Emilie Stecher

# A Change of Matter

## The Alps our living freshwater source and reservoir

**“... and there, all around us, barely touched by the sun, stood the white and brown mountains, new as if created during the night that had just ended and at the same time innumerably ancient. They were an island, an elsewhere.”**

Primo Levi, The periodic table, 1975

01 | Kulturlandschaft of the Kaunertal

Transitional Territories Graduation Studio
Department of Urbanism, Faculty of Architecture and the Built Environment
Delft University of Technology

A Change of Matter
*The Alps our living freshwater source and reservoir*

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Cover image:
Slope portrait of the Ötztaler Alps

*This thesis is dedicated to my Ähne,*
*Friedrich Lang, who showed me the*
*beauty of the Alps since I was a child*

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# Abstract

The following project falls within the Rights of Nature movement as a response to the climatic crisis. It is situated in the Alps. From the moment Hannibal managed to lead his Carthagnian army, including their elephants, through the Alps until the construction of modernist glacial skiing resorts and monumental hydroelectric power plants, the Alps have been seen as an object to be overcome and exploited. This resulted in extensive infrastructural projects throughout the whole territory and at all elevations. In order to restore the agency of this living entity, the project repositions the Alps as an active subject with their own right. Moving through three phases – *listening to - speaking with - negotiating on behalf of the Alps* – results in the foundation for the Parliament of the Alps, composed of a group of people which will act as guardians of the Alps, and the illustration of their most urgent project.

The site of the project is the Gepatsch glacier in the Ötztaler Alps in Austria, one of the largest and most rapidly melting glaciers in the territory. Glaciers are a record of time, connecting past, present and future. On one hand, the memory of the past – an archive of human interventions – shedding light on vernacular knowledge practices, gathered in their yearly deposited layers of ice and atmospheric particles. On the other hand a holder of meaning for the future, as their disappearance is causing major changes and challenges within the biophysical environment of diverse biotic and abiotic socioeconomic and cultural systems.

The Alps are a true representation of *the web of life*, as the interdependencies of each part of their ecosystem are vital for the survival of each species. Many elements contribute to it, such as their East to West orientation, their ability and responsibility to collect water from the atmosphere, store it for dry seasons and years, carry it through their veins, and share it equitably and steadily with all living beings which are dependent on freshwater to survive – from the top of the mountains to the deltas of Europe. With increasing temperatures and the further realization of infrastructural projects for the sake of European visions on green development, which often neglects local conditions, this essential role and responsibility of the Parliament of the Alps, to share freshwater democratically, is at risk.
The changing states of water, from frozen to fluid, brings with it the need for all places and ecosystems connected to the Alpine water system to adapt to non-glacially influenced conditions.

By envisioning an Alpine Ocean, which emerges from the synergy of water and soil, and empowering the natural dynamics, which were defined through the establishment of prominent characteristics of the Alpine range – *erratic, connected, mosaic-like and cyclic* – the transition shall secure the democratic share and availability of freshwater for all living beings, now and for future generations.

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# 1. **Introduction and context**
motivations and inspirations

## 1.1 Experiencing and discovering the Alps
### Changing perspectives

#### Emergence of a new Era

The Alps. A place of stories - tales, myths, songs, poems - a place we may never fully understand. Most people have heard of them, some may even have had the pleasure of seeing them. And then there are the most fortunate ones who have experienced their steep slopes, ice cold water or wonderfully fresh air. The Alps have long been a place people feel attracted to. They have something mysterious about them, something that makes one feel small and belonging to something bigger.

The first recorded image of the Alps is one of fear. The Romans called them “montes horribles”, painting a picture of a dangerous territory where barbarians live (Bätzing, 1991). Once they knew the territory was crossable they had no interest in the place itself but used it merely for transit (Mathieu, 2013). Only during the Enlightenment era this image shifted drastically into that of an admiration of the mountains. A letter written by the Italian poet Petrarch in 1336 was the first time the Alps were described from a different perspective (Nejeschleba, 2019). In the letter he described his ascendance to Mont Ventoux, a peak in the South-West of the

02 | Montes horribles (David Herrliberger, 1756)

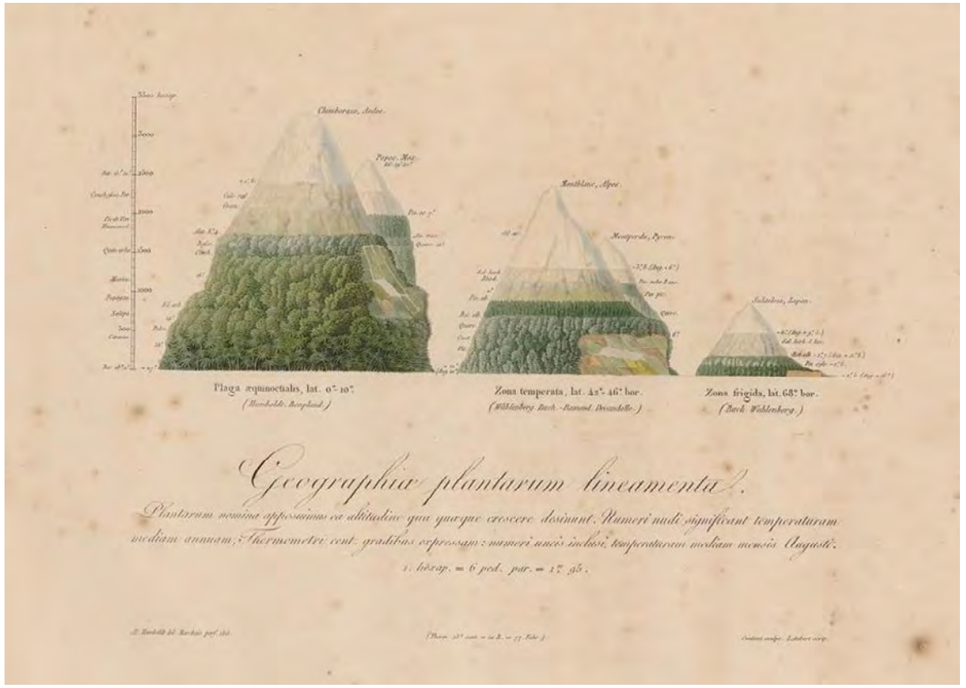


03 | The beautiful Alps (Mathias Gabriel Lory, 1822)

Alps, out of pure pleasure, driven by an intrinsic motivation “to see”. While hiking up the mountain he was held back by a local, urging him to turn around, but nevertheless he continued his journey. Throughout the story one can feel the presence of the two worlds he finds himself in – the old and familiar world of the Middle Ages and the new, yet to be discovered. Standing on the peak of the mountain, with tears in his eyes, unable to grasp the beauty, he falls back into the old patterns, feeling guilty for allowing himself to witness something that could be greater than God. With nature becoming a subject of aesthetic experience it got value from the person observing or experiencing nature, a previously nonexistent value from within oneself. This formed a new relationship between the inner self and nature. Therefore, the aestheticization of nature is often seen as the beginning of subjectivity and therefore the birth of the subject-object understanding. “The ascent of Mont Ventoux thus symbolizes the beginning of a new era, the beginning of a new perception of nature and the world and man’s relationship to it.“ (Nejeschleba, 2019)

#### Understand

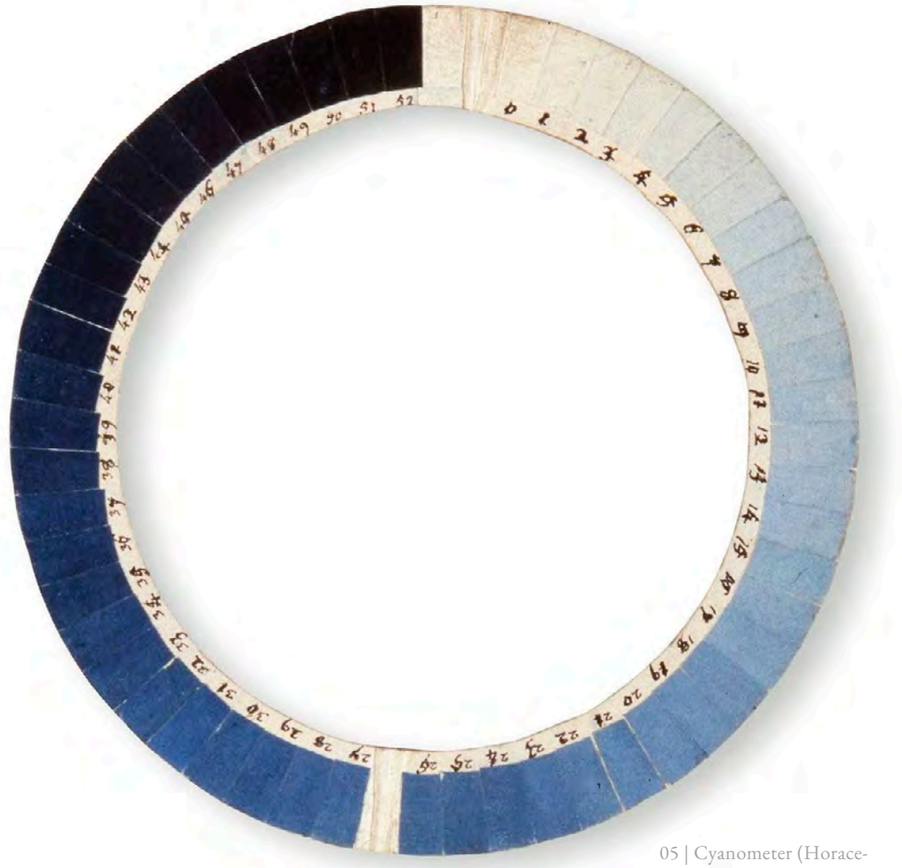
In the 18th century, another big change of perception emerged from the growing urge of natural scientists to understand the world. One




04 | Humboldt investigating the Alps (1817)

of them was Horace-Bénédict de Saussure, a Genevan researcher. In 1760 he developed a tool which helped him to measure the blueness of the sky – the Cyanometer (Hemmer & Meßner, 2022). His theory stated that the more water particles are present in the air, the brighter the blue is. Therefore, he wanted to hike up all the way to the top of Mont Blanc, which was known to be the highest peak in the Alps, to measure the intensity of the blueness there. Back then, Mont Blanc was seen as a cursed mountain where one cannot and should not ascend. The biggest obstacle on the long hike to the top is the glacier, one was supposed to stay there overnight in order to succeed, but back then no one knew that it was possible to do so. For many years all his attempts failed. Finally, in 1786 other mountaineers, due to a change of weather, were forced to bivouac on the glacier while attempting to climb the mountain, finally revealing the secret of the ascendance. One year later, Saussure measured the blueness of the sky from the top of Mont Blanc. This time, his science and the motivation of wanting to understand natural phenomena opened up a new perspective on the mountains (Hemmer & Meßner, 2022).





05 | Cyanometer (Horace-Bénédict de Saussure)

## Discover and conquer

In the 19th century mountaineering as a sport and contest started to emerge. Interestingly, this new development did not take place from within the local communities living in the Alps, but from a few English colonizers. They founded the first Alpine club in London in 1857 which was a collective of rich, royal gentlemen who started a race around the ascents of the highest and most prominent peaks in the Alps. This happened with the aid of local guides and carriers but as already the title of the book “Playground of Europe” by Leslie Stephen (1871) suggests, the local community and way of life was not their main interest. The British saw the Alps as a playground of their European imperial politics


06 | The journey of Horace-Bénédict de Saussure on the Mont Blanc (Christian von Mechel, 1787)

and wanted to establish their supremacy on the European continent as well. The golden age of mountaineering ended with a disaster on the Matterhorn, one of the most iconic mountains of the Alps – one may know it from the shape of the Swiss Toblerone chocolate – situated in the South-West border of Switzerland and Italy. A race between two separate roped parties, approaching from different sides of the mountain, ended in a terrible accident leaving many dead (Hemmer & Meßner, 2022).

Mountaineering became available to the mass in the industrial and service age, offering unique physical sensations. The center of this experience was the individual body, the inner feeling which turned the landscape into a background for those activities to take place in. This detached the people from the place and metaphorically positioned them on top of the Alps, allowing for people to drastically change and alter the landscape to their liking (Bätzing, 2018).



## From subject to object

Throughout the centuries, the agency of the Alps changed from an active subject to passive object, from a place of fear inhabited by barbarians, to an attraction available to many. What most of these changing images have in common, is the origin of their view – a projection from outside onto the body. From the urban onto the rural. This makes me wonder: How can the Alps be portrayed from within? What makes the multiplicity of humans and more-than-human inhabitants and cultures present in the Alps unique? And what kind of design project and relationship with the Alps emerges out of this?


THE

PLAYGROUND OF EUROPE

BY

LESLIE STEPHEN



VALLEY OF LAUTERBRUNNEN

"We complain of the mountains as rubbish, as not only disfiguring the face of the earth, but also to us useless and inconvenient; and yet, without these, neither rivers nor fountains nor the weather for fostering and ripening fruits could regularly be produced."

Abp. King *On the Origin of Evil.*

*NEW IMPRESSION*

LONGMANS, GREEN, AND CO

39 PATERNOSTER ROW, LONDON

NEW YORK AND BOMBAY

1904

07 | The Playground of Europe (Leslie Stephen, 1904)


08 | First ascent of the Matterhorn, Switzerland (Edward Whymper, 1865)

## 1.2 The Age of Mankind
### Accumulation

**“No doubt about it, ecology drives people crazy; this has to be our point of departure – not with the goal of finding a cure, just so we can learn to survive without getting carried away by denial, or hubris, or depression, or hope for a reasonable solution, or retreat into the desert. There is no cure for the condition of belonging to the world. But, by taking care, we can cure ourselves of believing that we do not belong to it, that the essential question lies elsewhere, that what happens to the world does not concern us.”**

Latour, 2017



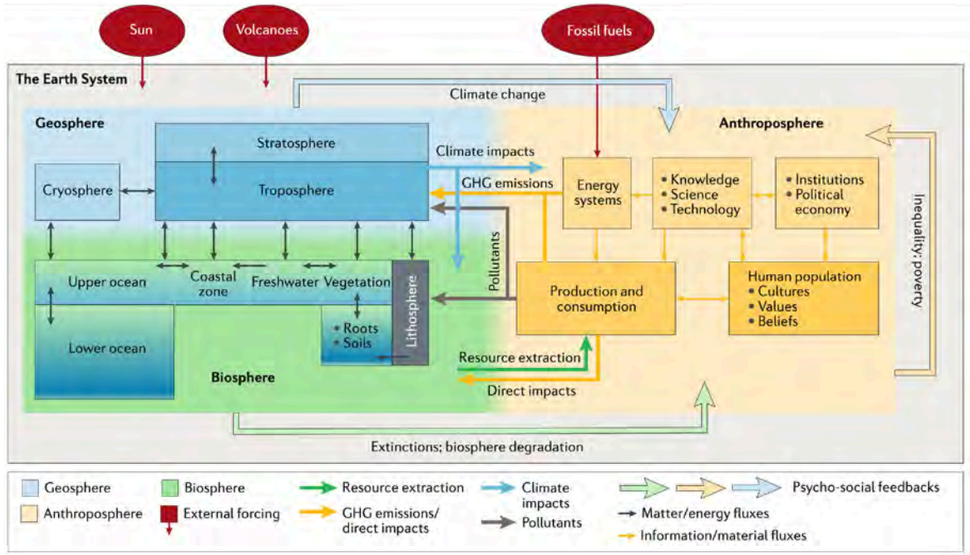
#### Nature and culture

Although the precise beginning of the Anthropocene is not unanimously agreed upon, one can say without doubt that we are living in an era where humans are inevitably altering the Earth’s systems – forming a new force on the planet (Crutzen & Stoermer, 2000). We are living in an age which is defined by extraction, manipulation and appropriation of natural resources. Most of the time, not considering the consequences of our actions, especially regarding more-than-humans, meaning all other living entities we share our planet with and with whom we are intrinsically connected. Focus lies on the economic growth, even the Sustainable Development Goals – goal 8: good jobs and economic growth – explicitly mention it as one of the components necessary for the future of our world (United Nations Development Programme, n.d.) showing that “ it’s easier to imagine the end of the world than the end of capitalism” (Fisher, 2022). And although the Club of Rome already pointed out the Limits to Growth in 1972 (Meadows et al., 1972), we are still trapped within the capitalist system. Therefore, the era which defines the appropriation of nature for profit and the relations between capital, power and nature is sometimes described as the Capitalocene (Altvater et al., 2016). Whatever the definition used for the Age of Men (Chwałczyk, 2020), it remains an age where humans perceive themselves as existing outside of nature. Haraway (2008) pointed out the inextricable link between humans and more-than-humans and therefore rejects the western dichotomy between the two. This resulted in the term natureculture. The natureculture discourse and its theorizing has been excessively analyzed and elaborated on by different scholars, one of them being Bruno Latour (2017) in the book “Facing Gaia”.

#### Networks of being

In his book “We Have Never Been Modern”, Latour (1993) questions the current perception






09 | Extension of the 1986 developed Bretherton diagram of the Earth System (Steffen et al., 2020)

**“The imperative confronting us, therefore, is to discover a course of treatment – but without the illusion that a cure will come quickly. In this sense it would not be impossible to make progress, but it would be progress in reverse: this would mean rethinking the idea of progress, retrogressing, discovering a different way of experiencing the passage of time.”**

Latour, 2017



of modernity. The division of almost everything into certain categories, for example social sciences and natural sciences, leaves behind the relationships in between. The networks that are connecting things to each other. Therefore, although we are calling ourselves modern, we are not able to describe what is happening in the world. This makes Latour question the very existence of it, asking us to rethink what it means to be modern and what else it could be. And if we have never been modern “what are we going to become? [...] Will a different democracy become necessary? A democracy extend to things?” (Latour, 1993, pp. 12)

One prominent attempt of understanding the world as one interlinked and complex system is the study of Earth System Sciences.The processes present between chemical, physical, biological, and human are cycling “materials and energy in complex, dynamic ways within the system” (Steffen et al., 2020, pp. 57). This makes internal forces and feedback as important as external drivers and shows that humans are a crucial asset for the functioning of the system. Therefore, Steffen et al. (2020) propose an extension of the 1986 developed Bretherton diagram of the Earth System by NASA which should include the Anthrosphere in order to fully understand the effects of humans.

Whereas the initial diagram only included human activities, the new one expands and puts an emphasis on cultures, values, beliefs and also knowledge, technology, institutions and other socio-economic systems that influence behavior. One can therefore go back to the previous assumptions following Haraway and Latour that nature and culture are intrinsically linked to each other.

The place where most of these activities of the system are taking place, is the layer of the earth where living things as well as resources are concentrated. It’s a zone only a few kilometers thick, and still it is the place that enables life on Earth. This zone is called the “critical zone” (Latour & Weibel, 2020). The processes described above are altering and defining the critical zone. And whereas most changes and dynamics are out of our control, the relationship humans have with the land can bear a chance for change in the challenges which the Anthropocene is giving rise to for ”in each civilization, nature is that which the culture designates to be such” (Corboz, 1983, pp.34).

So *who* are the Alps and what is their agency within the web of life and how can they be supported rather than exploited? How do they shape the life around them, and what would happen if they were not there?

## Repositioning in the Anthropocene

There are roughly 4 positions one can take in the light of the Anthropocene, following the unpublished manuscript “Mobilis in Mobile” (2020) by Dirk Sijmons. The theory is described through a diagram where the axes of a quadrant describe and determine the world views. They are vertically going from seeing humans as a pointless species impotent of changing the world‘s systems to a powerful humankind and horizontally from a passive earth to a powerful earth.

In the left top corner one can find between passive earth and pointless species the “denialist“. Obliviousness about climate change and the wish to live in an eternal present define the world view of the silent.

The engineer sits in the left bottom corner of the quadrant. Almost 75% of all humans are positioned in that corner. Present problems ask for solutions that can be solved through rational and technical projects, while still aiming for economic growth the footprint shall be diminished

for “the best is always yet to come“ – welcome in the worldview of Eco-modernism.

On the right side of the axis one enters the powerful earth. On the top right sits the shaman and the post-humanist position. “We are all brothers and sisters of tomorrow” and therefore have to consider ontological plurality because all ways of living are equal.

On the right bottom corner one returns again to a powerful humankind. The healer is taking up responsibility and tries to repair, defragment, reverse engineer, recover or restore what has been broken so that “the worst might still be avoided“. Anthropocentrism 2.0 acknowledges the irreversibility of changed systems through human interference and is looking into causes and effects, following the complexity theory.

The positions can be seen as a journey where one starts in denial and ends up in a new anthropocentrism, also important to mention is that most probably all worldviews are present in all of us at the same time but with different degrees of intensity. Depending on how we take our daily decisions we can actively stir into one direction. What emerges out of this is a need for care. In “Matters of Care: Speculative Ethics in More than Human Worlds” (2017) by María Puig de la Bellacasa, care is defined as “*everything that we do* to maintain, continue and repair “our world” so that we can live in it as well as possible. That world includes our bodies, our selves, and our environment, *all of which we seek to interweave in a complex, life-sustaining web*” (de la Bellacasa, 2017, pp.3).

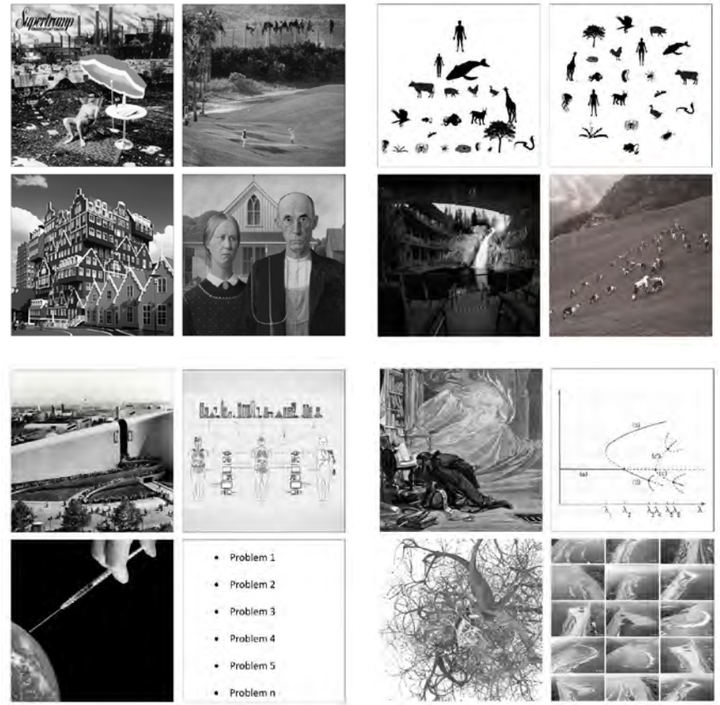
By seeing the earth as a project which needs to be taken care of, the work presented in this thesis can be seen as an act of care for the planet. It is positioned clearly on the right side of the quadrant where it takes parts of the philosophy and worldview of posthumanism, in order to create a common ground between all living entities on our shared planet, but takes up the urgent need for a caring agency of humankind. It is therefore positioned in the bottom right quadrant and poses a counter project to the omnipresent worldview and abundance of projects of Eco-modernism.



A pointless species/
impotent to change the Earth system

**Denialism**
“protect the eternal present”

**Posthumanism**
“we’re all brothers and sisters of tomorrow”




Passive Earth

Powerful Earth

**Ecomodernism**
“the best is always yet to come”

**Anthropocentrism 2.0**
“the worst might still be avoided”

Powerful humankind/
changing the Earth system

10 | Different positions in the Anthropocene – The Age of Humankind (Adapted from the unpublished manuscript of Mobilis in Mobile by Dutch Lanscape Architect Dirk Sijmons, 2021)

## 1.3 Agency
### The Rights of Nature

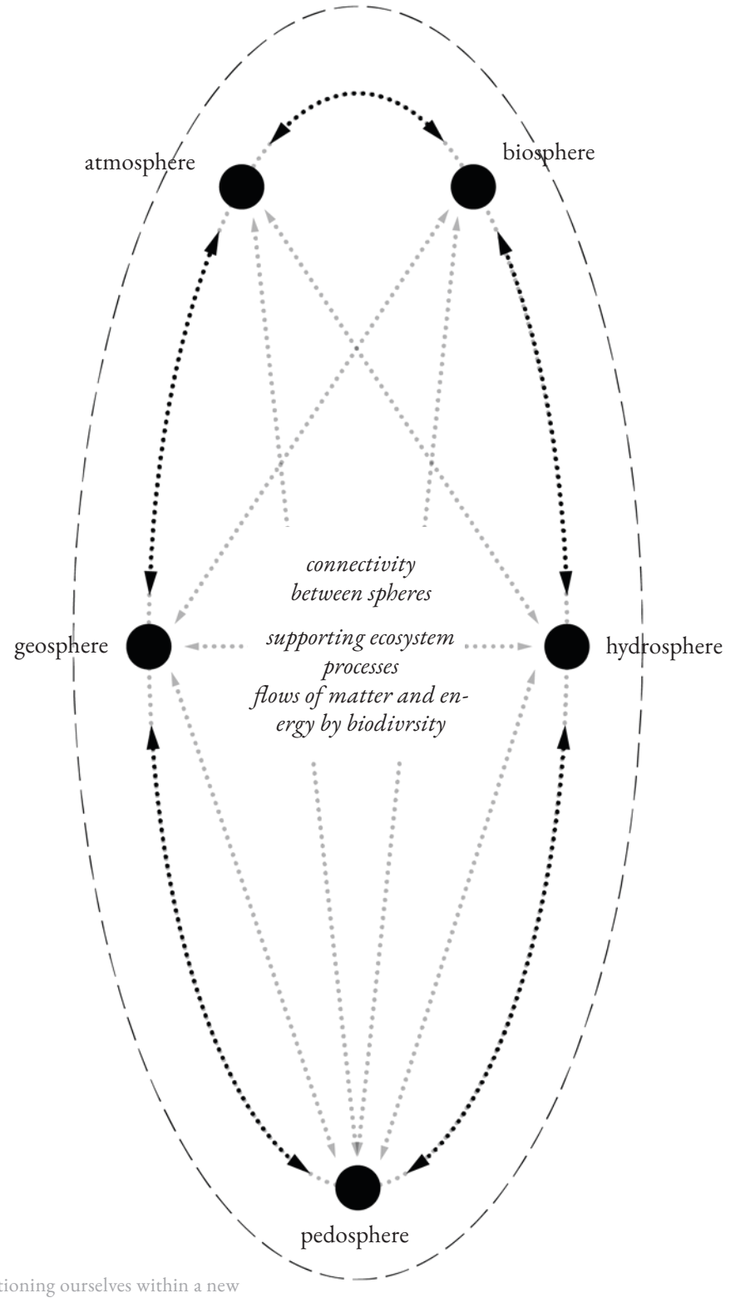
**“The reconnection of the people with the land has to do with restoring our relationships to each other, regrowing our sense of purpose, our sense of community and our kindness to each other. We get that because of what we observe about nature. We see relationships between trees and insects, between mist and land, between rock and mud and we see how in that extreme diversity everything works together. Reconnecting with land and nature is your sense of security about the future.”**

**Kristi Luke, Chief Executive, Tūhoe Te Uru Taumatua in Filmmaker, 2020**

#### Ownership

The division between nature and culture in the western world has a long history. Already hundreds of years ago, William Blackstone, an influential English legal scholar and the author of the Commentaries on the Laws of England wrote: “The Earth, and all things herein, are the general property of mankind, exclusive of other beings, from the immediate gift of the creator.” (In the Rights of Nature, Boyd, 2017, pp XXVI) Nowadays, it feels the most predictable thing to see nature as merely something to be used by humans. Through owning the land, humans also claim to own all living beings inhabiting it, no matter whether they are wild or domesticated. This turns animals and other biotic beings into objects without their own agency, and from a legal perspective, grants the owner “the rights to possess, use, transfer, dispose of, and exclude others from taking it” (Boyd, 2017). And although we are sharing the planet with innumerable other living entities, with whom we, all together, in conjunction, create the diversity of the earth, and separate ourselves from them by dividing the world into people and things - illustrating another one of the strictly separated disciplines that keep us from being truly modern (Latour, 2017). “If we are the only species with rights, we are the only species that really matters“ (Boyd, 2017).






11 | Repositioning ourselves within a new cosomology (adapted from Dominati, 2010)

## Responsibility - an act of care

One would think that with ownership also responsibility comes along, but property responsibility barely exists in the Western legal system. Terri-Lynn Williams-Davidson, an indigenous canadian artist, drafted an Earth Covenant in which responsibility is the most important part and only once they are fulfilled, people may have related privileges and rights to benefit from the planet and live in a healthy environment (Boyd, 2017). She sees the responsibilities of humans in for example recognizing and respecting that we are together living in an interconnected world, the restoration and conservation of the earth, as well as the cultures and species she supports, to respect planetary boundaries and manage our use so that it may not exceed them and does not disrupt cycles or interrelationships, and to respect future generations. In the same line, as mentioned before, De la Bellacasa (2017) introduces the act of care, as maintenance, in order to establish a new responsibility and relationship with the Earth.

## Representation

Many indigenous tribes, like the Lakota Native Americans or the Haida in Canada, have been living by the values which see the earth as an assemblage of interconnected living organisms with her own rights, deeply rooted in their cosmology, but this is a new concept for big parts of the world (Boyd, 2017). The first time in western civilization The Rights of Nature were proposed, was in an essay called “Should trees have standing?”, written by Christopher Stone in 1972. He argued that we should “give legal rights to forests, oceans, rivers, and other so-called ‘natural objects’ in the environment – indeed, to the natural environment as a whole.” Already foreseeing the argument that natural entities have no voice, he stated, “It is no answer to say that streams and forests cannot have standing because streams and forests cannot speak. Corporations cannot speak, either; nor can states, estates, infants, incompetents, municipalities, or universities. Lawyers speak for them, as they commonly do for the ordinary citizen with legal problems” (Stone, 1972). He introduced the idea of Guardians who would act as “legal representatives for the natural environment” (Stone, 1974). Furthermore, he suggested establishing an authoritarian body - the “holder of legal rights“ which ensures that the body (1) can institute legal actions at its command, (2) gets compensated for injuries, and (3) the relief must add up to its benefit.



12 | The Whanganui River has a legal personhood (iStock )

The questions about ownership, responsibility and representation raises many questions, with the most important ones being: who owns the Alps? Will the future be as exploitative as the present? Or do the Alps own themselves? And if they do own themselves, how can we actively listen to what they are saying in order to recognize their agency and needs? Who is able to fulfill this task and therefore can be their Guardians? And how will this manifest in the form of the landscape?

## A new paradigm

Starting with including the Rights of Nature into the constitution of Ecuador, the movement of the Rights of Nature is gaining momentum (Filmmaker, 2020). The most prominent case is probably the Whanganui river in New Zealand, where after many years the Maori finally managed to  where a Maori and a state representative share the Guardianship over the river. In 2022, by giving legal rights to the highly polluted ecosystem of the Mar Menor in Spain, all continents on the planet have at least one element or system of nature represented in their legal framework (GARN, 2022). And with projects like the Embassy of the North Sea it seems as if


13 | Parliament of things (Embassy of the North Sea)

there are many more to come (Ambassade van de Noordzee, 2021). Also in Switzerland the movement for the Rights of Nature is starting to be discussed. The rivers "Rhine and Rigi should be allowed to go to court" (Schmied, 2021) and there is an ongoing petition asking the United Nations to add The Rights of Nature to the Human Rights (Care2 Petitions, n.d.).

