Master Thesis

Panta Rhei

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Architectures of Correspondence
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Architectures of Correspondence
Diploma Project Panta Rhei
Autumn 2023

Chair of Affective Architectures
Chair of the History and Theory of Urban Desing
Chair of Circular Engineering for Architecture

Summary

Panta Rhei

> **“We use stories to regulate our emotions and govern our behavior; use stories to provide the present we inhabit with a determinate point of reference – the desired future. The optimal “desired future” is not a state, however, but a process – the (intrinsically compelling) process of mediating between order and chaos“**
>
> **Jordan B. Peterson**

One of the central tragedies of the impending climate change is the cognitive dissonance that is generated by the general acknowledgment of its existence on the one hand and a lack of corresponding action on the other hand. While the signs of the imminent and drastic impact on climate, society, and landscape are already clearly palpable, the dynamic is still perceived as abstract, distant, and decoupled from the behavior of the individual. One reason for this alienation can be found in the temporal and spatial intangibility of a global phenomenon. Due to their gradual changes, both climate and landscape are often experienced as static entities eluding human perception and subsequently hindering a sense of responsibility and affinity.

To counter the prevailing human exceptionalism and individualism the Heraclitean philosophy proposed a worldview in which existence is not considered static and detached, but rather part of an eternal, dynamic process. Everything is united by being part of a constant change of substance and form. To represent the dynamic and interconnected nature of the physical world, the ever-changing nature of the flow of a river was utilized as a guiding allegory.

Fig. 01: Olafur Eliasson, Riverbed, 2014

Following this line of argument, in my thesis, I aspire to translate this allegory into the physical world. By revealing and unmasking the complex past, entangled presents, and contested future of a tangible and acquainted body of water, the intricacy, volatility, and vulnerability of the global water cycle are made comprehensible to a broader public.

For my project, the river Sihl was determined as a site of intervention. Historically, the city of Zurich identified itself with the calm Limmat River. Meanwhile, the “wild” Sihl was considered to be the inferior river that could be shaped and controlled unrestrictedly according to civilizational will. Along its course, the water of the Sihl is consistently controlled and diverted to serve the ever-increasing demand of the sprawling metropolis for energy, water, and security. Yet, by placing the corresponding infrastructure underground the complex metabolism within the landscape is disguised at first glance.

The dam of the Etzelwerk hydroelectric power plant is a prime manifestation of this parasitic yet hidden approach. Only 80 years after its construction and the concomitant flooding of more than 10 km2 of the Sihl Valley resulting in the eviction of 500 inhabitants, the Sihlsee is now perceived as a natural body of water. This infrastructure can be considered a key component for the increasing urbanization process of the city of Zurich. On the one hand, the Sihlsee transformed an entire valley into a storage for much-needed electric energy. On the other hand, the dam allowed for unprecedented control over the wild mountain river that was known to flood the lowlands around the city. This new configuration enabled a dense build-up along the course of the river increasingly constraining the flow of the meandering river. In its current state, only a few sections of the former floodplain in the basin of Zurich are still undeveloped.

While in the recent past, a shift towards a more respectful treatment of the Sihl is observed, the attitude is still compromised by a dichotomic view with an original state formed by nature

and an artificial state designed by human interventions. In line with this perception, the approach in current revitalization projects tends to recreate and imitate a pseudo-natural state that remains highly artificial and unsustainable. One prominent location where the inherent fragility of the river and its dependency on human interventions is disguised is the Allmend Brunau, south of the city border.

With my project Panta Rhei I respond to this complex reality with two interventions: Regarding the Sihl lake, linear structures are embedded in the southern, shallow part of the lake to promote the formation of wetlands. Bogs offer a diverse habitat for endemic wildlife and, by acting like a sponge, could dampen the stress generated by the highly fluctuating water level of the lake. Both, the swift change of the water level and the gradual formation of wetlands are made perceivable by a bird watching tower that is constantly altering both in appearance and accessibility according to the dynamic of the lake.

At the Allmend Brunau a landscape park is transforming the meadow into a flood plain, drawing a clear line between the protected and exposed. It is intended as a counter proposal to the relief tunnel in Thalwil, which is currently under construction, costing more than 175 Mio. CHF and generating earth movements of more than 260'000 m3. Instead of following the prevailing logic of hiding and disguising infrastructure, the immense effort and invasiveness of human interventions are revealed to the visitors of the park.

In both projects, I seek to question the unilateral human authority over the landscape and strive for a different architectural articulation that accentuates the intricate interplay between human and non-human formative forces. By revealing, exposing, and making tangible the intertwined and dynamic nature of the surrounding waterscape the proposed interventions aspire to counteract a segmented and abstracted perception of the landscape, hinting towards a stronger global awareness.

Chaper 1

Water - More than a Resource

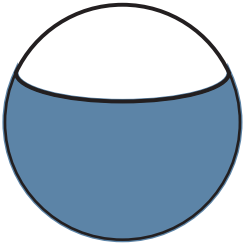
The Blue Marbel

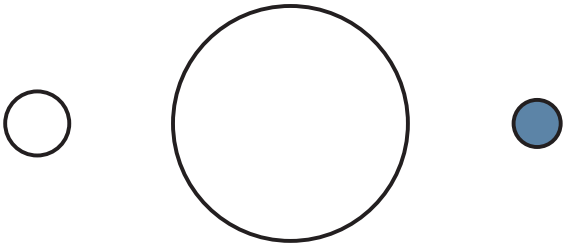
On December 7th, 1972, the crew of the Apollo 17 spacecraft captured an image of our planet as they departed it for their mission. Little did they know that this single photograph would become one of the most iconic and widely circulated images of the 20th century. The image profoundly transformed our perception of Earth, once seen as an almost boundless realm, revealing its profound significance and vulnerability.

Dominating this captivating image is the vast expanse of the world‘s oceans, which cover approximately 71% of our planet‘s surface. This remarkable snapshot of the Earth is known as The “Blue Marble“, underscoring the profound connection between water and life on our planet.

At first glance, the incomprehensible extent of the water might not hint at the fragility, instability, and sensitivity of our global waterscape. However, looking into the statistics, as illustrated in Figure 4, a stark reality becomes apparent. Only 2.5% of the Earth‘s water is freshwater, of which a mere 1.2% is readily available on the surface. These limited water reservoirs, ranging from the billions of cubic meters within our oceans to the few thousand in our atmosphere, exist in an unceasing state of exchange and interdependence, maintaining a delicate and dynamic equilibrium.

Fig. 02: Philbird, Storm passing over Lake Geneva
Fig. 03: Three depictions of the global distribution of water: In the known current state (up), with land and water strictly divided (middle) and as an isolated planetary body next to an earth deprived of water and the moon (bottom).





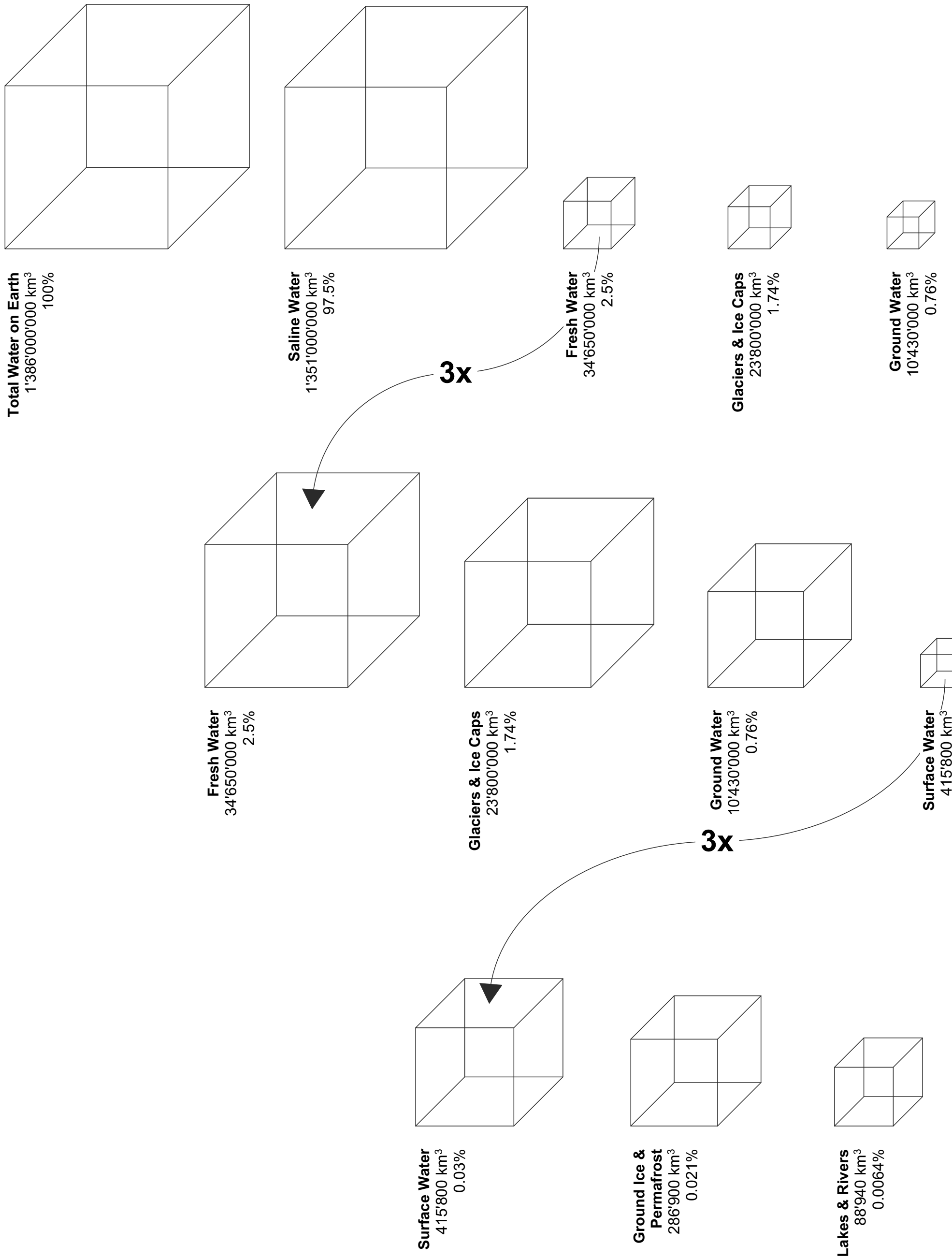


Fig. 04: Comparison of the global distribution of water.

0.03%

Soil Moisture, Swamps, Marshes
26'610 km^3
0.0019%

Atmosphere
12'470 km^3
0.0009%

Living Things
8'080 km^3
0.00008%

Total Water in Switzerland
341 km^3
0.000002%

Surface Water
415'800 km^3
0.03%

Ground Ice & Permafrost
286'900 km^3
0.021%

Lakes & Rivers
88'940 km^3
0.0064%

Soil Moisture, Swamps, Marshes
26'610 km^3
0.0019%

Atmosphere
12'470 km^3
0.0009%

Living Things
8'080 km^3
0.00008%

Total Water in Switzerland
341 km^3
0.000002%

Bridging Space and Time

In our globalized economy, most resources, be it grain or gold, can be precisely localized and are readily susceptible to commodification and exploitation. Profits are often gained in one corner of the world while the externalities and detriments unfold in a distant location. Water, however, defies this conventional model. It is a truly global entity, intricately interconnected through a vast network of atmospheric and oceanic currents.

These global currents create a dynamic, planet-spanning circulation system that transcends national borders and plays a pivotal role in shaping Earth‘s climate, ecosystems, and landscape.

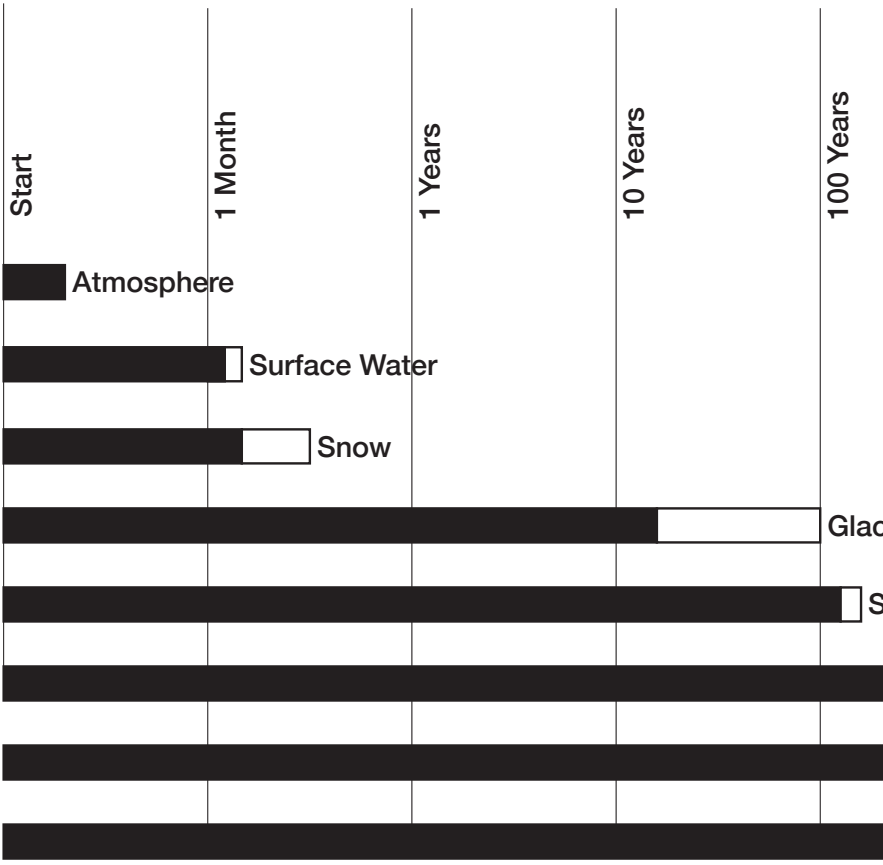
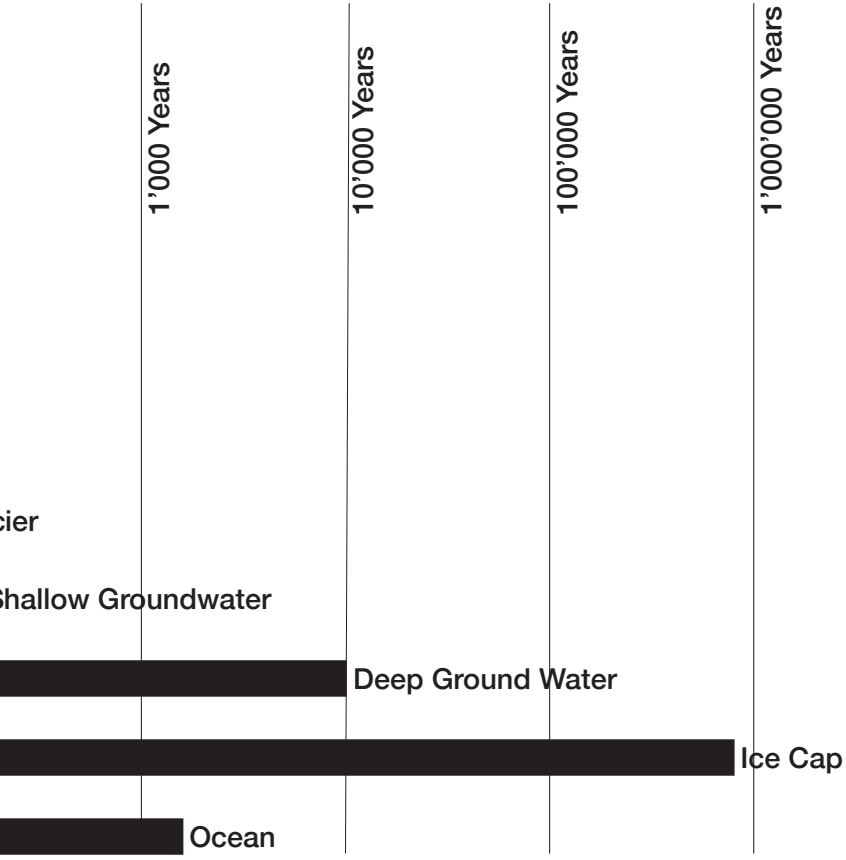


Fig. 05: Logarithmic timescale of water in its global circulation.

