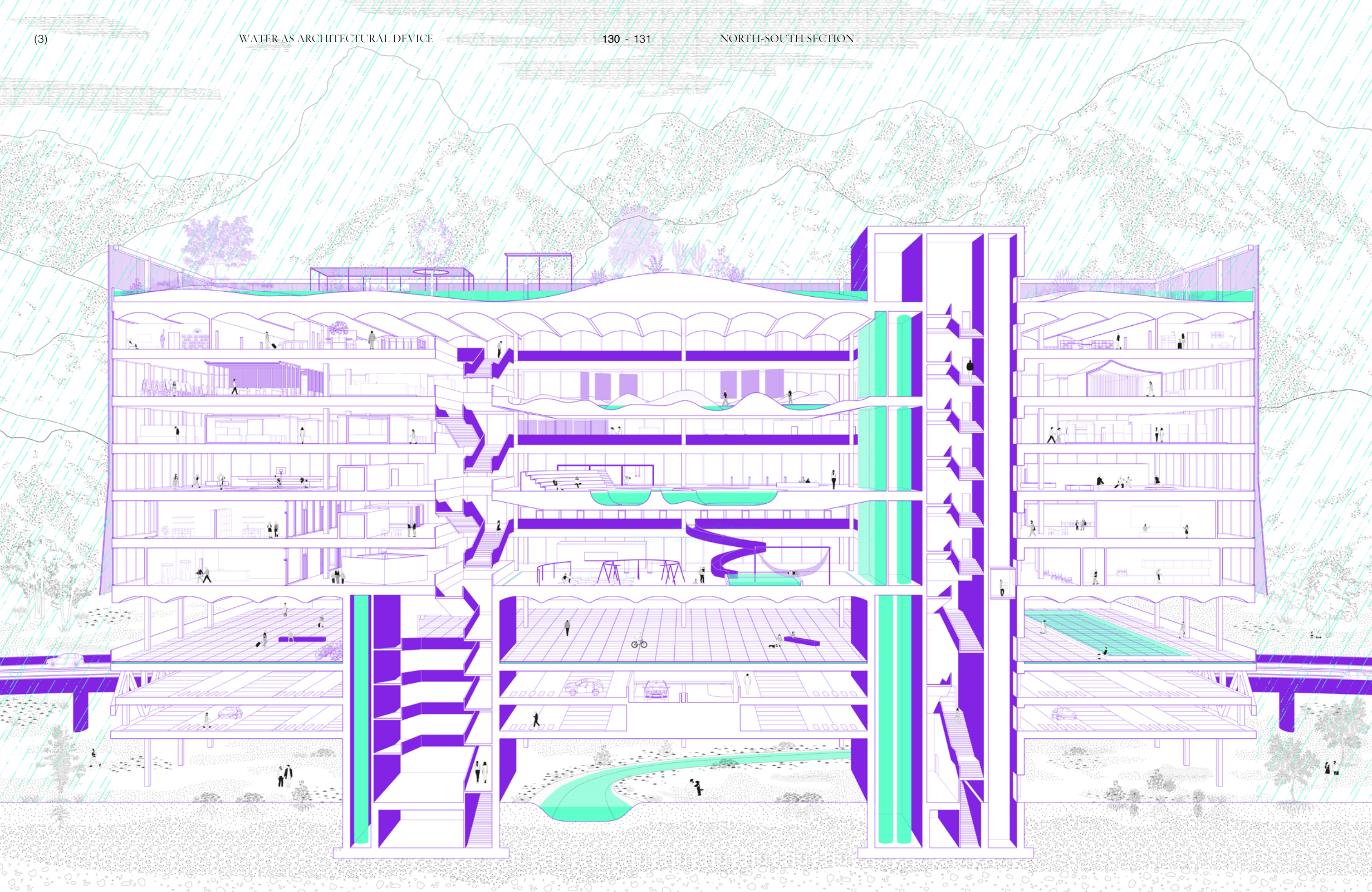
0_GROUND LEVEL
park

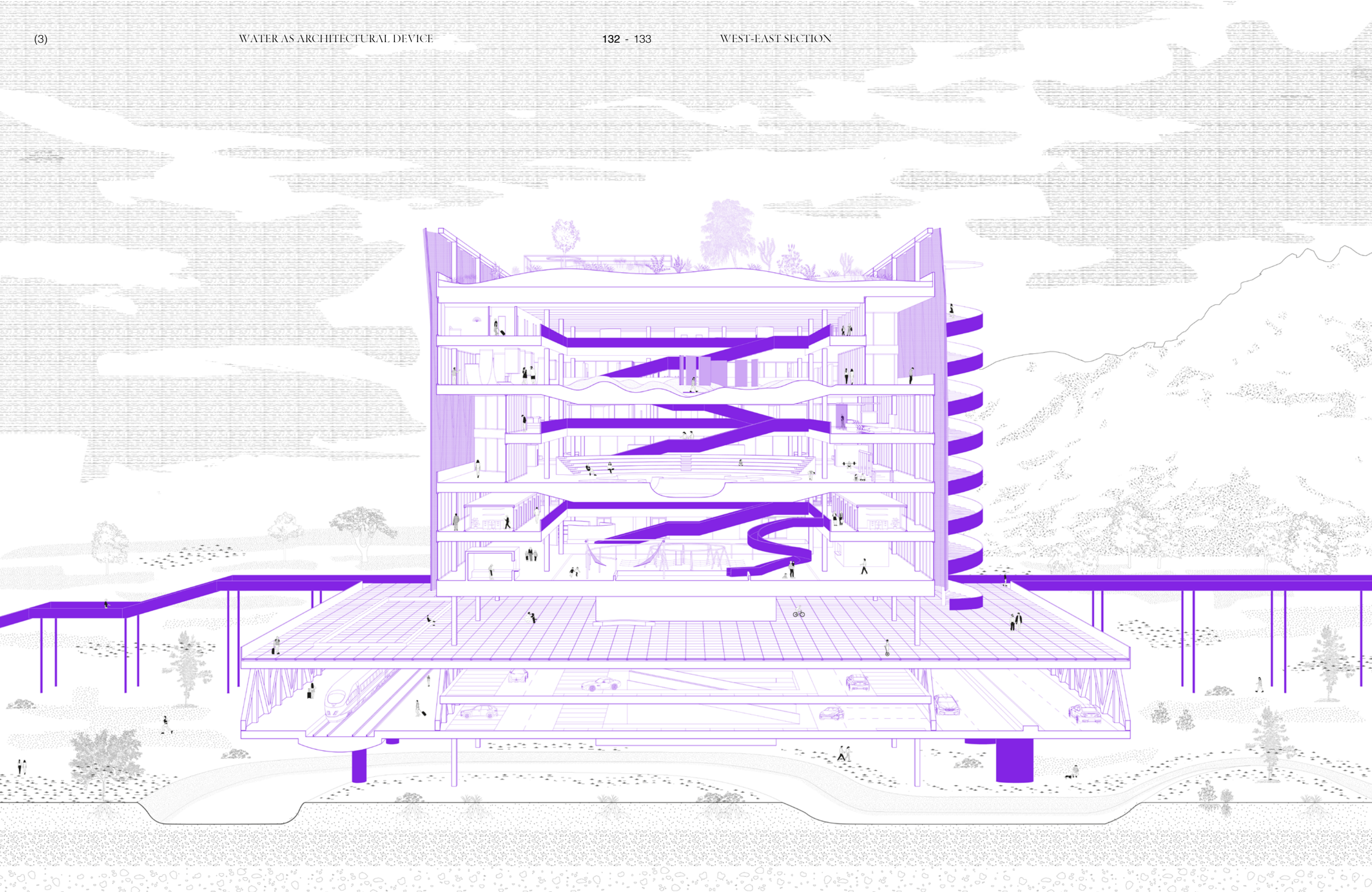
- 1. dry pond



0 5 10m









NATURAL FILTRATION

Organic Soil
natural system of water purification through the soil layers that hold polluted micro-organism.

MECHANICAL FILTRATION

System of tanks that collect purified rainwater, distribute it to the building functions and managewaste water

storage tanks water pump

WETLAND ROOF

Bio-retention soil with depressions flooded by water with vegetation of aquatic plants. Water drains through the various layers of the soil and purifies itself.