## Protecting the Alps

In the Alps most of the regulations that aim at protecting more-than-humans, are based on finding agreements between the economic, social and environmental. This often results in compromises which tend to favor human activities. The Alpine Convention is the most prominent (legal) contract in order to protect the Alps. It is an already more than 30 years old agreement between the states who are part of the Alpine territory – Austria, France, Germany, Italy, Liechtenstein, Monaco, Slovenia, and Switzerland – in which they oblige to protect the Alpine range and foster sustainable development (*Alpenconvention*, n.d.). There are a lot of strong and very important projects, and I do not want to denigrate them, on the contrary I would like to highlight how much more power and impact they could have. For now, the agenda of the Alpine convention is put forward from an anthropocentric worldview where human wellbeing is at the core, this often asks for compromises. This is especially because there is no legal foundation based on the Rights of Nature which could give representatives and activists more capabilities.

To illustrate, I would like to describe an online interview I had with Katharina Lins, the nature-protection-lawyer – Naturschutzanwältin – of Vorarlberg, Austria on the 21st of November 2022. The role of being a nature-protection-lawyer or environmental advocate is very special and rare within the Alps. Nevertheless, although it sounds very progressive, during our talk it became apparent that her role mostly lies within preventing things from happening. It is their responsibility to "demand compliance with the rules for the preservation of nature" (K. Lins, personal communication, November 21, 2022), the point of reference for the condition of nature is the pre-industrial cultural landscape, an already altered landscape. Almost exclusively all projects were about bringing forward evidence that a certain project will cause harm and in a next step finding agreements of how the damage could be paid off with some sort of compensation work. When finding the right agreement the notion of proportionality was very important, it always had to take into consideration all actors involved. The work they are doing is mostly working against something, preventing something from happening. How would the role of the nature-protection-lawyers look like if they could make conditions better rather than keeping the status quo in order to not make matters worse? How would they be able to empower the land if they had an active agency themselves? Could they be the Guardians of the Alps?

## Parliament of the Alps

At this point I would like to raise the open question of how a legal representation of the Alps could look like. What if there would be a Parliament of the Alps? A collective of engaged, knowledgeable and caring people which take up the responsibility to look after the wellbeing of biotic and abiotic living beings and the wellbeing of their interconnected processes. A group that protects, represents and demands a present and future condition that can foster a life worth living for. Not only for humans but for all living beings in the Alps. They would act as Guardians of the Alps and together form the Parliament of the Alps. It would have to be a very diverse group, since they would have to represent the different spheres and at the same time be able to communicate, document and pass on their knowledge and decisions. There would be natural and social scientists, anthropologists, geologists, glaciologists, ecologists, climatologists, journalists, artists, educators, citizens and many more, a diverse group representing the pluriverse of the Alps. With this thesis I would like to step into the role of one of the Guardians and dig deep into the unknown worlds of the Alps.

## 1.4 Personal motivation
### The Alps are appearing

When I was a child, I used to go to our family's pasture house during the summer. I spent my time looking after the cows, watching milk turn into cheese and play hide and seek in the endless fields. I still remember the smell of dried grass when laying in the hay on the Stadel, a storage place above or adjacent to the cowshed, accompanied by the sounds of bells ringing from underneath. But experiences who can build these kinds of memories are becoming rare.
The pasture house we used to go to every year, is now vacant. The cultural landscape with its traditions, the parts of Alps that I call home, is slowly disappearing. And these are not the only elements that are vanishing.

A few years ago, as part of my Bachelor program at the University of Liechtenstein, we spent one week in the Engadine in Switzerland at the Morteratsch glacier. It was the first time that I saw the mouth of a glacier. It is blue, the intensity of how it shines into the atmosphere, I will never forget. But I also will never forget the impact of global warming on the alpine glaciers. Sticks marked the backward movement of the ice and white tarpaulins covered its surface in order to protect it from solar radiation. And once more, the Alps are disappearing.

During that week we built Ice Stupas, which are simple constructions made out of willow-tree

14 | S'Ähle - my grandmother

15 | Ice Stupa near the village of Lamso (Ciril Jazbec, 2020)



**For me, the Alps are composed of memory and feeling. A tenderness only to be felt if one listens and spends time with them. They grant calmness while being unexpected; I can hold on to them when I need it, fleeing into their deep understanding and listening to the rumbling of their voice. When the light shines through, they give me wonders of a soul that can only be felt and come into my heart. Not to make sense of it, but to hold on to it and take it with me wherever I may go.**

Emilie Stecher, 2022

branches bent into a curved form, imitating the shape of a Buddhist stupa, a historical burial mound used for meditation. By using gravity the water from a nearby river can be sprayed over the structure in fine particles. If the temperature is low enough the particles freeze on the structure and through time create a frozen water tower – an artificial glacier. This method has been developed in Ladakh, in the Alpine desert of the Himalaya. Due to melting glaciers and changing precipitation patterns the local agricultural practices suffer from water shortage during the growth season of the plants. By creating Ice stupas the people of Ladakh manage to store the melting water of the glacier into the spring and grow their own food.

I hope that my thesis opens an alternative path to navigating the climate crisis. Just like the Ice Stupa project, I hope that it will spark a movement, the beginning of a process or the seed for a new way of thinking.
*The Alps are appearing.*

16 | Forest clearing near Götzis, Austria

36

## 2.1 Problem statement

### Objectification

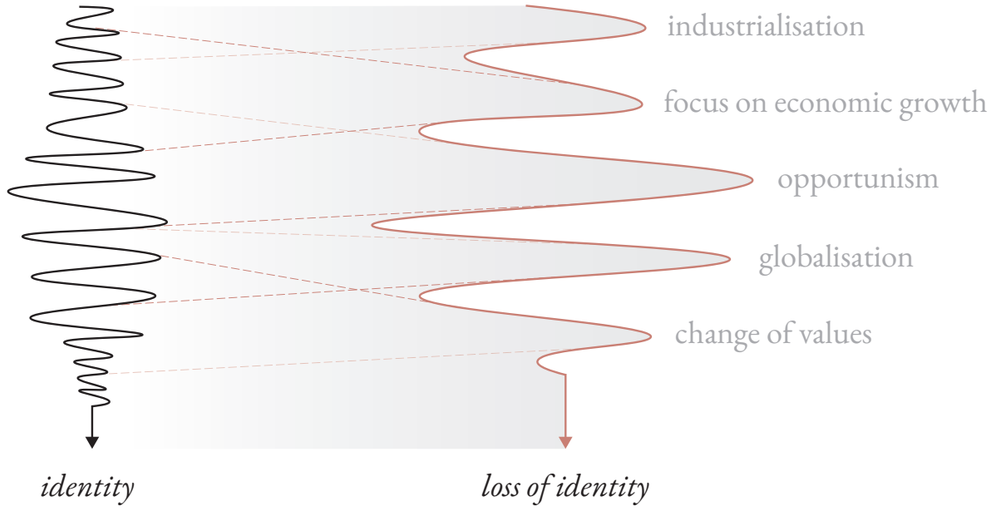
Since the industrialization, the Alpine region has been going through a major transformation process (Bätzing, 1991, 2015, 2021). As in many other places, through engineering processes and technological advances, humans managed to develop tools that enabled them to overcome natural limits. This also accounts for the Alps. Whereas the traditional cultural landscape – the Kulturlandschaft – was based on a regenerative, mostly agriculturally-based, economic system, which made life in this difficult landscape possible and created a symbiosis of human and nature, the new technological advances made it unnecessary to take natural conditions and limits into account. Nowadays, skiing resorts are covering large mountain sides with artificial snow, hydro-power projects disrupt river ecosystems, and uncountable roads and tunnels provide access to even the most remote areas, pushing wildlife out of the territory. By turning the Alps from a cultural landscape into an industrial factory and a tourism playground, people have stripped them off their own agency. The different objectives led to a division of nature and culture, turning the Alps into an object.

### Subject

At first glance, the Alps may seem like majestic sculptures. As giants, steady and immovable. When in reality they are fragile and prone to climate change and human interference. They need the inhabitants safeguarding and care. The historical appropriation of the alpine territory and the change of narrative in their perception let us forget that they are, in fact, a living organism which provides a multiplicity of habitats for thousands of interrelated living beings, together creating a robust but fragile ecosystem in which every smallest change causes a loss of much-needed equilibrium.

### Changing conditions

Human induced climate change is increasing global temperatures. Especially in the Alps they are rising faster than in other European regions, destroying the sensitive ecosystem. The Alps play a crucial role in the collection, storage, carriage and equitable sharing of freshwater throughout Europe (Agency, 2009). With melting glaciers, less temporal and spatial range for snowfall, and changing precipitation patterns the water system is successively altered. Furthermore, the rise in temperature causes the superseding of certain habitat zones, especially prone are high lying areas which tend to inhabit alpine ecosystems which are strongly adapted to local conditions.




17 | Loss of identity through objectification

### New way forward

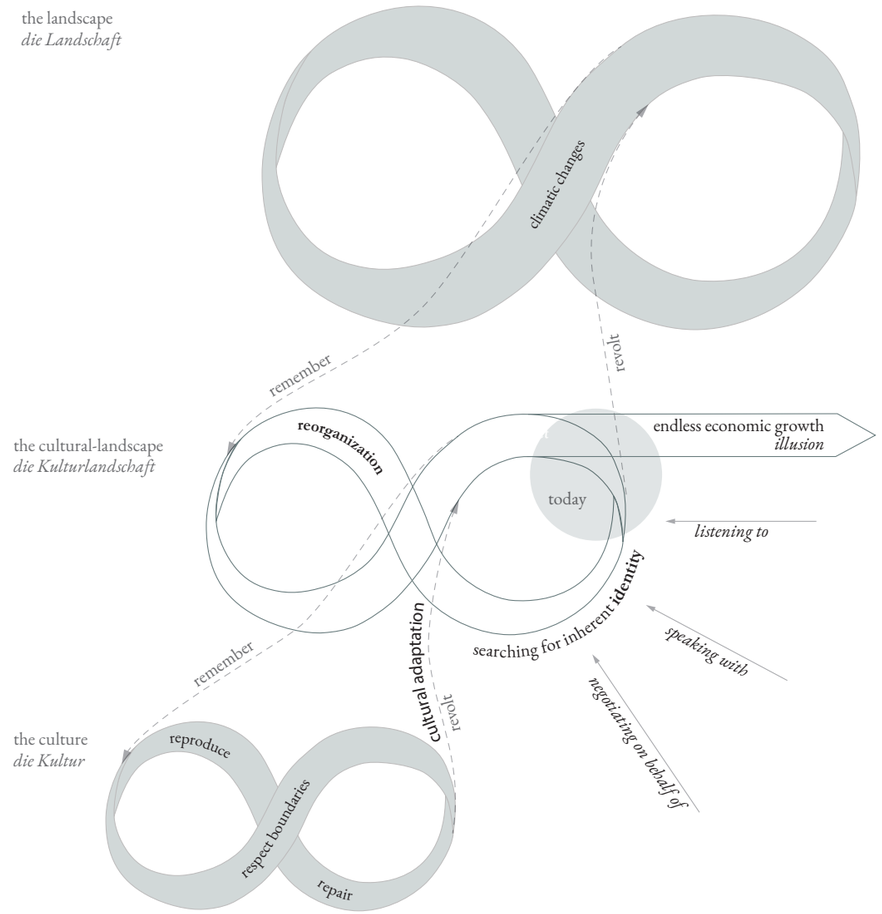
The consequences of climate change becoming visible, make us more aware of the interdependencies of the complex systems present on planet earth. Realizing this, we can no longer take only the human perspective into consideration. The Alps are in need of their own agency, independent of the economic growth-oriented profit, in order to reach the goal of a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland & Khalid, 1987, p. 34). The only way to step away from the anthropocentric worldview, is to learn how we can actively listen and give agency to more-than-human entities in order to provide a viable future, not only for humans, but for all living beings on this planet.

## 2.2 Conceptual framework

The theory of the adaptive cycle (Gunderson & Holling, 2002) brings forward that complex adaptive systems are in constant movement. They go through different stages while constantly evolving and reorganizing. The cycle goes through the phase of accumulation which results in the conservation phase. Here growth comes to a halt and the available resources are mostly used to maintain the system, resulting in low resilience.. In the following phase of creative destruction,  release and chaotic collapse are marking a time of uncertainty. From there on the reorganization of the system starts in which a lot of innovation takes place. This phase is defined through high resilience but at the same time great uncertainty. The last phase of the adaptive cycle is the growth phase. Here resources are accumulated and  opportunities taken. This phase holds high levels of diversity and connections and is marked by slowly decreasing resilience. The adaptive cycle exists in a panarchy with other systems which are following the same adaptation patterns. There are larger and slower systems and also smaller and  faster cycles. They influence one another through revolt from a smaller to a bigger cycle and through remembering from bigger to smaller systems. With the quickly changing climate a bigger system is influencing the Alps complex system. This causes distress and the need for adaptation. The notion of endless economic growth has created the illusion of a way out of the interconnectedness of different systems but as recognized by Steffen et  al. (2020) human culture is intrinsically linked to the Earth Systems.

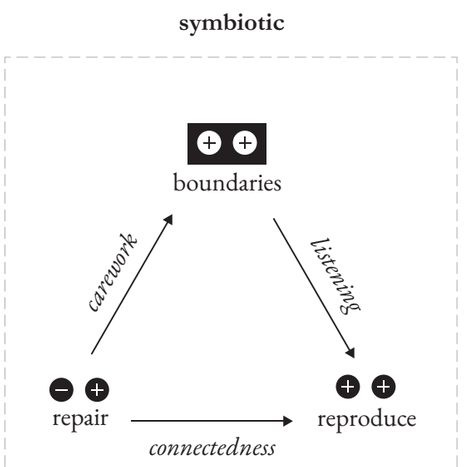
This brings forward the need to rethink current patterns of appropriation.  In the traditional cultural landscape the Alps have been recognized as an active subject. Basing their mostly agriculturally-based economy on regeneration, the people living in the territory had to recognize certain limits of the land in order to be able to survive in a place that is characterized by harsh living conditions. Therefore, going from object to subject, reintroducing the vernacular knowledge is a key concept in the making of this thesis. Whereas the modern perceptions of economic growth and technological advances enabled people to stretch the boundaries of the Alps, taking away their agency, the thesis attempts to  reposition the  Alps and give an alternative identity to them



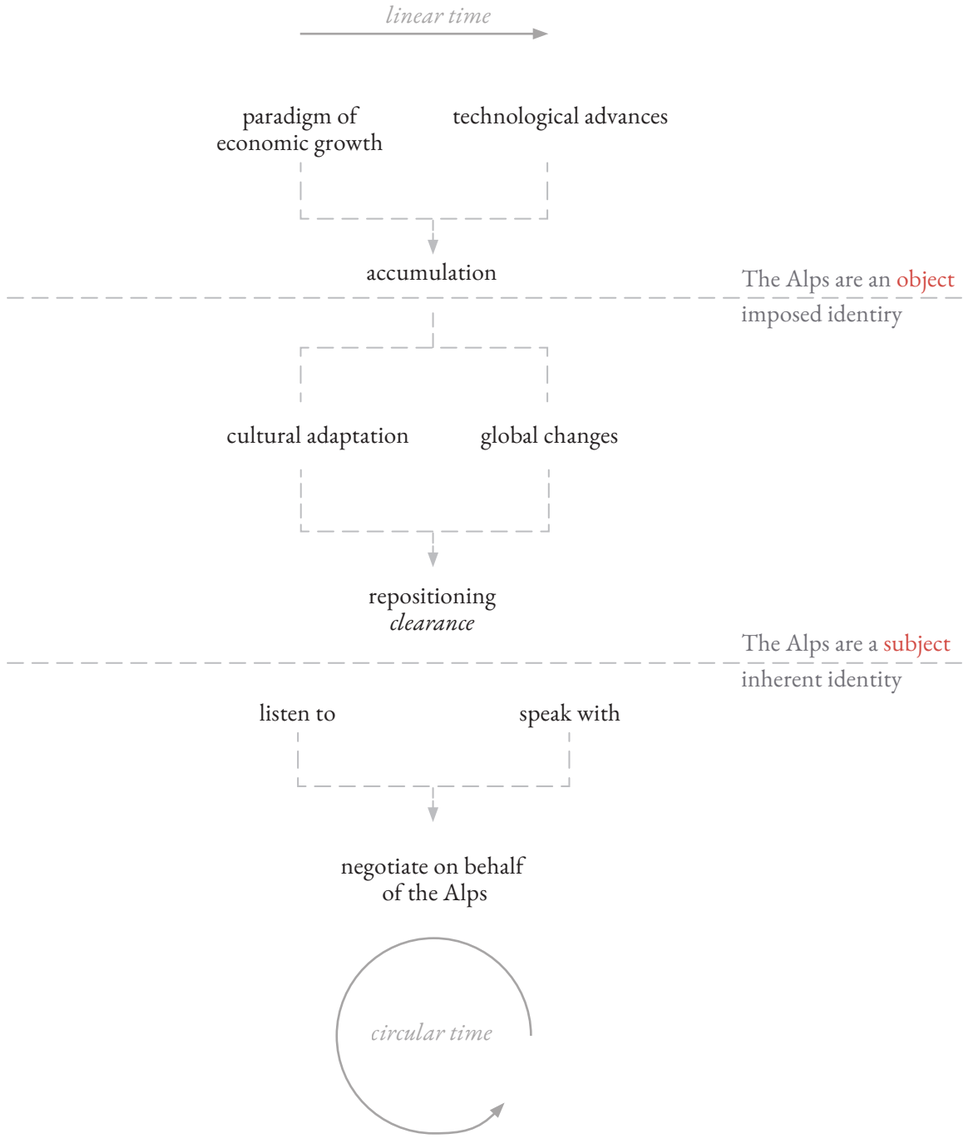


from within. Therefore, the project uses the moment of disruption in the changing complex system in order to reposition the Alps as an active subject. This happens through listening to, speaking with and negotiating on behalf of the Alps and aims to reveal the natural identity of the Alps.

The process is guided by reintroducing three traditional strategies of the making of the traditional Kulturlandschaft. The first one is repairing, which involves taking care of things, places and processes that were broken or lost, in order for them to function fully again. This work accounts for ecological as well as cultural objectives. The second strategy is reproducing. On one hand it is about multiplying something that works well, or is beneficial, but on the other hand it considers the reproductive capacity and the regeneration possibilities of established or new elements. Repairing and reproducing combined together enhances connectedness. The last strategy is acceptance of boundaries of the ecological system. Together these strategies may redefine and bring forward the inherent identity of the place. Furthermore, these strategies of the Kulturlandschaft may help the spatial repositioning and the reorganization of the Alps as an active subject.




19 | Traditional strategies of the Kulturlandschaft




20 | Project transformation process

## 2.3 Research question

**In light of historical objectification and increasing pressure on the body of the Alps due to global and local changes,**

**how can the emerging new order of the Kulturlandschaft be formed by the Alps as an active subject?**

### RQ 1: Historical analysis

How have the Alps been manipulated, appropriated and colonized over time and how did it change their identity and agency?

### RQ 2: Future changes

How will the current vertical and horizontal borders and thresholds change due to climate change?
What are the environmental, cultural, economic and spatial consequences of temperature rise?

### RQ 3: Methods

What methods can be used and/or developed throughout this project to aid listening to more-than-human subjects present in the Alps?

### RQ 4: Objective

What are the spatial, cultural, environmental and economic implications if one projects the findings of the natural identity of the Alps onto their territory?



*Objectification* describes the process in which a being is turned into a thing by taking away its agency. Because of the external force taking control there is no need to understand the entity anymore which may lead to emotional detachment justifying exploitation or manipulation.

*Emerging* is coming from complexity theory describing the sum as more than its parts. Emerging in the context of this thesis is linked to the changing condition of the land due to climatic change and the consequences — on a variety of scales in space and time — it brings with it. And the need for a new relationship with the planet.

*New order* stands as opposite to continuation. It implies the breaking of path dependencies.

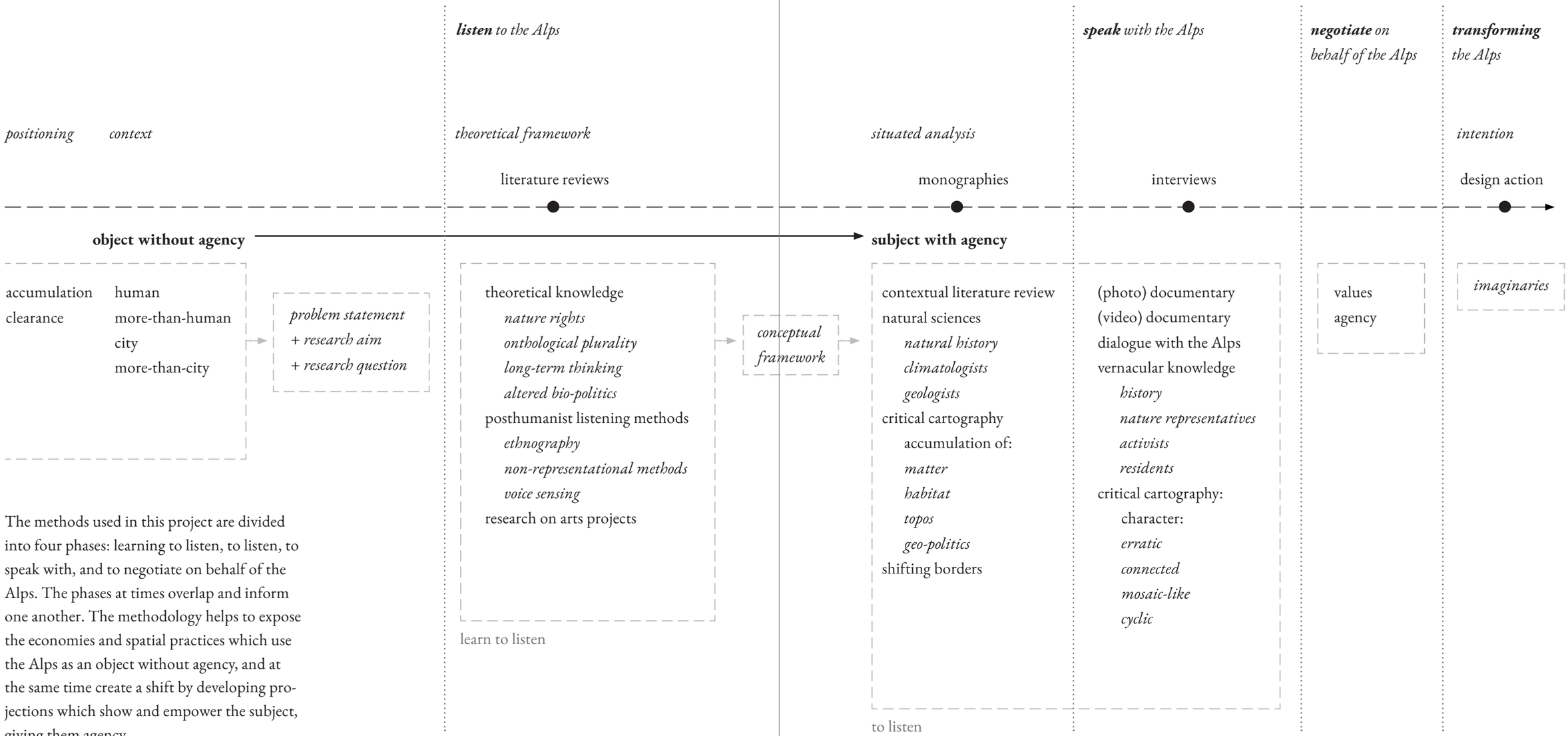
*Kulturlandschaft*, in English cultural landscape, describes the Alps as a territory that has been altered by human actions, especially by cultural practices and traditions, over many centuries. Turning the land into an expression of culture.

The term *active subject* gives agency to the entity in question and allows it to form and inform economic, social, and environmental structures which it is interconnected with.

## 2.4 Aims, methods and outputs

| Research questions | Aims | Methods | Outputs |
| --- | --- | --- | --- |
| RQ 1. How have the Alps been manipulated, appropriated and colonized over time and how did it change their identity and agency? | Finding current path-dependencies and patterns of appropriation, discovering the pressures of local changes, and the anthropogenic influences on the territory | Historical literature research, spatial analysis, photographic comparisons between now and the past, interviews with experts and locals | Photographic essay, timeline of object-subject dichotomy, text, analysis maps |
| RQ 2.1. How will the current vertical and horizontal borders change due to climate change? | Understand the spatial effects of climate change; researching the landscape changes, understand growth and migration patterns and processes of ecology | Critical mapping of accumulation - with focus on deglaciation: matter, tops, habitat, geopolitics, climate scenarios, IPCC, natural sciences papers | Maps, sections, spatio-temporal diagrams, climate and/or societal scenario(s), idea for an action to spatially reposition the Alps as a subject |
| RQ 2.2. What are the environmental, cultural, economic and spatial consequences of temperature rise? | Research dependencies and relationships between human and natural systems; understand interdependencies of global changes and the alpine human and natural systems, understand the environmental, social, economic and spatial consequences of deglaciation | Critical mapping of accumulation - with focus on deglaciation: matter, tops, habitat, geopolitics, climate scenarios, IPCC, newspapers, natural and social sciences papers | |
| RQ 3. What methods can be used and/or developed throughout this project to aid listening to more-than-human subjects present in the Alps? | Engage with the Alps, finding their identity and their 'Nature', developing methods for Urbanists that can be used further when working with more-than-human entities, redefine the agency of design, including more-than-humans into the practice of Urbanism | Ethnographic research, posthuman methods of listening, non-representational methods (investigating relations between subjects), photographic and film documentary, research into art, interviews, fieldwork | Film, photographic essay, mind maps, stories |
| RQ 4. What are the spatial, cultural, environmental and economic implications if one projects the findings of the natural identity of the Alps onto their territory? | Let the Alps speak, start a discussion about what the future of the Alps is and how we can support their sustainable development, imagine an alternative to the current path-dependencies, reposition the Alps as active subject | Imaginative mapping, experimental model making, layering, deconstruction, reconstruction | Speculative drawings, territorial projection map, actions, strategies |

## 2.5 Research framework
### For a Parliament of the Alps




The methods used in this project are divided into four phases: learning to listen, to listen, to speak with, and to negotiate on behalf of the Alps. The phases at times overlap and inform one another. The methodology helps to expose the economies and spatial practices which use the Alps as an object without agency, and at the same time create a shift by developing projections which show and empower the subject, giving them agency.

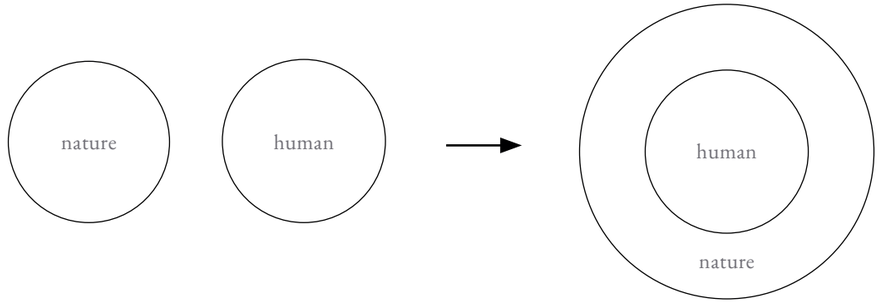
## 2.6 Learning to listen
### Between experiments and memory

**Knowledge creation**

The attempt of listening to the Alps tries to put forward the need for decolonizing current knowledge systems by "unlearning and re-imagining how we construct, produce, and value knowledge" (Thambinathan & Kinsella, 2021) in order to include marginalized presences into decision making and the public awareness. In the Cambridge Dictionary knowledge is defined as "understanding of or information about a subject that you get by experience or study, either known by one person or by people generally" (Cambridge University Press & Assessment, 2023). This illustrates the importance of the two sides – experience and evidence based knowledge – existing next to each other. In design, knowledge is often only driven by evidence and imagination. As mentioned before, knowledge can also be created through experience. This is what happens for example in a museum through exhibition design – my father is an exhibition designer, therefor I have been exposed to many exhibitions and their creation processes. This has shown me the existence of two narratives at the same time – the informative and the encounter. By making voices of more-than-human entities, or other marginalized or overheard groups and individuals visible through evoking emotion in the viewer, a relationship between two or more subjects emerges. Through this newly gained awareness and sensitivity for and of the other, decisions may be taken differently. This position questions our current definition on how knowledge is being created, at the same time being an essential asset of researching and designing for and with more-than-human entanglements. Therefore, one has to question current epistemology and expand the perception and the methods on how knowledge is created. By listening to the Alps this project is one part of a new "weaving of tales (...) to reclaim a future worth living" – in the words of Isabelle Stengers (2015). The Listening shall help us to go beyond an anthropocentric worldview, therefore rethinking current paradigms which are formulating projects of urgency and concern.

**"To listen to and tell a rush of stories is a method. And why not make the strong claim and call it a science, an addition to knowledge? Its research object is contaminated diversity; its unit of analysis is the indeterminate encounter. To learn anything we must revitalize arts of noticing and include ethnography and natural history."**

Anna L. Tsing, 2021




22 | From human and nature to human as nature

**Engaging with each other**

In the 1970s James Lovelock (1974), an English environmentalist and scientist, introduced the Gaia hypothesis. He explored the idea of a living planet, which is keeping the conditions for life optimal, putting forward the belief that the earth is a self-regulating system with interconnected ways of being, different ontologies, co-existing side-by-side. The Gaia hypothesis informed ontological pluralism (Turner, 2010), which recognizes the multiple different ways of being as equally rightful. This so-called post-humanist perspective, therefore, either evolves out of social sciences, which have been for many decades researching critical studies like gender, race, faith and capitalism and now "finally arrived at human complacency" (Sijmons, 2021).

In other studies posthumanism emerges from spirituality linked to animism, where all beings are seen as animated. Many scholars are convinced that the present environmental crises are the result of a spiritual crisis (Sijmons, 2021). Therefore, apart from changing our behavior, we must rethink the way we position ourselves in the world by expanding our awareness in order to be more conscious of other beings and stop putting ourselves in the center.

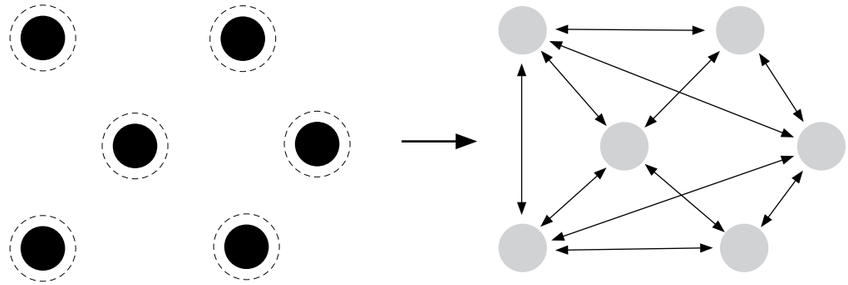
I am aware that posthumanism often neglects the power of humans. Therefore, I would like to highlight at this point the importance of human agency. The Anthropocene makes the irreversible influence humans have on the planet non-negotiable which makes it our shared responsibility to turn to action and repair what we have broken. The first step in order to do so, is to be able to immerse into other perspectives than the anthropocentric. This helps to shape awareness for the other living beings we are sharing the planet with, and whose lives we have been unsolicitedly altering. The theory and methods presented below will be used to portray the Alps from within throughout this research.