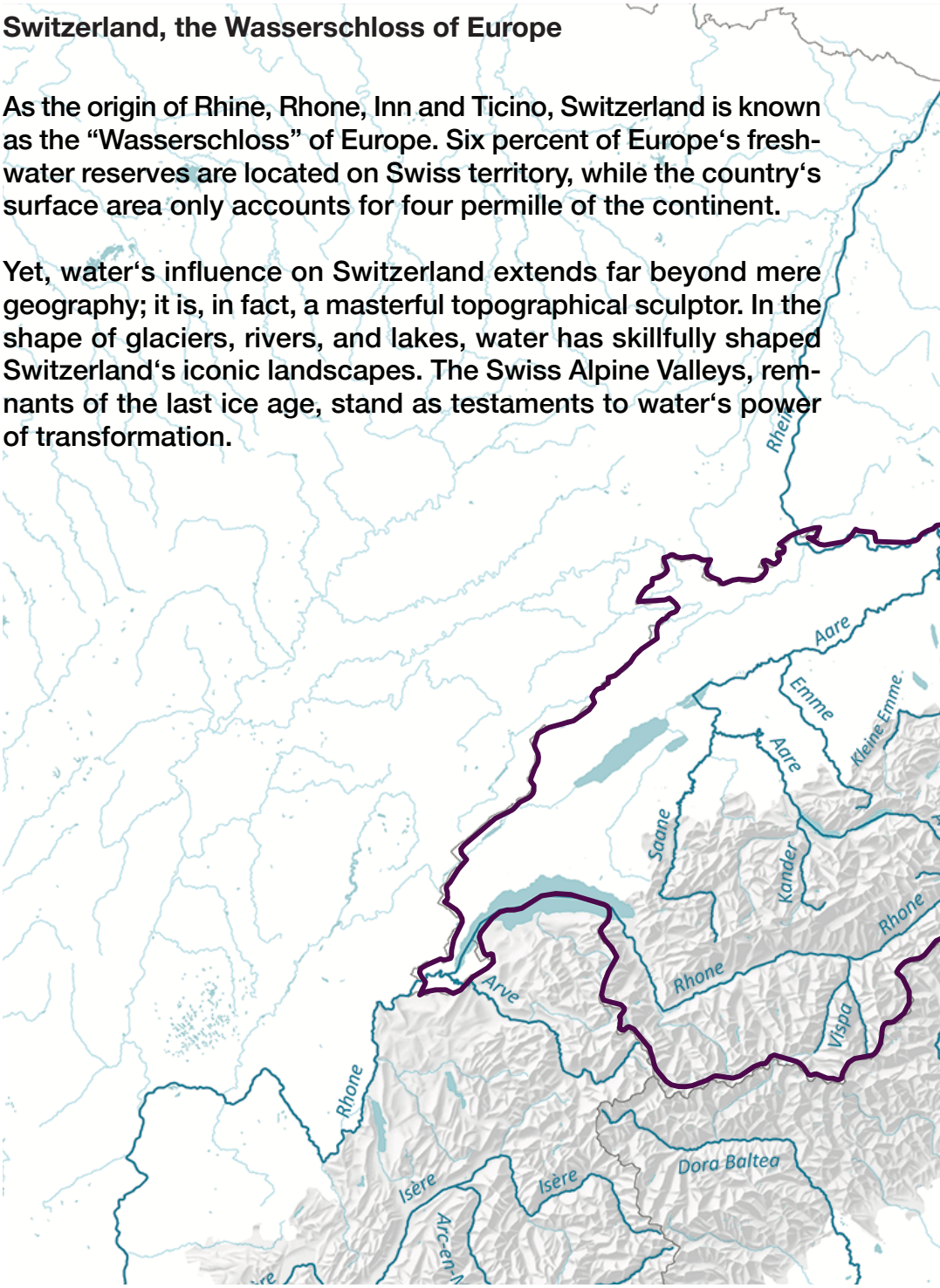
This globe-spanning movement of water regulates temperature worldwide while having far-reaching effects on weather patterns and marine ecosystems, profoundly impacting life on our planet. Besides this spatial dimension, the water cycle has a remarkable temporal characteristic. Water‘s dynamic nature gives it the unique capacity to bridge timescales. Thus, it weaves a narrative which spans from the human dimension and the immediate concerns of our daily lives to the deep geological epochs that have shaped our planet‘s history. As a result, water in all its forms stands as a testament to nature‘s ability to connect the past, present, and future in a continuous, flowing story.



Switzerland, the Wasserschloss of Europe

As the origin of Rhine, Rhone, Inn and Ticino, Switzerland is known as the “Wasserschloss” of Europe. Six percent of Europe‘s freshwater reserves are located on Swiss territory, while the country‘s surface area only accounts for four permille of the continent.

Yet, water‘s influence on Switzerland extends far beyond mere geography; it is, in fact, a masterful topographical sculptor. In the shape of glaciers, rivers, and lakes, water has skillfully shaped Switzerland‘s iconic landscapes. The Swiss Alpine Valleys, remnants of the last ice age, stand as testaments to water‘s power of transformation.



Throughout Switzerland‘s history, water has stood as one of its most abundant and vital resources, nurturing agriculture, fueling industry, and sustaining communities. Its 1500 lakes and rivers have been the wellspring of countless villages, tying the nation‘s past to its present.

However, this wealth of water has proven to be a double-edged sword. Switzerland‘s untamed mountain rivers, originating from the alpine peaks, possess the potential to unleash devastating floods. Thus, the history of water in Switzerland is also a history of permanent negotiation of agency between the element and the human interference.

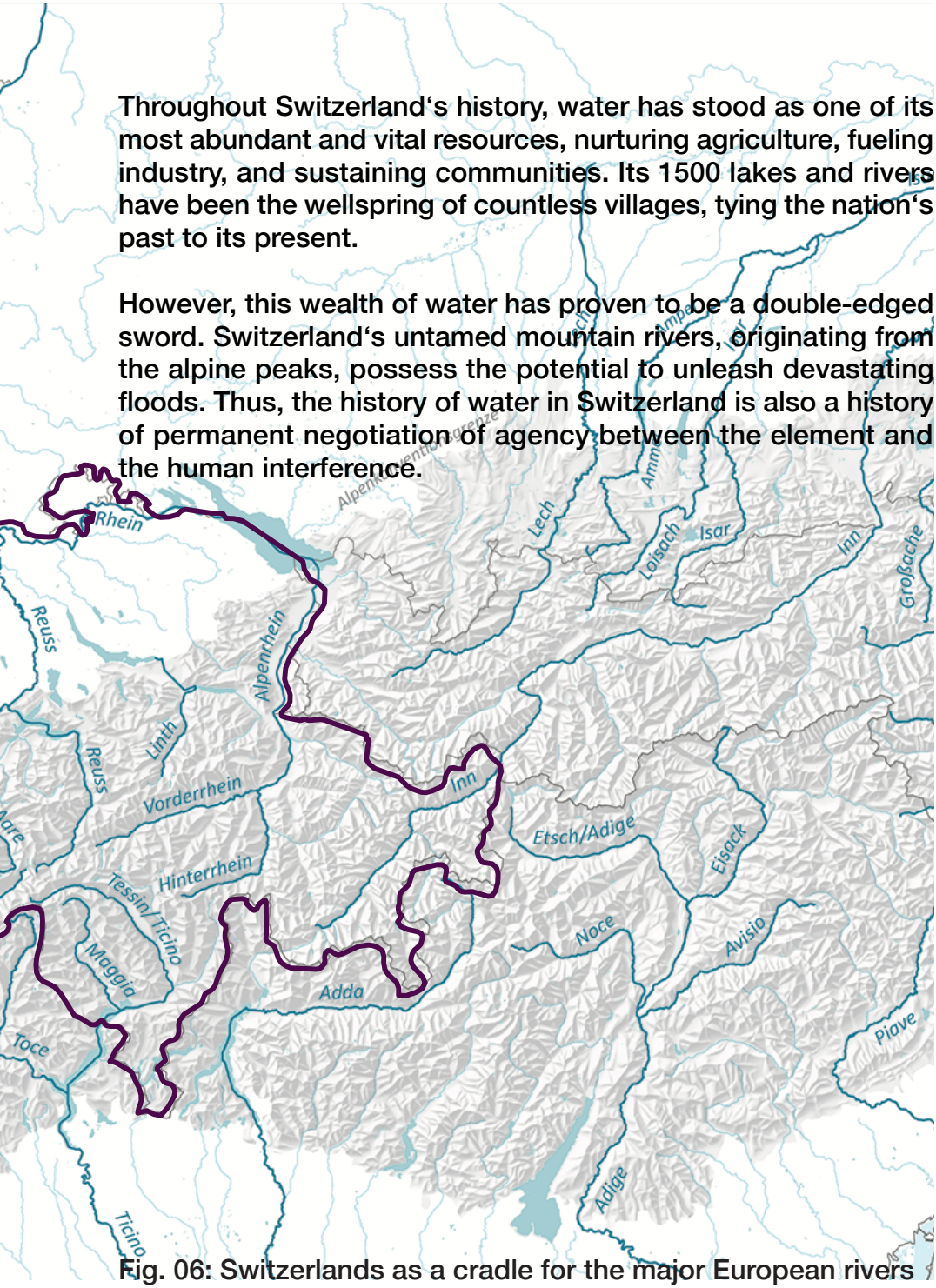


Fig. 06: Switzerlands as a cradle for the major European rivers

In Constant Flow

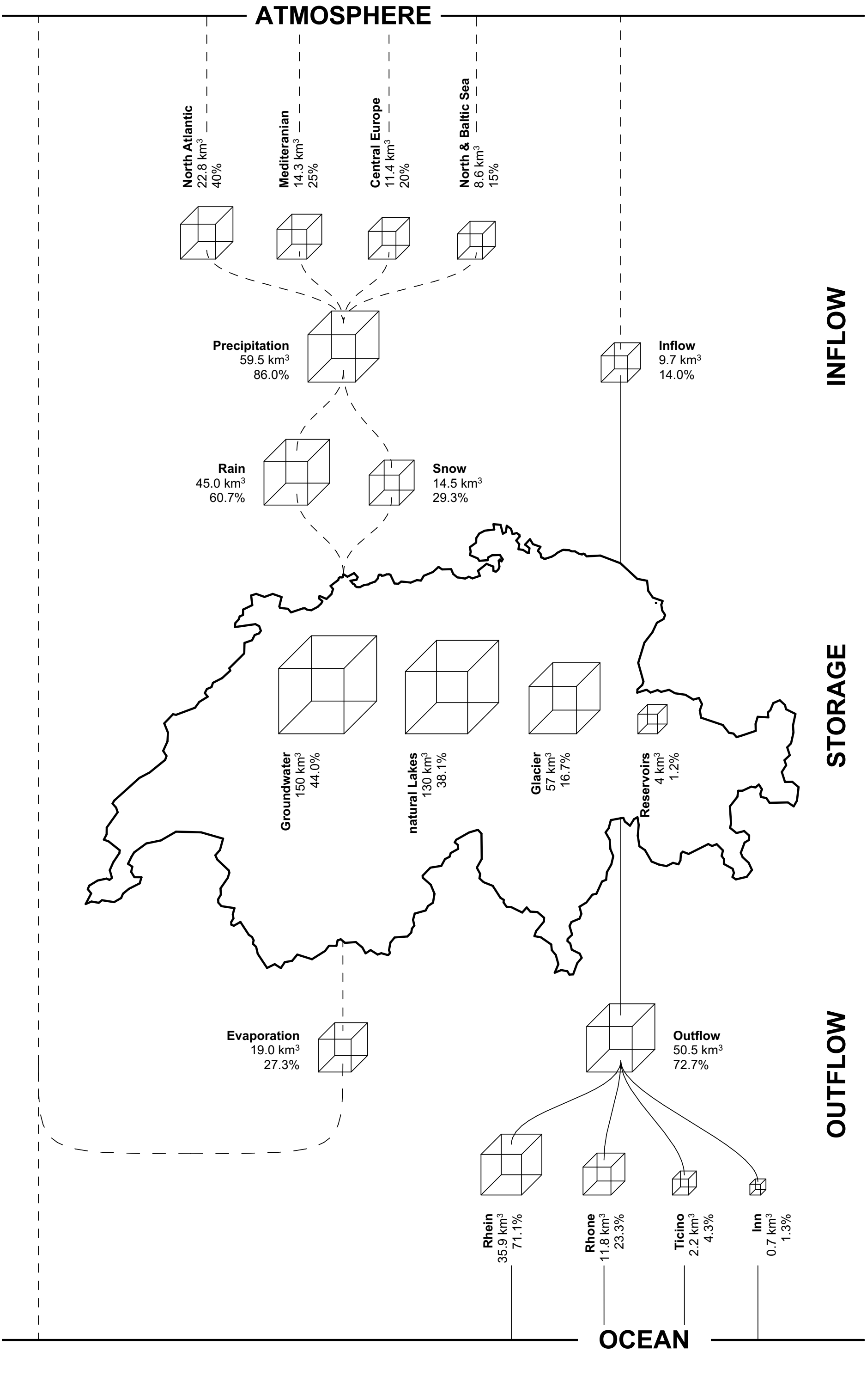
Due to the abundant amount of water on its territory one might be misled to assume that Switzerland is less susceptible to the consequences of climate change. Yet, it is imperative to position Switzerland within the intricate and interconnected network of the global water cycle to comprehend the ramifications of a changing climate.

The hydrologic cycle, commonly known as the water cycle, is a vital natural process that intertwines Earth‘s water resources into a complex web of interdependence. This intricate cycle commences with the evaporation of water from the Earth‘s surface, driven by solar radiation. The resulting vapor ascends into the atmosphere, condenses into clouds, and eventually descends as precipitation. Subsequently, water embarks on a complex journey. It can replenish lakes and rivers, sustain terrestrial plant life, or permeate into the ground to refill aquifers. Alternatively, it may join larger water bodies, ultimately finding its way to the oceans, thus perpetuating the cycle.

Switzerland‘s water cycle is an integral component of this global system. On average, roughly 40% of Switzerland‘s precipitation evaporates in the North Atlantic, with an additional 25% originating from the Mediterranean region. Further 20% arises from the land surface of Central Europe, and the remaining 15% evaporates from the North and Baltic Seas.

Switzerland‘s glaciers also play a pivotal role in the annual water cycle. While gradually diminishing due to global warming, these extensive ice formations remain vital reservoirs, storing substantial quantities of water that contribute to Switzerland‘s and central Europe’s water flow.

Fig. 07: The hydrologic cycle of Switzerland



ATMOSPHERE
North Atlantic
22.8 km³
40%
Mediteranian
14.3 km³
25%
Central Europe
11.4 km³
20%
North & Baltic Sea
8.6 km³
15%
INFLOW
Precipitation
59.5 km³
86.0%
Inflow
9.7 km³
14.0%
Rain
45.0 km³
60.7%
Snow
14.5 km³
29.3%
STORAGE
Groundwater
150 km³
44.0%
natural Lakes
130 km³
38.1%
Glacier
57 km³
16.7%
Reservoirs
4 km³
1.2%
OUTFLOW
Evaporation
19.0 km³
27.3%
Outflow
50.5 km³
72.7%
Rhein
35.9 km³
71.1%
Rhone
11.8 km³
23.3%
Ticino
2.2 km³
4.3%
Inn
0.7 km³
1.3%
OCEAN

The Agency of Water

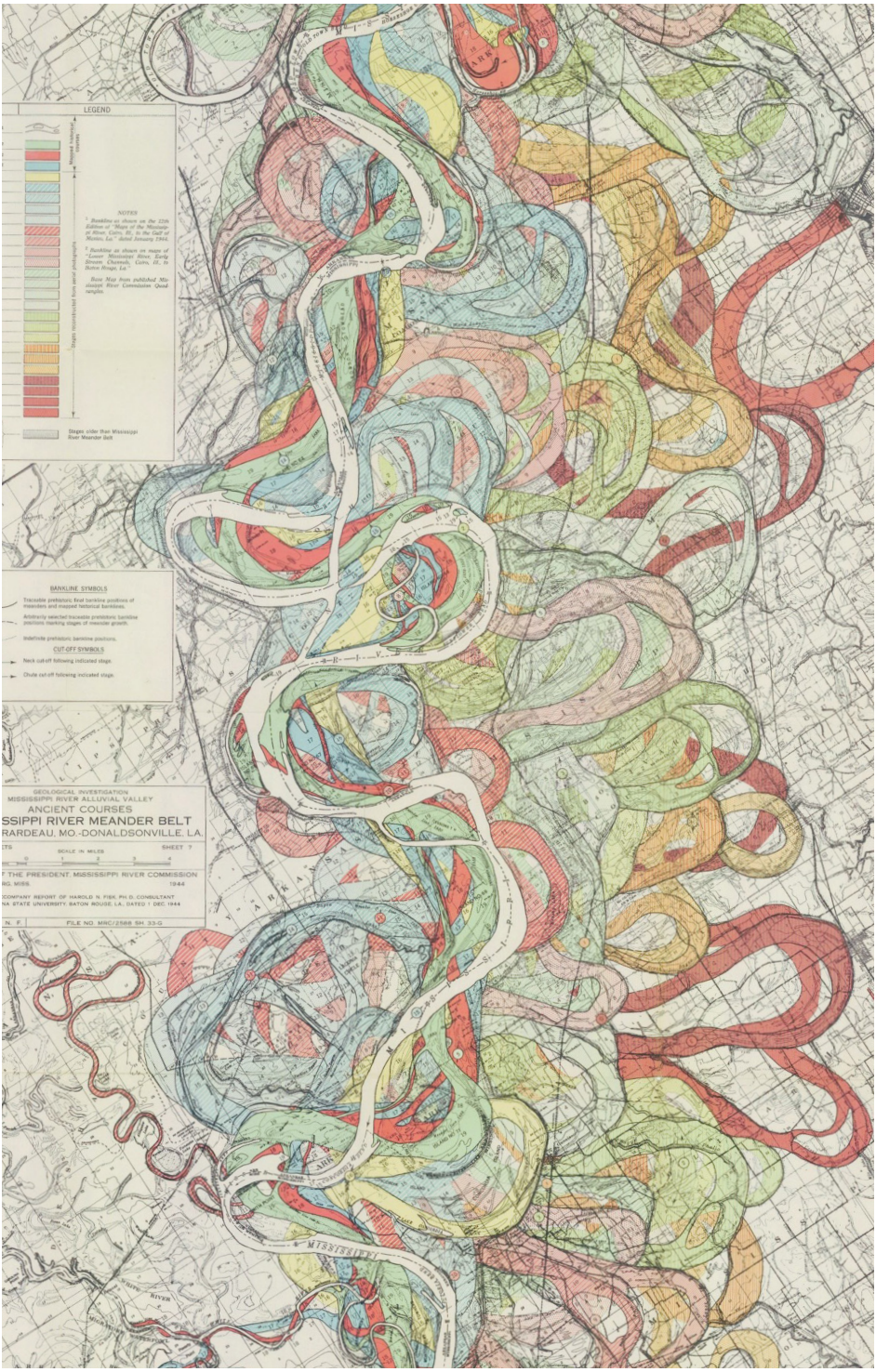
In all its various forms and manifestations, water wields a myriad of influences on our world and our perception. From the quiet trickle of a brook to the roaring force of a river in flood, water has an undeniable and transformative agency. It is an active and dynamic force that continually shapes the land we inhabit and our perception of the world around us.