WATERSCAPES

System of connected **floodable plazas** which have a public function that evolves with the presence of water

/ cultural floating plaza
reuse of a % of purified water creating a floating exhibition space

/ aquatic sports plaza
reuse of a % of purified water creating space for water activities

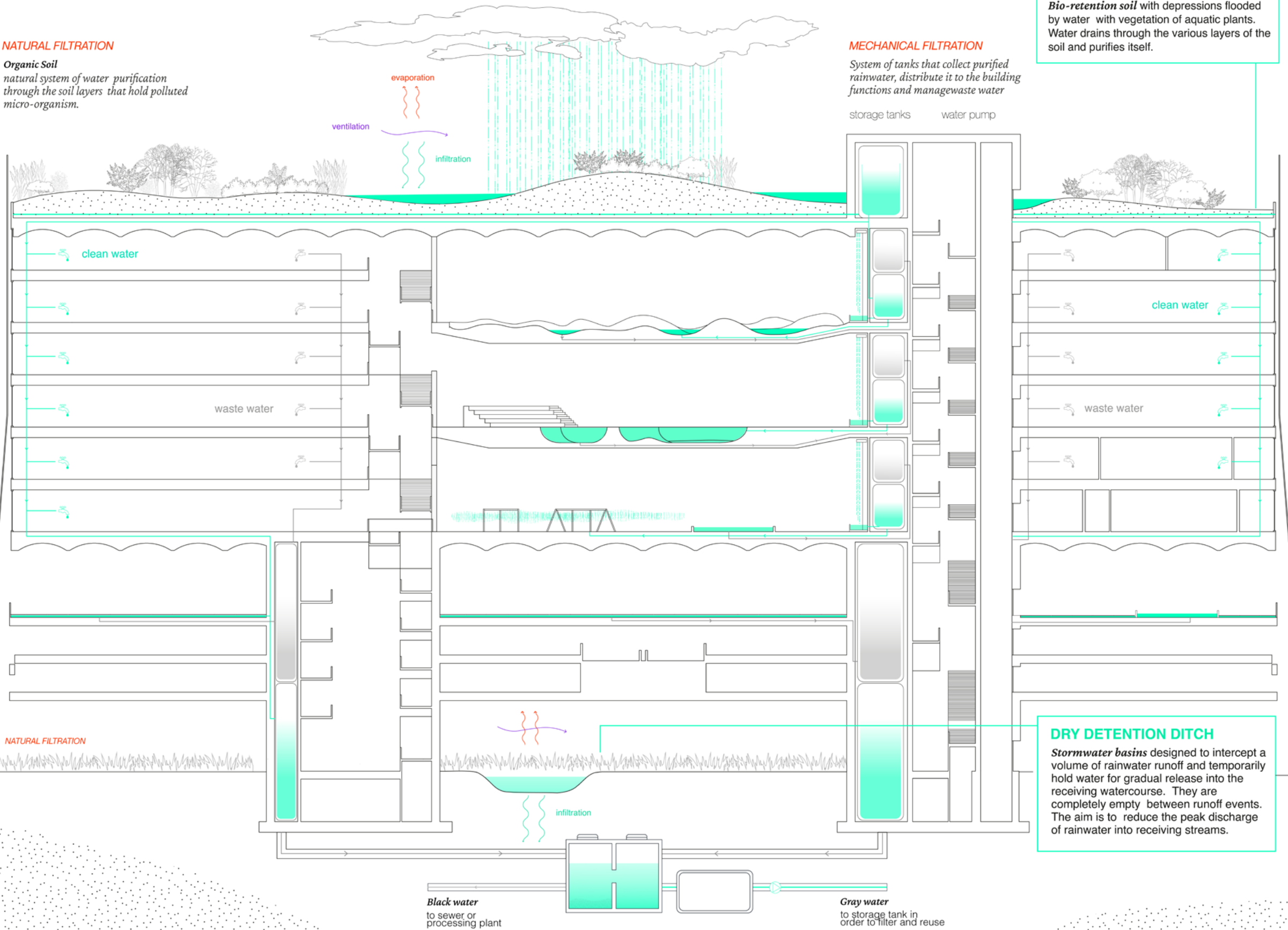
/ playground plaza
reuse of a % of purified water creating playground with fog and sprinkle