## Ethnography

It can be helpful to investigate more-than-human entanglements from the viewpoint of ethnography, the study of different cultures. Using their methods in developing multi-species research methods may encourage researchers to not only see the observed as a research object but as a research subject with whom to as well work along with. Therefore, these two roles are complementary and not oppositional or separate. In order to achieve this, one has to engage with those under investigation in a physical, discursive and emotional way (Hamilton & Taylor, 2017).

**“However, our objective is no longer to transform the Earth, but to produce frameworks through which the Earth‘s entities can inscribe their traces. By means of science or practical knowledge, paying attention to events, clues, and manifestations of these entities, we “document“ them in models designed to welcome them and make them visible”**

Ait-Touati et al., 2022, p. 22-23



23 | From a single species research to researching the web of life

The sensitivity with which ethnography is looking at different cultural contexts, shedding light on a multiplicity of diverse, and sometimes also contradicting, practices, objects, symbolic forms and discourses of everyday life, brings forward an “ecology of methods” for the act of listening in the posthuman practice (Hamilton & Taylor, 2017).

The different methods described in this chapter which can be used for listening to more-than-human entanglements have their origin in the theoretical standpoint put forward by Hamilton and Taylor (2017) in their book “Ethnography after Humanism: Power, Politics and Method in Multi-Species Research”. It is a blend of the above mentioned angle of posthumanism and actors network theory, which highlights the intersection and networks created through processes of humans, animals and material objects. Furthermore, by integrating unequal power structures between gender, race and species borderlines the theories of ecofeminism, post-colonialism and critical human geography are important assets. Additionally, the interest and

playful integration of experiential learning theories can bring forth new methods of listening to more-than-human entities (Hamilton & Taylor, 2017). Another field of reference is non-representational theory. It aims to step away from the bare representation of entities and towards methods of sensing that highlight the entanglement between different phenomena and species present on the Earth rather than trying to make sense out of them (Ulmer, 2017). Lastly, research into natural history, as suggested by Anna Tsing (2021), can bring forward certain qualities and insights into a multi-species world.

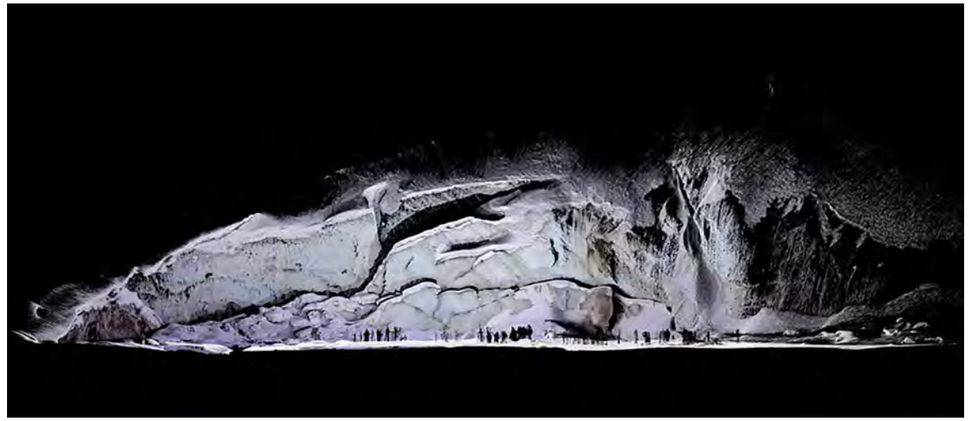
## What is a voice?

Usually, when listening to something we tend to watch out for a voice. What happens if we expand the perception of what a voice is, and include into the term, for example, the notions of power, silence and the act of silencing? Chadwick (2020) argues that this could help us to think of voice as a process that goes beyond the individual and manifests itself in certain assemblages. Therefore, voices are nothing stable within one body waiting for their moment to voice out, but rather constantly moving entanglements (Chadwick, 2020).

Following the thoughts of Donna Haraway's (2008) embeddedness of humans within nature in dynamic processes and the research of Earth System Sciences (Steffen et al., 2020), we cannot claim that any given body is independent from everything else happening around it. We, as humans, breathe in the air that has been enriched through natural processes, or bears traces of dust from nearby factories or volcanic activities. Therefore, with every breath an individual takes it becomes and manifests itself as part of a larger complex system it is intertwined with – each body, even the human, is more-than-human. It only exists with, because of and through the other. We are one part of an interconnected web of living entities together sharing the world we are creating life on. Voices extend the body and are eventually more than what is recognizably said or uttered, emerging out of that is a "breathy embodiment" (Chadwick, 2020).

Chadwick highlights five components to take into consideration when working with post-human voices which are (1) to recognize that voices are always multivocal, they are (2) emergent and created through processes and movements, one should listen to the voices that are (3) interruptive, out of line and telling a different story. Furthermore, she highlights that voices (4) always exist in a dialogue, resonating with other perspectives, and finally, there are (5) power structures that one should take into consideration, including awareness of what it means to speak about, or for someone. In this regard, the notion of situated knowledge (Haraway, 1988) is an important asset when having a conversation with another culture. In respect to this thesis, it is, therefore, crucial to be critical and self-aware in this dialogue.

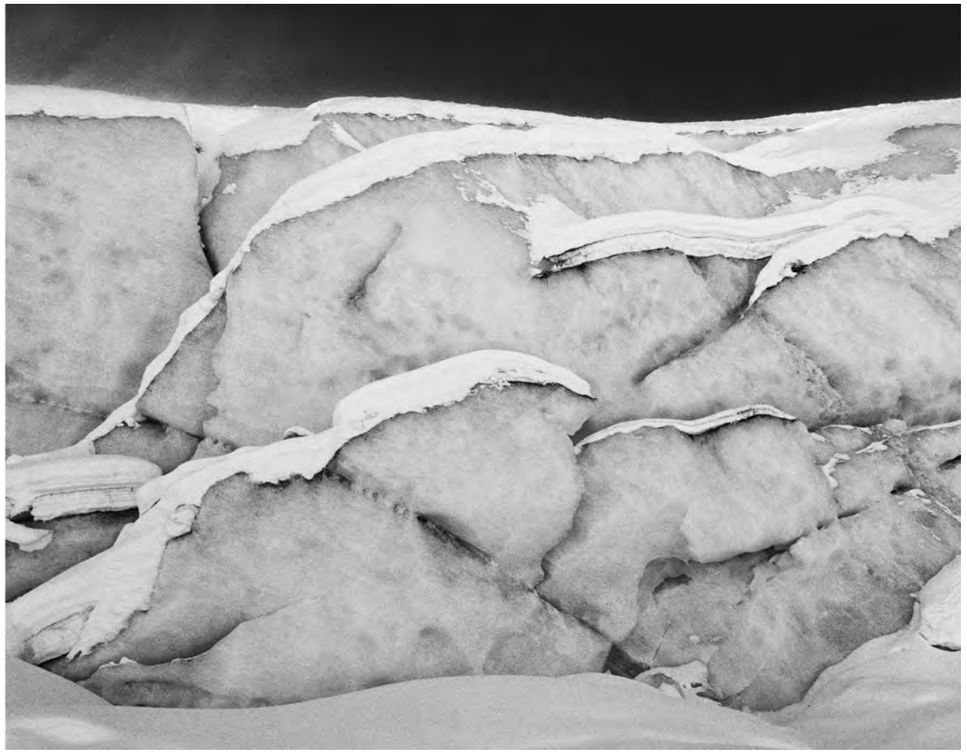




24 | Point cloud image of the Morteratsch glacier – Melting Landscapes (Chair of Christophe Girot, 2018)

## Listening

There is a significant difference between the act of hearing and the act of listening. Whereas hearing is subconscious, with sounds manifesting as noise or constant companionship, listening is an active form of paying attention. It requires consciousness which Paulina Oliveros (2005), an American musician and the author of "Deep Listening: A Composer's Sound Practice", calls active listening. She sees listening as an act of awareness and presence, and the eliciting of personal memories. By connecting what one hears to past feelings, experiences or



25 | Morteratsch glacier – Melting Landscapes (Chair of Christophe Girot, 2018)



knowledge of certain events, these memories are brought from the past into the present. Listening, therefore, becomes subjective and an art of paying attention and noticing one's surroundings (Oliveros, 2005).

Notably, Christophe Girot's students of Landscape Architecture at the ETH Zürich experimented with sound and sight observations at the Morteratsch Glacier in the Engadin in Switzerland. As one might note, this is the same glacier on which I have built an Ice Stupa, described in the first chapter.

The students recorded different soundscapes of the glacier's activity such as its melting or formation. Furthermore, they took analogue photographs. Through the combination of the two observation techniques "the impressive sounds of the moving ice mass contrast with the eerie silence of the black and white pictures" (Girot, 2018). This turns the glacier into an energetic sensual experience which brings to life and bears witness to the rapid changes of the Alpine landscape.

Another notable project related to sound, is taking place in the Ötztaler Alps, situated in the Eastern Alps at the border of Austria and Italy. The project is called "Call me! Calling the glacier" (Laar & art {at} artcircolo.de, n.d.). Kalle Laar, a German artist, installed a microphone connected to a phone number at the Vernagt Glacier. Thanks to the soundart project the glacier can be called at any time and from anywhere. Throughout the year and with the changing seasons, the sound of the glacier changes. The aim of the project is to activate the emotional connection and perspective towards climate change, audible as the process of glacial retreat, and a matter concerning all of us.

*Vernagt Ferner Glacier*
*+43 5254 30089*

## Empathy

In environmental humanities fieldwork is based on physical experience and referred to as field philosophy, or experiential environmental philosophy. It is grounded on the theory that physical experiences will create connections and empathetic relationships with the natural world through which environmental learning is increased (Goralnik et al., 2014). By creating a relationship with the natural world and the surroundings, this branch of philosophical environmental pedagogy aims to create an ethic of care. The notion of care has its origin in feminist social psychology which highlights the female moral development as being grounded in networks of caring relationships, as opposed to the male rather principle driven and linear process (Goralnik et al., 2014). Ecofeminism, in turn, takes this dualism and relates it to the ambiguous relationship humans often have with the natural world. Taking these different perspectives into consideration, the practice that emerges out of them is a place-based care ethics (Goralnik et al., 2014).

The practices that arise from this perspective are also closely connected to *deep ecology* which sees people as a part of a bigger system. The Austrian environmental educator Andreas Schelakovski believes that the wish to actively engage is not a result of moral obligation, but rather developing out of inner awareness about connectedness.

26 | Soil portrait #55, chromatogram (Debra Salomon, 2019)

Therefore, he developed methods to engage experimentally with the environment (*Tiefenökologie Netzwerk Österreich*, 2020).

One exercise, for example, asks the participants to draw a listening map. They choose a place in nature, and mark the position of themselves with an X on a piece of paper. After that, everyone starts drawing the sounds that are observed in the surroundings. The person has to give weight to their intensity and position them either far away from the X or very close, depending on how it is perceived. The exercise aims at enhancing the sensibility of the participants. In another exercise the focus lies on discovering the beauty of nature, sharpening one's senses and trusting one another. The exercise is done in pairs. One of the two has to close their eyes and is guided by the other. When the guiding person finds a place of interest, they ask the other to open their eyes for seven seconds and take a mental picture of the place. This exercise is repeated three times until they change roles. The act sharpens the awareness of a place and often manages to keep the images alive longer than usual (Schelakovsky, 2020).

## Experiments

Another approach to listening to more-than-human subjects is conducting experiments through which knowledge about certain entanglements and conditions is collected. This can shed light on the natural history of a place and its inhabitants or describe the present condition of it. Just like Saussure (Hemmer & Meßner, 2022), who invented a tool to measure the intensity of the blueness of the sky in order to better understand the world, other scientists collect samples and conduct experiments in order to shed light on something that is otherwise hidden. One such project working with this objective is "Multispecies Urbanism" by Debra Salomon (*Multispecies Urbanism: Interview With Debra Solomon*, 2019). She uses the imaging method of soil chromatograms in order to gain insights into the conditions present at a specific location in the city. By collecting samples of the soil, dissolving it in water and letting the mixture be absorbed and distributed through a piece of paper, she was able to very precisely describe the conditions and qualities of the soil. The soil sample is split into three circular areas, differentiated by the weight of the material in the soil. The heaviest particles form the inner circle, followed by the organic components in the middle and bacteria and enzymes in the outermost ring. The higher the waves in the outer circle, the higher the diversity present in the soil. The intensity and number of channels going through the cross section from the innermost area to the outermost indicate the level of nutrients (Salomon, n.d.).

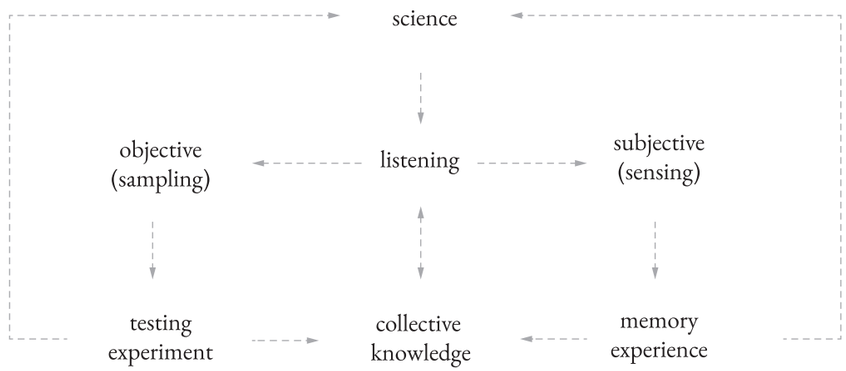
These two experimental methods described above are different from the more subjective listening methods mentioned before. They follow a more objective path and work with physical evidence. All in all, the methods used in the act of listening are divided into two fields of knowledge creation. One includes testing, it is part of the experimental realm of the objective sampling of evidence, and the other is an experience based field which is composed of subjective memory and (self-)consciousness, aiming for awareness and connectedness, as well as historical traditions. The two knowledge systems are two different ways of producing collective knowledge,

existing in parallel with each other and informing one another. Through time, numerous individual experiences and experimental endeavors have been creating a collection of collective knowledge evolving out of site specific conditions. This form of knowledge is referred to as vernacular knowledge or traditional ecological knowledge and especially present in indigenous communities (Berkes et al., 2000). Gathered by observers over many centuries the knowledge is passed on, either orally or through practical experiences, from one generation to the next, for many of them a necessity to survive. With every generation the knowledge is developing further, adjusting to present conditions and needs of people and land (Berkes et al., 2000). It is living knowledge, constantly changing and evolving. Is there still traditional ecological knowledge existing in the Alps? Or can these methods of listening help us understand a place that has been colonized for too long to find traces of its identity? Can a collective effort of listening to the Alps result in new vernacular knowledge that can be passed on to the next generations?

**"Traditional knowledge may be holistic in outlook and adaptive by nature, gathered over generations by observers whose lives depended on this information and its use. It often accumulates incrementally, tested by trial-and-error and transmitted to future generations orally or by shared practical experiences."**

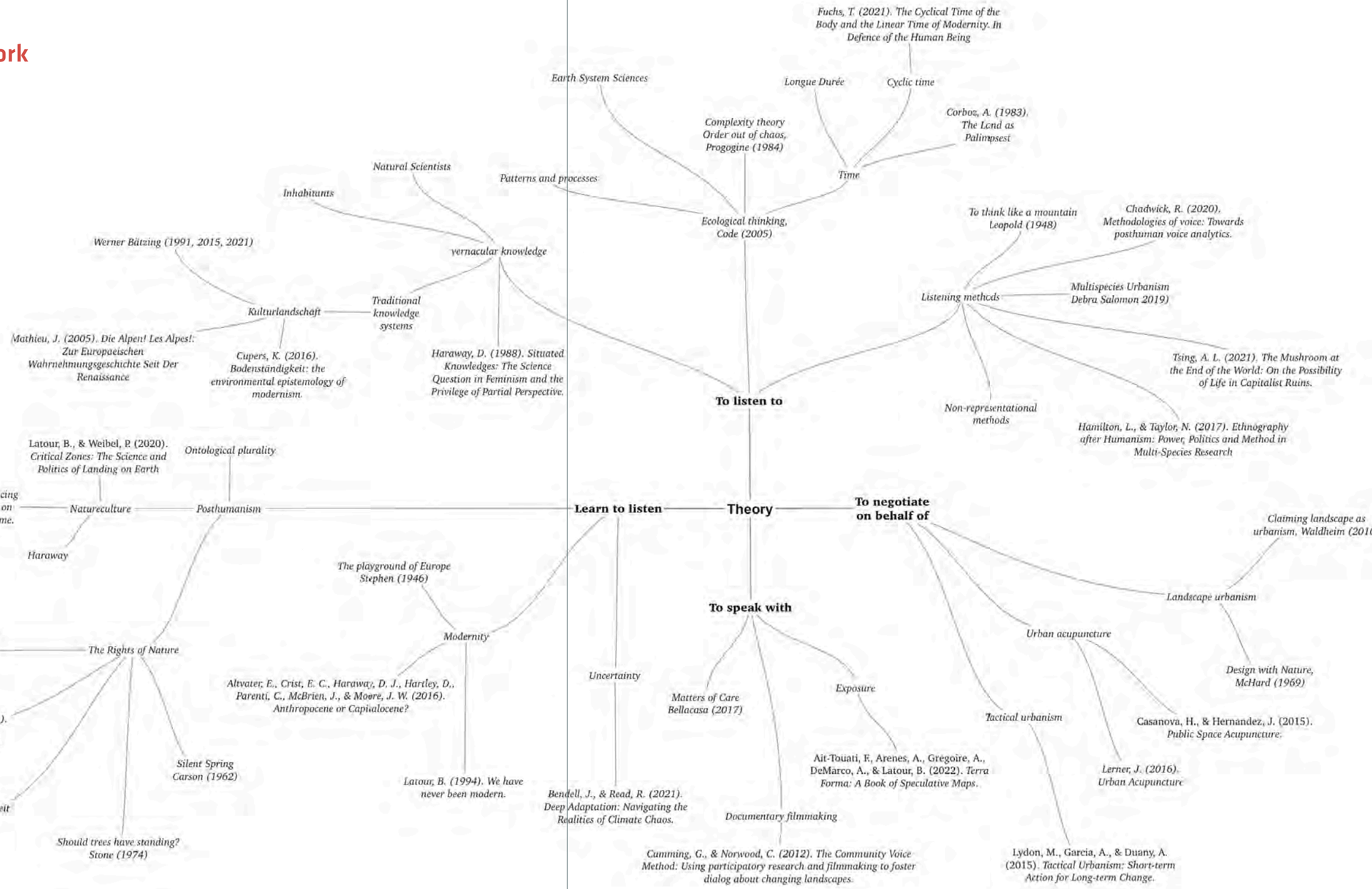
Berkes et al., 2000, pp. 1252






27 | Multispecies listening methods

## 2.7 Theoretical Framework



# 3. Listening to the Alps
discovering inherent agency

## 3.1 A Portrait of the Alps
### Key data

**Body**

| | |
|---|---|
| Age: | 100-26 million years (growing up) |
| Life expectancy: | immortal |
| Surface: | 220.000 km² |
| Length: | 1200 km |
| Significant areas: | Eastern Alps, Western Alps and Central Alps |
| Width: | 150-250 km |
| Furthest extension: | From mountain tops, through rivers connected to four deltas of Europe: |
| | Rhine – Meuse Delta |
| | Po Delta |
| | Rhône Delta |
| | Danube Delta |
| Significant divisions: | Northern Alps, Southern Alps and Central Alps |
| Elevation: | from sea-level to 4807,81m above sea level (Mont Blanc) |
| Peaks: | 60,614 named by humans |





**Diversity**

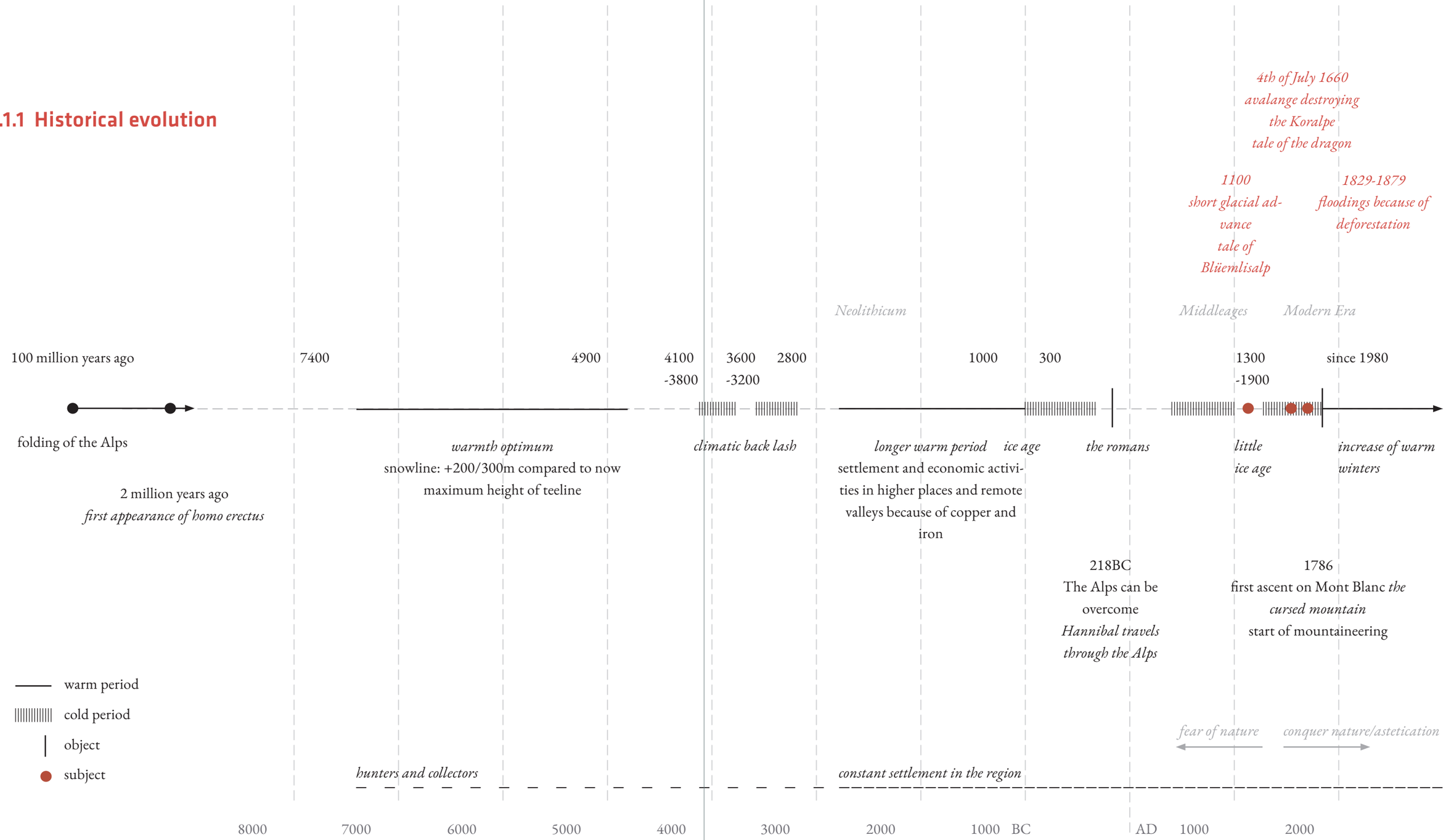
| | |
|---|---|
| Number of species: | Flora: 13.000 |
| | Fauna: 30.000 |
| | Human: 14,9 million |
| Regions: | 83 |
| Communities: | 6200 |
| Countries: | Austria, Switzerland, Liechtenstein, Germany, Italy, France, Monaco and Slovenia |
| Languages: | Slav, the Rhaeto-Romanic (including Romansch, Ladin and Friulian), German (Alemannic, Bavarian and the Walser dialect), Romance (French and Italian) |

**Climate**

| | |
|---|---|
| Climate: | between subtropical climate (South) and temperate climate (North) |
| Temperature: | 0°C line between approximately 2500 m (Northern Prealps) and 3300m (Central Alps) |
| | each 100m upwards corresponds with -0,5°C |
| Change: | +2°C since 19th century |

Numbers have been compared and collected from the following sources which are represented in detail in the Literature section: Alpenconvention (n.d.), Alps (2021), Austria-Forum, das Wissensnetz (2018), Bätzing (1991, 2015, 2021), CIPRA (n.d.) and Main Climates of Europe ( n.d.)

## 3.1.1 Historical evolution



## 3.1.2 Identity
### Forms of time

What is the identity of the Alps? What is their character and what are their capabilities? In search for the *nature of the Alps* this chapter first looks at their natural history, the formation processes and time that spans long before humans. By connecting it to human appropriation in the second step, it becomes more clear how the bodies of the mountain range and their character have been altered and restrained. This helps to understand where and when violations have taken place and how to give the agency back to the Alps. This chapter references extensively Werner Bätzing's (1991) book "Die Alpen – Entstehung und Gefährdung einer europäischen Kulturlandschaft" (English: The Alps – Emergence and Endangerment of a European Cultural Landscape). Bätzing is one of the most extensive researchers of the past and present development of the alpine culture and landscape.

#### Cyclic time

When observing natural processes, one thing is striking. They follow cyclical patterns of time. Day and night, seasons, death and life, they repeat themselves over and over again. In the Alps the mostly agrarian lives of the people followed the rhythms of natural processes. The perception of cyclical time was connected to the life of people. Especially in the modern age the way people used to live changed. I argue that this had a lot to do with how the perception of time changed. As Fuchs (2021) puts forward, the shift from a circular perception of time to a linear has its origin in several developments.

**"The conception of time as a linear, uniform, and continually pro-gressing process appears to us today as so self-evident that we easily forget that it is a concept that was especially developed in European modernity. Concepts of time in earlier cultures were based primarily on the cyclical recurrence of cosmic and earthly processes."**

Fuchs, 2021

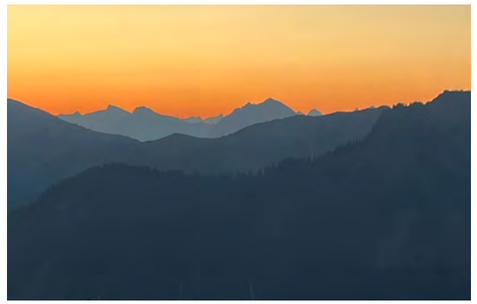


31 | Formation of the Alps (Fernand Braudel, 1966)

Since Galileo, the goal- and creation oriented motion was replaced with the idea of a uniform, linear movement which is progressing indefinitely without friction. When it became possible to loan money with interest, this created for the first time the possibility of a far in the future lying economic planning. Emerging out of this was the capitalist perception of growth as a linear notion of time. This was further spread into society when from 1350 onwards mechanical clocks became publicly available and allowed people to rationally and linearly organize their time. This for example resulted in work being paid in hours instead of products. At the same time, through the collective experience of the Black Death, the European citizens were reminded of the "discrepancy between limited lifetime and unlimited universal world time" (Fuchs, 2021, pp. 59). This strengthened individuality and brought to light the *being-towards-death,* as defined by Heidegger (1927), where life is directed towards the moment of death. Nevertheless, from a biological perspective even when a living being dies "life always strives to preserve itself in autopoietical cycles" (Fuchs, 2021, pp. 59).

The concept of linear time implies that present actions have no consequences in the future, they are left in the past as soon as they are performed. When following the rhythms of ecology, its processes visible in seasonality or day and night, the

need for thinking again in cyclical time emerges. This is a crucial cultural return which needs to be taken in order to build on a shared ground in the repositioning and further definition of natureculture. Therefore, the first identified characteristic of the Alps is their cyclic nature.



32 | The foldings of the Alps

## Connected

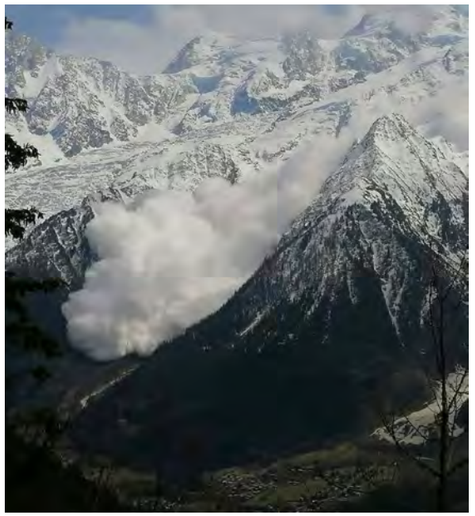
At this point, it is interesting to look at the formation processes of the Alps. As Bätzing (1991) describes, there are different temporal dimensions connected to it. One can divide the whole formation process into two larger divisions. The first one is considering the *earth formation time* looking at hundreds of millions of years and a planetary scale, and the second one the *processes of today's time*, measured in 10,000s of years and visible mostly in the immediate territory of the Alps.

There are five stages of earth's formation processes in the Alps (Bätzing, 1991). The first one goes back 450 to 280 million years to the Paleozoic Era, the early earth age. During that time different European mountain ranges, that nowadays are already mostly eroded, were formed. Because of their double folding, as explained in the paragraph, some remnants of these first formations form the highest and most dense alpine peaks today, for example the Mont Blanc massif. The second phase, which is about 200 to 100 million years ago, is dominated by sedimentation. Through the drifting apart of the European and African tectonic plate the Tethys ocean was formed. Throughout time the sediments deposited on the ocean floors slowly hardened and provide nowadays a diverse range of rocks in the Alps, as well as trust sheets from different geological times.

100 to 26 million years ago, the second folding of the Alps started because of the African plate drifting North squeezing the Tethys ocean together. The movement affected especially a horizontal layering which turned the Alps into a low mountain range. Only since 7 million years, after 20 million years of rest, through the growing tension of the African plate, the Alps have been growing into a high mountain range. There is one exception, influenced by a circular movement of the Adriatico tectonic plate, creating a push towards the South, which is visible in the landscape.

At the same time there are erosion processes, through water and ice, at work, without which the Alps would be around 8000 to 10,000 meters high by now.

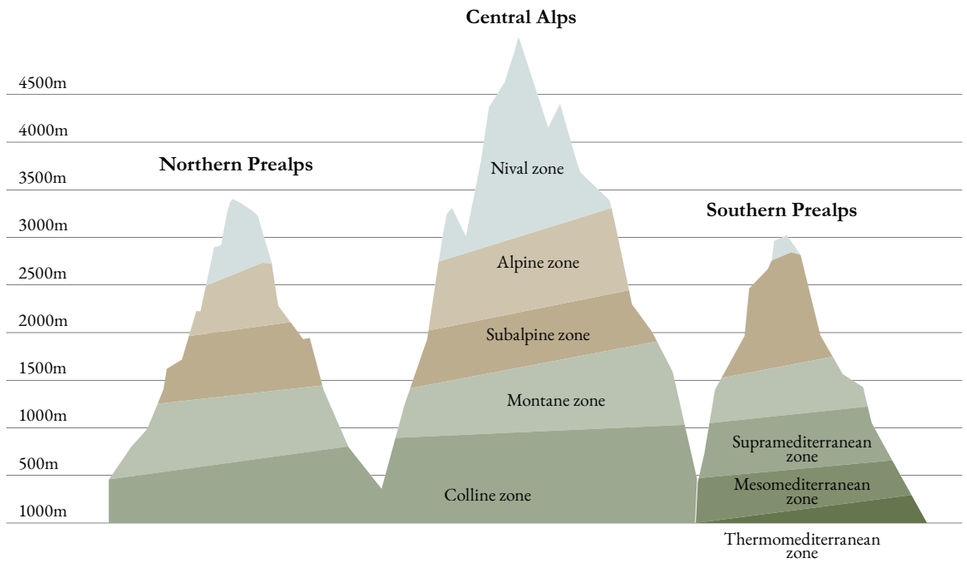
The processes mentioned last are still ongoing until at one point the pressure of the African plate will diminish and the erosion processes will take over. That will be the last of the five earth formation stages. The different geological processes make the Alps a folded mountain range which shape its iconic and long mountain sides, at times almost seeming like a wall. At the same time this temporal and geological dimension connects the mountain range, making it one network.