One of the most remarkable aspects of water‘s agency is its ability as a geological artist to weather and erode solid rock over time. Water is a sculptor of landscapes, leaving behind its mark in the form of canyons, waterfalls, valleys. These geological features are a testament to water‘s slow but persistent influence.

Furthermore, as a transport medium, it carries sediments downstream through rivers and streams forming floodplains and deltas. In lakes and oceans, water accumulates sediments, changing their depths, composition, and ecosystem over time.

Water‘s agency is not limited to gradual, almost imperceptible processes. It can also act swiftly and violently, demonstrating its power to shape the physical world dramatically, as seen in devastating floods that reshape entire regions and communities. In these moments, water reveals its agency as a formidable force that challenges the perceived human control over the elements.

Fig. 08: Harold Fisk, Overlay of the historic Mississippi riverbeds and the riverbed of 1944 in white.


LEGEND
NOTES
BANKLINE SYMBOLS
CUT-OFF SYMBOLS
GEOLOGICAL INVESTIGATION
MISSISSIPPI RIVER ALLUVIAL VALLEY
ANCIENT COURSES
SSIPPI RIVER MEANDER BELT
RARDEAU, MO.-DONALDSONVILLE, LA.
SCALE IN MILES
SHEET 7
F THE PRESIDENT, MISSISSIPPI RIVER COMMISSION
1944
COMPANY REPORT OF HAROLD N. FISK, PH.D. CONSULTANT
NA STATE UNIVERSITY, BATON ROUGE, LA., DATED 1 DEC 1944
FILE NO. MRC/2588 SH. 33-G
MISSISSIPPI
RIVER

Chaper 2

A Contested Landscape

A Contested Landscape

With over one quarter of Switzerland‘s rivers and streams obstructed or buried underground and more than 100,000 transverse structures scattered along its streams, the Swiss waterscape is highly impacted by human interventions. To mitigate flood risks, the delicate bedload balance is further disturbed by bedload collectors, inadvertently impacting the environment by causing sedimentation issues and altering the natural dynamics of riverbeds. This reality of extensive manipulations of the water flow sharply contradicts the image of pristine landscapes that Switzerland likes to project.

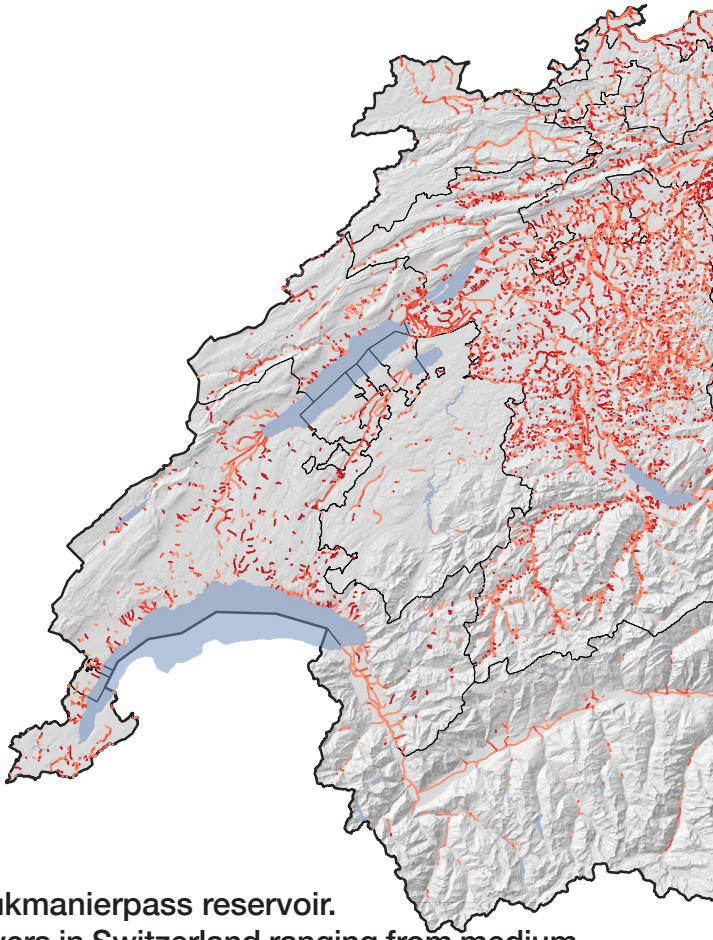
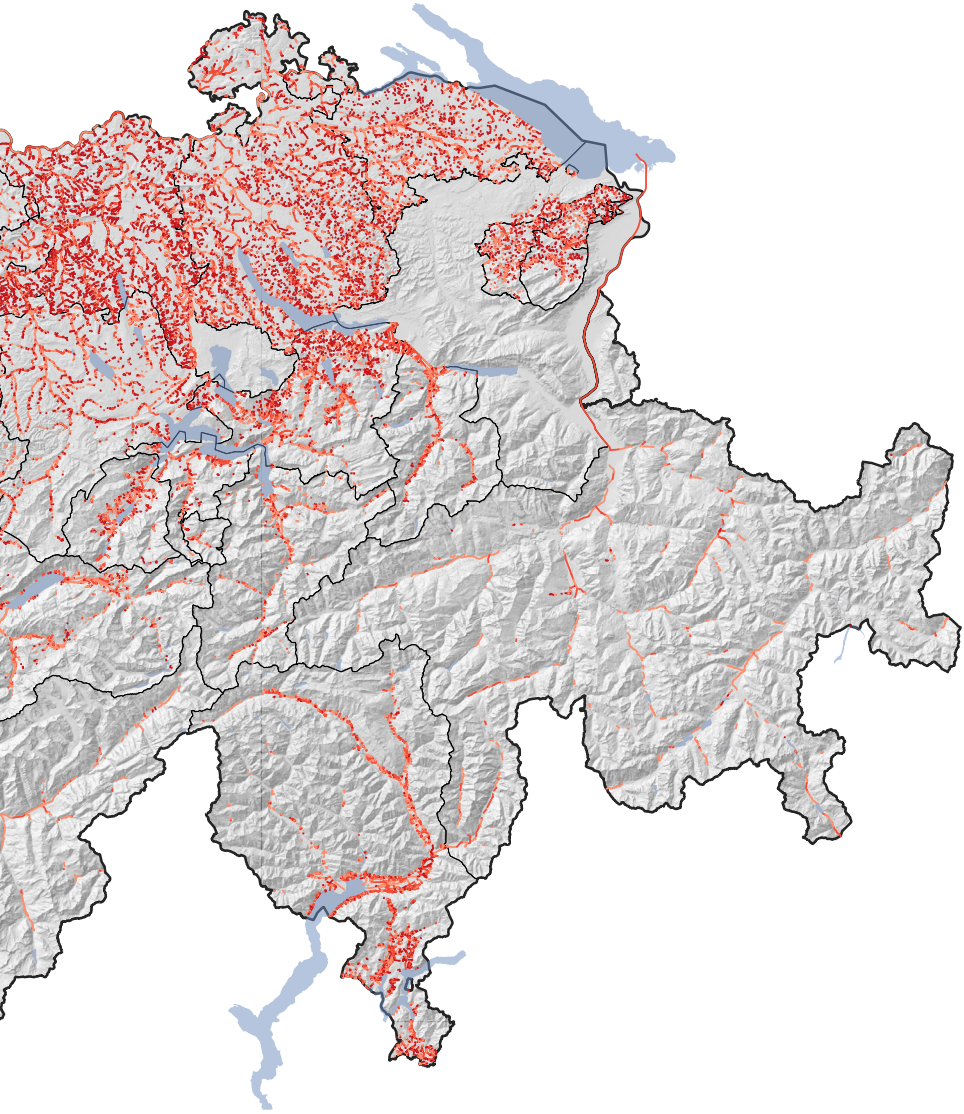


Fig. 09: Simon Walter, Lukmanierpass reservoir.
Fig. 10: Disturbance of rivers in Switzerland ranging from medium impairment (light red) to culvertization (dark red)



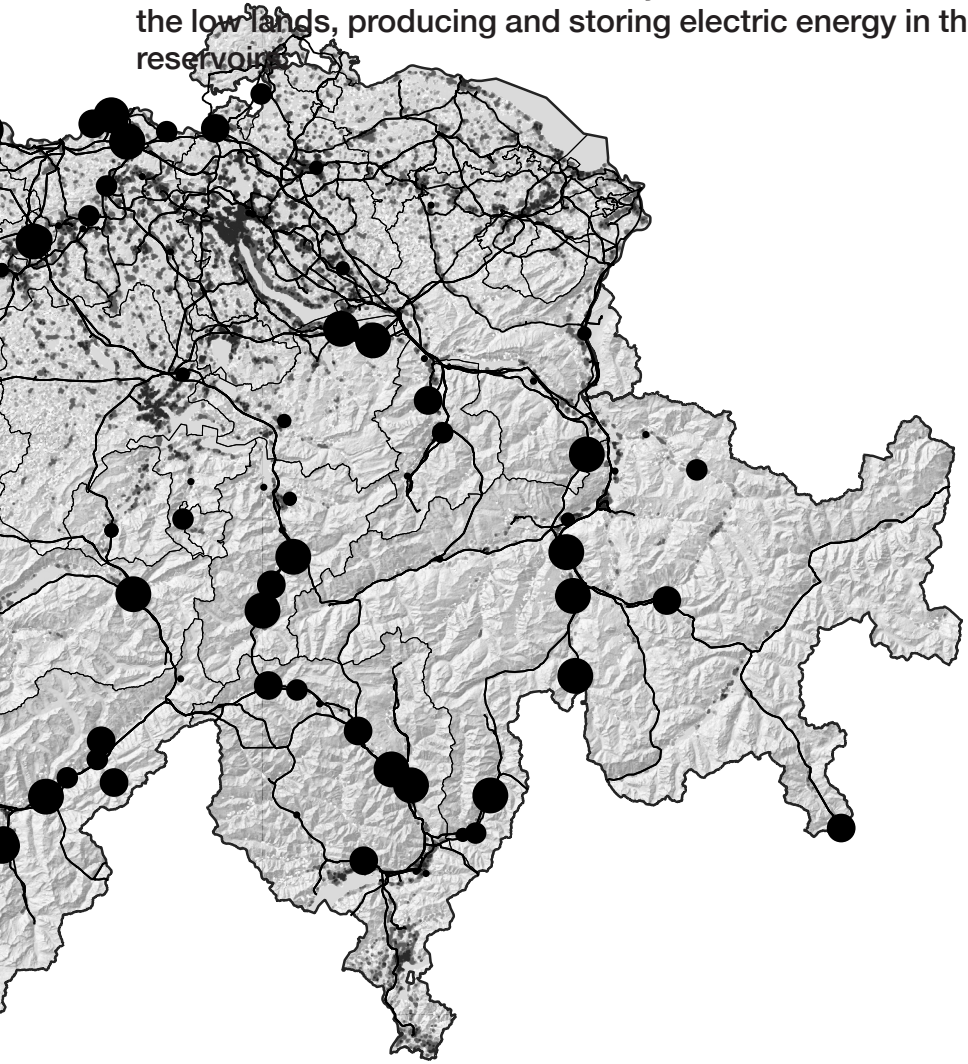
Lifeline of the Urbanisation

While Switzerland has a long history of harvesting the energy of its waterways, before the means of electric submission, the interventions were bound to be localized at the same place as the usage of the energy. This only changed in the beginning of the 19th century with the advent of the industrial revolution, where both the means of transporting electric energy and the growing demand allowed for a territorial approach. Through the intense use of hydropower, Switzerland‘s lakes and rivers, became the driving force behind its industrialization. Annually around 550 billion cubic meters of water flow through turbines, several times the total annual runoff. Every cubic meter of river water is used 13

Fig. 11: The electric grid linking urban zones with the reservoirs in the hinterland (sizes according to storage capacity).

times for energy production before it flows across the country ‘s borders. Due to this high intensity of use, the domestic electricity industry is highly vulnerable to fluctuations in precipitation.

The interplay of Switzerland‘s energy production and consumption demonstrates a hidden territorial metabolism. The Alpine region acts as a powerhouse and battery for the urbanized zones in the low lands, producing and storing electric energy in their vast reservoirs.



Monuments of the Antropocene

Through the intense and continuous interference with the waterscape over the last 200 years, a palimpsest of human interventions along the course of the rivers was generated. In countless monuments of the Anthropocene, one can read the ambivalence between interpreting the agency of water either as a resource, that can be exploited, a void that can be utilized for infrastructure or a natural force that must be tamed.

Fig. 12: The dam of the Etzelwerk hydroelectric power station.

Fig. 13: The Shilhochstrasse highway over the Sihl river bed.

 Fig. 14: The driftwood rake at the Sihl close to Langnau am Albis.

A Sustainable Approach?

The dichotomic worldview of separating nature and culture is deeply ingrained into the Swiss culture as can be seen in its legislation. In article 664 of the Swiss Civil Code surface water as well as rocks or ice are declared as elements that are not able to contribute to culture. Furthermore, the ambition of domination over the element of water is captured in article 76 of the Swiss constitution. In the first paragraph it is stated that the federal government has the responsibility to ensure the economical utilization of the available water resources, while simultaneously protecting the waterscape from human overuse and vice versa protect its citizens from the destructive forces of the water flow.

In recent years this conflict of interest has gradually shifted towards to protection or recovery of the Swiss waterscape. With the Federal law on the protection of water bodies from 1991, the intention was formalized to restore the integrity of the waterways to an idealized original state. Yet, how can one define an original state for an agent that is in constant change? How can this ambition be realized in a completely artificial context? Is this pseudo-natural state not just another expression of human dominance over the formative forces of water?

The revitalization project of the Sihl river close to the Zurich main train station serves as an insightful case study revealing the inconsistency of the current revitalization approach. At first glance, the idyllic landscape of islands of gravel protruding from the meandering river generates the impression of an untamed stream. Only on a closer look, the fortified riverbanks indicate the tight constraints that are imposed on the waterway. Yet, below the surface of the water, gradually more and more bedload accumulates in a mounting layer. Due to the upstream manipulation of the river and the extraction of water along its course, the Sihl does not have enough force to carry it into the river Limmat. Thus, only a few years after the restoration of this section of the river, plans are already made to dig up the riverbed to remove the excess material.

Fig. 15: The Sihl as a transportation hub in the 1960s.

 Fig. 16: The Sihl as an idyllic riverscape in the 2020s.

Chapter 3

Climate - A Changing Reality

Chosing Paths

In its climate report from 2018 the Swiss National Centre for Climate Services NCCS investigated the climatic future of Switzerland based on two scenarios. One with an extensive reduction to zero emissions before the turn of the next century, yielding an global atmospheric warming of about 2.6°C and one in which no measures to reduce C02 emissions were taken, leading to an atmospheric warming of about 8.5°C.

In both cases, the impact on the Swiss waterscape is forecasted to be severe, with a reduction of runoff from snow fall of between 15% and 45%. By the end of the century, the glacier volume in the Alps will have disappeared by 65% or even 95%. Sommers will be dryer, with a reduction of runoff between 10 and 40%, while the water temperature is expected to rise by 2°C to 5.5°C.