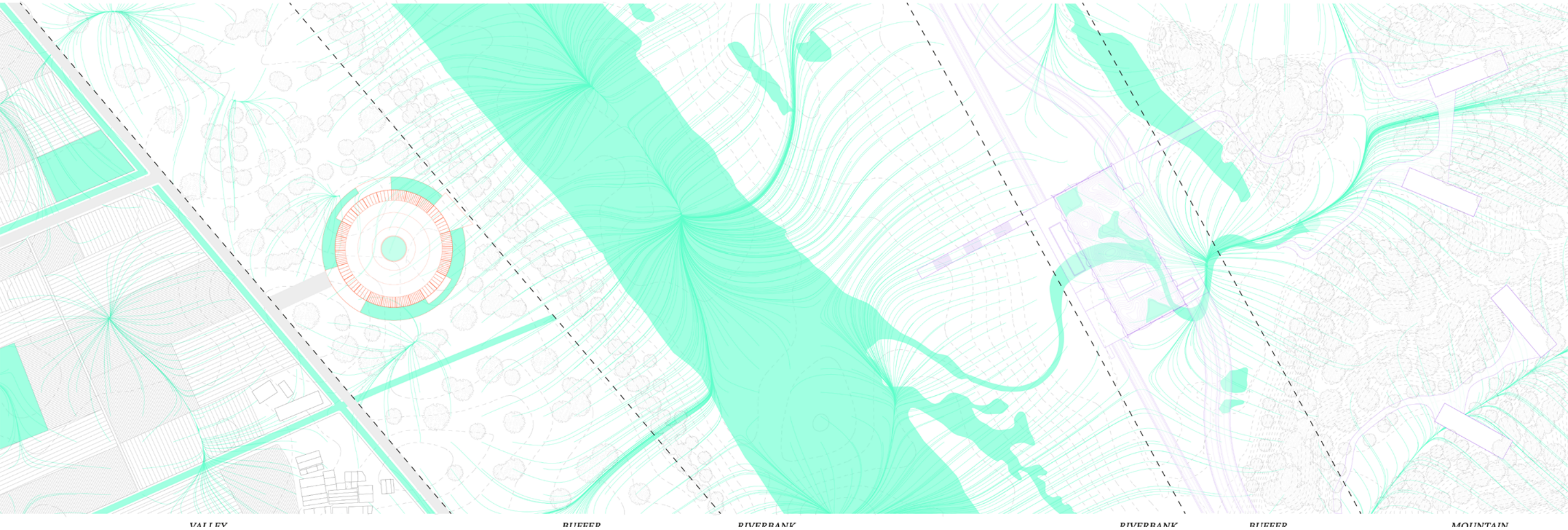
/ elevated floating plaza
public space with permeable pavements that direct flows into water storage tanks

NATURAL FILTRATION

DRY DETENTION DITCH

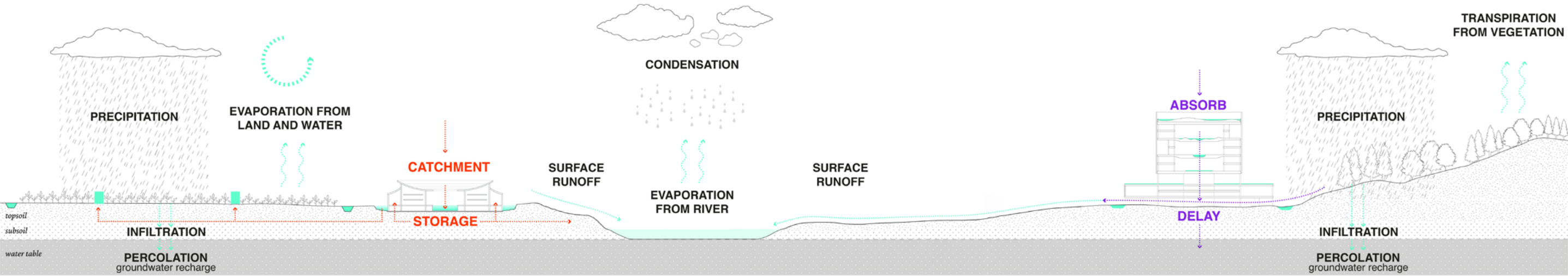
Stormwater basins designed to intercept a volume of rainwater runoff and temporarily hold water for gradual release into the receiving watercourse. They are completely empty between runoff events. The aim is to reduce the peak discharge of rainwater into receiving streams.