33 | The erratic nature of the Alps Avalanche at the feet of Mont Blanc (SWNS, 2021)

## Erratic

The different qualities of rocks offer different possibilities for humans (Bätzing, 1991). Making, for example, the Central Alps with their hard grounds difficult to live in, while the Northern and Southern Alps, where also the big valleys are, are attractive settlement places due to their softer subsurface. Ice ages during different




34 | Habitat zones (adapted from wikipedia, 2014)

**Colline zone | 600-900m**
cultivated arable land
fruit trees, decipuous and mixed forests

**Montane zone | 1000-1600 m**
thick larches, pine forest, steep mountain meadow full of flowers, fruit and agriculture still possible on south-facing slopes

**Subalpine zone | 1700-2100**
swiss pine (till -40°C), light coniterous forests, stunted trees (green alder, mountain pine)

**Alpine zone | 2100-2800**
edelweiss, spring gentian, mountain avens, primrose, smalll dianthus, glacier buttercup, alpine lawn: alpine flowers and grasses more intesnse
UV radiation makes everything more colourful

**Subnival zone | 2800-3100**
mosses, clump-forming flowering plants and lichens, existing in a symbiosis between funghi and algea, isolated plants, short vegetation season, sophosticated roots for optimum nutrient absorbtion

**Nival zone | 2800-3100**
only thyllophytes: do not need substratum of soil, they grow densly on uncovered rock surfaces, more snowfall than melting (glaciers form)



eras further shaped the territory. The valleys became wider through the repeating processes of glaciation and deglaciation, and the glacial tongue formed terraces through the transport and deposition of sediments along its sides, the moraines walls. The terraces, due to their elevated position above the wet river valleys, were for a long time the most suitable places for human settlement. The thawing of the ice has also brought, and is still bringing, great challenges with it. At times, whole slopes collapse or slide downhill or water, frozen in-between rocks and holding them together, melts. This leads to so-called “frost shattering”. Furthermore, the thawing of permafrost can cause sudden changes in the landscape. These phenomena are especially happening in glacial and periglacial regions, these are in high elevation zones spread throughout the entire Alpine range that were for example recently covered with ice or are in an elevation zone which has most of the time temperatures below 0°C. With rising temperatures due to climate change, the erratic nature of the Alps is going to increase further. Also in other places, further down the valleys, the erratic nature of the Alps becomes visible in the form of landslides, avalanches or floodings. In tales and myths, stories of the changing Alps are being told, often referred to as natural disasters, when actually they are cultural ones (Bätzing, 1991). These dynamics of the land are part of the Alps themselves, of how they are formed, how they are evolving. It is part of their being. Therefore, they can not be natural disasters. The question is rather, how do humans deal with that?

35 | Mosaic-habitats in the Alps (Josef Steufer, 2022)

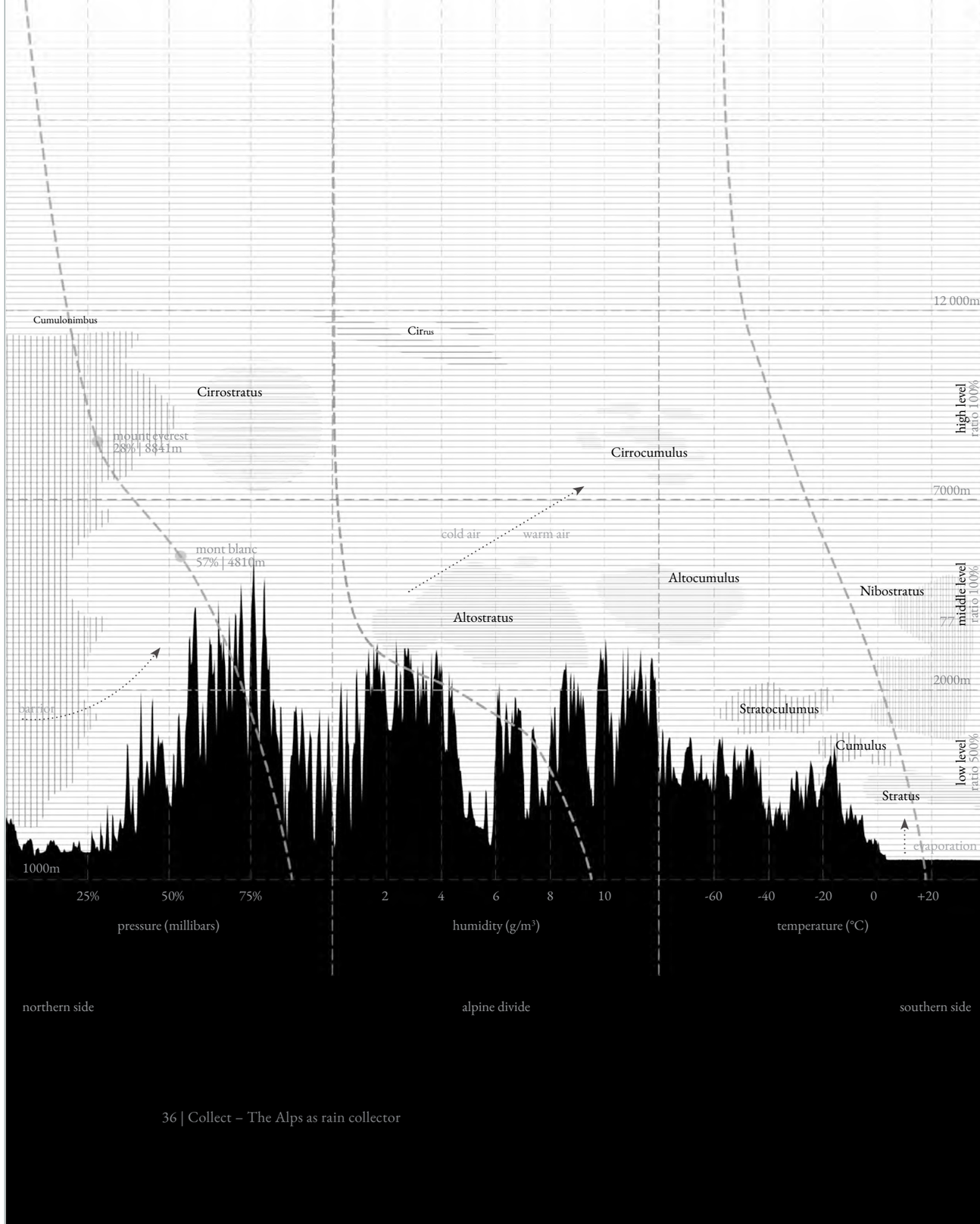
**“The infinite diversity of the alpine flora, and of the associations which constitute it, a diversity so great that probably no two square meters of vegetation in the whole chain of the Alps, possess exactly the same floristic composition. This diversity, which seems at first to escape all rule, really presents elements of regularity, which we have now to establish.”**

Jaccard, 1912, pp. 43



## Mosaic-like

The Alps follow a set of climatic rules. The higher the elevation, the lower the temperature, the higher the precipitation, depending on elevation in the form of snow or water, the shorter the vegetation period. At the same time the higher the elevation, the stronger the solar radiation, which makes, for example, plants more colorful, as well an increase in small scale temperature differences. Those aspects lead to micro-climatic conditions that make plants extremely adaptable to the circumstances. These different rules result in distinct climatic zones which are present on different elevation heights, and vary slightly depending on whether they are North or South facing slopes and the general position within the main Alpine range. At the same time, with their general longitudinal orientation from West to East, the Alps work as a rain catcher, influenced either by the Atlantic or Mediterranean climate. Their folded morphology accumulates clouds on the edges of the Alps, making them places of higher precipitation than the central mountain range. Furthermore, they also function as rain collector and water tower, nourishing four deltas of Europe: the Rhine – Meuse Delta, the Po Delta, the Rhône Delta and the Danube Delta.




36 | Collect – The Alps as rain collector

## 3.1.3 Capabilities

Suddenly the wind changes, there is tension in the air. The sky turns darker as clouds start to accumulate. The familiar sound of water drops on the summer meadows comes along with the smell of wet soil, which thirsty absorbs their welcome treat.

The Alps have many capabilities. Drawing from the multi-species research methods described in chapter 2.6 Learning to listen, one may notice that the capabilities of someone often become visible in their relationship to something else. Therefore, I conducted a questionnaire asking people from the Alps what the Alps mean to them. The result is a diverse range of potential of the mountain range that paints a colorful picture of the Alps. This list of capabilities is far from being complete and does not aim to represent the whole. Rather, by being a form of investigation, the questionnaire aims to open our perception of what the Alps really are and therefore could be.

For one, they are able to *protect*. They shield from wind and rain, and they give people a sense of security. They are also able to *store* water, carbon dioxide, methane, but also history and memory. They can *provide* a lot of space and time, they create diverse habitats and are for many a place of *home*. Their attraction is very strong, people are drawn to them. Some described that even when they move from the Alps to another place, they feel constantly called by them. They also *impress*, by provoking astonishment or romantic feelings. And they have the ability to *calm*. They are good for mental health – providing a place of *retreat* for humans in a world which seems to get faster by the minute. They remind us what *freedom* feels like and balance the density of urban areas by providing spaces inaccessible to humans where ecosystems and wilderness can thrive. Their ability to *regenerate* is the base of their being, which will always, no matter what is happening, outlive us. What becomes evident in the diverse relationships people have with the Alps, is how much they love them. There was always a smile on the faces of the people, when I asked them: "What do the Alps mean to you?". They are their place of belonging. In this regard we should be aware that they are not only a place of home for humans but also for uncountable non-humans like wild animals, plants, or glaciers, who most probably are also very attached to them. One of the most important conditions allowing the Alps to be home to so many, is the constant availability of freshwater, being the source for myriad forms of life to unfold.

**"For me the Alps are home. I grew up with the view on them and especially as a child and teenager I spent a lot of time hiking and skiing. Those were very important and formative moments. But also being surrounded by them makes me realize that they give me a sense of belonging which I can never find again elsewhere."**

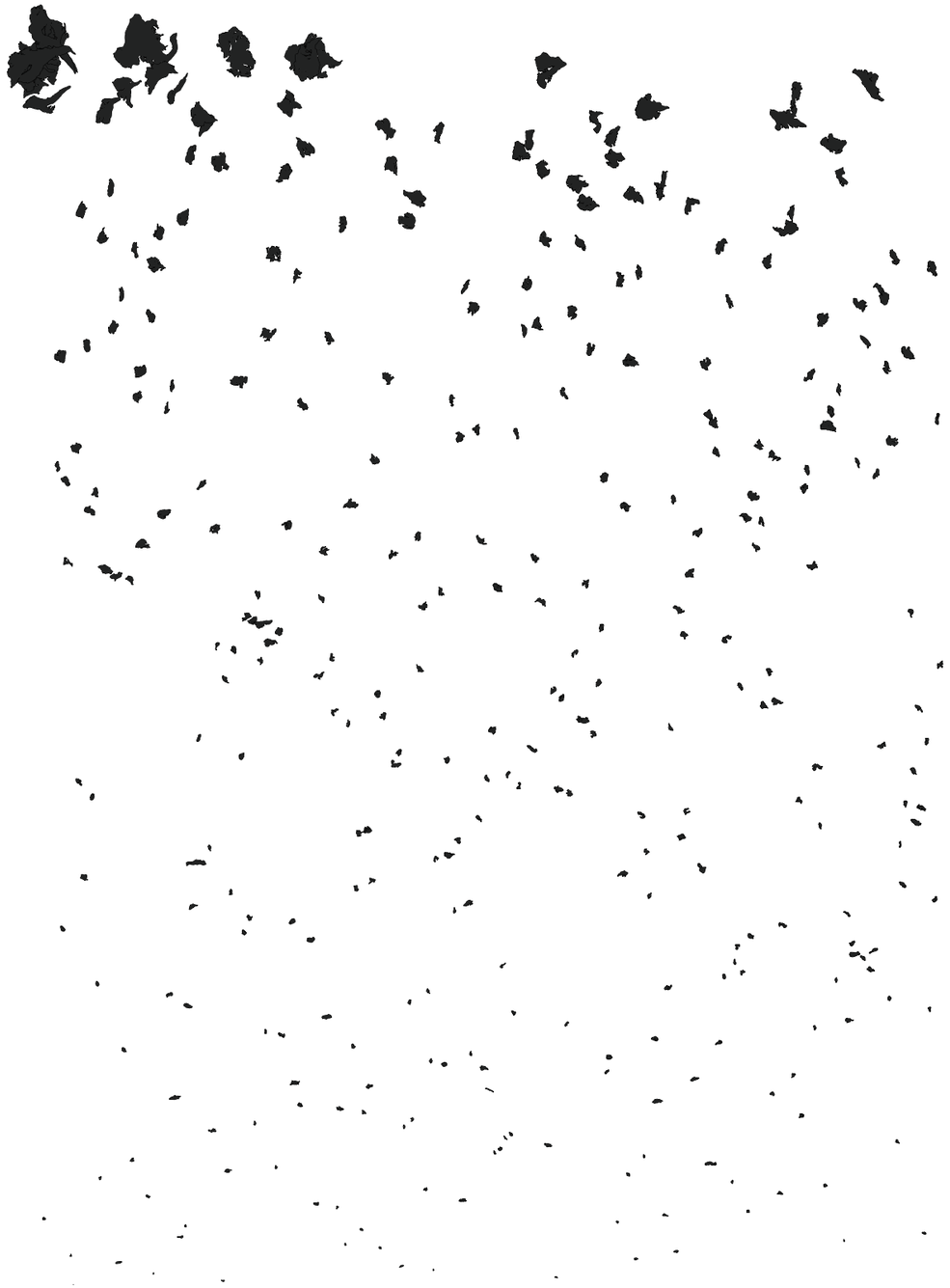
Antonia Futscher, 2023

**"For me the Alps are a place of retreat – for animals but also for humans. A recreational space. Freedom, beauty and wilderness – since there's often wild and untouched nature. But also history for humans – the alpine region has been an important resource for agriculture for a long time, turning it somehow into cultural heritage."**

Moana Häusle, 2023

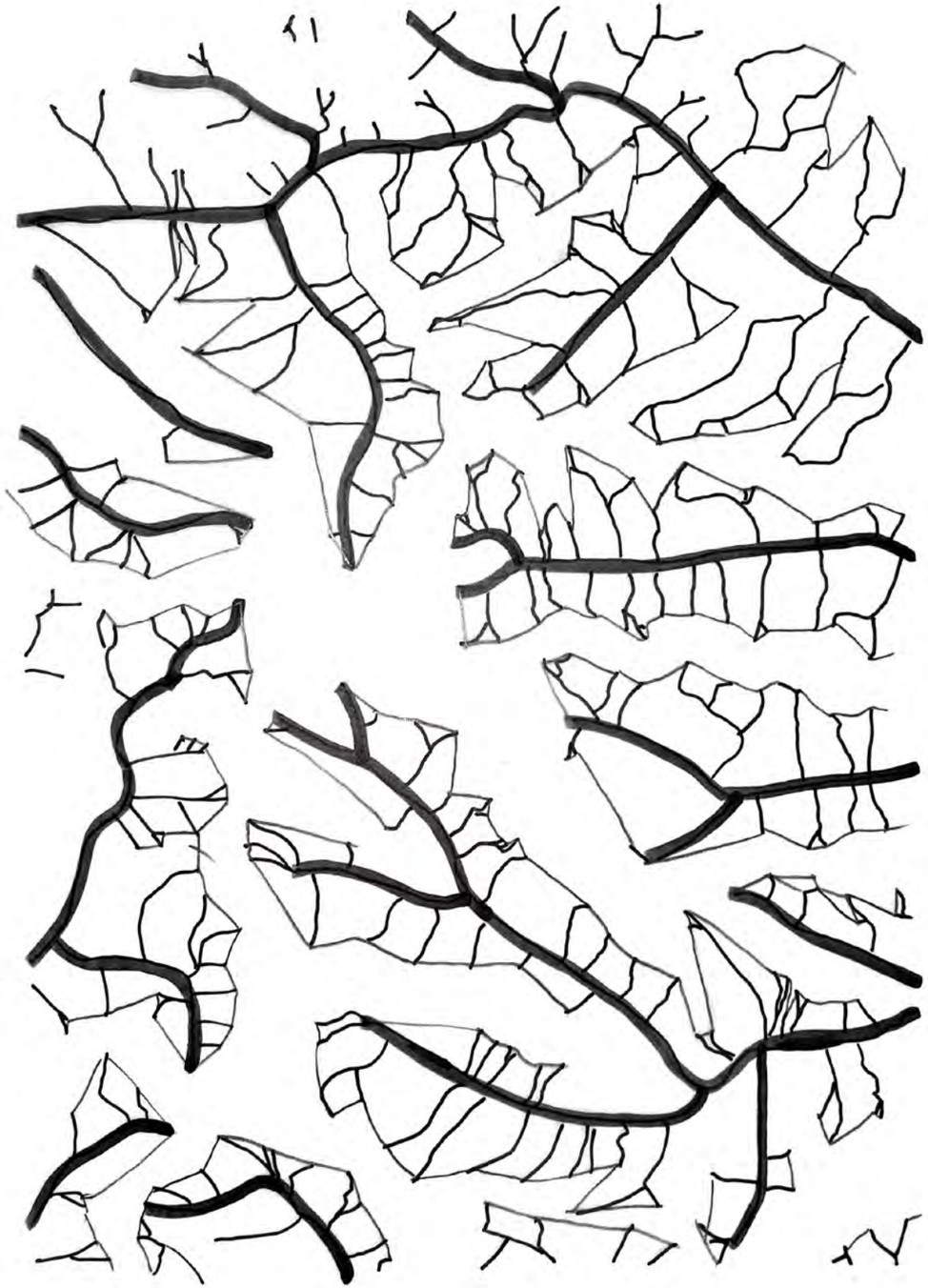
### collect – store – carry – share

It is exactly this abundance of freshwater and the mentioned before relationship between the Deltas and glaciers where the impressive capabilities of the Alps are visible the most. Through their stretching from east to west they act as rain catcher. They collect the water from within the clouds, they accumulate it within their territory and when they release it as rain or other forms of precipitation, the elevation differences of the Alps create the condition for the water to freeze



37 | Store – Collection of all glaciers of the Ötztaler and Pitztaler Alps storing water for centuries and millenia





38 | Carry – The rivers and their chatchment areas transporting water

and to be stored in place on high elevation zones in the form of snow and, over a very long time, in the form of glaciers. This way, they store water that would otherwise run off very quickly towards the ocean, and therefore, they keep it for dry seasons and years. In phases of low precipitation and high temperatures the Alps release the stored water. Through the rivers above and below the surface they carry the water and share it equitably with all species in their reach which are depending on the freshwater supply. Their territory extends from the highest peaks of the mountains all the way down the four deltas of Europe and to all the places in between: the cities where humans accumulate, the natural environments, the alluvial ecosystems, the terrestrial ecosystems, all of them are dependent on this equitable share of water, a democratic distribution thereof. This is the essential role that the Alps play within the web of life, which describes the interconnected and interdependent networks of species throughout the world (Bascompte, 2009). They have always been a barrier that catches the water and they have always distributed the water throughout their whole territory, through their valleys and their diverse geomorphological conditions. One could say that this is their responsibility.

**“... and during the whole trip back from the South Tyrol into the Büntnerland, down the Alpine Rhine Valley, I was playing passenger princess sticking to the windshield to see the beautiful landscape (...) Once we took a break on the gravel field, this marks a core memory of myself. I was sitting on a rock looking at the landscape and I just had to cry. I don’t know, I couldn’t hold back it just happened just because I was so impressed by the landscape that was so foreign and at the same time so close to me.”**

Aurelia Winter, 2023



## 3.1.4 Resources

The Alps have a wide range of resources. They have water and soil, they can provide food and they have wilderness, untouchedness and diversity. They also have a lot of space and time. And they can offer silence.

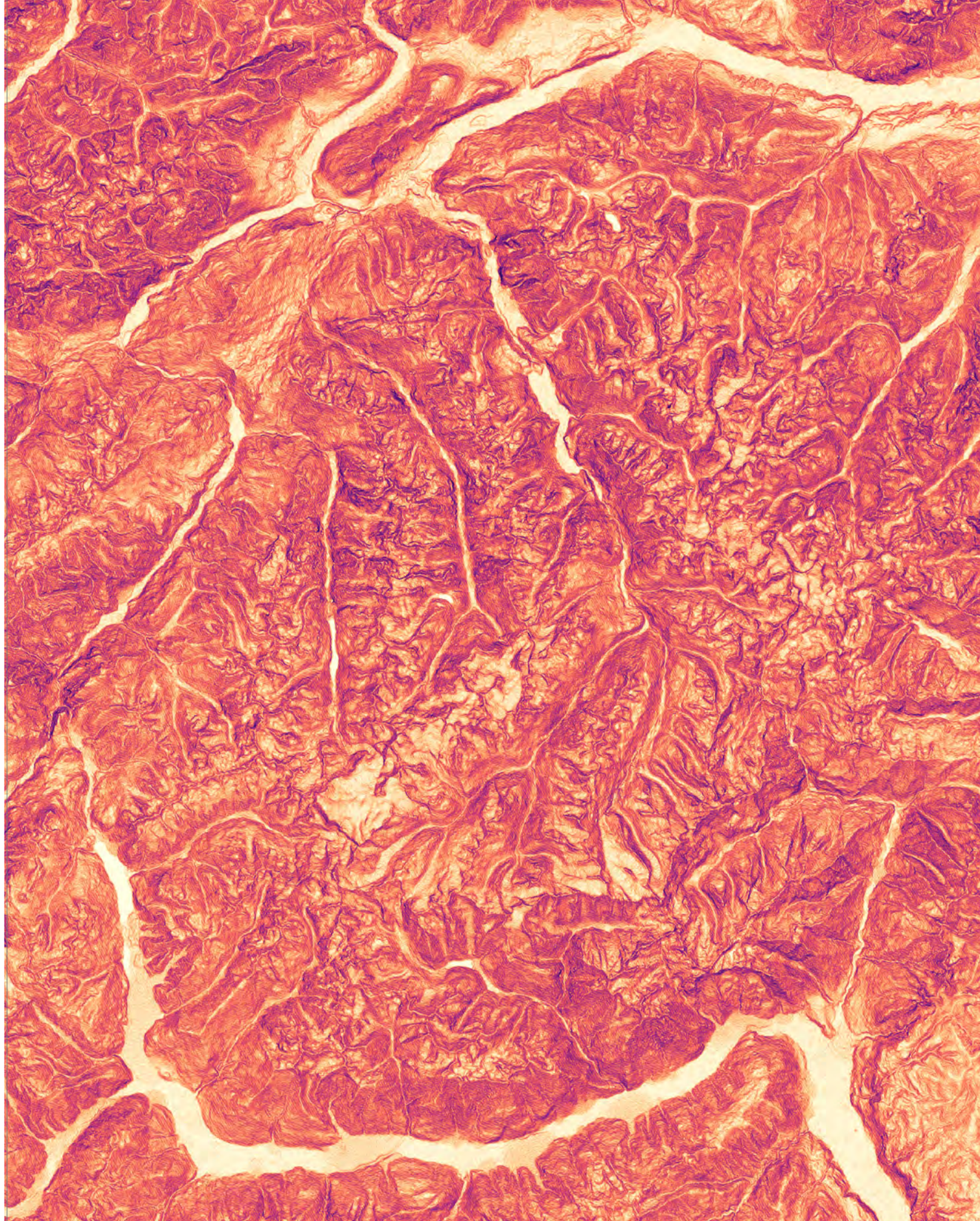
In regards to water, one characteristic of the Alps, which is often disregarded, plays a significant role – the slopes. During my fieldwork in Austria, a Tyrolean tourist guide I had a conversation with in Innsbruck, told me that the impressive mountain sides are often perceived as something that is enclosing and limiting, something that keeps one from seeing further than the mountainous wall. But her perspective was contrary from this general view. She explained that when she sees the slope, when she sees the mountain, she sees the endless opportunities of places that she can go to. This perception of the slope, from the point of view of the valley, displaying a sometimes almost infinite surface of possibilities, is an attribute which is often missing in cartography because of the common orthogonal perspective of maps onto places. Therefore, this space, which has a very steep vertical angle but a lot of surface, gets lost. The maps, therefore, project a wrong image of the surfaces within alpine regions since they do not represent their real spatial attributes. One of the efforts of this thesis is, therefore, to shift the view to the slope and highlight it as an important aspect of alpine territories. Especially when it comes to the element of water.

The slope is the place where the water starts its way downwards, its place of arrival. The slopes’ surface, depending on their texture, lets the water go down either quickly over rocks and other surfaces with low porosity, or keeps the water within their matter. For example, if there is a forest covering the slope, the water will go down slower, which shows the retention capacity of the slope. Therefore, the thesis aims at portraying the slope. The precise making of a slope portrait will be further explained in the chapter 5.5 Design Taxonomy, here is barly a small excerpt in order to give an impression of the endeavor. A slope portrait consists of the various components that a slope may have, which conjointly form the composition of a slope. These are divided into three different states of matter of water – solid, fluid, and gas. The solid water represents the morphological and mostly static elements. This includes for example the orien-

tation or degree of the slope. The fluid waters explain the more vivid elements, like vegetation or the water system, that account for how the slope reacts. Lastly, the gas-like waters show the atmospheric elements, the temperature and precipitation, which are variables that change the conditions of any given slope and are mostly connected to climatic attributes. These different parameters shape the different ways on how water is going to react on the surface and the potentiality of an intervention. For example, snow will stay longer within an area that is sheltered from solar radiation and sun exposure. Therefore, north-facing slopes will store snow longer than south-facing slopes.

One of the main resources of the Alps is, therefore, the uncharted slope areas, which bears all these potentials for reimagining the Alpine landscape and for recognizing the agency that the Alps have. But their role within the web of life, the before mentioned collecting, storing, carrying and sharing of water, is in danger due to rapid global warming and the disappearance of frozen water. Furthermore, the centuries-long human appropriations, result in a non-equitable sharing of water. This puts more pressure on this essential role and agency that the Alps have within the web of life and sometimes makes it even impossible to do so. The next two chapters,, explain further how this system is changing, how humans have been appropriating the Alps, in turn, altering their character and potentiality.






40 | The underestimated potentiality of slopes

## 3.2 Climatic Transitions
### Patterns of movement

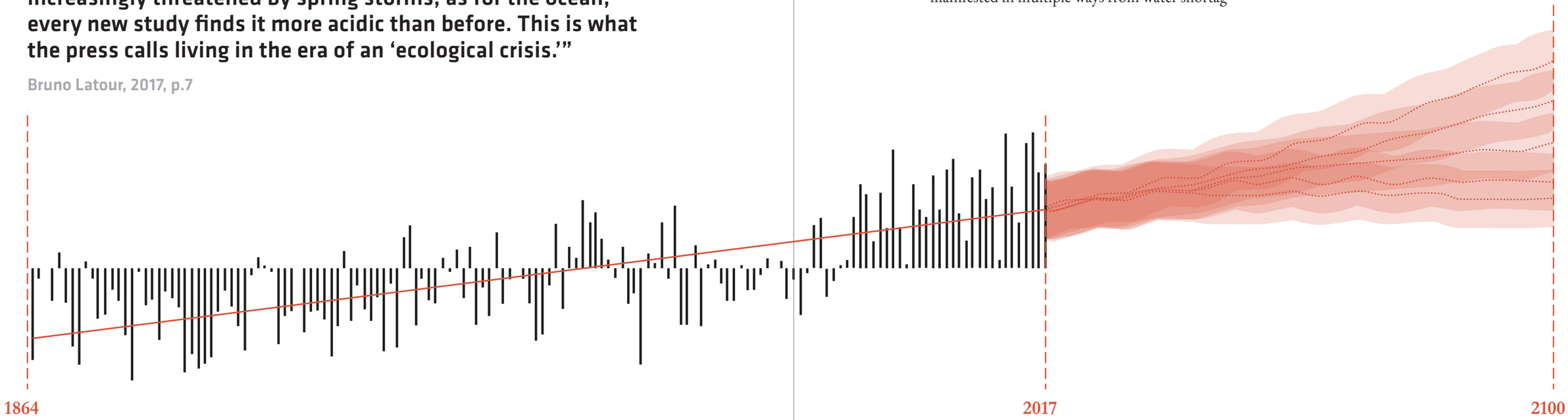
**“It doesn’t stop; every morning it begins all over again. One day, it’s rising water levels; the next, it’s soil erosion; by evening, it’s the glaciers melting faster and faster; [...] Every month, the measurements of carbon dioxide in the atmosphere are even worse than the unemployment statistics. Every year, we are told that it is the hottest since the first weather recording stations were set up; sea level keeps on rising; the coastline increasingly threatened by spring storms; as for the ocean, every new study finds it more acidic than before. This is what the press calls living in the era of an ‘ecological crisis.’”**

Bruno Latour, 2017, p.7



One can see the effects of human-induced climate change in various forms. Compared to other places in Europe the temperature is rising faster. Whereas in Europe mean annual temperatures, compared to the numbers in the pre-industrial times, increased by around 1°C (IPCC, 2022), in the mountains they already rose by 2°C (Alpenconvention, n.d.). This already has manifested in multiple ways from water shortages in rivers and lakes to a lack of snow in winter, and will only continue to worsen. According to the models of the Intergovernmental Panel on Climate Change (IPCC), the increase of temperature is dependent on different emission scenarios (IPCC, 2000). Each degree has disastrous






41 | Temperature rise in Switzerland

decrease of percipitation (2100)

increase of farmland value (2100)

42 | Future farmland value in Europe (data from Van Passel et al., 2019)

consequences on the liveability on earth (IPCC, 2022). The faster humanity manages to bring global carbon dioxide and methane emissions to a halt, the less and for a shorter period of time temperatures will rise on our planet. Therefore, the faster and more rigidly we act, the higher the chances that humanity will still be able to inhabit the planet.

Following a recent report of the Institute for Economics and Peace (2022), an estimate of 3.4 billion people will be living in areas facing catastrophic ecological threats by 2050. With rising sea levels, coastal settlements will be flooded, leaving many people without a home. Furthermore, the increase in temperature will make certain areas in the world inhabitable. This will result in strong migration movements pushing people inland towards more suitable grounds to live.

As the Alps are situated in central Europe, economically valuable cities, the most dynamic being Munich, Zurich, Genf, Marseille, Nizza, and Milan, were already expected to expand into the Alpine territory in the 1990s (Bätzing, 1991, P. 97). According to an interview I conducted with Herbert Formayer (personal communication, 5th of October 2022, Vienna), the continuingly increasing temperatures will result in more daily visitors within the Alps. The comfortable climatic conditions during hot summer days, which will also be more recurrent due to global warming, will provide pleasant cool air during heat waves.