This new reality will also drastically reshape the agency of water. Due to higher air temperatures, more energy and moisture will be present in the atmosphere. While the annual amount of precipitation is expected to remain almost at the current level, the frequency and intensity of heavy precipitation is expected to increase on the entire Swiss territory. This will lead to more prevalent and severe local flooding events. Furthermore, the Alpine region the shifting of the zero-degree line will lead to greater destabilization of the ground, increasing the sediment transport in Alpine watercourses.

Fig. 17: Silva Schnurrenberger, Low water at the Sihlsee, 2020

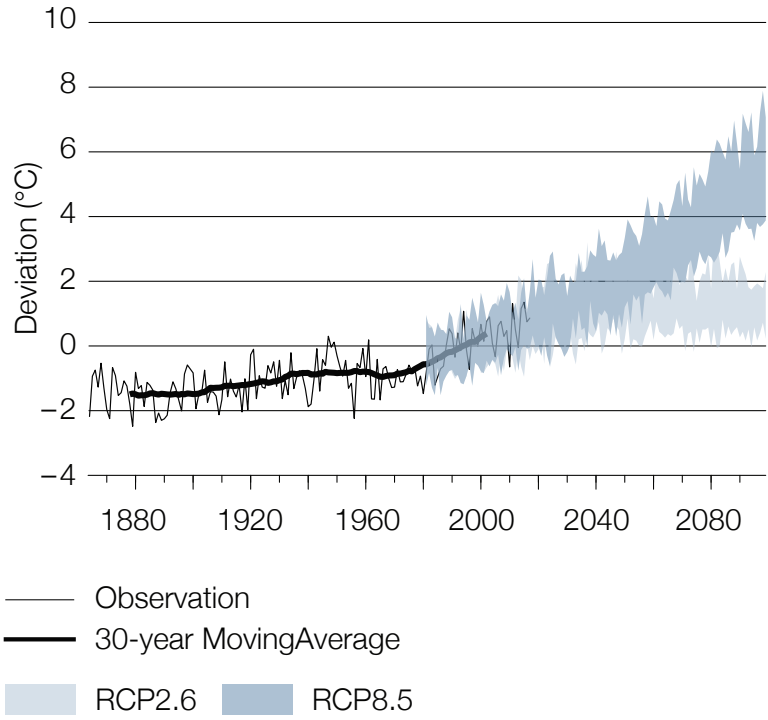
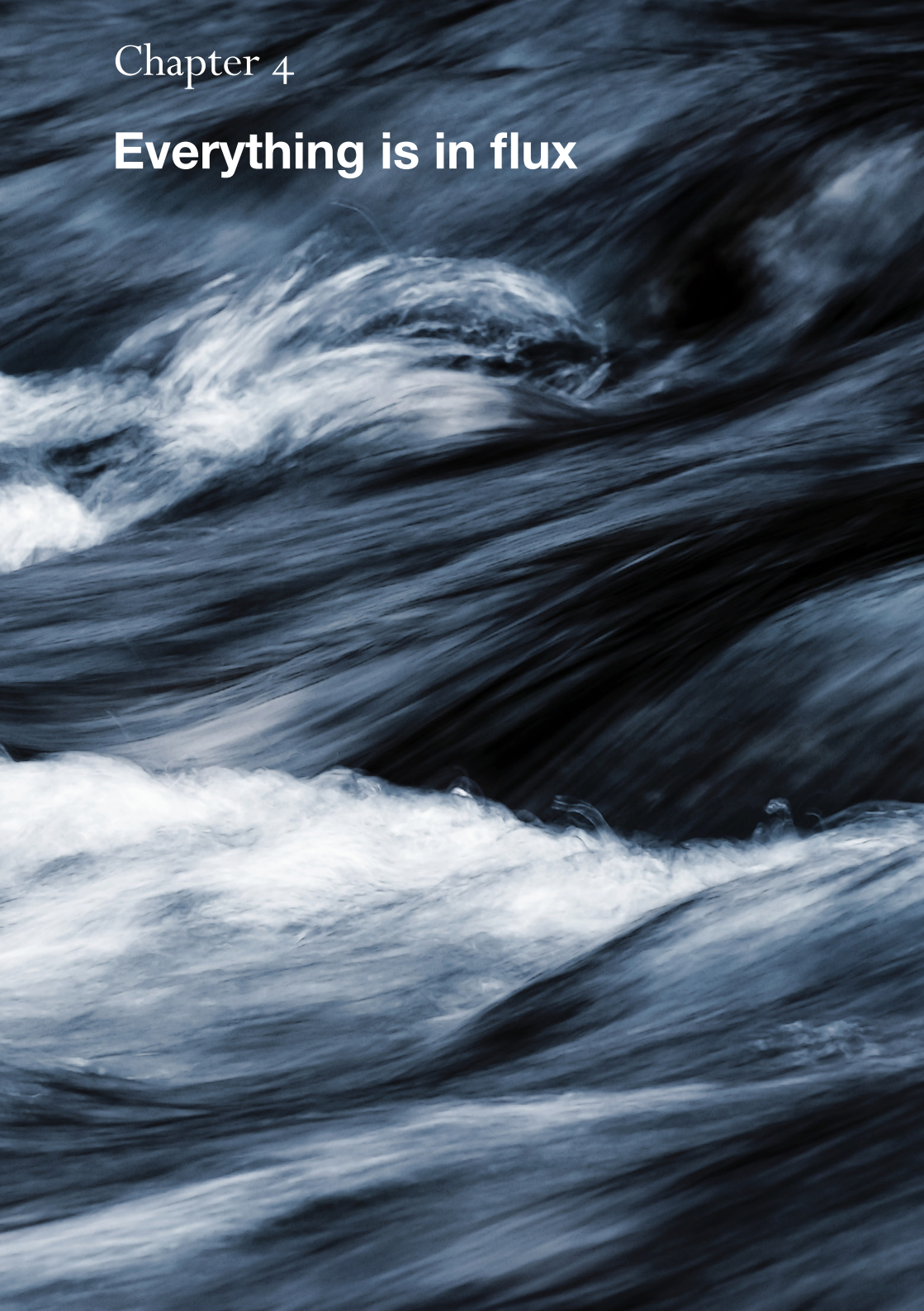


Fig. 18: Expected increase of air temprature due to climate change with and without mitigation measures.

Chapter 4

Everything is in flux



Let's Reterrestrialize

The climate is changing and consequently society must as well. There is no lack of knowledge or acceptance, with over 98% of the Swiss citizens agreeing on the existence of climate change. Moreover, it is perceived as both the largest threat to society and the individual. Yet, if external emissions are accounted for, each citizen is still responsible for an emission of 12 tons of CO2 per year, well above the 0.6 tons per person that would be required to successfully soften the impact of the changing climate. This raises the question: How can be counteract this cognitive dissonance between the general acknowledgment on the one hand and a lack of corresponding action on the other hand.

In his book "Facing Gaia" Bruno Latour argues for a change of mindset. According to Latour we must understand the ecological crisis not as a crisis of a nature that must be protected and restored. On the contrary, the acute crisis in our living conditions makes it clear that the idea of a healthy nature confronted by a self-created and sometimes destructive culture already represents the core of the problem that needs to be solved in the future.

Latour argues for a distribution of agency beyond the human-centered point of view. Every being is constantly changing and shaping its environment. We have to face our civilization's delusion of a unilateral human agency that abstracts itself from its surroundings. Or as formulated by Latour himself: "We shall try to rematerialize our existence, which means first of all reterritorializing it or, better, though the word does not exist, reterrestrializing it."

How can we overcome the current perception of climate as abstract, distant, and decoupled from the individual? One reason for this alienation can be found in the temporal and spatial intangibility of a global phenomenon. Due to their gradual changes, both climate and landscape are often experienced as static entities eluding human perception and subsequently hindering a sense of responsibility and affinity.

Panta Rhei

To counter the prevailing human exceptionalism and individualism we can borrow from the Greek philosophy attributed to Heraclitus, known as “Panta rhei“, which can be translated to „everything is in flux“. In his teachings Heraclitus proposed a worldview in which existence is not considered static and detached, but rather part of an eternal, dynamic process. Everything is united by being part of a constant change of substance and form.

To represent the dynamic and interconnected nature of the physical world, the ever-changing nature of the flow of a river was utilized as a guiding allegory. Heraclitus is believed to have proclaimed: „You cannot step into the same river twice“ meaning that the river is constantly flowing and adapting, thus, the water you step into one moment is not the same as in the next.

This concept has profound implications for understanding the nature of existence. It suggests that nothing remains static, and all things are subject to change, whether in the natural world, human life, or even philosophical and scientific theories. It encourages a perspective that embraces change, impermanence, and interconnectedness as fundamental aspects of reality.

Fig. 19: Jozef Jankola, Dark blurred river.

Following this line of argument, in my thesis, I aspire to translate this allegory into the physical world. By revealing and unmasking the complex past, entangled presents, and contested future of a tangible and acquainted body of water, the intricacy, volatility, and vulnerability of the global water cycle are made comprehensible to a broader public.

For my project, the river Sihl was determined as a site of intervention. Historically, the city of Zurich identified itself with the calm Limmat River. Meanwhile, the “wild” Sihl was considered to be the inferior river that could be shaped and controlled unrestrictedly according to civilizational will.

Yet, it continuously resisted this exertion of dominance by human agency. Through devastating flooding events or by pressing thick sheets of ice into the territory of the city of Zurich it reminded the residence of its ferocious nature. Revealingly, the name “Sihl”, which is of Celtic origin, can be translated as “the wild” or “the strong”.

Fig. 20: Collage of the Sihl River and the Limmat River.

Chapter 5

Subjecting Sihl

History Repeats

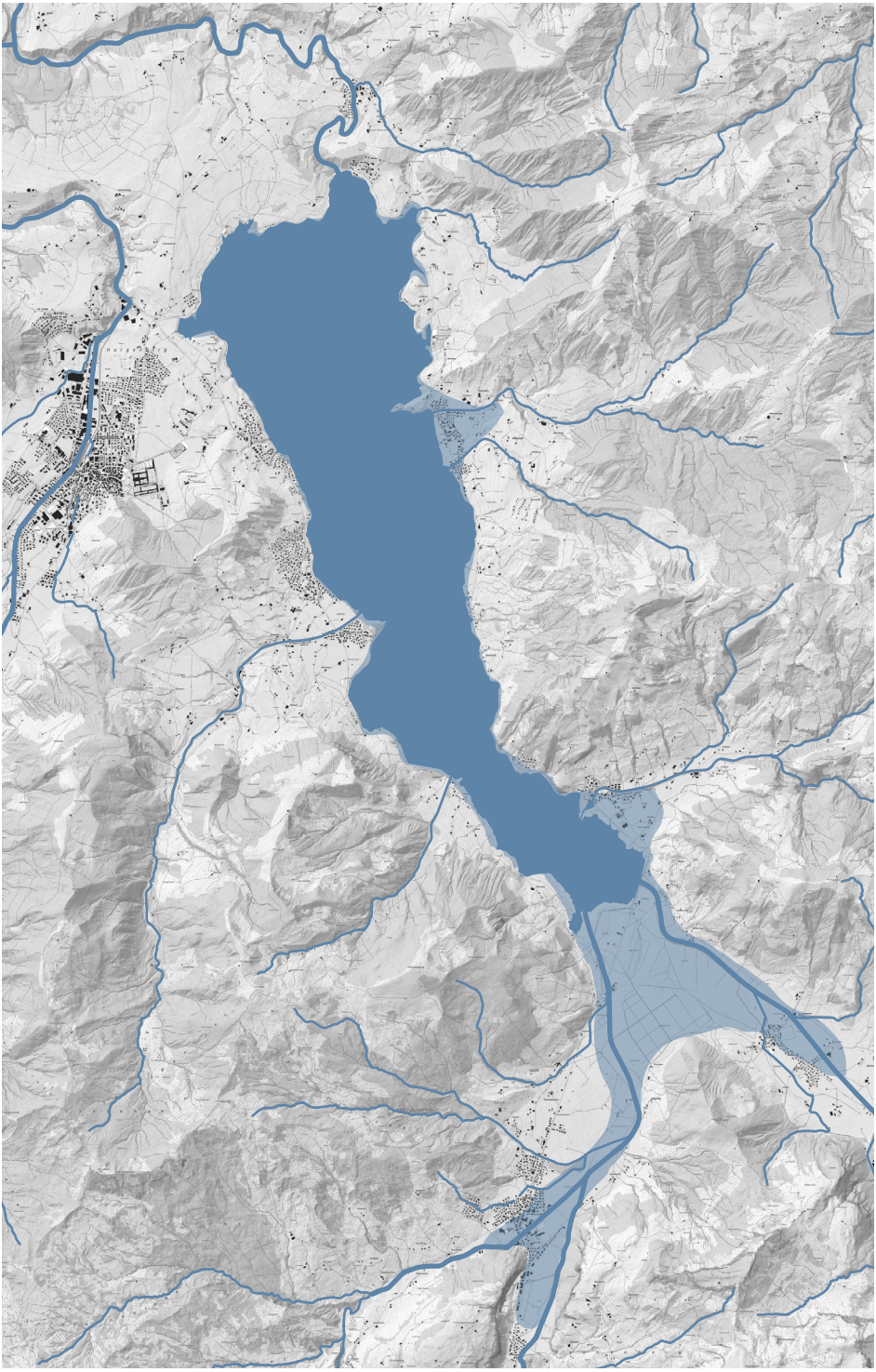
The negotiation of agency between the Sihl and human interventions is visible on the entire length of the river, all the way to the river source at the highlands around Einsiedeln. While today the Sihllake is covering almost the entire valley with 92 million cubic meters of water, up to the 1930s a moor and peat landscape could be found with the Sihl meandering gently through the plain.

To fuel the furnaces of the young industry prospering in the Swiss Plateau at the beginning of the 20th century an increasing amount of energy was needed. Being a country without noteworthy reserves of fossil fuel, Switzerland intended to evade being energy dependent on foreign countries by heavily investing in hydropower.

The Sihl plain, which is only separated by a small mountain range from the basin of the Zurich Lake 480m below, already inspired the use of the heigh different as early as 1797. One hundred years later the first project for the construction of a dam was submitted. It took, however, 30 years until the legal framework was established. Finally, in 1937 the hydroelectric powerplant was inaugurated. Today, only 80 years after its construction the Sihlsee is now perceived as a natural body of water.

This, however, is not coincident. Roughly 15000 years ago, after last ice age, a natural dam of moraine was created be the retreating glaciers. This prehistoric lake is assumed to have been even larger than the current artificial one. Over the millennia it was successively filled up by sediments from the rivers. This process of silting up is a dynamic that the current artificial lake is also subjected to. A study on the siltation of the southern Sihlsee came to the conclusion that between ten and seventy thousand cubic meters of sediment are annually added to the lake.

Fig. 21: Alessandro Della Bella, Sihlhochstrasse.
Fig. 22: The Sihlsee at its current extend and in prehistoric times (transparent).



Drowning of a Cultural Landscape

> "With the old houses and homesteads, which were all plain and simply built, something of the simplicity and contentment of their residents was often lost."
>
> Markus Winiger

The Sihlsee project can also be viewed as an exemplary collision of tradition and modernity in Switzerland in early 20th century. While in November 1926, the building contract was approved by the Einsiedler Landsgemeinde with a clear majority, it came with a considerable toll for the local residences.

500 people and an agricultural area of 9.43km^2 had to make way for the reservoir. 55 farms were completely flooded. A total of 93 houses, 124 stables, 13 barns, 179 peat huts and 14 other buildings such as sawmills, chapels and covered bridges sank in the lake.

To relocate the affected farms the Swiss Association for Interior Colonization and Industrial Agriculture (SVIL) was commissioned , an organization that was founded in Zurich in 1918. The new settlements were located around Lake Sihl which was formerly uncultivated and often of inferior agricultural quality. Due to unappealing starting conditions, but also due to a feeling of deracination, two third of the affected people decided to settle down in another location or even moved abroad, primarily to the US.

Fig. 23: The inverted Sihlsee revealing the submerged territory.