RURAL

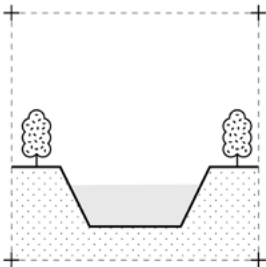
URBAN



LANDSCAPE SCALE

measure

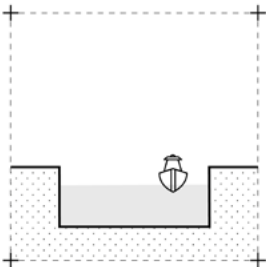
GREEN RIVERBANKS



description

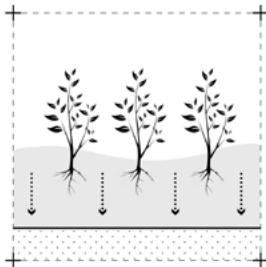
Keeping riverbanks natural protect the ecosystem, increase and preserve the biodiversity and leave more space for water.

CANALS



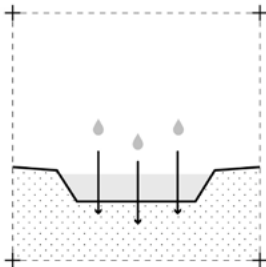
Implementation and regularization of existing canals in order to make them useful for agricultural production and as navigable transport system.

PHYTODEPURATION



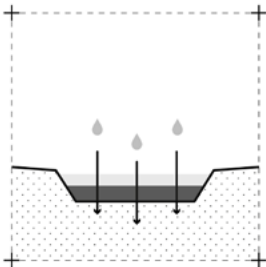
Natural depuration treatment through physical and biological processes as filtration and bacterial reduction by aquatic plant roots.

DRY DETENTION POND



Dry rainwater basin that temporarily fills with water during floods event. The aim is to reduce the peak discharge of rainwater into receiving streams.

WET RETENTION POND



Wet ponds are designed for storage and treatment of stormwater runoff; they hold a certain volume of permanent water even during dry weather.

SOIL INFILTRATION



Improving the soil infiltration capacity reduce peak runoff and promoted groundwater recharge. By improving the permeability, more water will percolate into the soil and less water will runoff directly.

adaptation target

Coastal and fluvial flooding
Pluvial flooding
Drought
Heat

Pluvial flooding
Drought
Heat

Pluvial flooding
Drought
Heat

Pluvial flooding
Heat

Pluvial flooding
Drought
Heat

Pluvial flooding
Drought
Heat

location

rural
urban

rural

rural
urban

urban

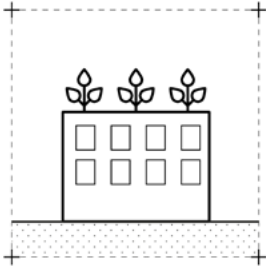
rural

rural
urban

ARCHITECTURE SCALE

measure

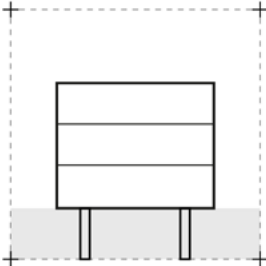
WETLAND ROOF



description

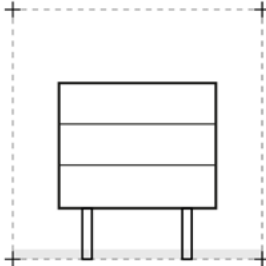
Bio-retention soil on the top of the building that absorb rainwater and purify it through an infiltration process with aquatic plants.

BUILDING PARTIALLY ON WATER



Buildings constructed on piles in the water. In this way is possible to combine urban development and give room for water.

ELEVATED BUILDING



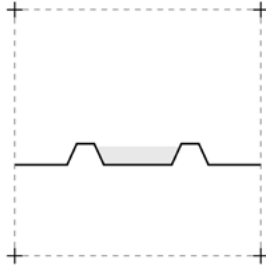
Buildings constructed elevated from the ground to allow water to flow onto the natural soil.

POROUS PAVEMENTS



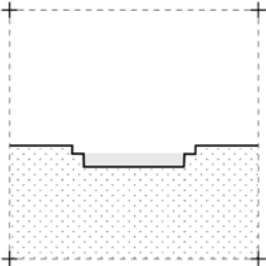
Paved surface with a higher than a normal quantity of air void to allow water to pass to through it and to infiltrate into the terrain or direct to the collector tank.

WATER BASIN



Water basins are retention ponds constructed to store water. Water storage is used to reduce the impact of flood events and to store water for dry periods.