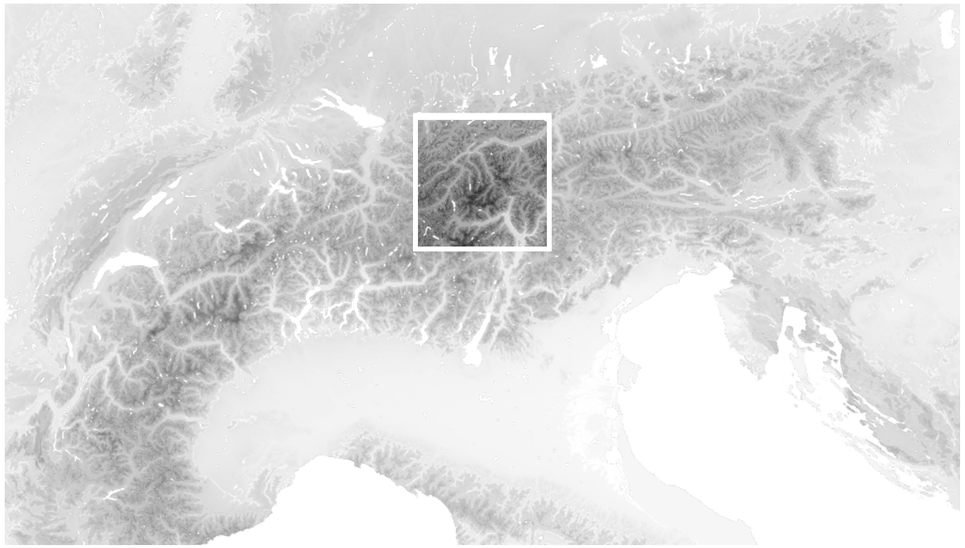
Furthermore, the economic centers close to the Alpine territory are, due to new transit routes and their growing suburbanization, in close proximity to the Alpine valleys and, therefore, in relevant distance for commuters living there (Bätzing, 1991, P. 97). However, rising temperatures do not only burden the Alps. According to the European Environmental Agency (Van Passel et al., 2019), some places in Europe will benefit from the temperature rise when it comes to agricultural land value. The Alps are one of them. Because the territory is getting warmer the "productivity in grasslands is projected to increase" (Adler, C, et al., 2022, pp. 2291). This could make the Alps an attractive place for a future in a more extreme climate.

At the same time, the rising temperatures have an impact on the character of the natural dynamics present in the Alps, which have been described in chapter 3.1.2 Identity. Especially visible will be the increase of the erratic nature. This is caused by an increase in extreme weather events, causing slopes to be more fragile due to an increase in water run-off due to higher precipitation patterns and an increase in floods and draughts. Furthermore, the melting of glaciers and thawing of permafrost is a main symptom of temperature rise in the Alps. This makes mountain areas highly vulnerable to climatic changes and at the same time holder of "high biological and cultural diversity that provide vital goods and services — such as water, food, energy, minerals, medicinal plants, tourism and recreation and aesthetic and spiritual values — to people living in and around these mountain regions and in downstream areas" (Adler, C, et al., 2022, pp. 2291).

The next chapter investigates  the relationships and consequences of melting glaciers and how it creates a risk of diminishing the capabilities of the Alps to share freshwater equitably and steadily. This will put at risk innumerable lives, from the tips of the glaciers to the deltas of Europe, who are dependent on it.

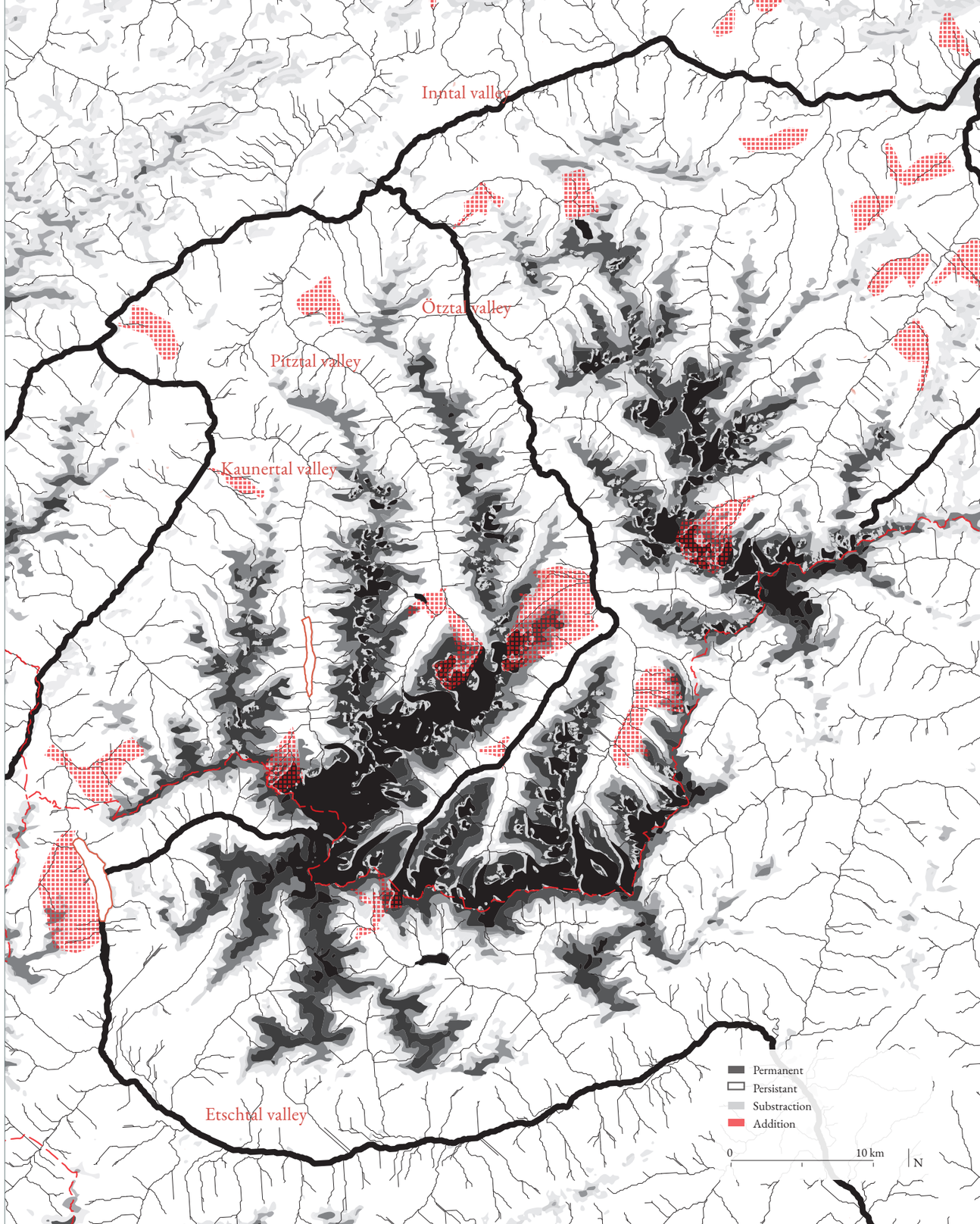
## 3.3.1 Ötztaler Alps
### Investigating juxtapositions

In order to understand the climatic transitions happening in the Alps, the Ötztaler Alps, situated in Austria and Italy, are the subject of this project, exposing and illustrating the changes and possible projections of the future. This region is especially significant, because it showcases a variety of phenomena happening in the whole Alpine territory and throughout its different landscape types – the traditional cultural landscape, the industrial landscape, and the service and mass tourism landscape, which is also referred to as Playground of Europe (Stephen, 1871) – which are further described in chapter 4.1 Patterns of appropriation. Furthermore, one can find there the fastest melting and one of the most excessively researched glaciers of the Alps – the Gepatschferner glacier (Ferner is the term used for glaciers in Tyrol), which is the starting



43 | Location of the Ötztaler Alps
44 | Palimpsest of the Ötztaler Alps (right image)





glacier
permafrost
skiing field
lake
river main drainage
river secondary
small stream
dam

0 10 km N

45 | Watersystem of the Ötztaler Alps



point of the research to understand the influence of climate change in the Alps.
In the northern part there is a rather agricultural based economy, with traditional pastures next to some of the largest glacial skiing resorts, such as the well-renowned Sölden or the insiders' tip Kaunertal. The different approaches become apparent when looking at the landscapes of the Playground. Whereas the Kaunertal tries to become a sustainable recreational valley (Tourismusverband Tiroler Oberland, 2022), Sölden is living the "après-ski life", offering a diverse range of entertainments for excessive pleasure (Ötztal Tourismus & Bergbahnen Sölden, n.d.).

Innsbruck is the biggest city within the Alps and is an important place of research and for young people, who are interested in sports. The river Inn forms the northern border of the Ötztaler Alps and has been subject to many river straightenings and drainages. South Tyrol, thanks to its Mediterranean influence, is characterized by its picturesque vineyards and castles. Throughout the Ötztaler Alps the industrial landscape becomes visible in multiple major hydroelectric storage lakes. One of them is the Reschensee, a place which has been purposely flooded in order to create a water reservoir – the only remnant of the village which used to be in the now flooded valley being a church tower sticking out of the lake.

## 3.3.2 The Gepatsch glacier
## Disappearing landscapes

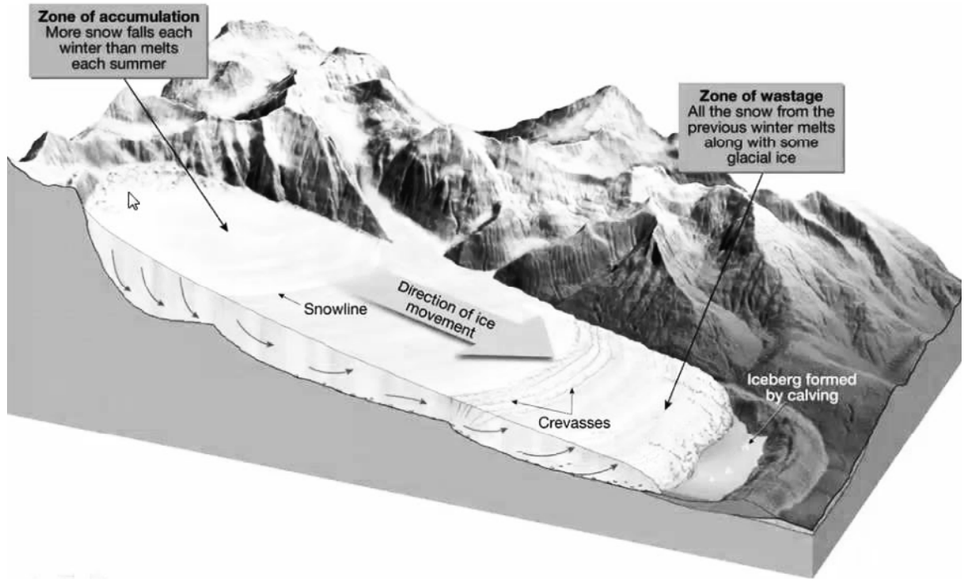
### Life within the unknown

At first glance, glaciers seem to be steady, standing still, when in fact they are moving at a constant, very small pace downslope, through the weight of the ice. They have a nourishing field at their highest point and the ablation zone, which is the zone of glacial decline, at their lowest point, if one of the areas is larger than the other, the glacier either grows or retreats. Once a glacier is not moving anymore, it is declared dead. These are the words that one can read on a memorial plaque which has been placed during their funeral on a rock where the Icelandic glacier Ok used to live: “A letter to the future. Ok is the first Icelandic glacier to lose its status as a glacier. In the next 200 years all our glaciers are expected to follow the same path. This monument is to acknowledge that we know what is happening and what needs to be done. Only you know if we did it.” (Árnason & Hafsteinsson, 2020, pp. 56)

At the end of the Kaunertal valley, one can find the Gepatsch glacier. Once its ice covered the whole valley and extended further out into the Inntal valley, where it merged with the Inntal glacier. During the last Ice Age, the whole territory of the Alps was covered with an ice-stream net. The biggest valleys of the Alps, such as the Alpine Rhine valley or the Inntal valley, used to be completely covered in ice. Only some small, very high peaks would stick out of the the glaciers, like islands, so called nunataks. Through retreat and growth throughout the centuries, they carved V-shaped valleys into the landscape. The net was composed of mainstream glaciers and side glaciers that streamed into the main glacier. Today, these meeting points are visible through so-called hanging valleys, which can be identified through a flat valley that has a steep ending when it enters the main valley (Seguinot et al., 2018).

Glaciers do not only shape the places they are traveling through, they also offer possibilities for life within themselves. A team of scientists (Garcia-Lopez & Cid, 2017) who conducted research on extreme environments such as glaciers and how organisms can cope with them, in order to understand how life could be possible on other icy worlds outside of the earth, described three different kinds of ecosystems within vertical section of glaciers, stretching from the atmosphere to the bedrock. The ecosystems “differ in terms



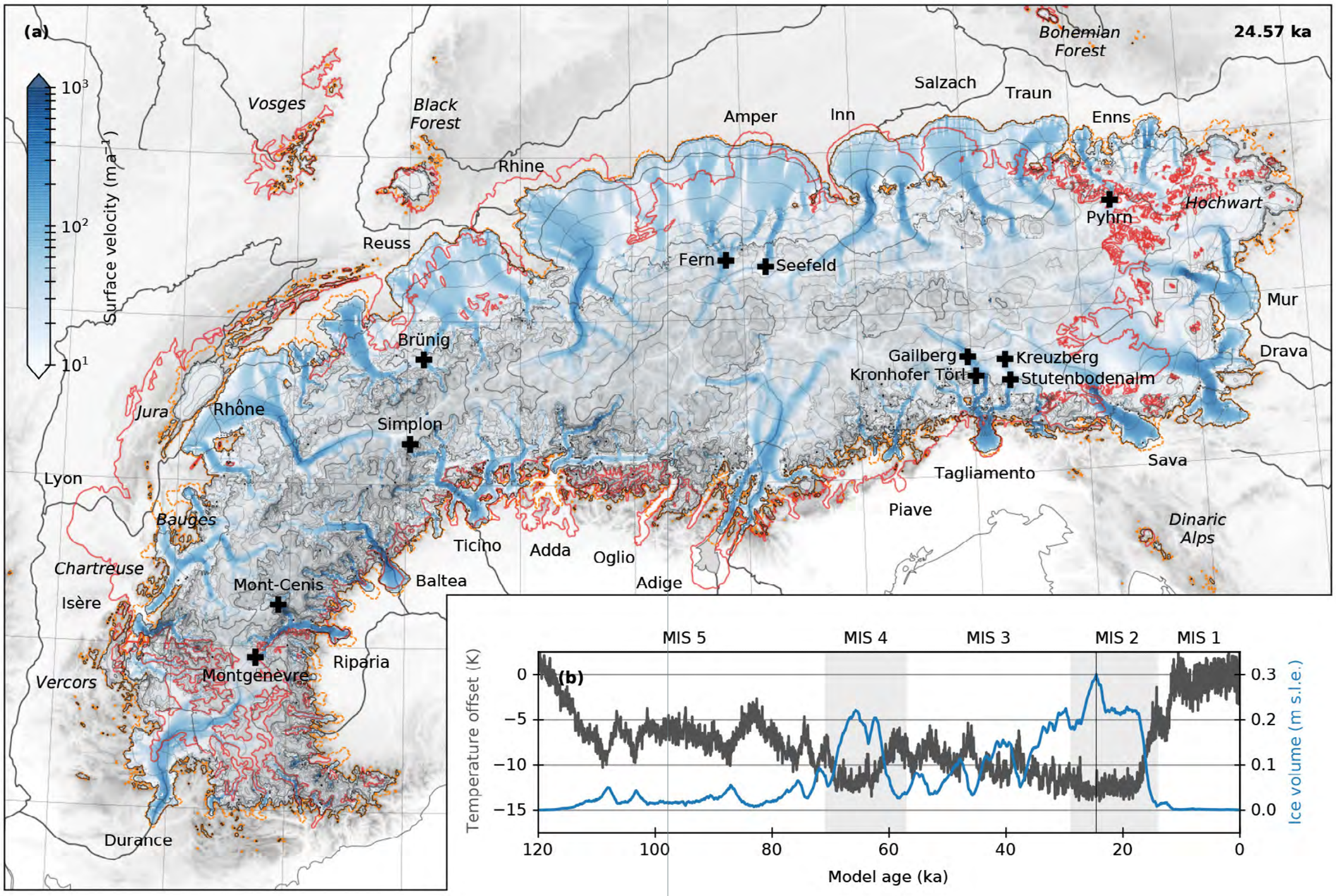



46 | Glacial mass balance (Middlebury Environmental Geology, 2016)

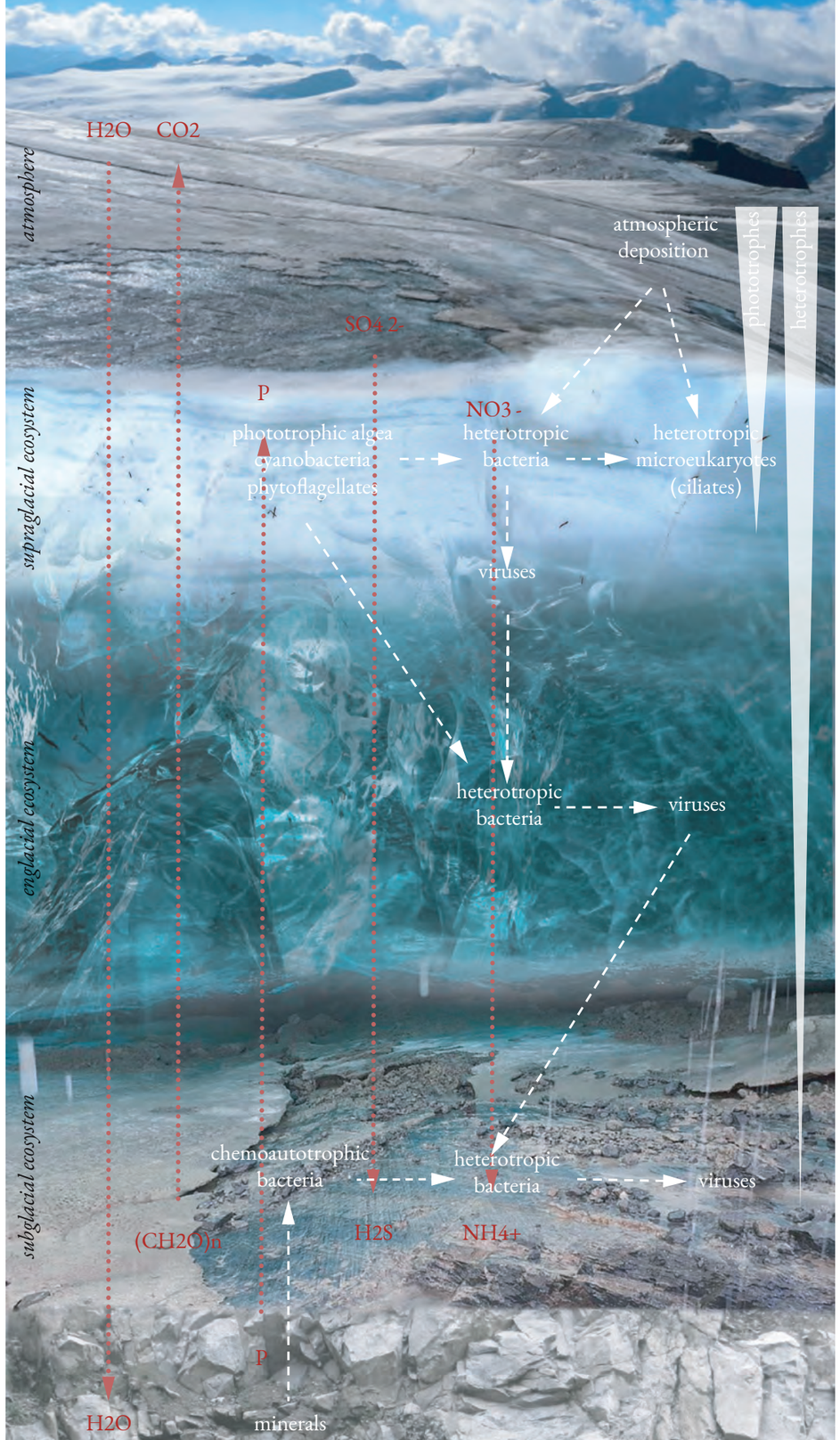
of their solar radiation, water content, nutrient abundance and redox potential” (Garcia-Lopez & Cid, 2017). They are referred to as subglacial ecosystem, englacial ecosystem, and supraglacial ecosystem. Through their research they discovered “a great biodiversity of prokaryote and eukaryote microorganisms” (Garcia-Lopez & Cid, 2017) within the glaciers. They cling to micro-particles of, for instance clay, which were grinded off from the rocks through the movement of the glacier.

The supraglacial ecosystem is positioned at the highest level, the one closest to the atmosphere, within the glacial section. Through solar radiation the ice melts which creates liquid water that dissolves nutrients from neighboring rocks as well as directly from the atmosphere. These atmospheric depositions nourish heterotopic bacteria and microeukaryotes. Phototrophic algae, cyanobacteria, phytoflagellates, as well as viruses, further nourish the heterotrophic bacterias in the englacial ecosystems.

The englacial ecosystem contributes the least to the dynamics of nutrients. The species are low in biomass and live in places that shield them from dehydration and radiation. They cling to clay particles, find habitats in intermediate spaces – for instance gas bubbles, triple point junctions




47 | Last glacial maxium (Seguinot et al., 2018)






or brine channels – or at grain boundaries. They are provided with water and nutrients through mineral substrates. The heterotrophic bacterias are part of the food chain of the viruses in the englacial ecosystem which are connected to the subglacial ecosystem by nourishing the there present heterotrophic bacterias which then again are connected to further viruses.

The lifeforms of the subglacial ecosystems are, furthermore, getting their live sources from rock fragments which provide chemoautotrophic bacteria with nutrients. There are small water streams, which go through the whole body of the glacier until they reach the subglacial ecosystem, where one can find conditions that remind a lot of a river or lake landscape composed out of bedrock and sediments. Where the glacier is not grinding and sanding the surface through its movement, the volume of ice is lifted above the ground, forming caves and other voids. In the subglacial ecosystem, temperature fluctuations are decreased by the constant ice-cover which make them suited places for microbial life. The microorganisms are often for years in a quiescent state until melting water reactivates them, the water acts as solvent of inorganic and organic nutrients which consist out of particulate gasses and matter. Furthermore, decaying plants or soil, from glacial advance periods, provide them with organic carbon, which they need to thrive. There are also bacteria present which live completely without influences from the atmosphere due a metabolism which is chemolithotrophic, thus, they do not need light to survive (Garcia-Lopez & Cid, 2017).

With melting glaciers, especially in Antarctica, scientists are worried that there may be ancient microorganisms in the glaciers that have been kept frozen but may cause harm in the future (Sajjad et al., 2020). The glacier is an almost unknown world, and yet they are silent witnesses of the past and present. They have shaped the alpine landscape, transformed its geomorphology, and release water for life to unfold. It is our source of freshwater, the ocean in the mountains. How will life change once they are dead?

48 | Glacial ecosystems, visualization by author inspired by research on possible life on other planets by Garcia-Lopez and Cid (2017)

49 | Gepatsch glacier around 1920 by M. Frey

## Ablation

One of the most iconic subjects prone to climatic changes are glaciers. They undergo a process of accumulation during winter and ablation during summer. If the accumulation phase is longer and stronger than the ablation phase, it means that the glacier is growing. Unfortunately, due to the climate change, nowadays, except for a few years, all glaciers in the Alps are subject to a longer ablation and a shorter accumulation period, which contributes to their shrinkage (Hartl et al., 2021). Corresponding to the different Representative Concentration Pathway (RCP) scenarios, there are different predictions as to how much the glaciers will melt by the year 2100 and beyond. The different RCP scenarios have been developed through a nexus of emission, concentration and land-use trajectories. These formulate four main possible pathways of radiative forcing by 2100 which are 8.5, 6, 4.5, and 2.6 W/m2 (Van Vuuren et al., 2011).
In a RCP 2.6 scenario two thirds of all glaciers will be gone by then, whereas in a RCP 4.5 around 80% and in a RCP 8.5 scenario almost 100% (Zekollari et al., 2019). However, because of the exceptionally high temperatures during the last few summers, the glaciers may disappear quicker than expected.

Last summer, the 0°C line in the Swiss Alps

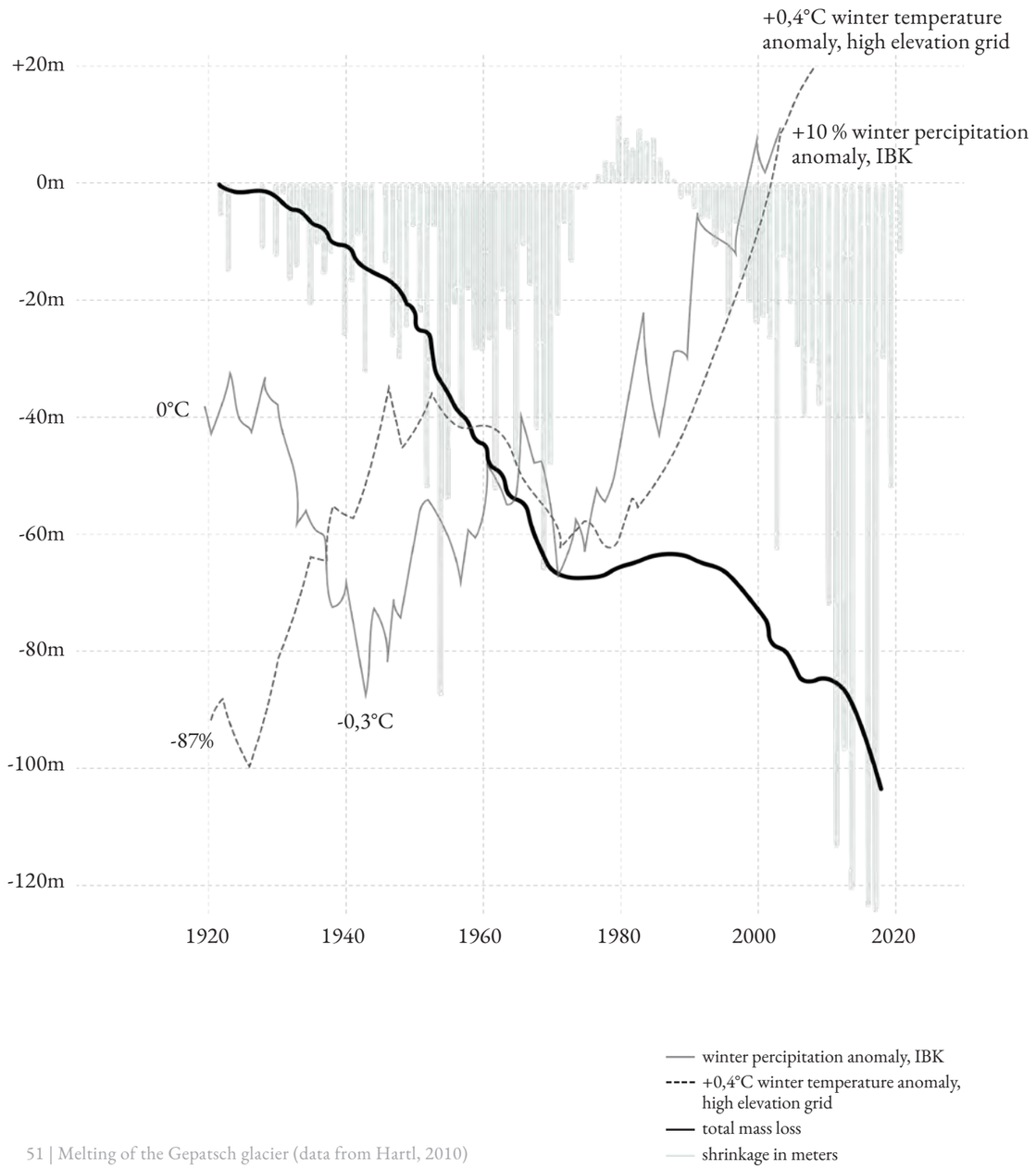


50 | Gepatsch glacier around 2019 by M. Altman

went up to 5,184 meters – it usually is between 3000 and 3500 meters (Farge, 2022). This height lies more than 300 meters above the highest peak of the Alps, causing temperatures too high for all Alpine glaciers. The elevation-temperature relation and the already fast pace of melting indicates that current conditions are already too high on most elevations for glaciers to survive. Lea Hartl, who is a glaciologist at the Institute of Interdisciplinary Mountain Research of the Austrian Academy of Science, warns “even if warming is stopped soon, the glaciers will continue to melt for some time. They are always slightly behind the climate and show a delayed response to climate changes, so a new equilibrium can only come about slowly, if at all” (Österreichische Akademie der Wissenschaften, 2021).

## Changing system

Rising temperatures at this altitude also have an effect on the snow cover. Nowadays, the melting of the snow buffers water availability during warmer seasons. With higher temperatures, most of the precipitation is coming down as rain instead of snow, which leads to an increase in floodings. The overall runoff pattern is changing and the buffering effect of the melting snow decreases. In the first part of the century, the melting glaciers will buffer this phenomena, but at one point the system will change to a non-gla-




51 | Melting of the Gepatsch glacier (data from Hartl, 2010)

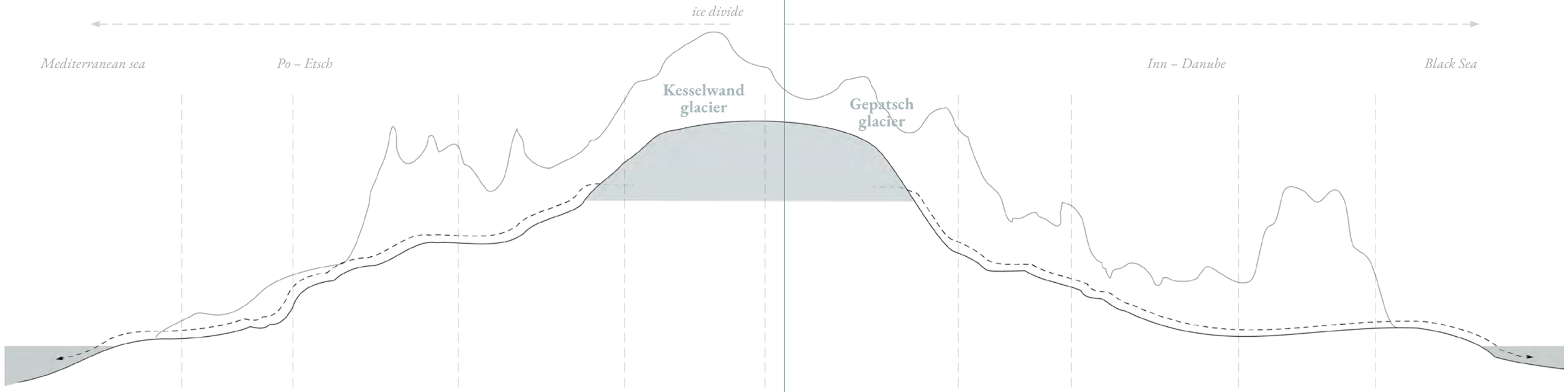


**“I don’t think that glaciers are replaceable. We have to expect a sort of regional tipping point where glacially influenced catchment areas will have to adapt to non-glacially influenced conditions – with all consequences attached. And we won’t be able to prevent that from happening.“**

Herbert Formayer, October 5th, 2022

cially influenced region (Bavay et al., 2013). The locally melting glaciers create a cascading effect that extends through and along the water system into the deltas of Europe. In summer of 2022, droughts already gave a small indication on geo-political and economic challenges laying ahead. On the river Rhine ship transport was hindered and the Po delta in Italy was suffering from a severe water shortage. Also for 2023, the time of this research, there is no easing of the situation in sight with still almost no rain until April 2023, the fear of another drought is rising (Giuffrida, 2023). The lack of water turns the soil dry, depriving it of its ability to absorb and store water. This became horribly true this spring when the northern Italian provinces drowned in rain after the dry winter, also reinforced by a high proportion of soil sealing (ZEIT ONLINE GmbH, 2023). As well as the severe floodings in Slovenia in August 2023 where infrastructures were overwhelmed by the amount of rainfall which usually falls within one month coming down in one single day (Mendonca, 2023). In these changing conditions of increasing extreme wheather events, the adjustments and appropriations during the industrial age, all the river straightening, drainage of the valley floors, or soil sealings, resulted in a water system which is built for a constant yet balanced abundance of water. With the territory changing from a glacially influenced to a non-glacially influenced place, all infrastructures and planning strategies have to be adjusted to this new condition (H. Formayer, personal communication, October 5th, 2022).