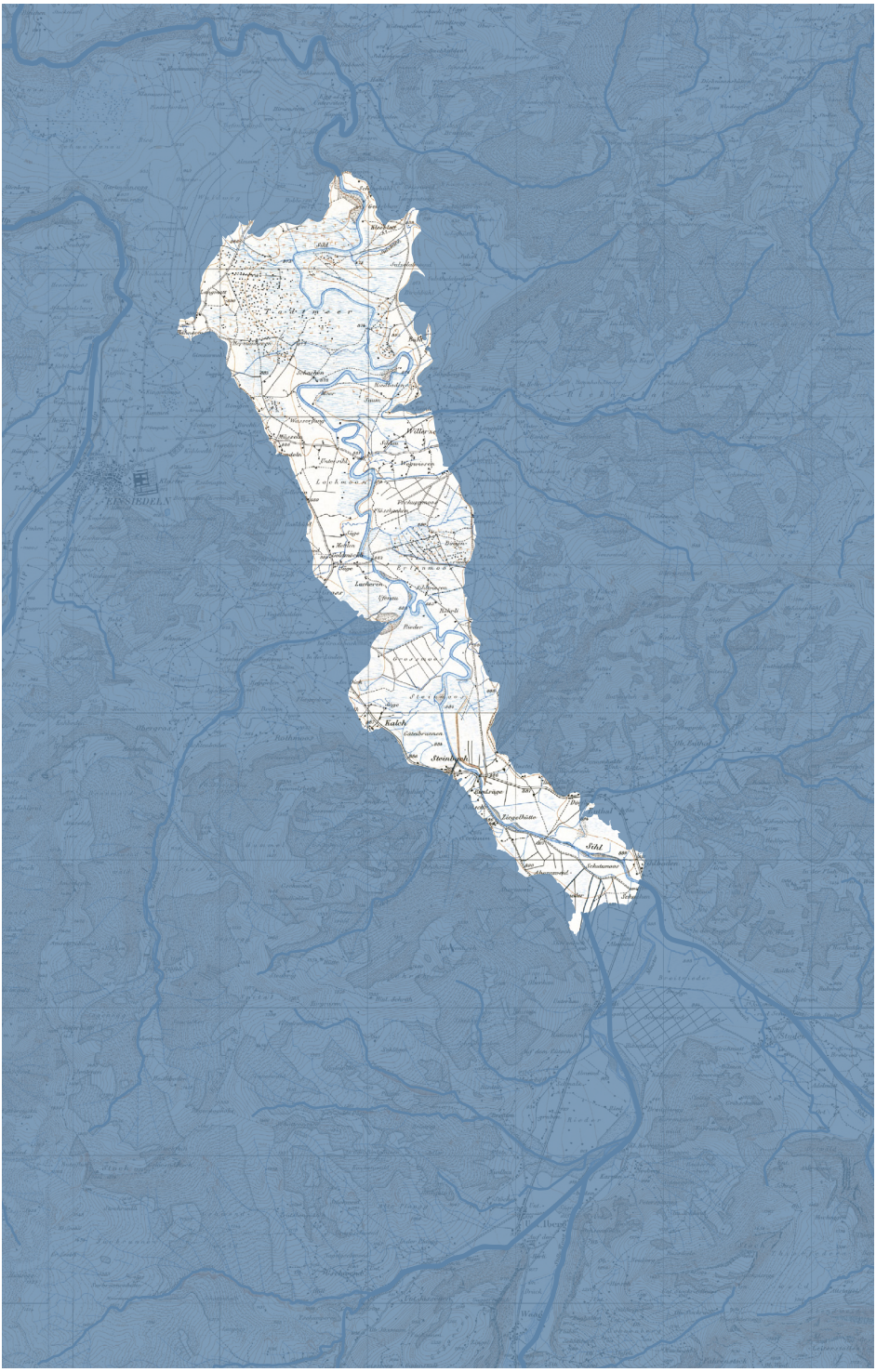


Fig. 24: The Haus in der Langmatt is slowly disappearing during the initial filling of the lake.

A Delicate Balance

Finally, the Sihlsee can be seen as an illustrative example of the complex, yet barely visible interconnection between the urbanized zones downstream and the water stored within the lake. The fragile balance between being perceived as a productive source or a destructive force can be directly read from the level of the lake.

The reference level, the so called filling target is precisely defined to be 889.34 meters above sea level. From the beginning of November until end of May the lake can be lowered by as much as 12 meters for energy production. During the summer months stricter restrictions are in place. Between June and October, the lake level is not allowed to divert more than 2 meters from the reference level. Lowering the lake further would expose the shoreline, presumably promoting an increasing breeding of flies and mosquitoes. If, like in the summer 2020, this mark is missed, as the owner of the plant the SBB has to pay between 20‘000 und 45‘000 CHF per day, the so called «Mückengeld».

While below the reference level, primarily the productive capability of the Sihlsee is of interest. Yet, when rising over the filling target, only a small intermediate zone separates the productive from the destructive capacity of the Sihl. While 10 cm above the reference level high water downstream is expected with no major damage, meanwhile 20 cm above would result in flood damage in the village downstream. If rising 30cm above the filling target, a major flooding event of the entire Sihl valley and the city of Zurich is expected, leading to Billions of Franks in damage.

As a countermeasure, the canton of Zurich can demand from the SBB to artificially lower the level to 64cm below the reference to generate excess storage capability within the lake. This precautionary measure, however, must be initiated days before expected heavy precipitation and thus relies on a reliable weather forecast.

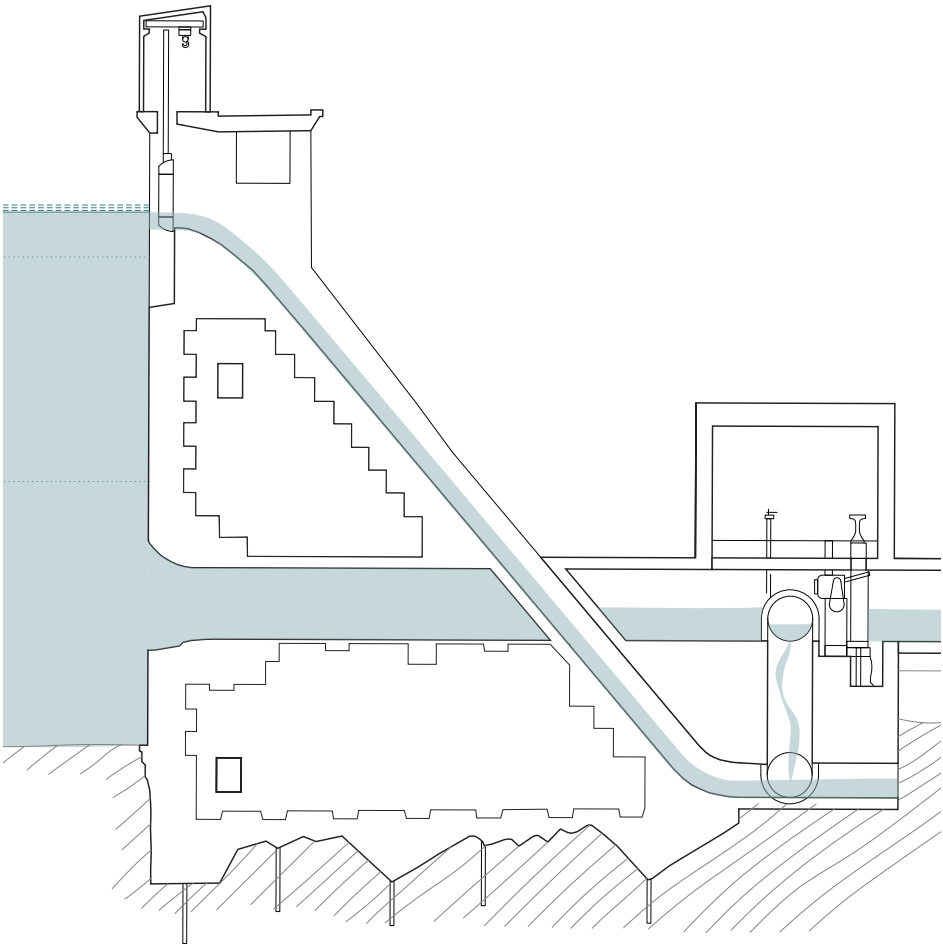
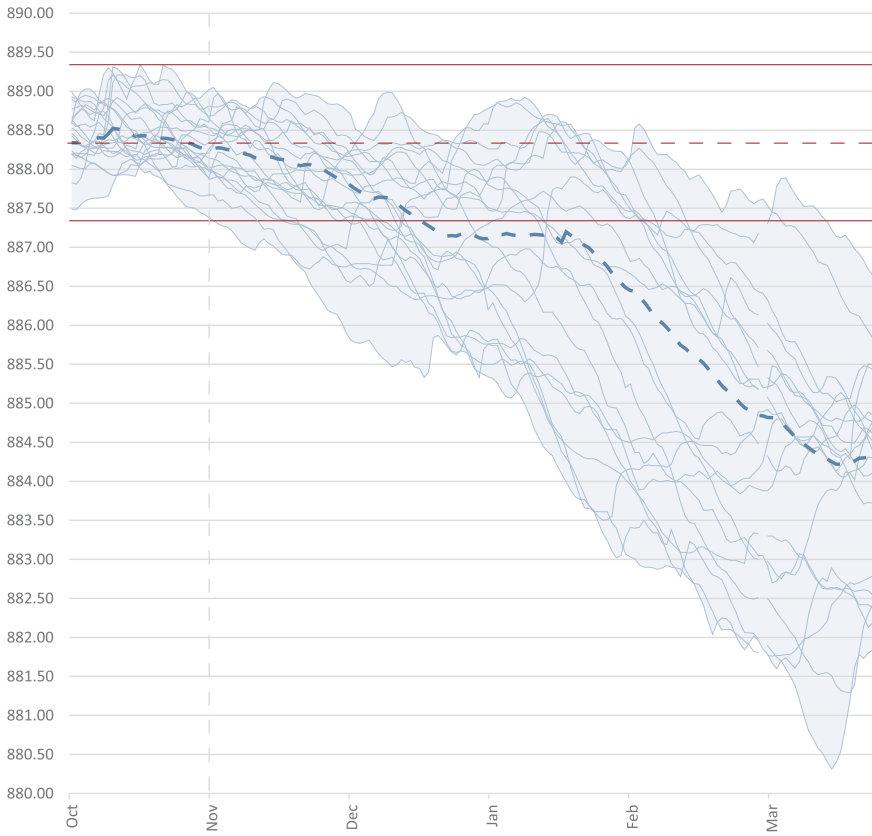


Fig. 25: Productive and destructive implications of the difference in the level of the Sihlsee.

Artificial Saisonality

The legislation in combination with the naturally occurring precipitation pattern causing a characteristic seasonality to the Sihllake: During the summertime the lake is normally only fluctuating within the narrow band of 2 meters as permitted by the concession. With the end of October, the lake level starts to decline gradually. As precipitation is now starting to accumulate as snow in the high mountains, only a reduced amount of water is reaching the lake. The battery is emptied. By mid of March the lake normally reaching is lowest level, up to minus 9 meters compared to the maximum.



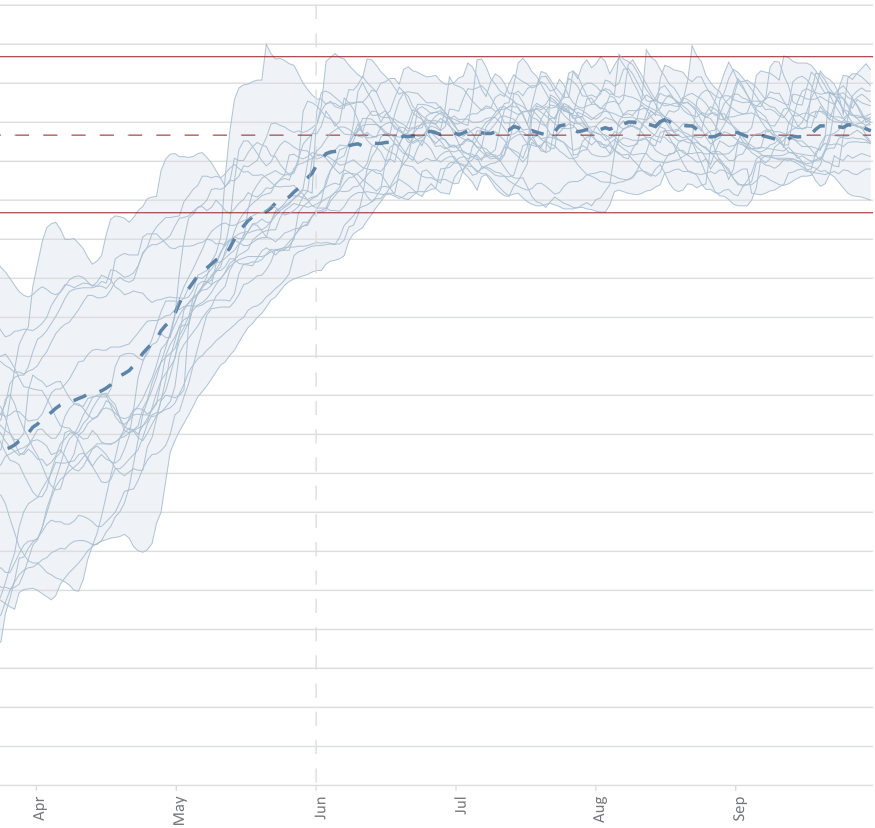
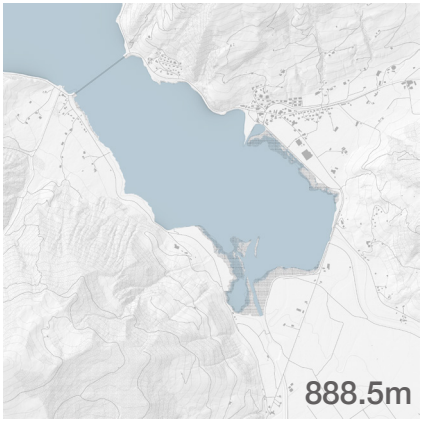
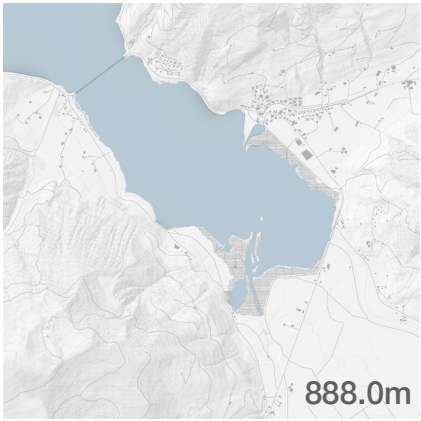


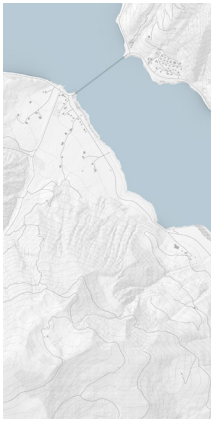
 Fig. 26: Level of the Sihl lake 1992-2016 with average indicted.

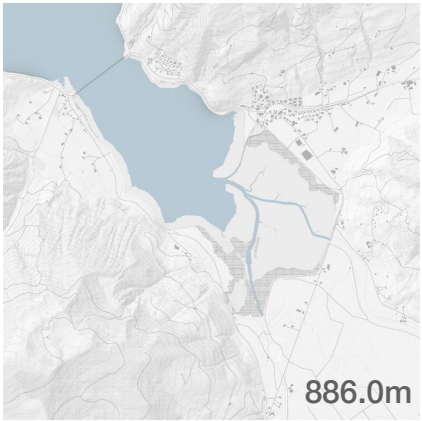
A Dynamic Landscape

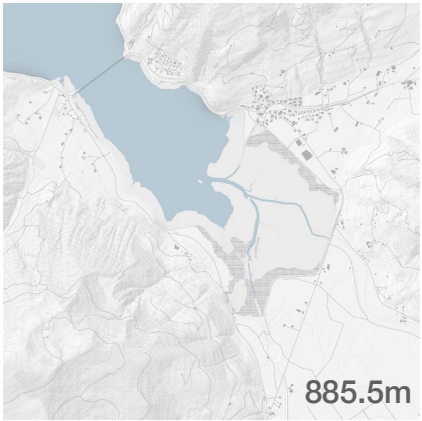
The profound changes of the change in lake level have a palpable impact on the residence as well as the ecosystem of the region. However, it is especially the southern part of the lake that feels the implications the strongest. While the northern part of the lake is up to 23 meters deep, in the south it only reaches a few meters. This implies that during the winter season, when the lake is emptied, this part of the lake is completely exposed, revealing a desert-like landscape that can persist for months. For Euthal, the only village at this part of the lake, this yields a distinct seasonality, where for half a year it is a settlement right at the lakeshore,











while for the other half it is a landlocked community hundreds of meters away from the shoreline. With the retreating water the history of the place is revealed as well: The remains of the former foundations of the formerly flooded farmhouses are still readable on the muddy floor.