WATER PLAZA



Public square that manage and collect rainwater, transforming a public space into a storage basin.

adaptation target

Pluvial flooding
Drought
Heat

Coastal and fluvial flooding
Pluvial flooding
Heat

Coastal and fluvial flooding
Pluvial flooding
Heat

Pluvial flooding
Drought
Heat

Pluvial flooding
Drought
Heat

Pluvial flooding
Heat

location

urban

rural

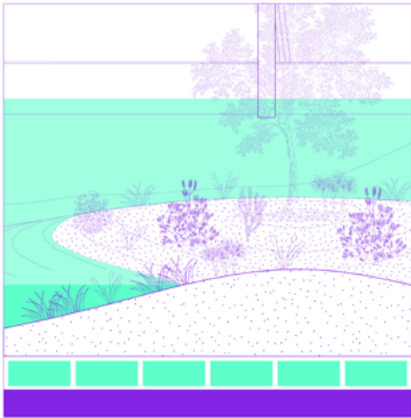
urban

urban

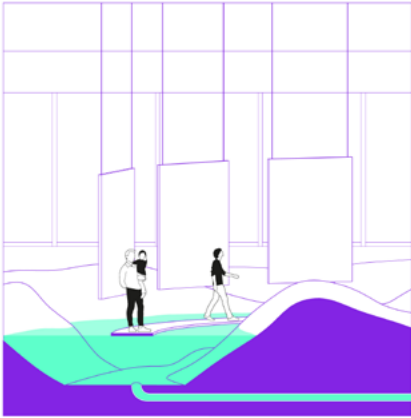
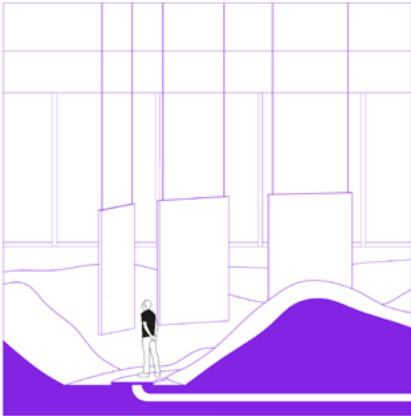
rural
urban

rural
urban

wetland park



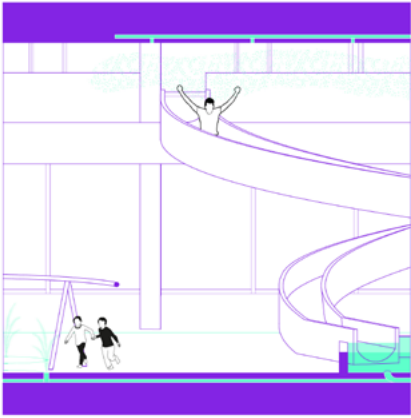
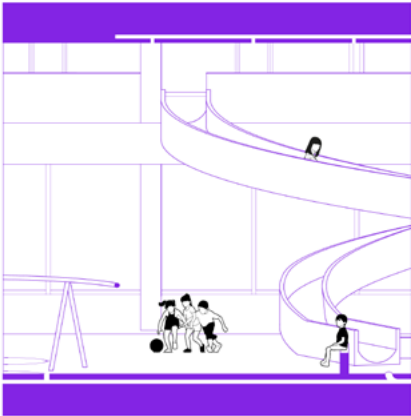
cultural plaza



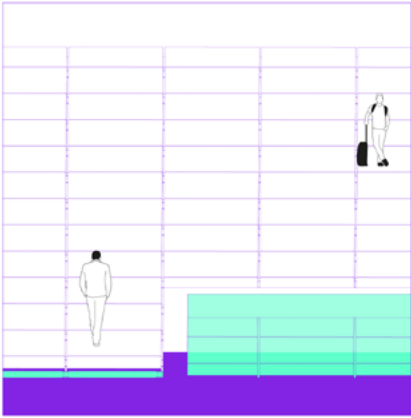
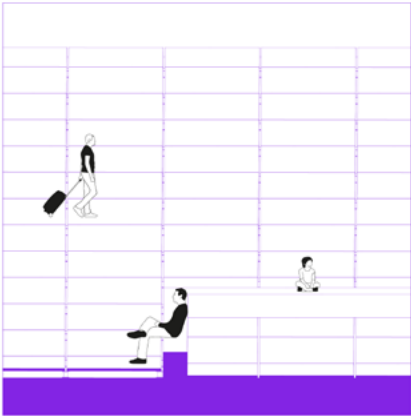
sport plaza