In this regard, it is worth delving into conditions downstream to examine what the glacial processes are connected to and how they will be affected by the disappearing glaciers as the 21st century progresses. The Gepatsch glacier is situated at an ice divide, a hydrological division point from which streams flow in different celestial directions, therefore, nourishing different deltas. The Gepatsch glacier is flowing towards the Danube delta whereas the Kesselwand glacier is merging into the Poo delta. In the Alps, along the Alpenhauptkamm – the main chain of the Alps – there are multiple divides, many of them sharing glaciers. In the illustration on the next page one can see the division from the Ötztaler Alps to the Black Sea and the Mediterranean Sea. One








mediterranean basin | Po valley | alpine foothills | alpine zone | high alpine zone | high alpine zone | alpine zone | alpine foothills | carpatians | east european plain


53 | Melting of the Gepatsch glacier



side is following the rivers Inn and Danube through the Carpathian Mountains down into the Black Sea. Major cities such as Innsbruck, Vienna, Budapest or Bucharest lay along the way. It is remarkable to see the proximity the glacier becomes through the visualization and its scope, while it often feels so far away. The journey the glacier takes starts with a small stream, freely floating and finding its way through the stony ground. This freedom comes to a sudden halt when an artificial reservoir appears for producing hydro-energy. After that the river is mostly channeled, with adjacent agricultural fields. Going through various cities and small towns, the stream leaves the Alps behind and enters the hilly Alpine Foothills. Once it crosses the Carpathian Mountains, the space of the river becomes wider, and when it reaches the Delta, the water merges with the Black Sea in Europe›s largest wetland (UNESCO, 2022). On the other side of the ice divide, the water undergoes similar patterns. In South Tyrol a large part of the river is embarked by vineyards. The further one follows the streams towards the Po valley, the more intensive agricultural becomes. Finally the glacier enters the Mediterranean Sea, close to the Venice lagoon.

## Geographical influence

According to Markus Strudl (2021) and Lea Hartl et al. (2021) the smaller the glacier, the more important the topography, since it influences the melting due to, for example, different intensities of solar radiation. Studying the small glaciers which are situated at the Kaunergrat, the mountain ridge between the Kaunertal valley and the Pitztal valley in the Ötztaler Alps, to understand how geographical conditions are influencing melting processes. This will become more important in the future, since large glacial agglomerations are going to, at one point, fall apart and scatter into smaller pieces. What the scientists explain is that if, for example, a glacier is on a North-facing slope, possibly in a sheltered space with little solar impact, it stays intact longer than if it was a South-facing glacier on an open field. Depending on the topography, the runoff water, which is currently stored in the glacier, will form new lakes. Counting throughout the territory of the Alps there could be at least 1500 new ones formed. These glacial lakes bear intrinsic risks for landslide or avalanches, due to their instability and the erratic natural dynamics which can put villages situated underneath the lakes at risk (Bätzing, 2018).

54 | Research project ColdIce (Norbert Span, ÖAW/IGF)



## Storing history

Glaciers do not only store water, they also reveal the climatic conditions of the last centuries or millennia, depending on their age. Each year during the accumulation and ablation phases, they collect precipitation and temperature data. Furthermore, particles accumulated in the atmosphere, from anthropogenic activities or other processes like volcanic eruptions, are being stored in the ice layers (Bohleber, 2019). A glacier is in very slow but constant movement, if scientists want to collect one of those historical records, they have to find spots on the glacier which are not moving. There, they can take a sample, a so-called ice core. These stable points of the glacier are not only valuable places for climatic records, but they also are possible locations for century-old archaeological findings. The force of the glacier usually destroys all objects that are falling into glacial crevasses or get lost on top of them, but within those non-moving places and the rapid thawing of glaciers some of these lost items may come to the surface (Hruby, 2022). The most famous one is *Ötzi the Iceman,* an exceptionally well preserved mummy from the Copper Age (Pinkowski, 2022). The discovery of him shed a light on how people during that Age lived, especially the content of his digestive system explained how their diet looked like and how people preserved food which is closely connected to the functioning of a society. In this case it shed light on the shift from hunters and gatherers to an agriculturally based culture (Maixner et al., 2018). Scientists hope to find more clues about the history of the Alps during the melting of the glaciers. In 2022, a year with extremely rapid meltings, scientists were able to safeguard a goatelope (Hruby, 2022). The finding process is very delicate since the mummies thaw quickly which can destroy the knowledge captured through their preserved condition (Hruby, 2022).

The transition from glacially influenced to non-glacially influenced is going to bring many surprises, challenges and uncertainties. In order to guide the transition from an urbanism perspective, concepts such as the sponge city, in this case a sponge region, are becoming more relevant. The concept of sponge cities has its origin in China and is widely used in order to retain storm water surges. The main idea is to create places, of natural or artificial nature, to capture, infiltrate, and purify rainwater in order to create a buffer within mostly urbanized areas. The interventions work equivalently to sponges that can absorb at times of abundance and release in moments of shortage (Li et al., 2017). Also projects like Room for the River in the Netherlands where the transportation volume of rivers is increased through a variety of strategies that give back space to the water (Francés et al., n.d.), inform the decision making and design processes ahead. The above mentioned concepts couple water management strategies with spatial quality for humans and more-than-humans. They often work with a landscape urbanism (Waldheim, 2022) or a landscape as infrastructure (Belanger, 2016) approach, which work with the potentiality of the land, its ecosystems and species. By taking the bio-geographical conditions into consideration and protecting ecological processes through design, the interventions aim at creating long term carriers of change (Sijmons, 1990). The Dutch regional landscape architecture *Plan Ooievaar* for example suggests a protected network for the river, which is the base of the design, and in between there is space for uncertainty offering possibilities for future generations (De Bruin et al., 1987). The earlier the strategy on how to deal with water changes, the better we will be prepared for the inevitability of the new condition. Natural processes take time in order to grow and should therefore be supported as early as possible. What if the loss of the glacier can be the start of a new ecosystem to thrive?

## 3.3.3 Vegetation Expansion
## Appearing landscapes

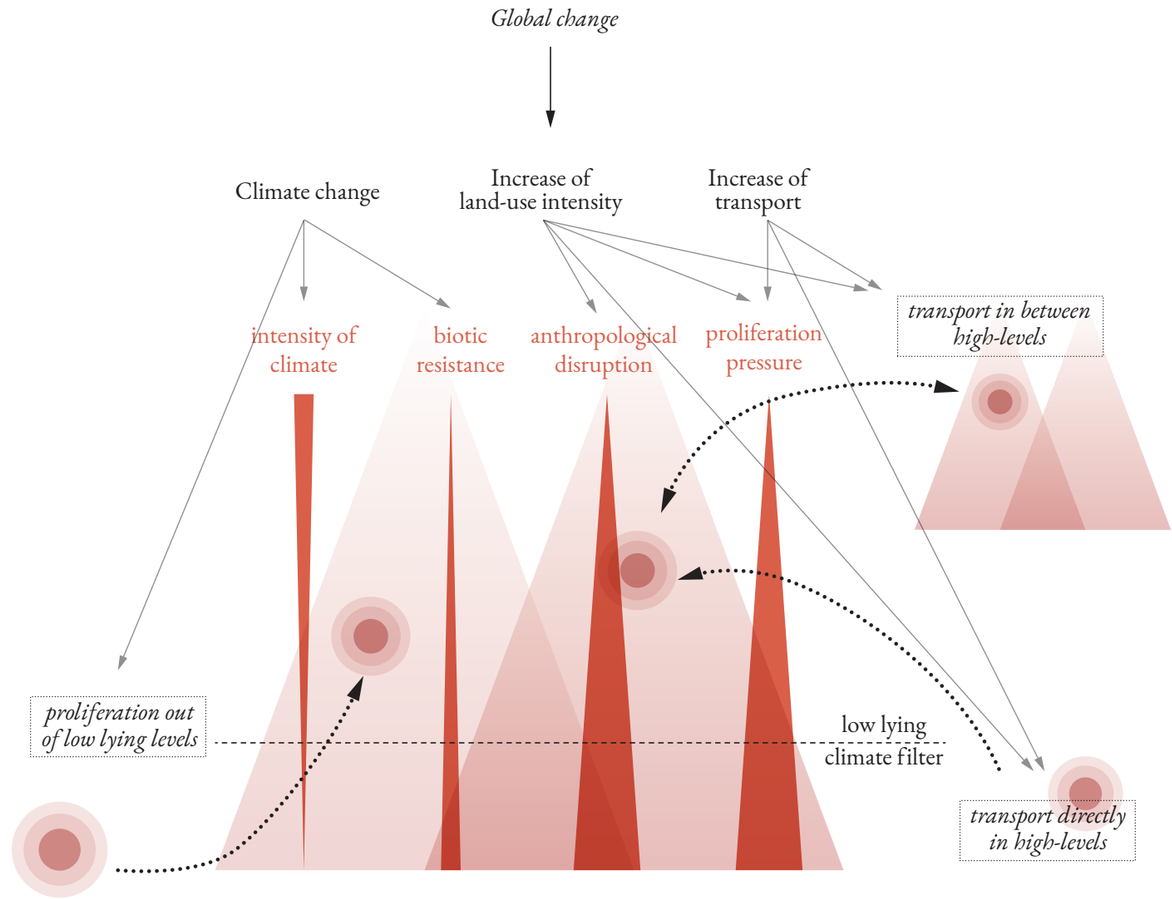
### Fragile fauna

The Alps consist of different vegetation zones which have been described in the chapter 3.1.2 Identity – through the character mosaic-like. The disappearance of glaciers is a symptom of the shrinking of the nival zone. Whereas the nival zone is decreasing, the montane zone is growing (Rumpf et al., 2022). The Alpine vegetation inhabits a range of sensitive plants which adapted to a difficult climate with short vegetation periods, the higher their habitat is situated the more difficult the prerequisites are. They grow in specific conditions and are very prone to external changes and pressures. With rising temperatures the growth period of plants gets longer which increases their productivity and offers favorable conditions for plants to grow. Therefore, the increase in temperature creates an upwards movement of vegetation which gradually unfolds. This becomes visible in the upward shifting of the tree line. The tree line indicates the maximum elevation height for trees to grow. However, plants that grow faster and stronger will over-grow the high-laying and sensitive ecosystems, pushing them upwards or even extinguishing them completely (Haider & Küffer, 2011).

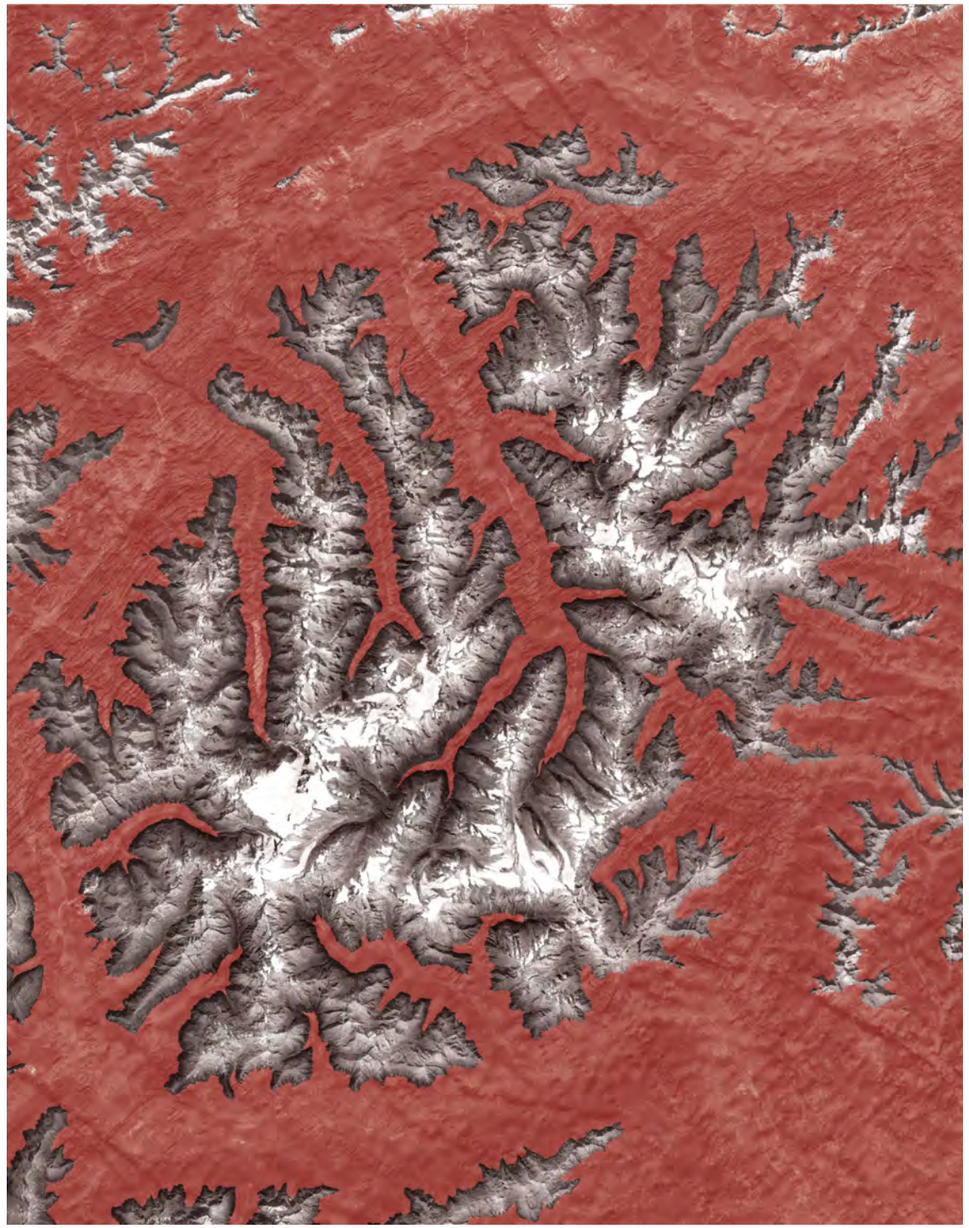
### Pressures of fragmentation

The disappearance of glaciers is, therefore, projecting the attention to the ground, more specifically the soil and the species living within and because of it. With those changing conditions, the relationship between humans and their land, and the awareness and knowledge about it, becomes more important again. Because of global changes, which are putting pressure on species in Alpine regions, the important networks of ecosystems to thrive and reproduce tend to get fragmented (Plassmann et al., 2016). This disconnection can happen through climate change, increase of land-use intensity, and an increase of transport. It puts species under pressure from either the ground or the top of the mountains. For example the intensity of climate has a bigger impact on higher altitude ecosystems whereas anthropological disruption and proliferation pressures tend to come from the valleys. The different pressures force species to move either through low-laying areas into higher grounds, directly into higher levels or in-between high levels. Due to the increasing urbanization of the region and anthropological disruption, wild species have increasingly less space for habitation and pro-creation in the Alps. Creating an almost






55 | Pressures on mountain ecosystems (adapted from Haider & Küffer, 2011)



56 | Increasing pressure on the Alps



island-like situation, where their habitats get limited and lack connectivity. The increase of infrastructural projects, as well as the increasing tourist numbers in high Alpine zones creates even more competition on already scarce ground (Haider & Küffer, 2011).

## Biodiversity

Soil plays a crucial role in providing life for biotic species. Plants grow through the richness of its nutrients and the water it captures, providing diverse habitats. Depending on its configuration it has more or less capacity for water retention and biodiversity to thrive. This potentiality is influenced by anthropogenic influences,which makes it vital to look at soil conditions in order to understand the potential of the ground and the relations between anthropogenic land-use and biodiversity (Dominati et al., 2010). Because of historical appropriation there are some contradicting phenomena happening. The predominant landscape type of mixed forest underwent major appropriations, first, during the traditional cultural age, and further during the industrial age. Because the people in the Alps realized the danger of cutting down too many trees, which leads to unstable ground and therefore increasing landslides and avalanches, they started afforestation programs. In order to not only quickly limit the threats of the Alps' erratic nature, but also gain economic benefits, mostly spruces, which are known to grow quickly, have been planted (Schmidt, 2017). Unfortunately, this resulted in often monocultural forests, which are very prone to bark beetles and have low species richness (Binder & Höllerl, 2017). On the other hand the typical meadows of alpine pasture, which have been maintained over centuries, are often very rich in species (Kampmann et al., 2008). This shows the deep interwovenness of human and natural systems in the Alps and the importance of cultural practices when it comes to future landscape changes (Zimmermann et al., 2010). The next chapter, therefore, dives into

57 | A monocultural spruce forest

## terrestial

(I) Lithosol
a thin layer composed out of rock fragments that were partially weathered

(E) Rendzina
shallow soil where the parent material is usually rich in carbonate or sometimes sulfate – lime clay

(P) Podzol
shaped through iron and aluminium processes occuring on corase textured materials and in mostly cool temperatures and moist regions

(B) Cambisol
less than 50% base saturation, low pH (acidic)
due to low temperature a slow soil formation process or a young parent material

(D) Podzoluvisol
closely related to Cambisol but the formation happens through relocation rather than through weathering

(H) Phaeozem
more than 50% base saturation, high pH (alkaline)
hummus accumulation soil

## hydromorph

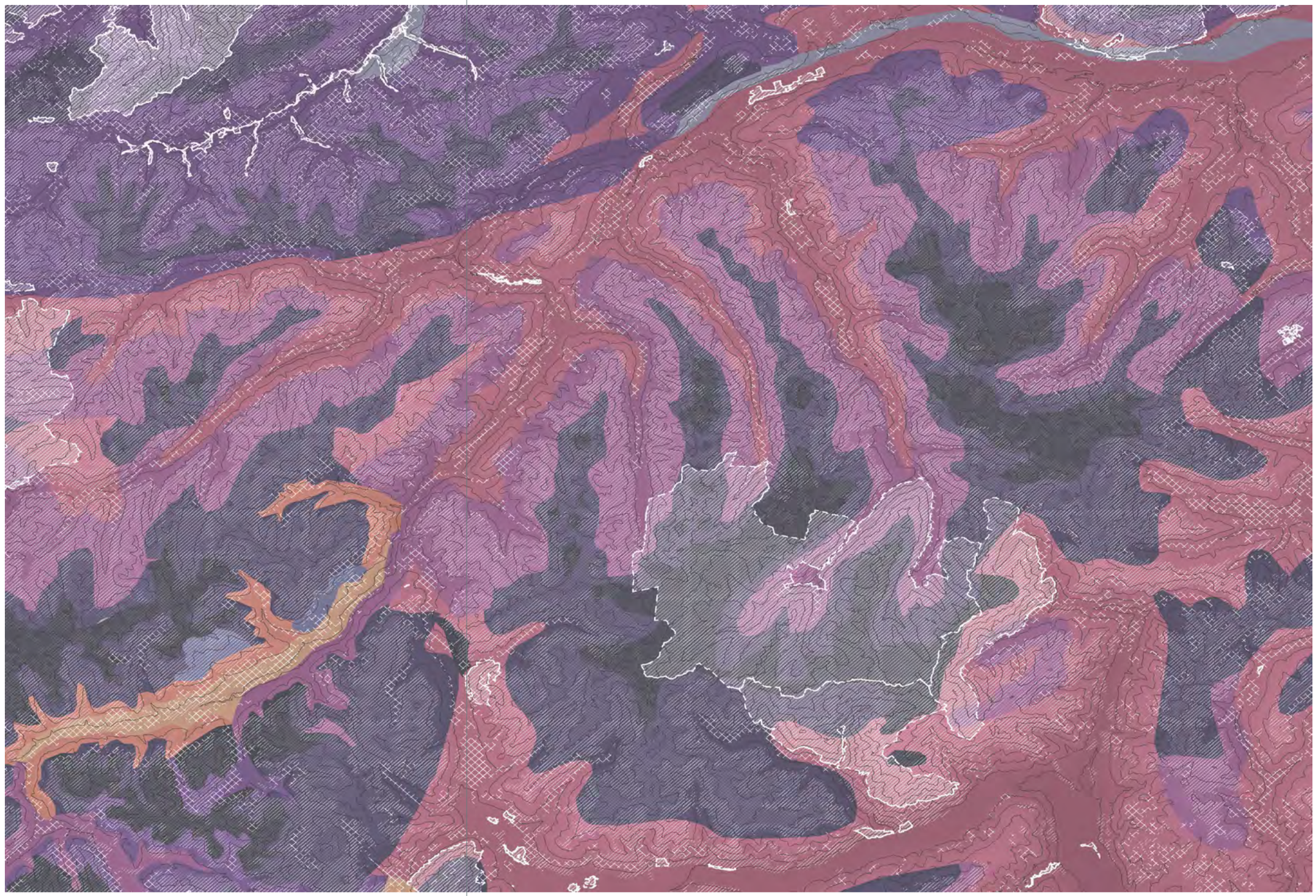
(J) Fluvisol
a young soil that is formed through water deposits, present in floodpleins

(G) Gleysol
especially present in low lysing river basins and other places where groundwater is close to the surface and is threfore wetting the soil for a big part of the year

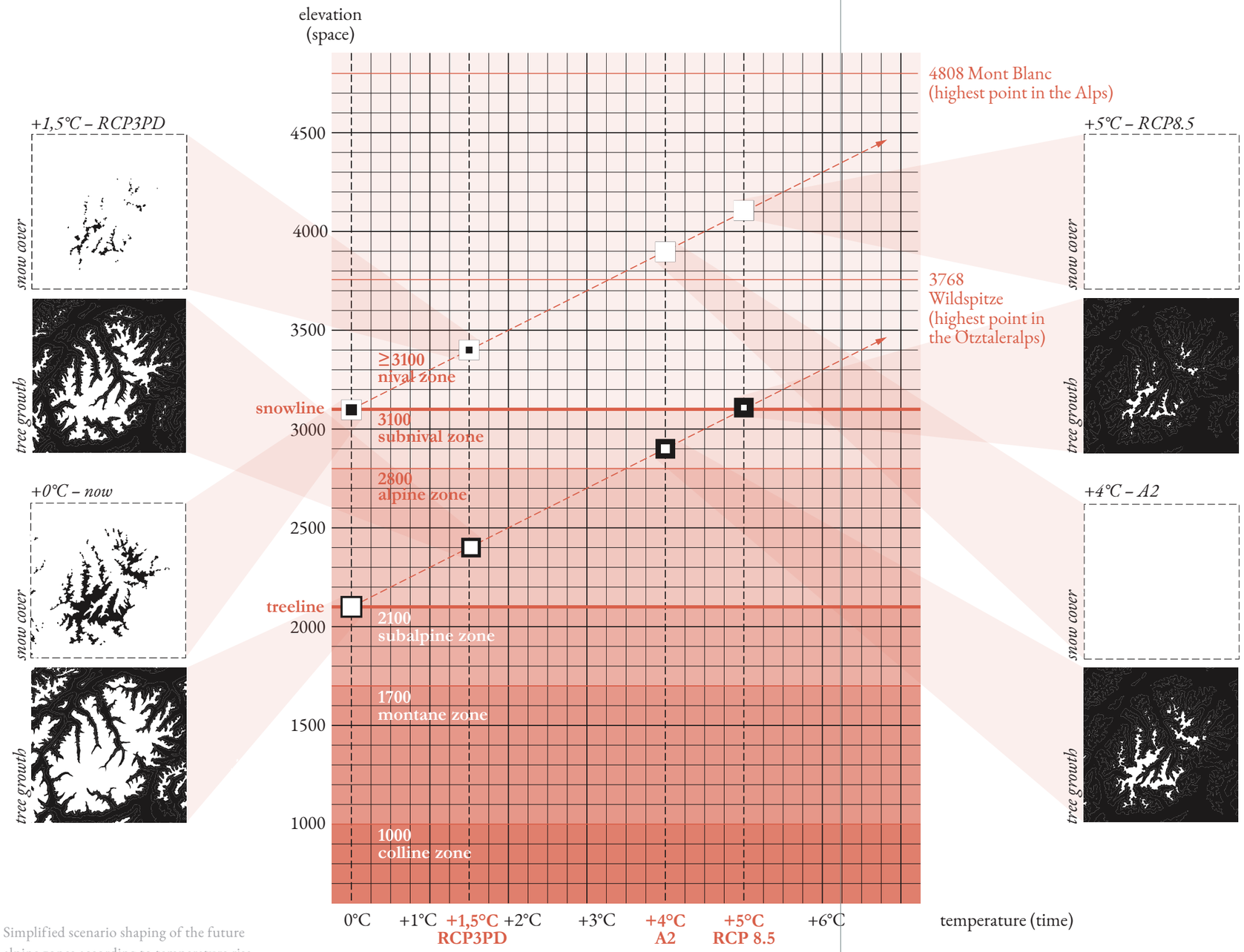
unknown

Natura 2000 (2021)
very rich in species
rich in species

0 10 km N



58 | Soil map and species richness according to land-use (data retrieved from the European Soil Data Centre and Land Copernicus)




59 | Simplified scenario shaping of the future alpine zones according to temperature rise



how the land has been appropriated and what kind of destruction, challenges but also lessons learned the anthropogenic processes brings with it.

## Shifting lines

In conclusion one can say that temperature rise is affecting a very fragile ecosystem. As mentioned before, micro-climatic conditions are created through a close relationship between temperature and elevation. With increasing temperatures habitat zones start shifting. This results in the superseding of high up vegetation zones and the extension of low-lying habitats, visible in a shift from white to green Alps (Rumpf et al., 2022). The two most relevant indicators are the snowline and the treeline. The snowline indicates the elevation for snowfall during summer, which means that all places above this line are constantly in a frozen state and all precipitation falls in the form of snow. This zone is called the “Nival zone”. The second line is the treeline. This is the elevation border for trees to grow and defines the limit of the Subalpine zone. In between the two zones lies the Alpine zone (Deutscher Alpenverein, n.d.). Here one can find the iconic Edelweiss, Primroses, Glacier Butter Cups and the especially colorful alpine lawn – due to a more intense UV radiation (Jaccard, 1912). Depending on the different emission scenarios (Marty et al., 2016), this zone will become subject to big ecological and economic changes.

# 4. Speaking with the Alps
human agency

## 4.1 Patterns of appropriation
### The human regime

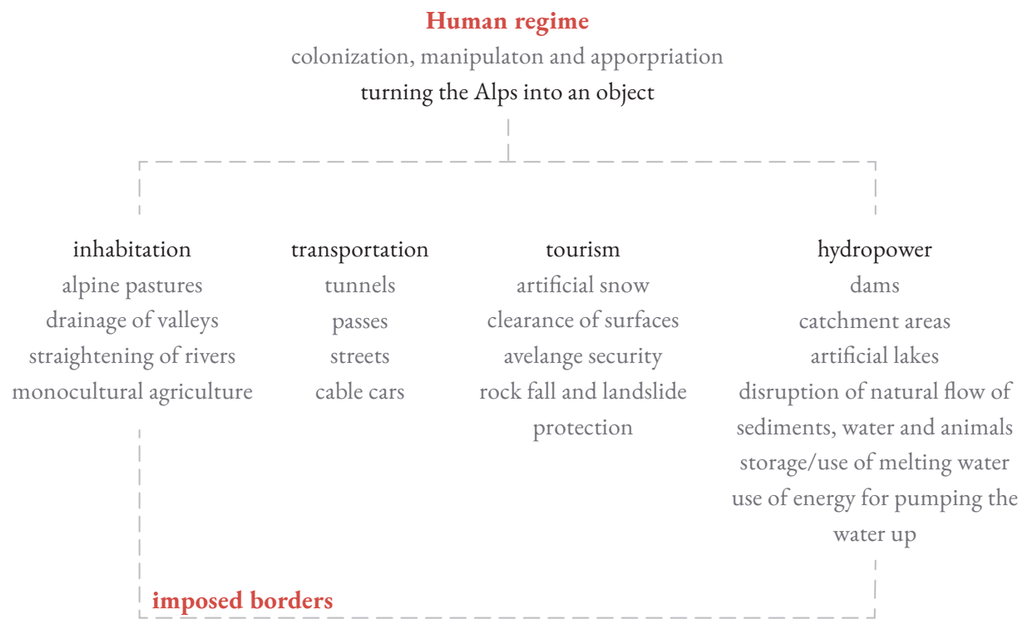
The Alps are constantly formed and shaped by geomorphological processes. Landslides, avalanches and the flow of water are ever changing the landscape. The modern project tries to freeze those natural processes by engineering the territory. The movements of the land are portrayed as natural disasters when in reality they are cultural. The next chapter, again drawing from research by Bätzing (1991, 2015, 2021), explores how the relationship between humans and the land shifted through changes in values and culture and how that influenced the form of the landscape.



#### The land is cultural (Haraway, 1988)

As proposed by Haraway (2003/2018) and Latour (2017) positioning ourselves within nature may help us to ground ourselves, so we may land on Earth. The German architecture and urban morphology theory of Bodenständigkeit, which describes "the quality of something rooted in, or uniquely appropriate to, the soil on which it stands" (Cupers, 2016), highlights the importance of local conditions and situated practice (Haraway, 1988). One of its core assumptions is the relationship between human, culture and the environment. At the same time as the Neue Sachlichkeit, a German art movement, emerged this very relationship turned from a focus on local identity to human behavior and abstract space. "This shift can be thought of as an objectification of [the] environment" (Cupers, 2016). However, the assumptions which developed out of the Bodenständigkeit continued to inform multiple communist, socialist and capitalist political projects as environmental determinism. The connectivity and interrelation between culture and nature has, therefore, always been present.

Defining the land as a palimpsest, a place that is constantly changing through cultural projections or geographical conditions, gives identity to the landscape. Through the recognition of it as a project "the land is semanticized. It can be parsed. It bears a name. Projections of all kinds are attached to it, transforming it into a subject" (Corboz, 1983). If a space gets meaning it turns into a place, therefore, "a place has a memory and some sense of identity" (Kuzniecow Bacchin, 2022) and the value a land can have can only be cultural (Corboz, 1983).




60 | The human regime



**"Its double appearance as a context marked by man and as a place of special psychic relation allows supposing that "Nature", in the West always considered to be an external and independent force, should instead be defined as the field for our imagination. This does not mean that it is at last domesticated, but more simply that, in each civilization, nature is that which the culture designates to be such."**

Corboz, 1983, p.34

## 4.1.1 Wilderness
### Natural landscape until 3000 BC

In its pristine state, the Alps were mostly covered by forests. They acted as a water buffer, collecting and storing rain drops or snow, and balanced the erratic nature of the territory. Furthermore, other wet landscape types such as swamps and marshes or fluvial forests were present. Through large scale clearings forests were logged and space was created for human activities to take place. This shaped the traditional cultural landscape. The further intensification of land-use since the industrial age led to the disappearance of almost all natural landscapes and an extreme decrease in species richness (University of Natural Resources and Life Sciences Vienna, 2020). Nowadays, after many centuries of cultural appropriations, glaciers symbolize one of the last remains of the natural landscape.