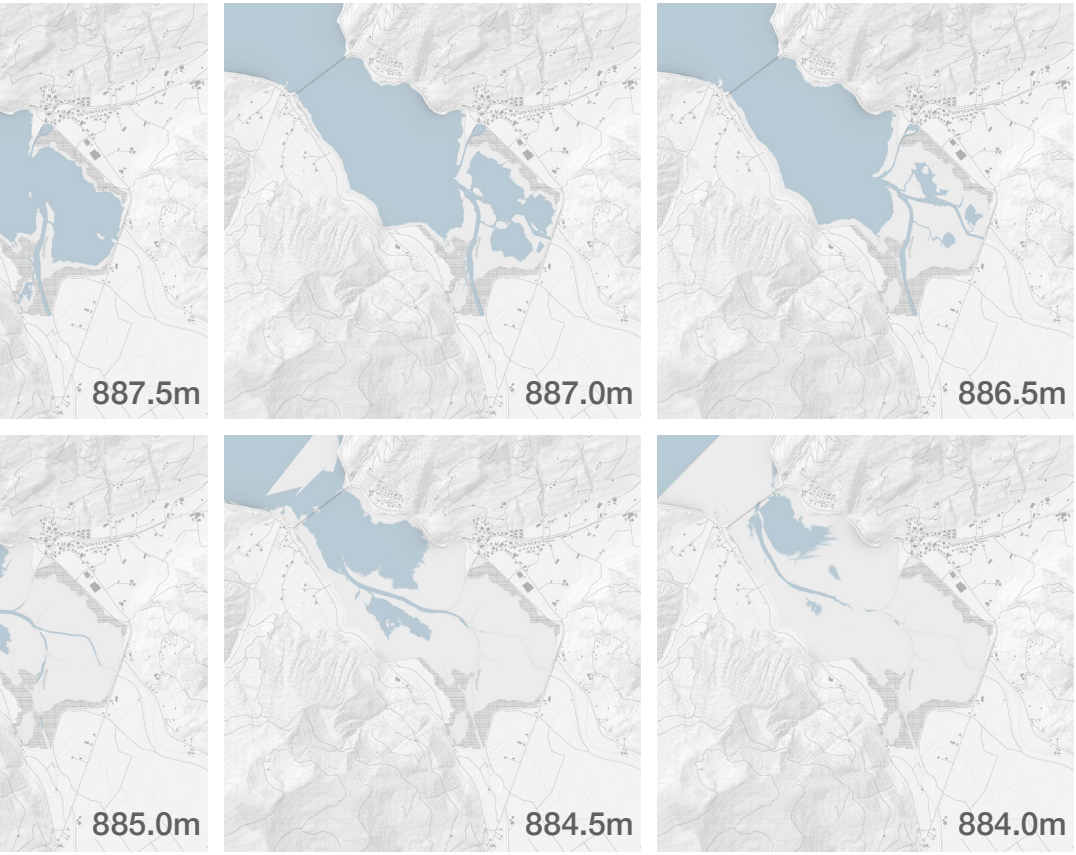


 Fig. 27: Impact of the lake level on the southern part of the lake.

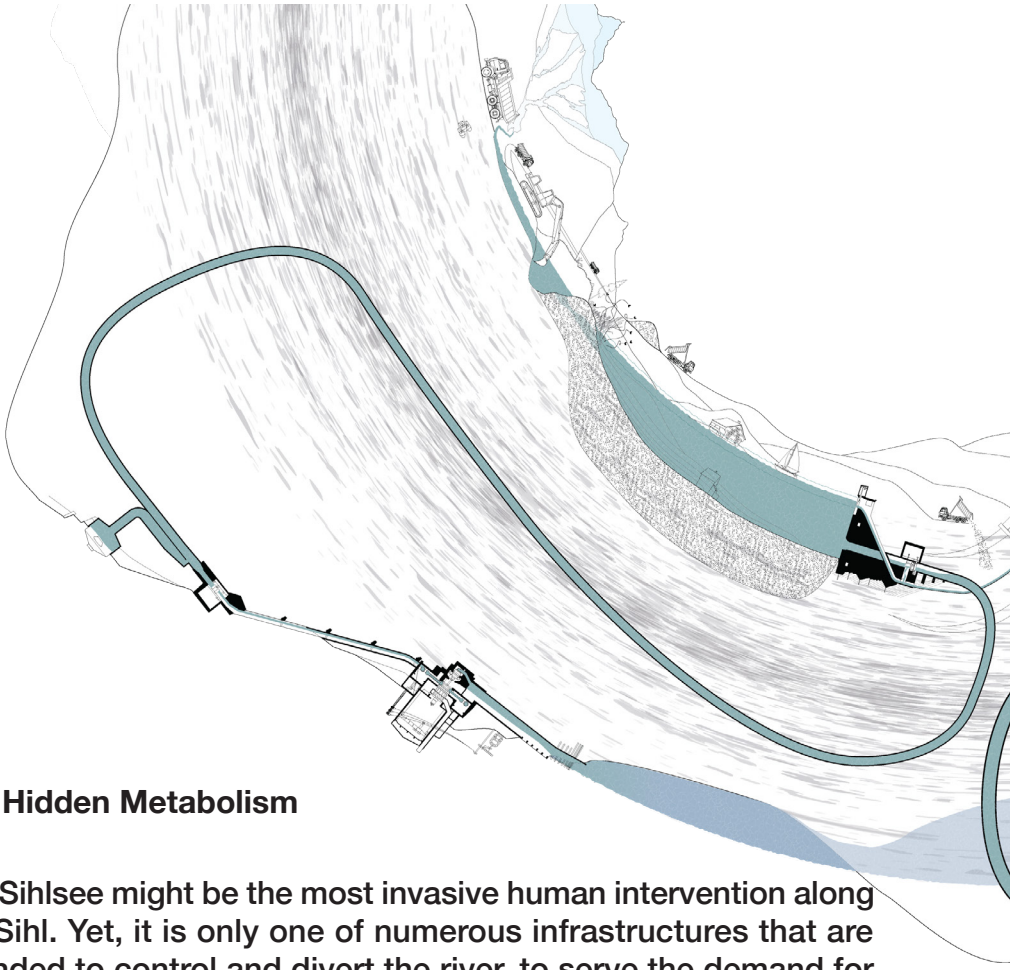
Fig. 28: Valeriano Di Domenico, Low water at the Sihlsee, 2020.

The silting up of the southern part of the lake is expected to only become more extreme: With the Sihl, Minster und Eubach the main tributaries are entering the lake at this location. Besides their water they carry copious amounts of sediments with them. In the still waters of the lake these sediments start to deposit as a thick layer of mud with 10’000 to 70’000 m3 of sediments added to the lake per year.
Currently, the deposition is primarily taking place at the lake bottom, invisible from the outside. At the lake shore, however, already a substantial belt of wetland has formed. This dense belt of vegetation forms an important habitat for the local fauna. Birds like the Teichrohrsänger and the Haubentaucher rely on a dense forest of reed for their nest building during breeding season. Furthermore, the reed is also actively cleaning the water of the lake and protects the shoreline from erosion. Recognizing its importance, part of the wetland at the Silhllake was already declared a moorland landscapes of national importance.

Fig. 29: A Teichrohrsänger feeding its chicks.

Fig. 30: The shoreline of the southern part of the lake after the initial filling.

 Fig. 31: The current shoreline with the belt of wetland.

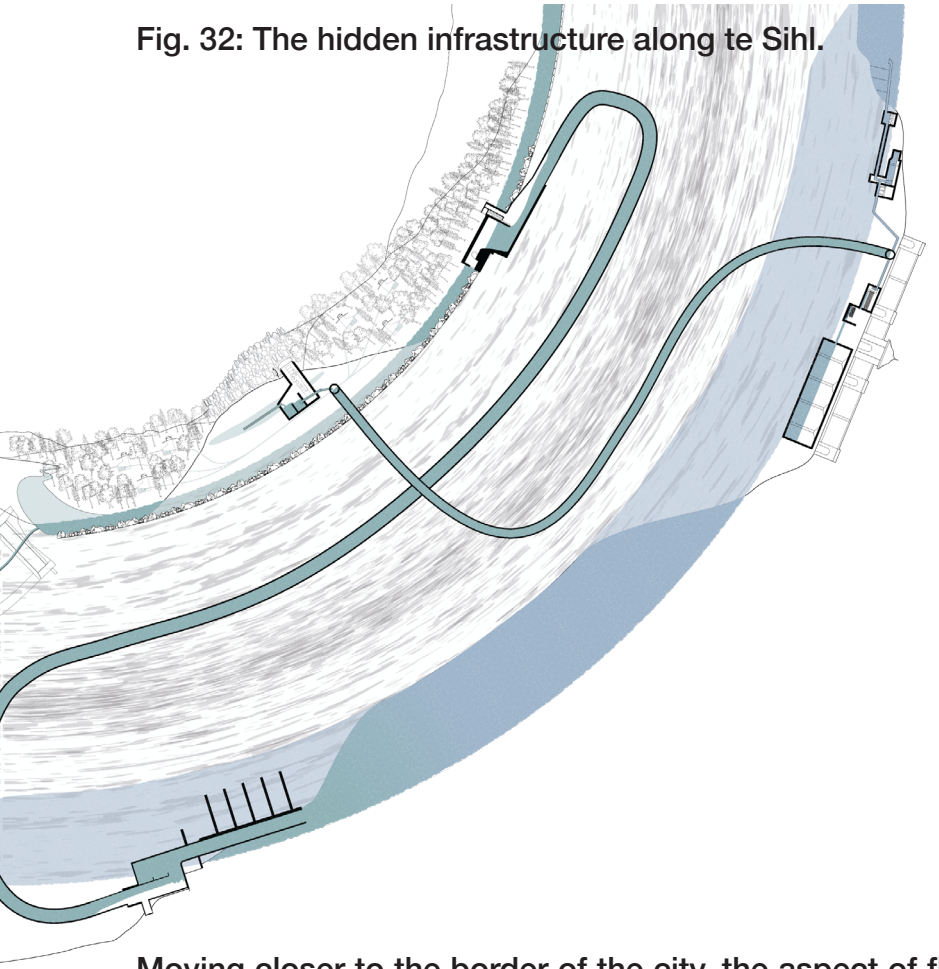


The Hidden Metabolism

The Sihlsee might be the most invasive human intervention along the Sihl. Yet, it is only one of numerous infrastructures that are intended to control and divert the river, to serve the demand for energy, water, and security of the metropolitan area downstream. With the hydroelectric powerplant Etzelwerk the flow of the river is effectively shorted. Currently, only 12% of the river is allowed to pass through the dam into its original bed, while the majority is discharged into the lake of Zurich.

Downstream in the Sihl valley 25000 cubic metres meters of spring water are collected daily in over 100 spring captures. Using gravitational force, the spring water is directed towards the city of Zurich and consequently revoked from its original watershed. In the city it is either used undiluted as water for over 400 public fountains or mixed with lake water from the waterwork Moos to be used as fresh water by the residents of Zurich.

Fig. 32: The hidden infrastructure along te Sihl.



Moving closer to the border of the city, the aspect of flood protection becomes increasingly pronounced. Immediately upstream of Langnau am Albis, the newest protective infrastructure is currently under construction. If completed in 2026, a relief tunnel with a diameter of 6.6m is planned to protect the urban area downstream against extreme flooding events. Up to 400 cubic meters of water per second can be diverted from the Sihl river into the lake of Zurich.

While being distinct in purpose all these infrastructures have in common that they are to a large extend constructed underground, hiding the complex metabolism within the landscape, and thus disguising the unilateral dependencies between the city and the hinterland.

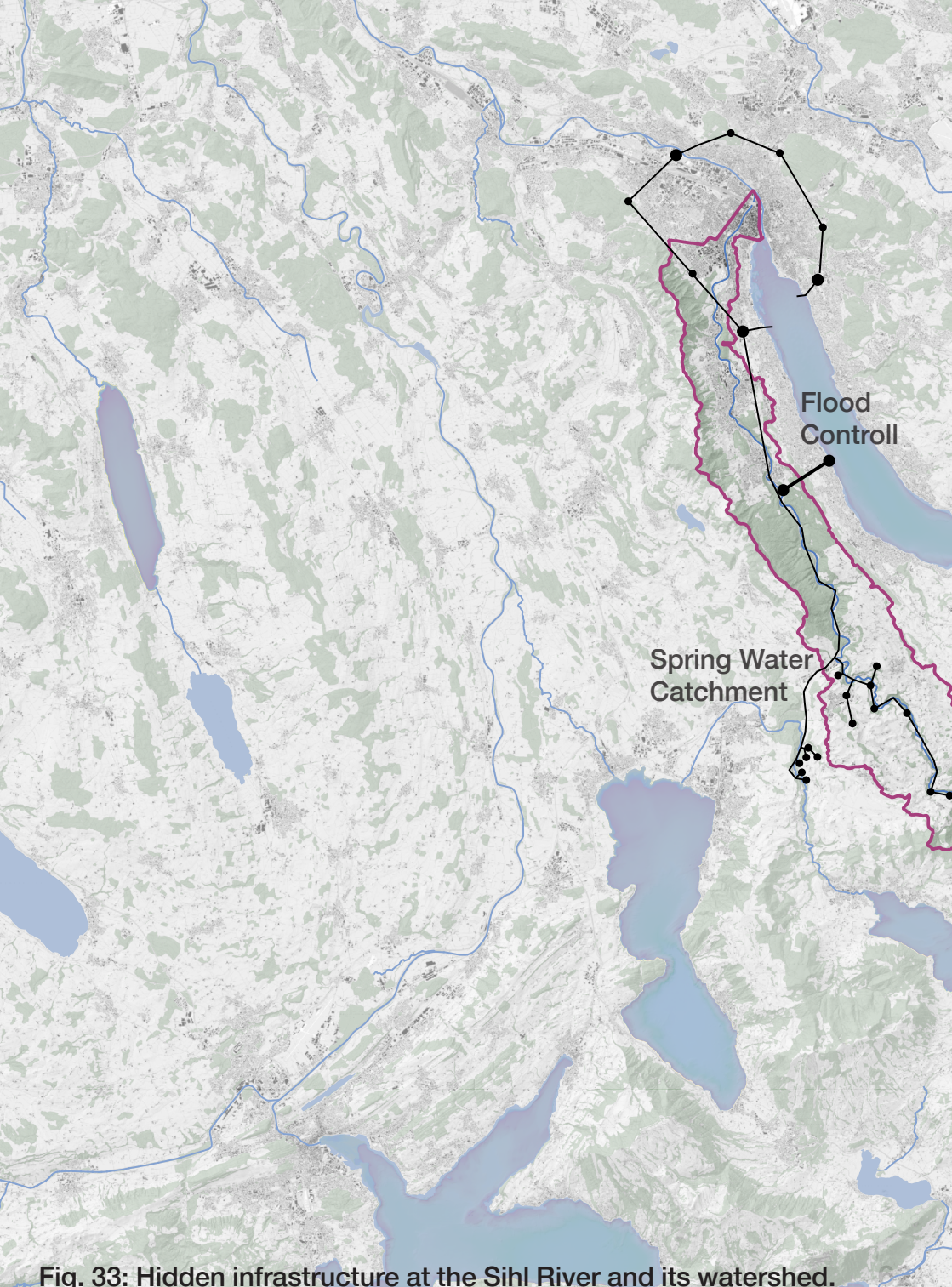


Fig. 33: Hidden infrastructure at the Sihl River and its watershed.


Energy
Production

Fig. 34: Overlaying th changing waterscape of Zurich: From the last ice age to the current condition.

The Foundation of Zurich

Today the Sihl might convey an impression of a tamed river. This holds especially true within the city limits of Zurich, where the profound extent of human intervention is omnipresent. Here, one can hardly see that this river has had a significant impact on the territory of today's metropolis. Even in the early 20th century, it still transported around 18,000 cubic meters of rubble annually from the high plains around Einsiedeln to the city of Zurich and deposited it in its basin.

After the retreat of the Linth glacier, it was primarily the Sihl that shaped the settlement area. At the mouth of the Limmat it formed a huge delta landscape - the plain of today's Sihlfeld. At times it also broke through the moraine wall and created a delta into Lake Zurich, which forms the subsoil of today's inner city. The accumulation of bedload at the mouth of the Limmat resulted in a damming of the lake, which consecutively flooded the entire area.

However, this dynamic interplay with the landscape did not stop with the arrival of civilization. According to findings from Archeologists, the lake level in Roman times was at least 403.5 meters above sea level, which is about 2.5 meters below today's water mark. This indicates a high degree of intervention in the drainage dynamics of the Sihl river.

Yet, in the early Middle Ages the lake level increased to 408 meters above sea level, 2 meters higher than today. and 4.5 meters higher than in Roman times. Apparently, the rubble at the confluence of the Sihl and Limmat was no longer cleared away from the late Roman period onwards. This could even be based on a conscious decision, as a high-water level caused the Lindenhof, which was fortified with the late Roman fort, to protrude into the lake like a peninsula, which considerably increased its defensive capabilities. However, it could also be the lack of intervention that at least temporarily transferred the agency back to the Sihl.

Build on Unstable Ground

With the immense growth of Zurich during the industrialization, more and more of the former floodplain of the Sihl was occupied by buildings. The Sihl was tamed and moved into a narrow channel. Yet, even with the completion of the dam at the Sihllake, the risk for flooding could not be eliminated. The continuous densification, however, implied that the severity of a flooding event was and still is increasing year by year. Current estimates suggest a potential damage of 6 Billion CHF in case of a major flooding event in Zurich alone.