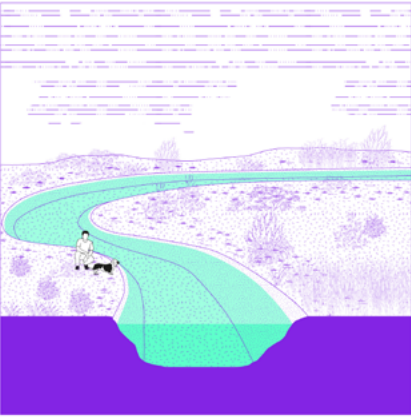
playground plaza



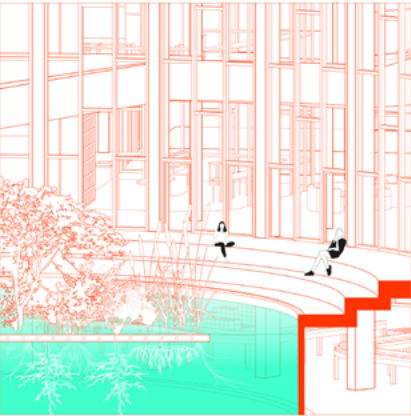
elevated plaza



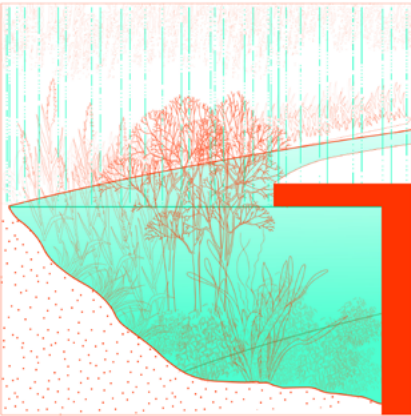
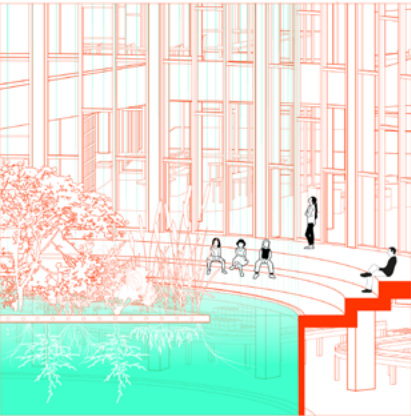
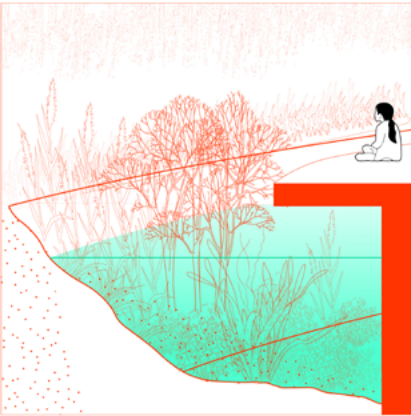
stormwater garden



water plaza



wet pond



CONCLUSIONS

结 论

No nation can boast such a deep-rooted and indissoluble bond with the water element if not China: since ancient times, philosophies, practices, and governmental entities have theorized and acted according to the management of water, its importance from a spiritual point of view and the close contact that the Chinese people have established with it. Today, talking about the current water situation in China is a rather complex issue: water problems are at the center of the international debate on environmental sustainability as they represent a wake-up call for the future evolution of the planet. Water risks are interconnected and aggravated by climate change: water pollution, water scarcity and flooding represent serious threats to the natural environment and to humans, who have to face them by seeking imminent and resilient solutions. This thesis project is part of the reflection of the Future Shan Shui City, as models of sustainable urban development that want to restore that ideal balance between man and nature, which has as its main purpose the protection of the ecology of water and mountain and a new urban awareness of the landscape. The theme of water has been addressed through reflections on a territorial scale that have allowed us to identify two different areas of intervention, the rural and the urban, and that have evolved with the design of two prototype buildings that show possible solutions for the management of water resources. To understand Lishui's water issues in their entirety, the buildings were placed in strategic areas near the water element, where proximity to the risk is most imminent and there is a need to protect the ecology of the valley and the mountain. The proposal of architectural solutions that use risk management to generate resilient public spaces wants to be a starting point to trigger a reflection on the development of the Shan Shui city. Finding conscious methods of action that start from the awareness of the landscape and its ecological value represents the main challenge for a near future in which man and nature coexist in harmony.



A Michele ed Angelo che ci hanno seguite in questo percorso

A chi crede intensamente in quello che fa

A noi e al filo rosso che ci lega

Alle persone che amiamo

水