61 | Landscape changes (adapted from University of Natural Resources and Life Sciences Vienna, 2020

## 4.1.2 Habitat
### Traditional cultural landscape
### 3000 BC – 1800 AC

**An obstacle**

Because of their geomorphology, being a chain mountain, the Alps often seem like a wall. Therefore, also historically, the Alps have been seen as a natural border – an obstacle. They have been thought of as big giant mountain tops, inaccessible and uncrossable for a very long time. Rather a place of fear called “montes horribles”, where only the inhabitants, thought to be barbarians, knew the way around. The image the Romans painted of the Alps was one of being an overall hostile and dangerous territory and the people living there being more animal than human, missing what the Romans valued the most, culture, in the sense of an urban high civilization (Bätzing, 2018). Only when Hannibal, the famous Carthaginian general, crossed the Alps in 218 BC to attack the Romans, it became apparent to them that the Alps were indeed crossable. The image and the stories of him crossing the Alps with his elephants remain vivid pictures in Alpine culture.

62 | Blown up part of the Udelberg, to make way for the A14 highway (Autor unknown)

After this successful crossing the Romans started to build roads through the territory to connect their capital with London, further expanding their reach. However, they did not bear interest in the territory itself but used it as transit and connector (Bergier, 2013). The Alps as an infrastructural project started with the Romans and expanded over the centuries. Nowadays, there is almost no place which is inaccessible. Almost every hilltop and every mountain has a path that leads along it, on top of it, or underneath it. An abundance of passes take visitors and inhabitants along serpentines on top of mountains and further. Impressive engineering projects like the Arlberg, the San Bernardino or the Brenner tunnel are connecting the North with the South, assuring a fast transit through the biggest moun-



63 | Hannibal crossing the Alps, 218 BC (Tancredi Scarpelli, 1866-1937)

walking paths
highway, primary and secondary roads
trainrouts
tunnel
mountain pass

0 75 km

N

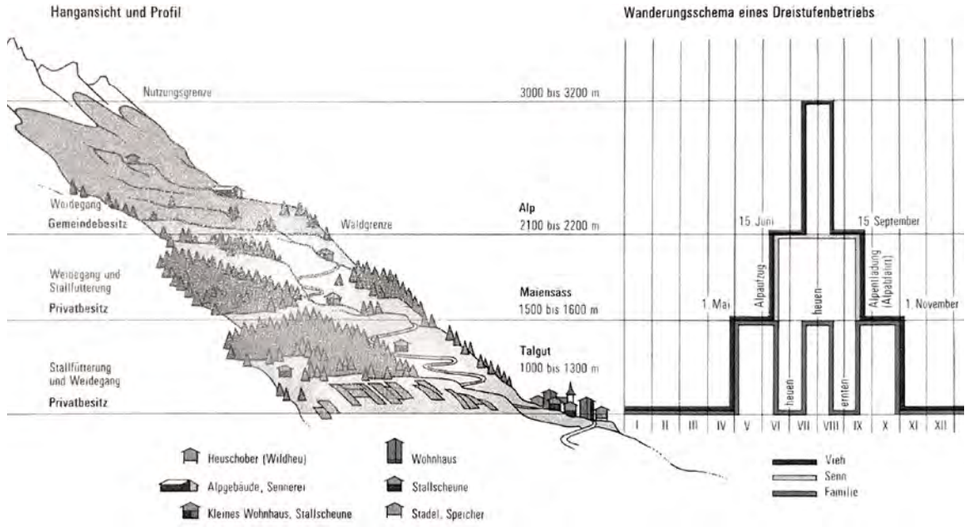
tainous region in Europe. Nowadays, the Alps are therefore seen as a connecting element rather than dividing (Mathieu, 2013).

## Kulturlandschaft

While from the outside the Alps were seen as an obstacle to be overcome, the people that chose to live there managed to turn a place that was formerly mostly composed out of forests and wetlands into a cultural landscape, a "Kulturlandschaft". Today's image of the Alps is a place that has been formed through anthropogenic influences for many centuries. The main foundation for all activities was the regeneration of nature, this resulted in an extremely species rich cultural landscape created through the symbiosis of human activity and their knowledge about a functioning ecosystem, and the work of nature.

65 | Kulturlandschaft in the Kaunertal, Austria (Tiroler Tourismusverband, 2022)






66 | Three field economy of Kulturlandschaft explained (Bätzing, 1991)

By shaping the traditional cultural landscape, the ecosystem has been altered almost everywhere. Even the small meadows were used for grazing and higher up forests for logging trees. The intensity and use differed, for example low laying regions and South-oriented hills were used more excessively.

According to Bätzing (1991) there are three principles of the creation of the traditional cultural landscape and how people tried to stabilize the ecologically fragile landscape and the erratic nature:
Firstly, a very conscious selection of the surfaces that should be turned into cultural landscape and which use they should have. This indicates the acknowledgment of borders for the use of natural resources.
Secondly, a very site-sensitive form of economic use which results in learning the proper measure of nature utilization, basing the economy on regeneration.
Thirdly, an intensive practice of preparation and care work as compensator and balancer for the erratic natural dynamic, and additional precautionary measures that work against these natural processes. This asked for an extraordinary expenditure of repair work.

One example illustrating these principles is the ratio between sheep or cows and land surface, which follows generation-long knowledge about the regeneration of vegetation. The measurement lies in-between too excessively used and

too little intensely used land. Sheep are cutting the grass right above the surface which leaves almost no leftovers and weakens plant growth and cows do not eat grass that is covered by their own feces. These two behavioral patterns indicated the limit for excessive use by diminishing or destroying the ability of the land to regenerate itself. However, if cows or sheep have too much freedom of choice, they only graze on the best weed. Over time a few robust species prevail, diminishing species richness and the feed value of the land. The people further had to take into account the individual preferences of different animals, for example horses enter wet areas whereas sheep and cows rather walk around them. The varied characteristics make a diverse herd the most effective. These kinds of indications had been passed on from generation to generation over many centuries creating a very distinct cultural landscape and a certain aesthetic. Basing the economic system on regeneration, the farmers saw themselves in need of a rotation system, also called three-field-system. The cattle were brought on three different elevation



67 | View on the Vineyards of St. Magdalena in Bolzano, Italy (Shutterstock, 2022)

68 | My cousin Lorenz Lang at the yearly “Almabtrieb” when the kettle is brought down from the mountain at the end of the summer (Daniel Moosbrugger, 2022)

heights, during different times of the year. These were following the regeneration rhythm of the vegetation.

The Alpine pastures that grew out of this traditional cultural landscape are nowadays a valuable contribution to the richness of species and the creation of biodiversity (Bätzing, 1991). The traditions that grew out of this practice are still present and bring together the communities. Pastoring is still being practiced in most countries of the Alpine region. And still today, when the cattle is finally brought back home to the farms, there is a big celebration where old and young come together to celebrate the successful summer, the livestock decorated with flowers and bells. But mostly these traditional practices of agriculture are disappearing and with the Industrial Revolution in the 19th century the inhabitation patterns and the urbanization processes changed and expanded their influence. Intensification of land-use for construction, agriculture, forestry, industry, and commercial use of natural resources once more transformed the Alpine region.

urban settlements
potential urban expansion
snowline 800m (winter)
mountane zone 1600m
(maximum hight for agriculture)

0 75 km

N

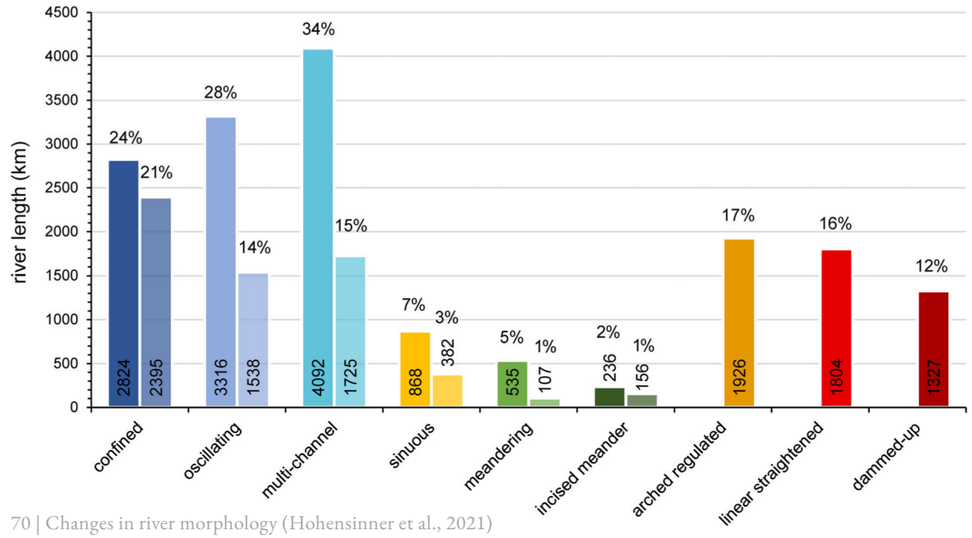
## 4.1.3 Factory
### Industrial landscape
### 1800 AC – 1900 AC

This agrarian culture experienced a sudden collapse in the 19th and 20th century due to the emergence of the industrial society. By introducing social stability, focus shifted to maximizing personal gain which resulted in the overexploitation and decay of the common good, also described as ”the tragedy of the commons” (Hardin, 1968). In the beginning of the Industrial Revolution the Alpine region stayed untouched by it but with the construction of the cross-transit train line in 1854 between Vienna and Trieste the new industrial lifestyle cut directly through the territory. Although it had only a linear spatial influence on adjacent valleys, the construction brought to halt the “Säumerverkehr” (an old trading business that many villages were living off) within a few years. Also, craftsmanship became less and less relevant due to the availability of industrial products. At the same time, the formation of an industrial society led to the emigration of often the most active and engaged inhabitants to urban industrial areas. Through these diverse changes “the period from 1850 until the beginning of the first world war marks the first big decay of the alpine culture and economy” (Bätzing, 1991, p. 93). Followed by a decay during the period after the First World War until The Great Depression in 1929, and the time after the Second World War. Only tourism, transit and industry managed to be three countermovements to the decay of economy and culture in the Alps. Alpine tourism started to emerge with the growing wealth in Europe, increased energy demand attracted industrial factories to locations where hydro-energy plants were appearing in the region, and trans-alpine train lines created a linear benefit to adjacent valleys. The new developments created an economic and demographic movement from the mountainous areas into the valleys because of their newly gained favorable locations. The factors‘ punctual nature increased the juxtaposition of urban and rural in the Alps (Bätzing, 1991).

#### Abundance of water

Another big change for the landscape since the industrialization was a large number of river straightenings and the drainage of valley floors. Whereas in the early 19th century more than a third of all rivers were multi-channel, by 2017 the number decreased to 15%. The formerly free-flowing rivers were either linearly straightened, arched regulated or dammed-up






70 | Changes in river morphology (Hohensinner et al., 2021)

71 | Confined river

72 | Oscillating river


73 | Multi-channel river


74 | Sinuous river

75 | Meandering river

76 | Incised meander river

71 – 76 | River morphologies retrieved from Hohensinner et al. (2021)

potentially artificial snow
dam
catchment surface
lake
river
≤ 1600m altitude
≥ 2000m altitude
permafrost > 2400m altitude

0 75 km

N

77 | Water infrastructures in the Alps

78 | Dammed river in Switzerland (Jérémy Toma)



(Hohensinner et al., 2021). This gave space to agriculture and settlements, which favored the movements towards them. Nowadays, it is often difficult to renaturalize rivers because the space is already occupied (Internationale Rheinregulierung, n.d.).

Due to their height difference, the Alps offer many possibilities for hydro-electric power. In the energy transition, hydro-electric power is seen as a great opportunity to make the shift to sustainable energy alongside wind and/or solar power. Many of the hydropower plants function circularly with the water being pumped up at night when there is less energy demand, and in peak hours the turbines can produce energy on command. They are completely independent of external influences. Other hydro-electric power plants work with runoff water or rainfall and melting water from glaciers and snow. Additionally, there are river power plants that produce energy through the velocity of water running down the stream. Whether hydropower can be a sustainable alternative energy resource for the future is constantly being discussed, for it also has some negative consequences (Frey & Linke, 2002). The construction of dams and catchment lakes leads to different forms of erosion downstream which have consequences for water resource preservation and human safety, increased danger of flooding and ecological damages, for example the loss of habitats, especially affecting aquatic ecosystems, and a reduced biodiversity in floodplains (Habersack & Piégay, 2007).

## 4.1.4 Playground
### Service industry
### 1900 AC – present

With the emergence of the tertiary sector the division between rural and urban increased further. The landscape changed, on one hand, into highly dynamic and economically active places, which are neither urban nor rural due to their sub urbanization, and on the other hand already structurally poor regions lost their economic activity and turned into passive spaces. The rural culture of these places completely vanished and led to some valleys being entirely depopulated.

The industrial as well as touristic appropriations of the Alps led to a projection of an image of urban ideas about the rural culture and landscape onto the rural. Therefore, the act of representation is of utmost importance especially because of the diversity of inhabitants and cultures present in the territory and their distinct perception of it. Some mountain regions were rejective, others were affirmative towards the projections coming from the outside. It remains difficult to give voice to the villagers of the 19th century which would give insight into the diverse local Alpine livelihoods and values. What can be said is that there is a strong incline between people living on mountainous grounds and on the valley floors (Mathieu, Boscani Leoni, 2005).

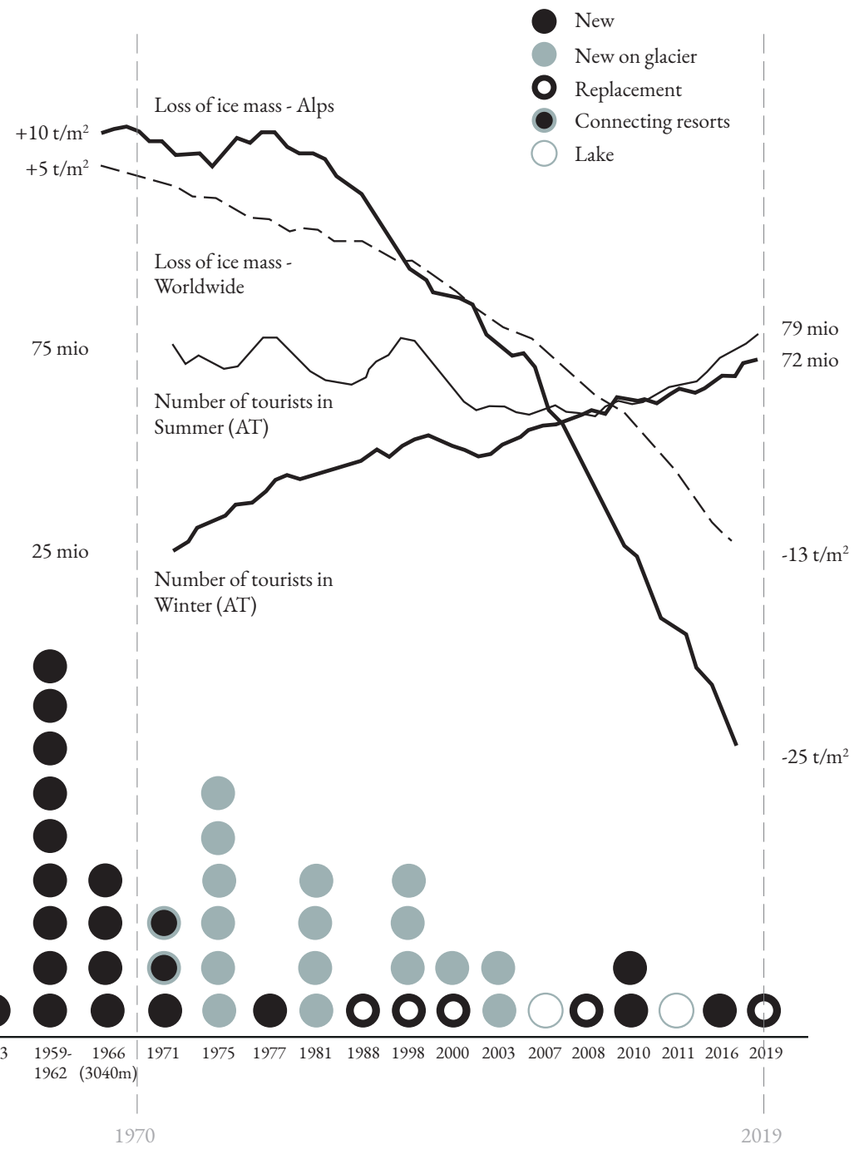
The service industry also gave a head start to mass tourism which developed approximately half the Alpine space and turned the Alpine region into a European recreation and leisure space, just like the book “Playground of Europe”, published in 1871, by the English gentleman and mountaineer Leslie Stephen had been suggesting. This brought new environmental, economic and cultural challenges, turning the Alps into a recreational park.

Especially the emergence of skiing tourism resulted in huge infrastructural projects with cable cars going through natural protected areas and on top the highest mountain peaks. In addition to the apparent intrusions, the preparation of a skiing slope needs great adjustments of the surface and subsurface. This includes the clearance of forests, the installation of water drainage lines, the protection of unstable slopes that could bring about avalanches, rock falls or landslides, and so on – resulting in securing mountain walls and steep slopes in close proximity to the resorts. Often, those protective elements are carried out not only for tourism, but also for villages.


79 | Sölden pistplan (Bergbahnen Sölden)

Mass tourism puts a lot of pressure on other forms of life and on the health of the ecosystem. One can see forests dying due to intense car traffic, which causes air pollution. The air which is trapped in the valleys can hardly escape, unlike in flat terrain. Furthermore, tourists use exceptionally more water, up to 10 times as much as the local inhabitants, causing a lot of pollution of water. Especially high laying amenities are a critical factor, because the ground has little natural filtering capacity and, therefore, pollution goes directly into the lower laying valleys, accumulating there (Bätzing, 1991, P. 154). Furthermore, the excessive expansion of land-use for tourism centers and accommodation pushes out farms and the inhabitants themselves. The locals can no longer provide the monetary needs that international investors can come up with, pushing the cost of living in some valleys to the levels of the city center in Munich.

Recently, I have been talking to a friend I studied architecture with who is living in Warth (C. Jug, personal communication, December 29, 2022), which is a skiing resort in the Arlberg region of Austria. She told me that the only




80 | Growth of sking industry, 1948–2019, Sölden, Austria

river, lake, permafrost
skiing resort
urban agglomeration

0 75 km

N

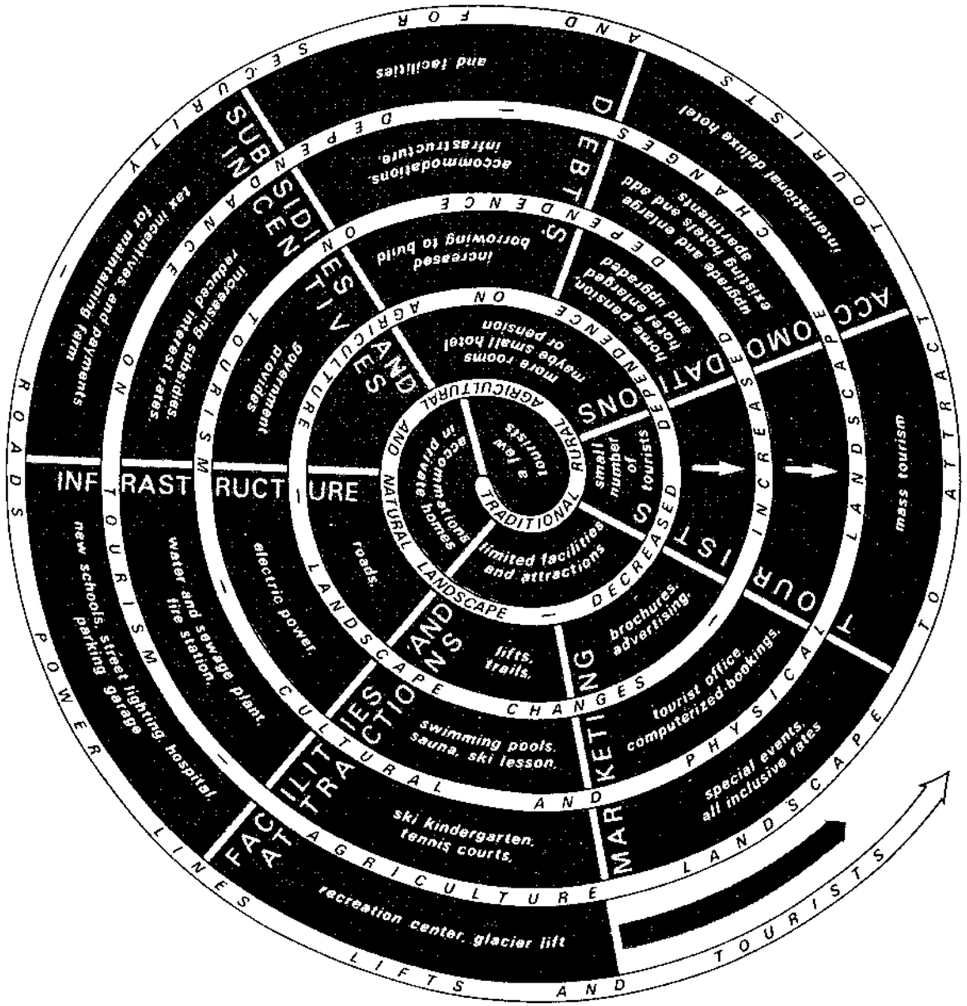
possibility for her and her family to stay in the place they grew up in, and where their ancestors have been living forever, is to invest into tourist accommodation. There is, according to her, not one flat for a family available in the whole town, urging them to combine their own living with tourism housing. On top of that, they are not able to pay for the construction of the building themselves, because the bank requires financial security, which pushes them to sell the individual apartments to foreign investors leaving her with a maintenance role. This illustrates the present socio-cultural problems indicated by Bätzing already in 1991. The above described phenomena (figure 82) have been visualized by Herber Kariel (1989) as a "spiral of economic and infrastructural growth and landscape changes under the influences of tourism" (Kariel, 1989, pp. 66) which increases the path-dependencies of tourism villages. Although the service industry created a new appreciation for the Alps, there are three main reasons this development was, and still is, problematic for the Alps. Those are also highly connected to other challenges of globalization and modernity.

Firstly, the appreciation came from the European level which did not put into the center the quality of life for the Alps' inhabitants but was linked to an "urban logic" coming from economic views from the outside.

**"The disregard of the Alps as an independent natural and cultural space is the reason why an inner and substantive relationship between modern Alpine use and the Alps is not established at all, why the existing natural and cultural-historical potential of the Alps is either not used at all or is exploited in the short term, and why fundamental social, cultural and ecological problems are inevitable."**

**Bätzing, 1991, p.209**






82 | Spiral of path-dependencies in Alpine tourism villages (Herber Kariel, 1989)

83 | Pitztaler glacial cave (Daniel Zangerl, SRT)

Secondly, the disregard for the work of nature by humans since the Industrial Revolution leads to processes and practices that are not based on regeneration. The accumulation of capital wealth depends on the appropriation of unpaid work or energy by the planet (Moore, 2015). So called ecosystem services are a form of commodifying the unpaid work of nature. These are being appropriated through resource extraction which often results in exhaustion. There are four sources of cheap profit-gaining domains – food, energy, raw materials and labor-power. When a limit is reached, through for example new laws which limit the exhaustion, one can observe a shift in the economy to one of the other "four cheaps" until exhaustion is reached once again (Moore, 2015).

Thirdly, the distinction into different sectors in the service industry, and the so-called modernity we are living in right now, results in specification and separation of domains which lack interaction and, therefore, a holistic view. This problem has also been observed by Latour (1993), which is why he is questioning if we ever have been modern.



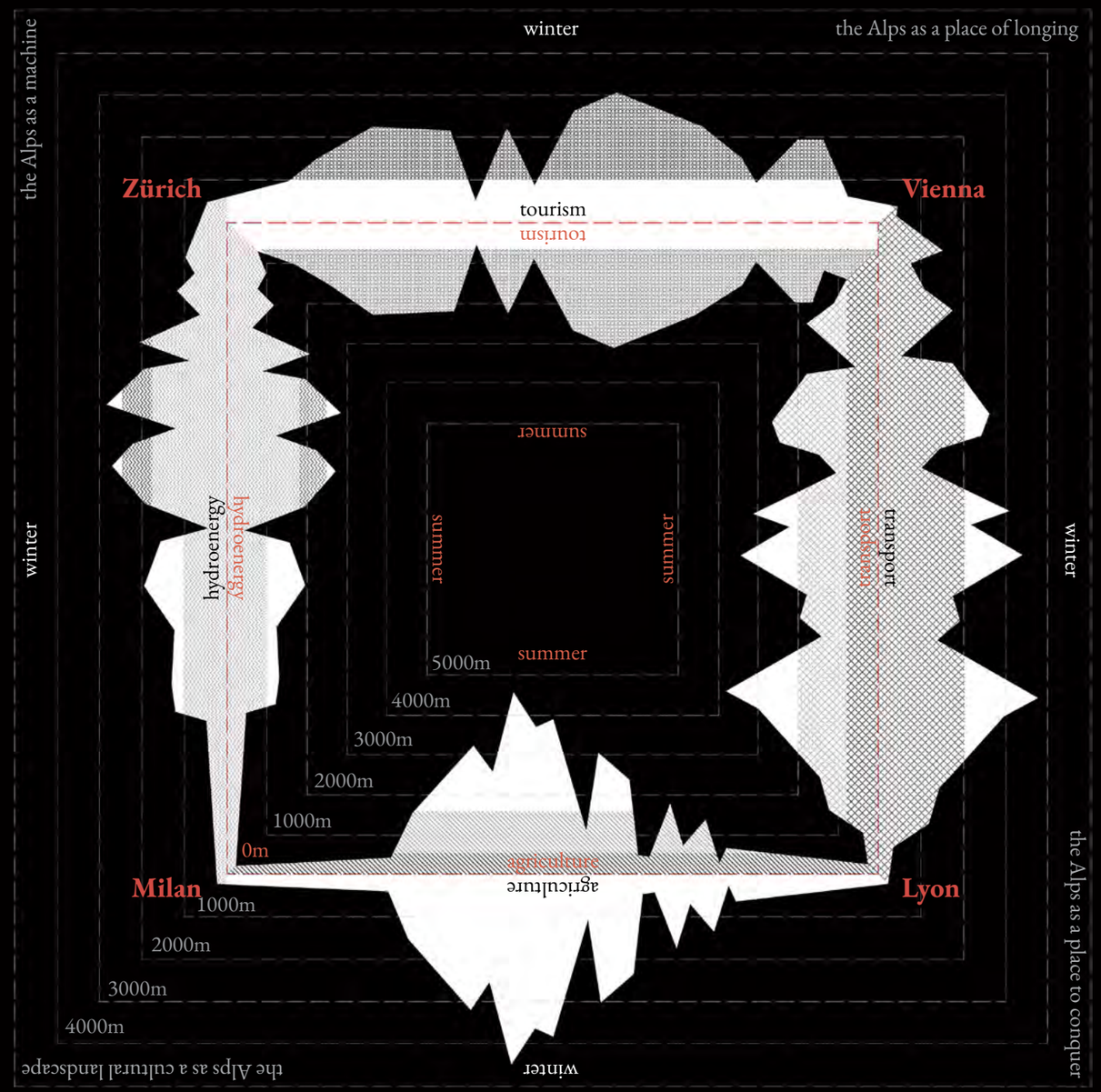
84 | Scars in the landscape, Dolomites, Italy (2022)

For the people living in the Alps "the central cultural problem is the fast change of values" (Bätzing, 1991, p. 160), which leaves them "overwhelmed and disoriented" (Bätzing, 1991, p. 160). Bätzing described the social conflict caused by a fast change of values, which, according to him, puts people of the older generation in conflict with the values of the new generation; their sense of responsibility for the common and caring for each other stands in the way of personal development, creating cultural contradictions. This results in insecurity for unfolding one's individual and social identity and often leads to numbing or escapism. Signs of that are alcohol as a socially acceptable drug, psychopharmaca as an individual drug, for especially old women, and with adolescence, apart from alcohol, also the use of other drugs (Bätzing, 1991).

Depending on the different emission scenarios described in chapter 3.3.2 The Gepatsch glacier, a big part of the infrastructures supporting the Playground landscape will eventually become obsolete. This will have extreme impacts on the Alps as the Playground. The scenario drawn in figure 86 is based on scenario A2 in 2085 described in Marty et al. (2016) – continuously increasing population and a low economic rate of growth are assumed and the CO2 concentration reaches roughly 860 ppm (slightly lower than RCP 8.5 scenario which assumes 940 ppm). The snow security is defined through economic profitability for skiing resorts which means at least 30 cm of snow for at least 100 days between 1st of December and 15th of April (Marty et al., 2016). The consequences of temperature increase raises questions of feasibility for the future of the skiing industry, especially because of the increasing need of artificial snow production (Steiger, 2010). How much more energy will be needed to produce artificial snow in order to create stable conditions? What kind of landscape will come after? And can it grow out of the nature of the place rather than from an imposed image from the outside like it has happened previously?



85 | Human appropriation patterns: the image shows the synthesis of human appropriations according to elevation and season. Drawing a section from Zürich to Vienna to Lyon to Milan and back to Zürich the profile goes through the whole alpine range and all its crucial parts. On the outside it shows the intensity of use during winter and in the inside during summer, each according to elevation. Each side of the quadrant shows a certain appropriation. These human patterns create different images of the Alps.