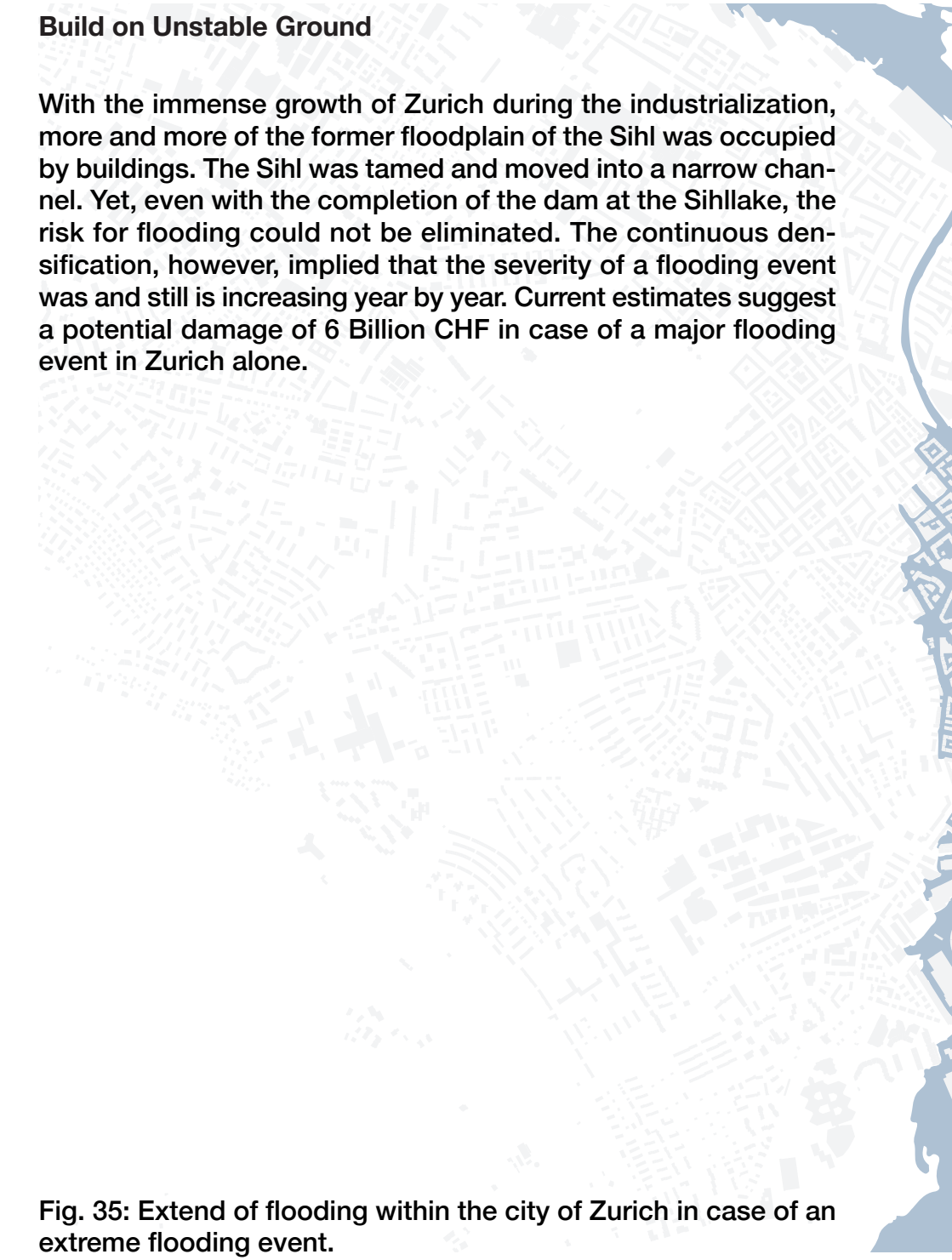
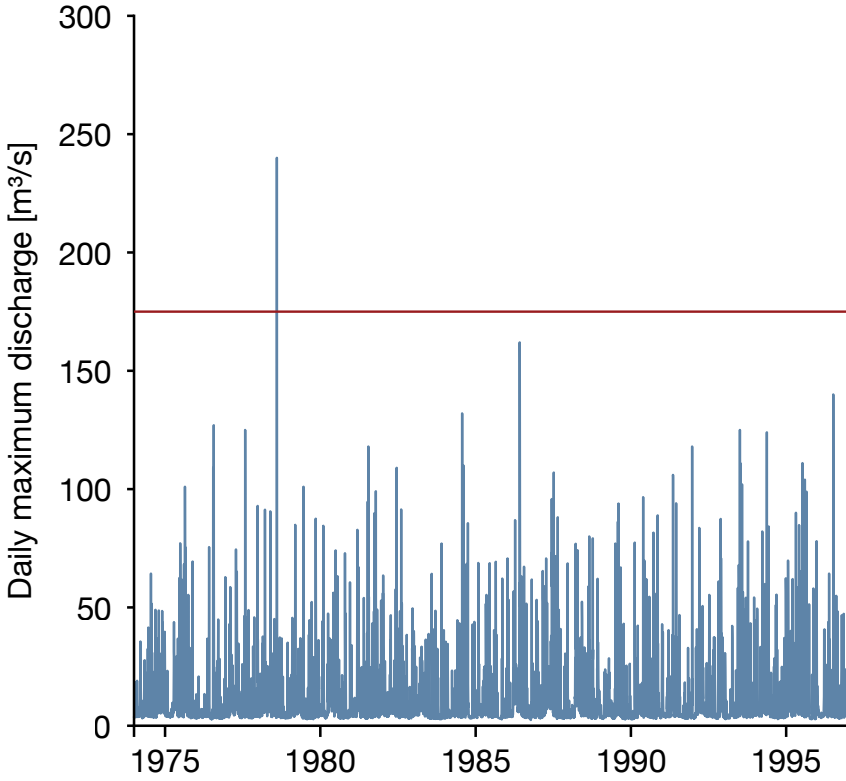


Fig. 35: Extend of flooding within the city of Zurich in case of an extreme flooding event.

From Calm Trickle to Ferocious Stream

Most the year the Sihl is slowly and calmly flowing along its riverbed. The fanlike mountain valleys upstream in combination with the funnel shaped narrow Sihltal imply that in case of heavy precipitation the level of the river can raise by more than a 100-fold from 2.2 m3/s at its lowest to above 280 m3/s and even more. As a risk mitigation the canton and city of Zurich are continuously adding additional protective infrastructure, like the Sihl- Schwemmholzrechen, which was completed in 2017 (See Fig. 14).

At the core of the flood-protective measures, however, it the relief tunnel Sihl-Zürichsee, which is currently under construction and will be finished by 2026. Following the prevailing logic of hiding and disguising infrastructure, the majorit of the



structure will be invisible to the public. Only a small portal will be visible at the inlet in the Sihltal close to Langnau, while at the outlet in Thalwil the entire structure will be place underground. Almost nothing will indicate that below the ground a tunnel with an internal diameter of 6.6 meters is crossing the mountain range for more than 2 km to divert the Sihl into the lake of Zurich in case of an flooding emergency. Current estimates suggest that this infrastructure will be active only every 20 years, questioning the immense effort that was required for its creation, with costs of over 175 Mio. CHF and earth movements of more than 260’000 m3.

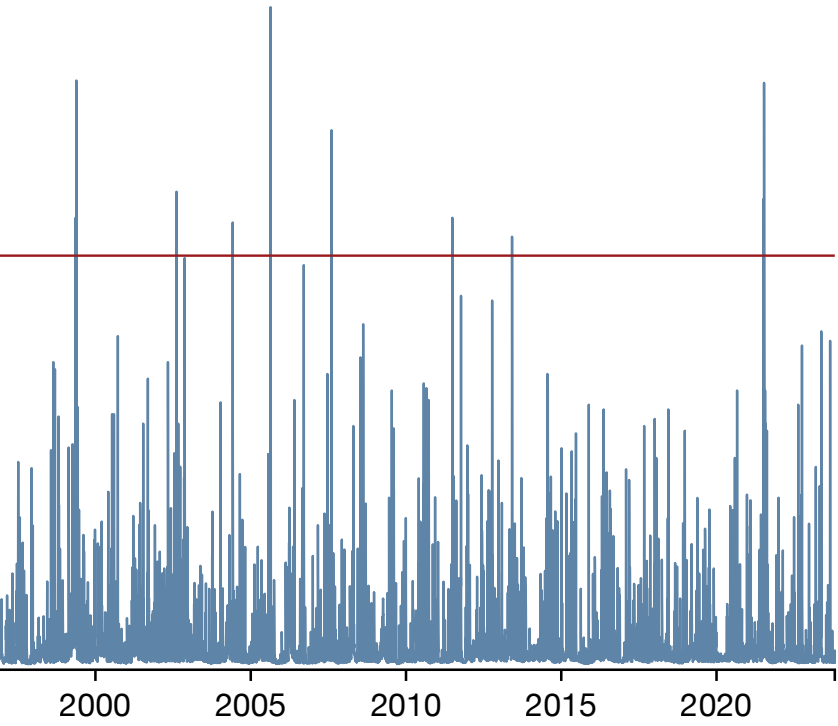


 Fig. 36: Level of the Sihl 1975-2023 with critical level indicated.

Fig. 37: Construction of the inlet of the relief Tunnel at Langnau.

With my project Panta Rhei I respond to this complex reality with two interventions: Regarding the Sihl lake, linear structures are embedded in the southern, shallow part of the lake to promote the formation of wetlands. Bogs offer a diverse habitat for endemic wildlife and, by acting like a sponge, could dampen the stress generated by the highly fluctuating water level of the lake. Both, the swift change of the water level and the gradual formation of wetlands are made perceivable by a bird watching tower that is constantly altering both in appearance and accessibility according to the dynamic of the lake.

At the Allmend Brunau a landscape park is transforming the meadow into a flood plain, drawing a clear line between the protected and exposed. It is intended as a counter proposal to the relief tunnel in Thalwil, which is currently under construction, costing more than 175 Mio. CHF and generating earth movements of more than 260'000 m3. Instead of following the prevailing logic of hiding and disguising infrastructure, the immense effort and invasiveness of human interventions are revealed to the visitors of the park.

In both projects, I seek to question the unilateral human authority over the landscape and strive for a different architectural articulation that accentuates the intricate interplay between human and non-human formative forces. Both projects are envisioned to encourage the visitor to a critical reflection on the profound social, ecological, and geographical implications of human interventions. By revealing, exposing, and making tangible the intertwined and dynamic nature of the surrounding waterscape the proposed interventions aspire to counteract a segmented and abstracted perception of the landscape, hinting towards a stronger global awareness.

Fig. 38: Chosen project locations along the Sihl river.

Fig. 39: The southern Sihllake at its current condition.

Fig. 40: The reed belt at Euthal.

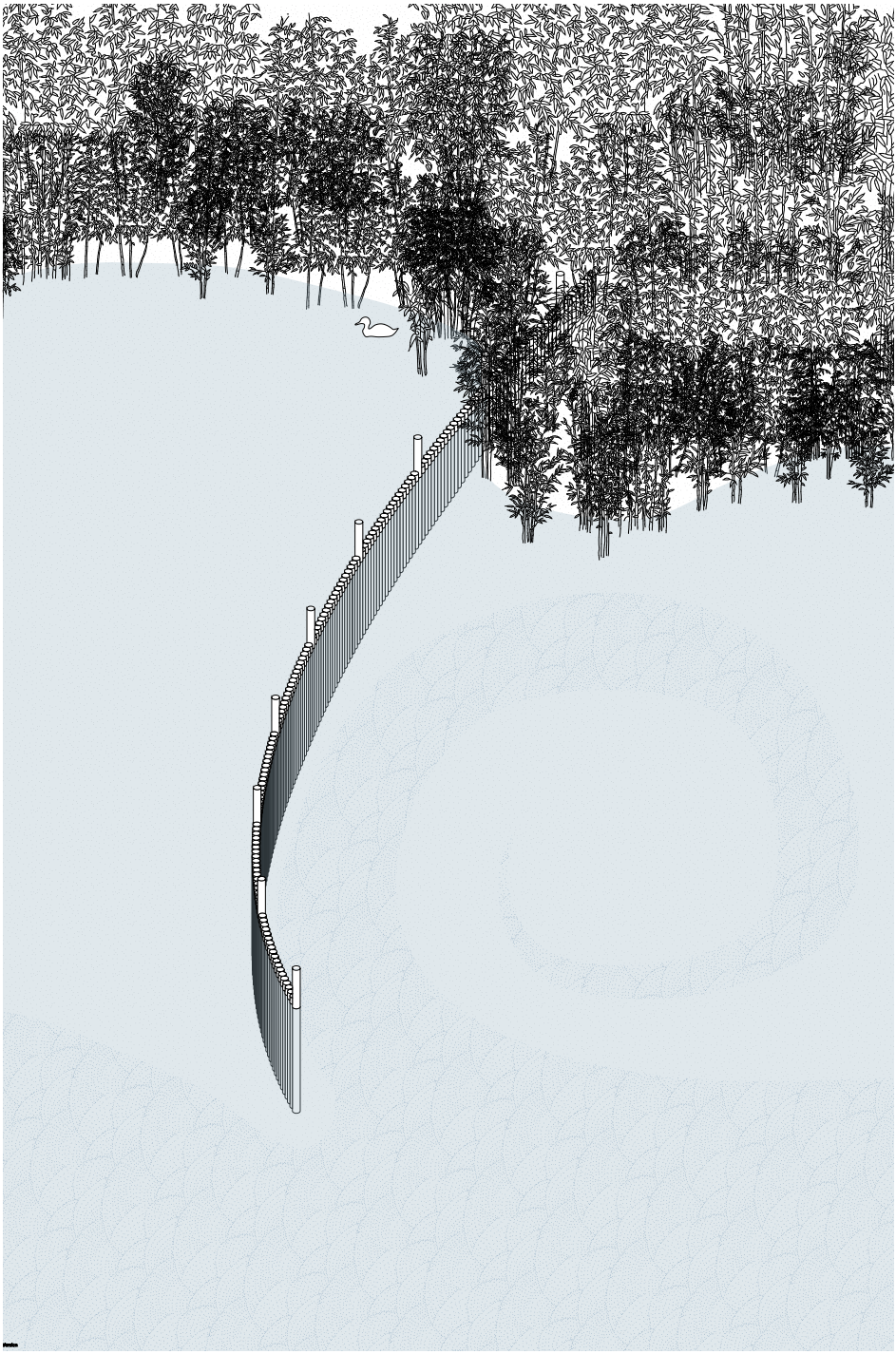


Fig. 41: Groyne structures diverting the sedimention process.

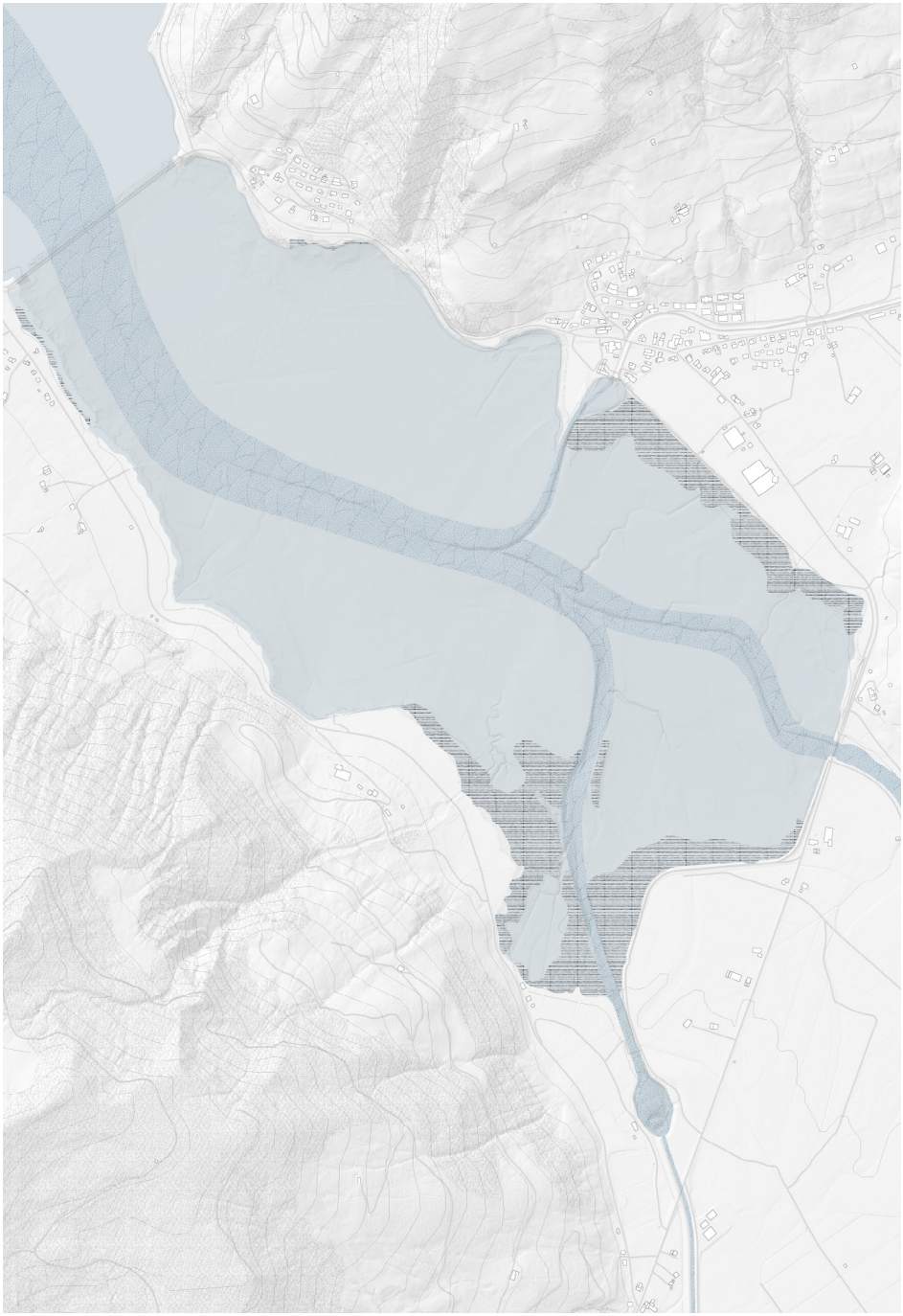


Fig. 42: The wetland around the southern part of the Sihllake at the current condition.

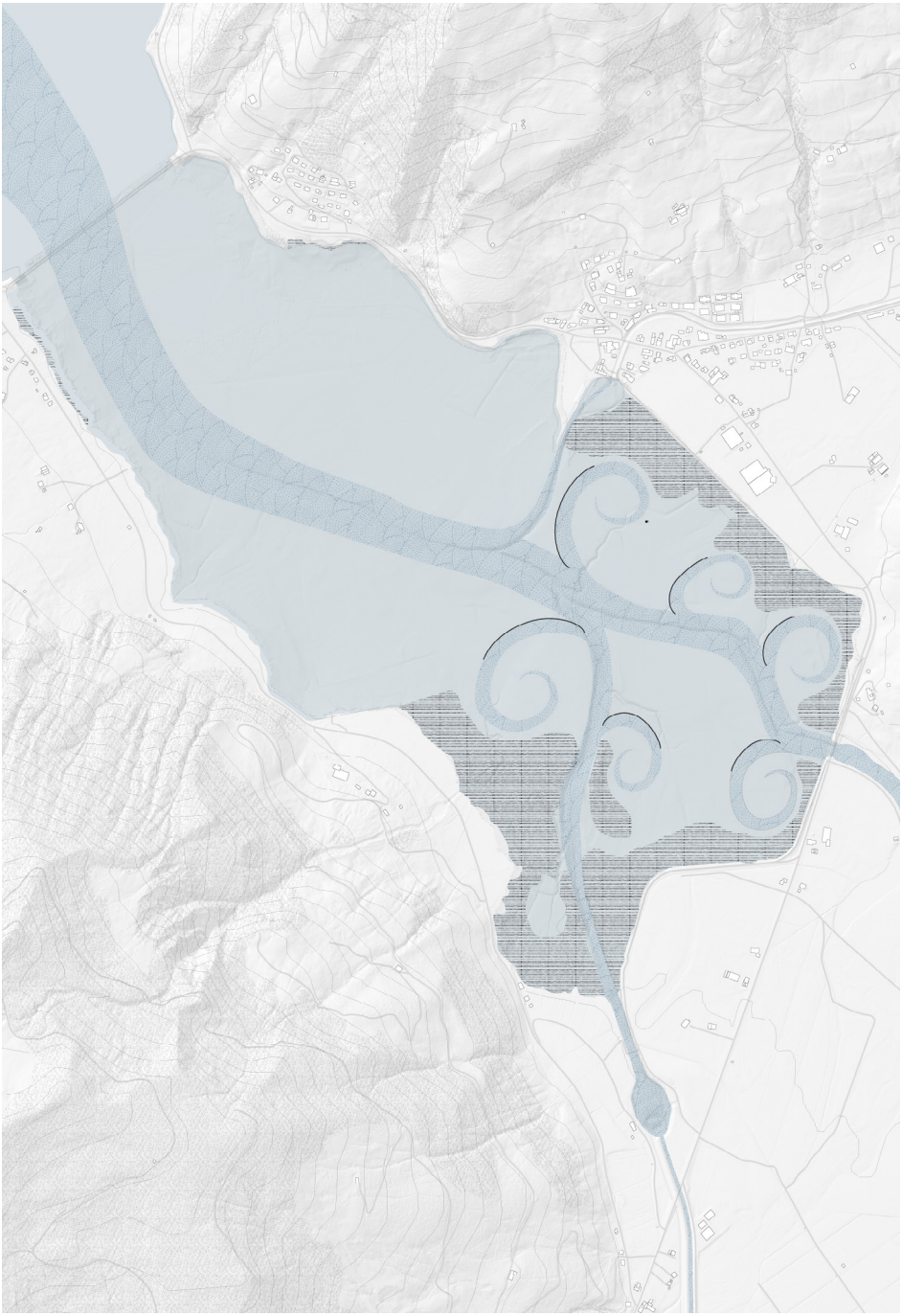


Fig. 43: The wetland formation after the implementation of the groyne structrues.

Location II: The Allmend Brunau

Fig. 44: The Allmend and the edge of the city.

Fig. 45: The Sihl meandering through the Allmend.

Fig. 46: View from the Saalsporthalle towards south.

Fig. 47: The open plain as a contrast to the dense urban area.

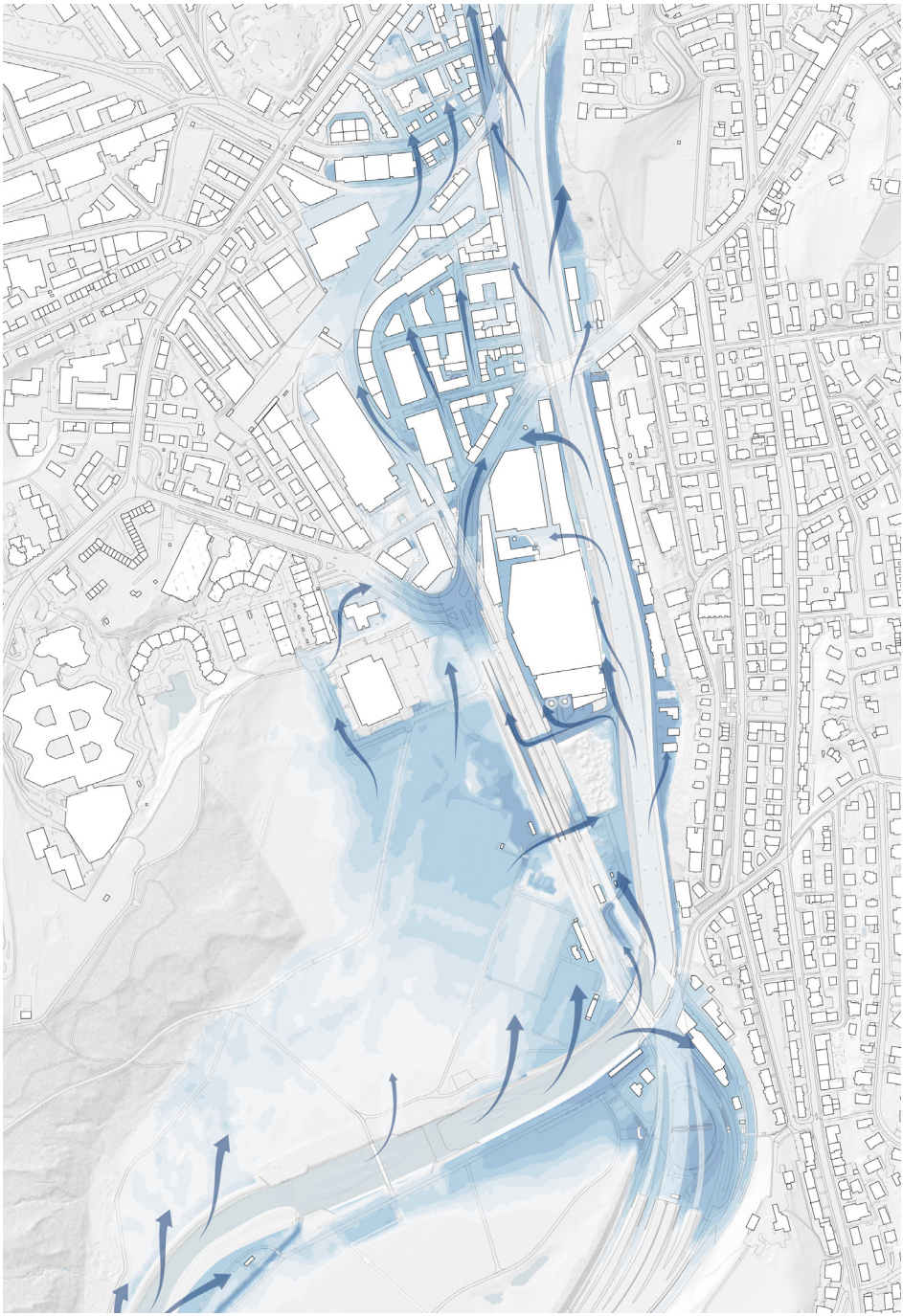


Fig. 48: Flooding prediction for the City of Zurich under current condition in case of a 300-year flooding event.

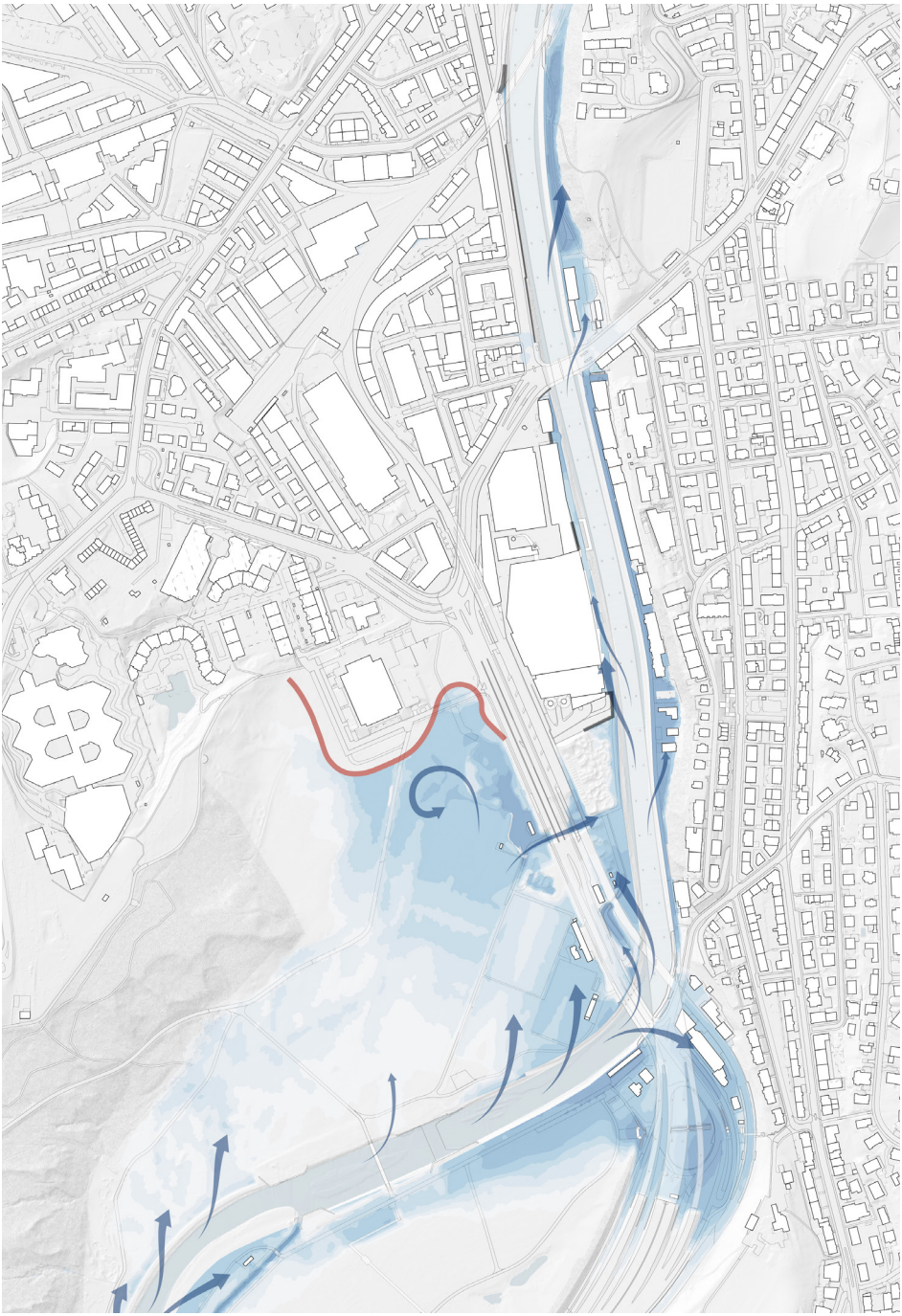
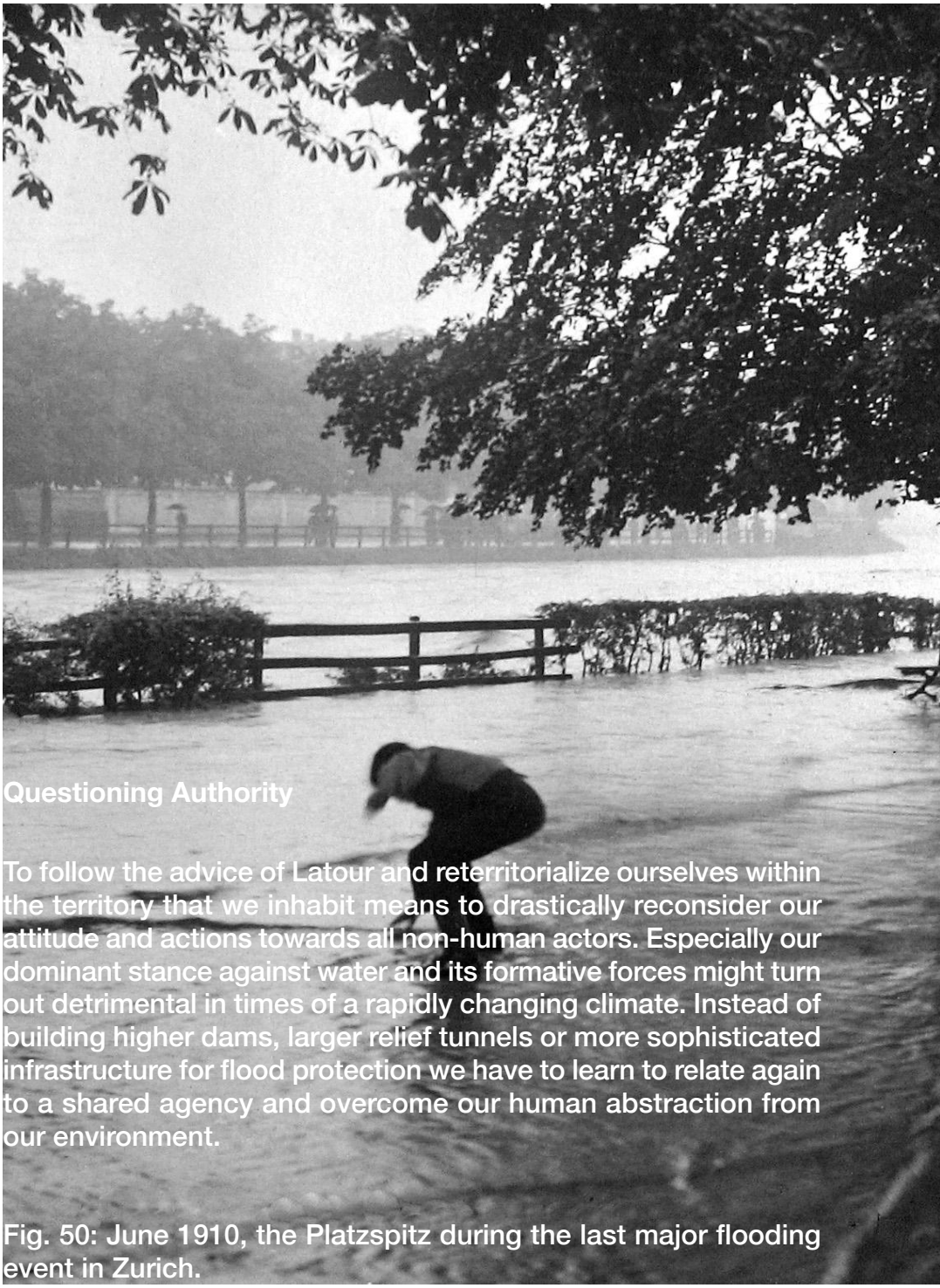


Fig. 49: Flooding and retaining water at the Allmend Brunau after the intervention.



Questioning Authority

To follow the advice of Latour and reterritorialize ourselves within the territory that we inhabit means to drastically reconsider our attitude and actions towards all non-human actors. Especially our dominant stance against water and its formative forces might turn out detrimental in times of a rapidly changing climate. Instead of building higher dams, larger relief tunnels or more sophisticated infrastructure for flood protection we have to learn to relate again to a shared agency and overcome our human abstraction from our environment.

Fig. 50: June 1910, the Platzspitz during the last major flooding event in Zurich.