0m line and division between summer and winter

altitude in meters

**activities**

transport

tourism

hydroenergy

agriculture

intensity of activity

snow free areas
areas with security of snow (2085) 2400m
glaciers
Skiing resorts
Skiing infrastructure like lifts and cable cars
soft skiing infrastructure
main roads
train tracks
complete road system

0 10 km N

# 4.2 Field work
## The Austrian Ötztaler Alps

### 4.2.1 Introduction

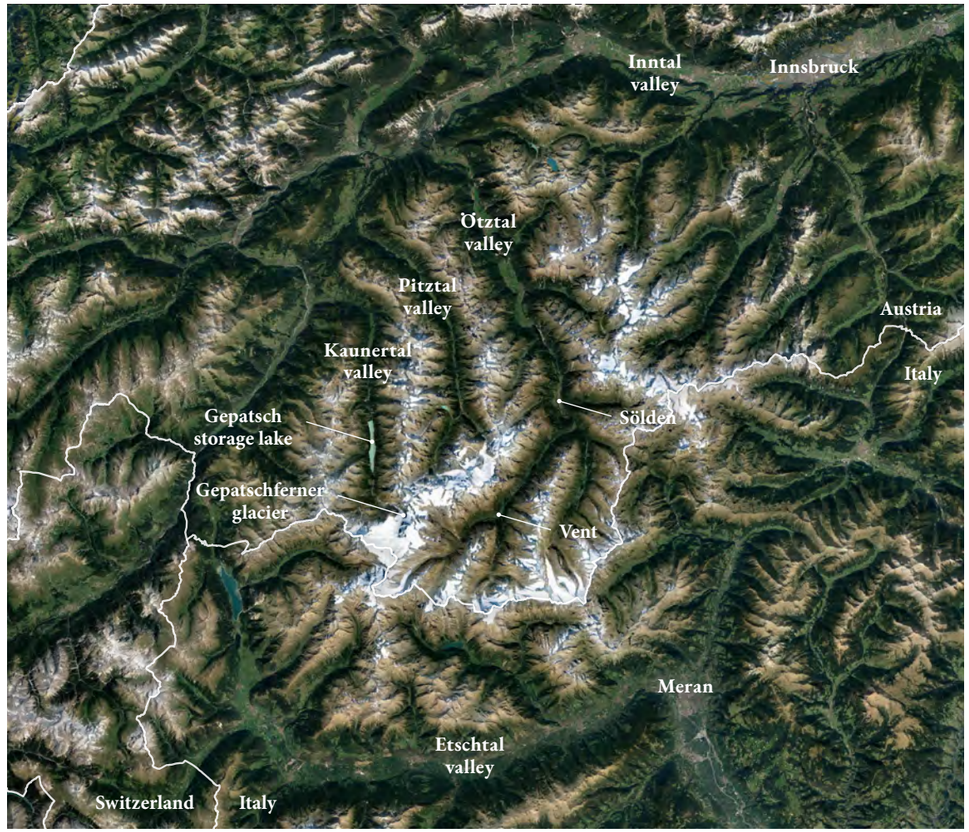
In order to find guidance from within for cultural repositioning, I conducted fieldwork in the Ötztaler Alps. As described before, the Ötztaler Alps are situated in Austria as well as Italy. The border of the nations goes through the main body of the mountain range. The range has a circular form with two main valleys, one being the Inntal valley in the North Tyrol in Austria and the other one being the Etschtal valley in the South Tyrol in Italy.

The Gepatsch glacier, as well as other glaciers around it form the center of the mountain range. From there linear valleys merge into the two main ones. All valleys were shaped through glacial processes, well readable in the traces they left in the landscape. In my fieldwork I focused on the northern part, the Austrian Tyrol, of the Ötztaler Alps. I investigated in depth three places: Innsbruck, the Kaunertal valley and the Ötztal valley. There, I have talked to many different people, who live or work in the region. I decided to investigate those three places in depth, because despite their different nature, they are all connected through the Gepatsch storage lake extension project.

Innsbruck is the capital of the region, its biggest urban center as well as the place from where decisions are taken – the place of power. It is situated, as the name suggests, in the Inntal valley. Innsbruck is known by Austrians as a University and Alpine research city right within the mountains, therefore, attracting many young adults for their studies who are often interested in outdoor activities such as climbing, winter sports or skating. Innsbruck is the biggest city within the Alps and lies scenically right in front of the Nordkette – North Chain – which is a constant companion while going around.

The Kauertal has already been introduced multiple times throughout this thesis. Its steep slopes are covered by spruces which protect the small villages along the V-shaped valley. At the end thereof resides the infamous Gepatsch glacier explored in this thesis. I visited, especially, the village of Feichten, which is the last one. From there the Kaunertal valley glacier road – Kaunertaler Gletscherstraße – leads all the way up to the glacier. On the road one passes by the, also in this thesis often discussed, Gepatsch hydropower storage lake.






87 | Overview of the Ötztaleralps

The Ötztal is especially important when it comes to mass tourism. The most famous place is Sölden, one of the largest glacial skiing resorts in the Alps. The mass tourism within the impressive mountains, as well as the almost untouched Ötztalerach river, which will be suffering from the Gepatsch storage lake extension, makes it a fascinating place of juxtapositions.

During the fieldwork I recorded still-video clips and conducted a number of interviews with locals and experts. This is an excerpt thereof and a small preview of the documentary film which is going to come out of it after the thesis project. The full report of the fieldwork, describing each day and all conversations, can be found in the Appendix 1.

## 4.2.2 Voices from the Ötztaler Alps
### A photo documentary

**“I have the impression that many people think, „I don‘t care, climate change won‘t reach me anyway, a few islands will sink somewhere where I don‘t want to go anyway, but why do they settle on an island at all?“ So to speak. It won‘t affect us and it won‘t affect my children.”**

Petra Paolazzi



88 | Highway through Innsbruck

89 | The northern chain and the city

90 | Zaha Hadid‘s ski jump (top)

91 | Construction of a new hydroelectric power plant

**“If tourists are disturbed by the cowbells, then the cows don’t wear them anymore. But when people are bothered by these airplanes, where the windows roar from half past five to half past eleven at night, every three minutes, no one cares. We only talk about tourism and tourism. But I think there is something else in life than just tourism. At least there should be. When I came to Innsbruck, almost 40 years ago, I asked, “ Where is there an ice skating rink? I am not a skier. I don’t like it.” I thought they would beat me to death there.”**

Woman from Poland living in Innsbruck”

92 | Innsbruck from above

**“The Alpine region is certainly one of the most densely populated mountain areas, you probably won’t find it almost anywhere else in the world.”**

Lukas Loacker

**“I love the Alps because I do a lot of sports in the mountains. The Alps are a huge playground and a therapy for me.”**

Lukas Loacker

**“The great thing is that it’s so close to the city, the Nordkette, and that city life is so well connected with nature. That’s what’s unique about Innsbruck.”**

Woman from South Tyrol living in Innsbruck

**“I love all seasons. In winter, most importantly, I love everything. Without the seasons, it would be boring. And so we have a lot of variety. I think that‘s good. When the first flowers are out in spring. When it gets green again and the day gets longer, that‘s great. Then the summer, when you go mountain climbing and swimming. And autumn, when everything changes color again. It is quite beautiful here. There are a lot of larches in the direction of Obergrugl. And they lose their needles. And in autumn it is like gold. The whole forest is like gold. It looks so great. In winter we have had very little snow. (...) But it is nature. (...) You can‘t change it.”**

Librarian of Sölden


93 | Skiing resort in Hochsölden

**“The magical thing about the Ötztal, that‘s something I look forward to every time I drive in, is that the Ötztaler Aache is so beautiful because it‘s not yet diverted into reservoirs by the power plant industry. And the Ötztaler Aache is different every time you pass. According to the daily rhythm, because if it was warm at noon, then the water melts, then the ice melts and then the glacier melts. And then it‘s roaring at four, five in the afternoon and by six in the morning it can be trickling again. That goes up and down like that in the daily rhythm and anyway, when it rains or there‘s little water in the winter and a lot of water in the summer.”**

Niko Hofinger



94 | Ötztalerach river

95 | Modernistic skiing resort in Hochsölden (top)
96 | Traffic on Sölden‘s main street

97 | Traditional houses in Hochsölden

**It‘s essentially a negotiating space, such a valley. And I think that‘s what will be the biggest challenge for the future, that people negotiate with each other, as a collective.**

Ernst Partl

**“The tourism industry is without design. It somehow designs itself. That is design through chaos. Somehow a lettering is put on it and it fits. And next year the new one. That‘s what architecture looks like. It‘s actually horrible, but at the same time it‘s totally grown. It has something organic in its ugliness.”**

Niko Hofinger

98 | Small dam near Feichten, Kaunertal


99 | Glacial skiing resort Kaunertal (top)
100 | Village Feichten, Kaunertal

**One has no claim on landscape, just as one has no claim on people. There is no claim. You simply have to understand that you are part of the whole. As soon as one formulates a claim, I place myself above the object. And that is, I think, what we are doing now.**

**Economic systems have shifted and applied attitudes, which may already be useless in the lowlands one to one into the Alpine regions. The problems there, are naturally stronger, because there is less space and, therefore, more challenges in the distribution of interests and resources.**

Ernst Partl



**Certain cultures that have lived with nature in unity, they have always just taken out as much as they needed and leave the rest there with the consciousness, so that it revitalizes again so the next year there is enough for the harvest again. That is of course a great principle, where you survive, because you are aware that you need the other system, that you can survive yourself, that's why you protect that. (...) we in Tyrol don't have it like that (...) the farmer has once cleared a clearing, so that he has his food for his cattle. (...) Then they somehow worked it out together, how much may be cleared, but there was certainly not the nature in the foreground, but that everyone has the same amount and not one farmer has more than the other.**

Petra Paolazzi

101 | Gepatsch storage lake

102 | Gepatschferner glacier

**Then you have these village powers that usually culminate in the mayor's office. (...) Then the political figure is at the same time the biggest entrepreneur. (...) The reason why Tyrol has developed politically so long, so unchanged, is that the people are now better off. With the reward, the revolution is postponed. (...) If things don't work out, you have to look for alternatives, but they are not automatically more environmentally friendly or sustainable, they are emergency plans.**

Niko Hofinger

**What has formed the Alps the way they are today, it's this whole glacial dynamic. And I think you can see that very well today, especially in the high alpine areas with all this melting of the glaciers (...), that certain areas are simply becoming unstable.**

Lukas Loacker

## 4.2.3 Conclusions

### Projection

During the interviews, a theme that was often repeated was projection. This notion was linked to a few parameters, such as: time, urban and rural urbanization, and scale. Especially the theme of urban projecting an idea of the rural onto the rural has a big impact on how or if people feel empowered and how the landscape is being appropriated. This comes from a romantic image of the rural that has to be kept alive by all means. Prohibiting the people living there from changing their living conditions or the landscape because of its aestheticization. At the same time, this objective was countered by the argument that the people who are the closest to the landscape can also hurt it the most. Apparently, this is coming from a historical perspective—the fear of having less than the other. The aspect of time therefore becomes relevant because the greed people develop in this way of thinking only satisfies short-term needs rather than long-term goals. This has led to the destruction of the landscape by local people for economic benefits. In regards to farming, this movement is being supported by EU funding for farms, which has made the traditional objective of reproduction obsolete. Another projection becomes visible in the scale of power. What emerged from the research is a top-down power structure where goals or aims on a larger scale are projected onto a smaller scale, often leading to huge infrastructure projects that do not benefit the local people or ecology. In sum, this means that in order to bridge the projections from outside on to the inside and from past to future, decisions have to be made collectively from within, while keeping in mind the long-term goals for the health of natureculture.

### Structure

The structures of the places offer possibilities for imagination. Whereas the valleys can, on one hand, be seen as dead ends, others suggest seeing the glacial areas as meeting and connecting points. This perception comes from when life took place mostly in the mountainous valleys and not in the valley floors. Back then it was easier to travel over the mountain into South Tyrol rather than through the wet valley floors. This also used to be the preferred economic orientation. In recent years, however, regionality has become a popular concept, with, for example, the “pleasure ambassador” in the Ötztal, which strengthens the local cuisine by building on regional products and education. What is important to highlight, is the diversity of  different valleys, which makes them all unique. And even if the steep mountains may, as some said, keep people from seeing beyond and make foreigners feel closed off, the huge vertical surfaces can be seen as places of possibilities that give freedom to their inhabitants. As well as the many roads that, from one perspective, lead to human appropriation in almost the entire territory and, from another perspective, offer a unique accessibility network for scientists to research the Alps.

### Irreversibility

When it comes to future projects, especially the infrastructural constructions that come along with them, it is important for the developers to consider if the landscape interventions they deem necessary are reversible or irreversible. Skiing fields situated on slopes, for example, are reversible within 20 or 30 years. The regeneration and formation of ecosystems of, for example wetlands, is taking way more time. This theme was especially often mentioned when I enquired about the new hydroelectric plant. This aspect of time as value obliges us to question the doings of the industrial landscape and aim to reverse certain actions. This is already being done, for example, through river regeneration projects. At the same time, the shift from an agriculturally based economy towards tourism and the emergence of it as mass industry brought about an extreme housing crisis within especially the village of Sölden. Pushing out locals because of skyrocketing prices. The destruction and containment of natural dynamics and cultural practices call for a different way of relating to tourism, for example, with soft tourism, as it is being practiced in the Kaunertal, which is based on getting to know the landscape, the species as well as the culture.

### Limits

Giving respect to the natural landscape means accepting its dynamics and one’s own limits. This statement was unilaterally agreed on by all interviewees throughout the fieldwork. One has to know the dangers and that the weather, and therefore, the conditions change quickly. We have to know our personal physical, mental and knowledge limitations such as stamina, fear of height, or the ability to read the landscape to indicate the probability of avalanches. Apparently, there is also a problem with trash,

especially when it comes to tourists. Therefore, for many, it was important to mention that one should leave the mountain the way one entered it. The dynamics of the place become visible also in risk zoning maps, which indicate the places where, for example, there is a high possibility for a landslide, avalanche, or flood to occur. In, for example, the Kaunertal valley there are no places left for further construction in safe areas, on the contrary many buildings are already in risk zones. Through the current paradigm of economic growth developments for extensions of housing are, nevertheless, often planned in those areas. Consequently, this puts people at risk and asks for further protective infrastructures on slopes or riverbanks to counteract. Furthermore, the investment into tourism accommodations can provoke a vicious cycle of investments, originating in new skiing infrastructures to attract more people and in return a necessary increase of housing in risk areas which attracts more tourists which yet again asks for an extension of the skiing resort.

## Belonging

There was a very strong sense of belonging from the people. Especially the question: “What do the Alps mean to you?” was, yet again, filled with emotion and connectedness to their own lifes and selves. The sublimity that people are bearing within themselves is very strong. They felt deeply connected to the place,  it seems to balance their emotions, and gives them strength. The connection between nature and culture is really strong in that place. Throughout the research people opened up on the importance the Alps have within their lives and how much they care about them. It is their home. I was impressed by the mountains and their power. Even after a few days I could, as well, feel a connectedness with them. It is possible that it was also the case because I feel very close to them through the research and my growing up, but nevertheless, the care for and belonging to the Alps was a shared feeling of me and the people I was in contact with who were living there. It revealed a shared Alpine culture of belonging to each other and to the territory of the Alps.

103 | Water flowing  below ice formations

## 4.3 Path dependencies
### Expansion of the Gepatsch storage lake

Human appropriations, as shown above, have a centuries long history in the Alps. As in many other places around the world, nowadays, the patterns follow economic profit-oriented development. The best way to explain current paradigms and the necessity of breaking the associated path-dependencies is by showcasing a project in the Ötztaler Alps, in the Austria region of Tyrol, which has been planned as well as heavily criticized since 2006: The transformation of the Gepatsch storage lake into a pumping storage lake (TIWAG-Tiroler Wasserkraft AG, n.d.-a). The Gepatsch storage lake is one of the biggest hydropower lakes worldwide. Its dam



104 | An image of the pasture which used to be where the Gepatsch storage lake is now (Hotel Kirchenwirt)

is 153 meters high and 600 meters long and the lake has a capturing capacity of around 140 million $m^3$ of water. It collects the melting water of the catchment area around the Gepatsch glacier and produces 661 GWh of electricity per year (TIWAG-Tiroler Wasserkraft AG, n.d.-b). As a comparison, an average person in Austria consumes around 8000 KWh (0,008 GWh) per year (Statista, 2023).

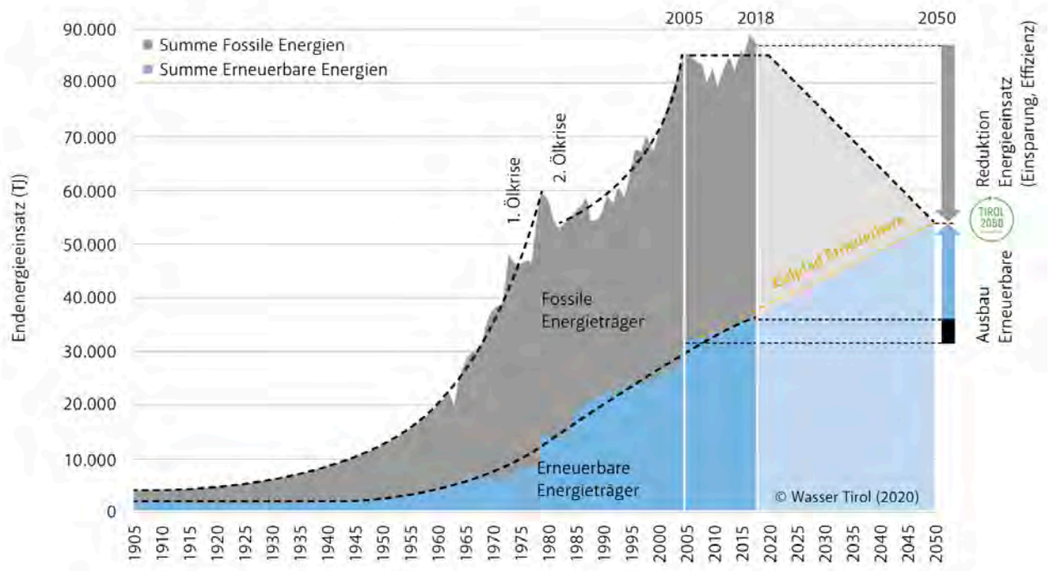
In order to achieve the goals of the European Green Deal (Fetting, 2020) Austria aims for climate neutrality until the year 2040 (Dobler et al., 2021). Therefore, the region of Tyrol aims




105 | Gepatsch storage lake, Winter 2022/23

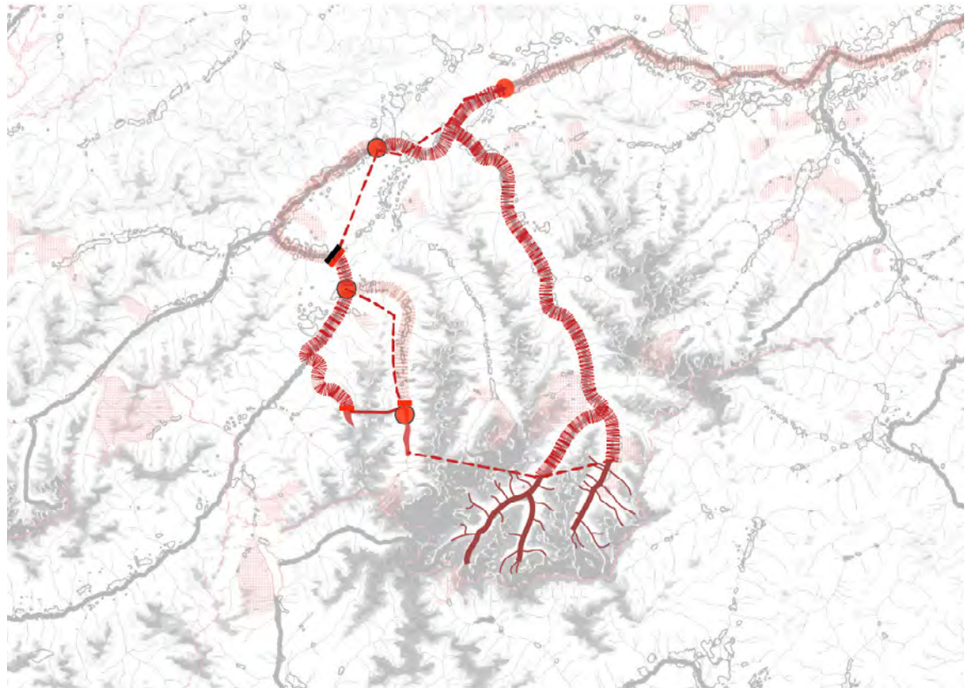
to reduce its energy demand by 50% and cover the rest of its complete, yearly balanced, energy demand with local and sustainable resources until 2050 (Dobler et al., 2021). In this regard, the regional energy provider TIWAG (2021) highlights hydropower as one of the most important assets to achieve this goal. Through the storage of water, energy can be produced on demand through gravity, buffering peak times and securing the stability of the energy net.

However, as mentioned previously, hydropower has severe consequences on the ecosystems and sedimentation processes downstreams as well as in its immediate proximity (Habersack & Piégay, 2007). This is also the case for the extension of




106 | Energy efficiency goals Tyrol 2050, Wasser Tirol 2020





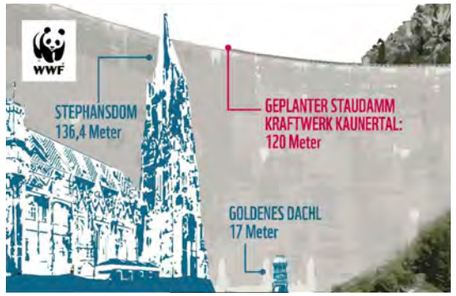
107 | Infrastructures of the planned Gepatsch pumped-storage hydropower plant and their influences

the Gepatsch storage lake. In order to convert it into a pumping storage lake, a dam will be built in the nearby Platzertal valley and filled with water. This higher-laying water reservoir will be the additional storage lake needed to pump the water up and down when necessary. It will provide an additional 225 GWh of electricity. At the time of writing this thesis, there is a heated discussion taking place between the WWF and the TIWAG (Rehfeld, 2023). According to the WWF the extension of the storage lake will destroy a, so far undocumented, marsh with very high ecological value (WWF Austria, 2023).

Furthermore, there is not enough water in the Kaunertal valley and Platzertal valley which is why the water will have to be pumped through the main body of the Ötztal Alps all the way from the Ötztal valley. The two rivers are the source of the Ötztalerach river, which is one of the rivers least altered by humans in the Eastern Alps (WWF Austria, 2023). All of these interventions are going to cause extreme distress to the ecosystem present and who are dependent on the source of the life-sustaining fresh water. The TIWAG claims to calculate the run-off water amounts in order to not harm the envi-

ronment, but one can never really anticipate the damage this disruption would cause.

Furthermore, the WWF questioned the liability of the safety report submitted by the TIWAG, and brought forward two new geological reports, which stated that the slopes above the Gepatsch storage lake are already highly unstable. The increasing changes of water levels, in case of the transformation of the lake into a pumping storage lake, will further intensify the slope movement. Additionally, the thawing of permafrost, melting of glaciers and the other changes discussed in the previous chapter of this thesis will have, as shown, strong impacts on the Alpine landscape, especially on the elevation in




108 | Comparison in size of the planned dam in the Platzertal and the Stephansdom in Vienna (WWF 2023)

question. This project illustrates that most strategies that will be developed in order to face the climate emergency are the ones that are "likely to make it a new source of profit" (Stengers, 2015b), therefore it is important to show that there is an alternative way, because, in the words of Stengers (2015b) "there will be no response other than the barbaric if we do not learn to couple together multiple, divergent struggles and engagements in this process of creation". Let me pose the question, climate neutrality – at whose cost and for whom?

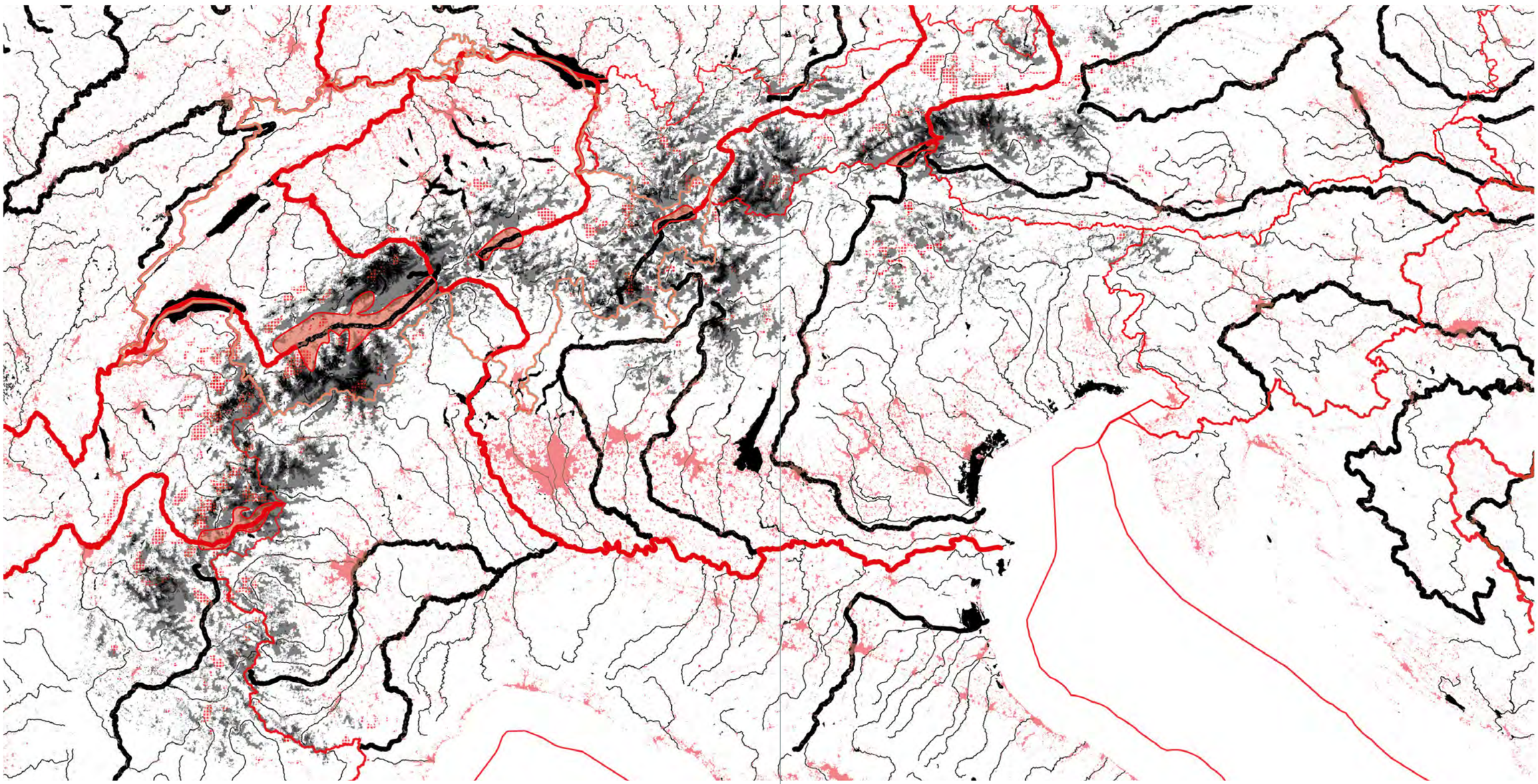
## Conclusion

In conclusion, one can say that the human regime present in the Alpine region, which is imposing borders onto the natural landscape, is an example for what is happening in many parts of the world and mirrors our relationship with the planet. A place uninhabitable for humans made inhabitable by intervention and technology, being operationalized and transformed into a machine. What can be seen in the Alpine region are the accumulation of historical and present layers of appropriation – pushing back and irritating the natural landscape. Furthermore, it overrules the traditional cultural practices, which worked

109 | Valuable marshland to be flooded in the Platzertal (Sebastian Fröhlich, 2022)



with a sensitivity towards the place. This especially becomes visible through the lens of water. Its abundance gave prosperity to the people and sustained myriad lifeforms. Now, the system is changing from a glacially influenced one into a non-glacially influenced. Human appropriation led to the manipulation of the water system. The traditional cultural landscape was focusing on survival, dwelling, and mostly agrarian cultivation. Therefore, the water system had only been changed when there was a lack of water in order for the inhabitants to survive, visible in, for example, traditional waal irrigation systems, which allowed the people to take advantage of land that otherwise would have been too dry. Throughout the 19th and 20th century there were mostly morphological adjustments implemented. Most formerly wet valley floors had been drained and their rivers straightened, leading to an increase of water velocity which became, next to gravity, an important source of energy. By the end of the 20th century, and until now, especially the manipulation of the state of matter, through the creation of artificial snow, became an important achievement. This allowed the tourism industry to blossom, despite the uncertainty of snowfall. The total sum of these adjustments is, nowadays, with the changing water system, limiting the capacity and the full activation of the Alps' potentiality as a living water source.

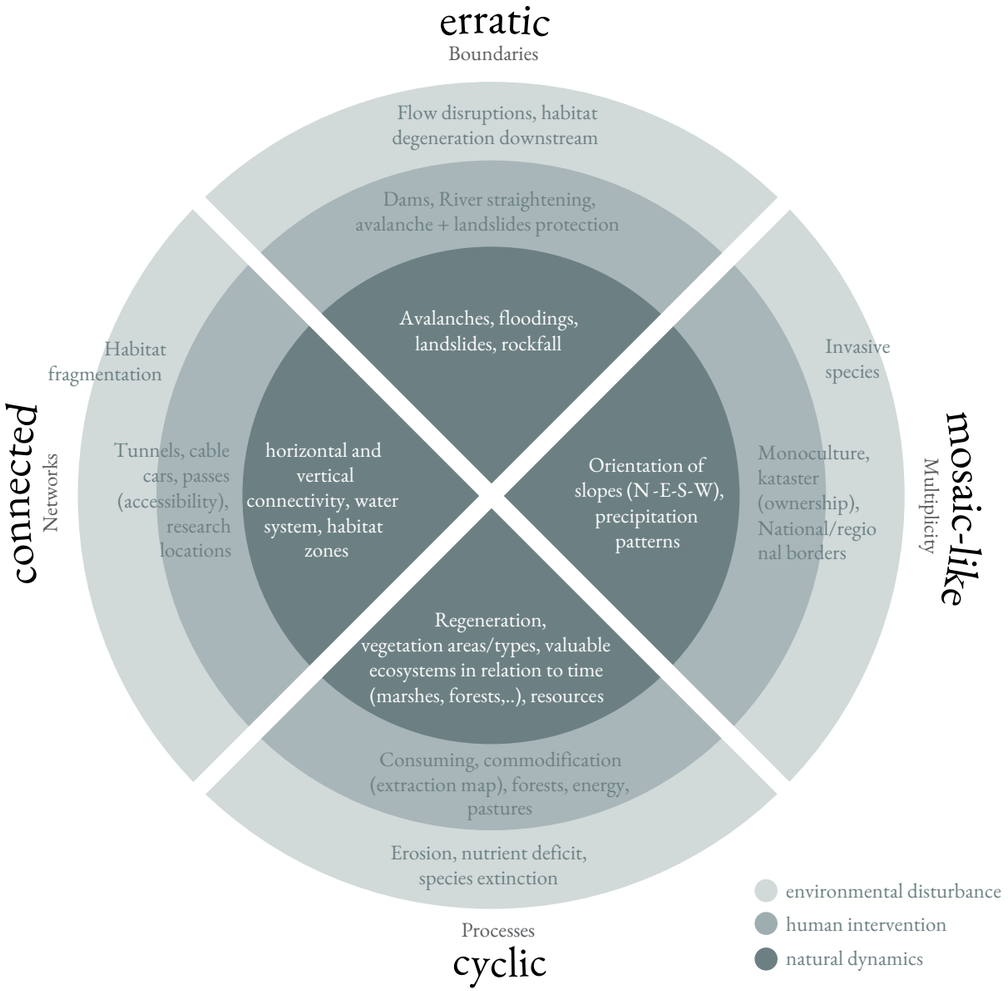


110 | Following path dependencies – the Alps as water tower of Europe with a range of dammed valleys catching the melting water of the glaciers

## 4.4 The character of the Alps
### Reconnecting with the land

In order to guide future decision-making and design in the Alps, through this thesis I suggest using their character as the basis for interaction. By paying attention to them, the Alps reveal their values, showing the priority of certain interventions necessary for a sustainable future of the territory and its diverse inhabitants. In an effort to make those characteristics spatial, the thesis uses cartography in order to map the different characteristics within the landscape. Through the mapping, a nexus between natural dynamics, human interventions and environmental disturbance or biotic responses was developed – each of them mapped within the four identified characteristics – connected, erratic, mosaic-like, and cyclic – of the Alps. This showed how the Alps are either in conflict with human interventions or where they play an essential role in protecting human life within the territory. Therefore, it identifies the interdependencies between natural dynamics and human systems.

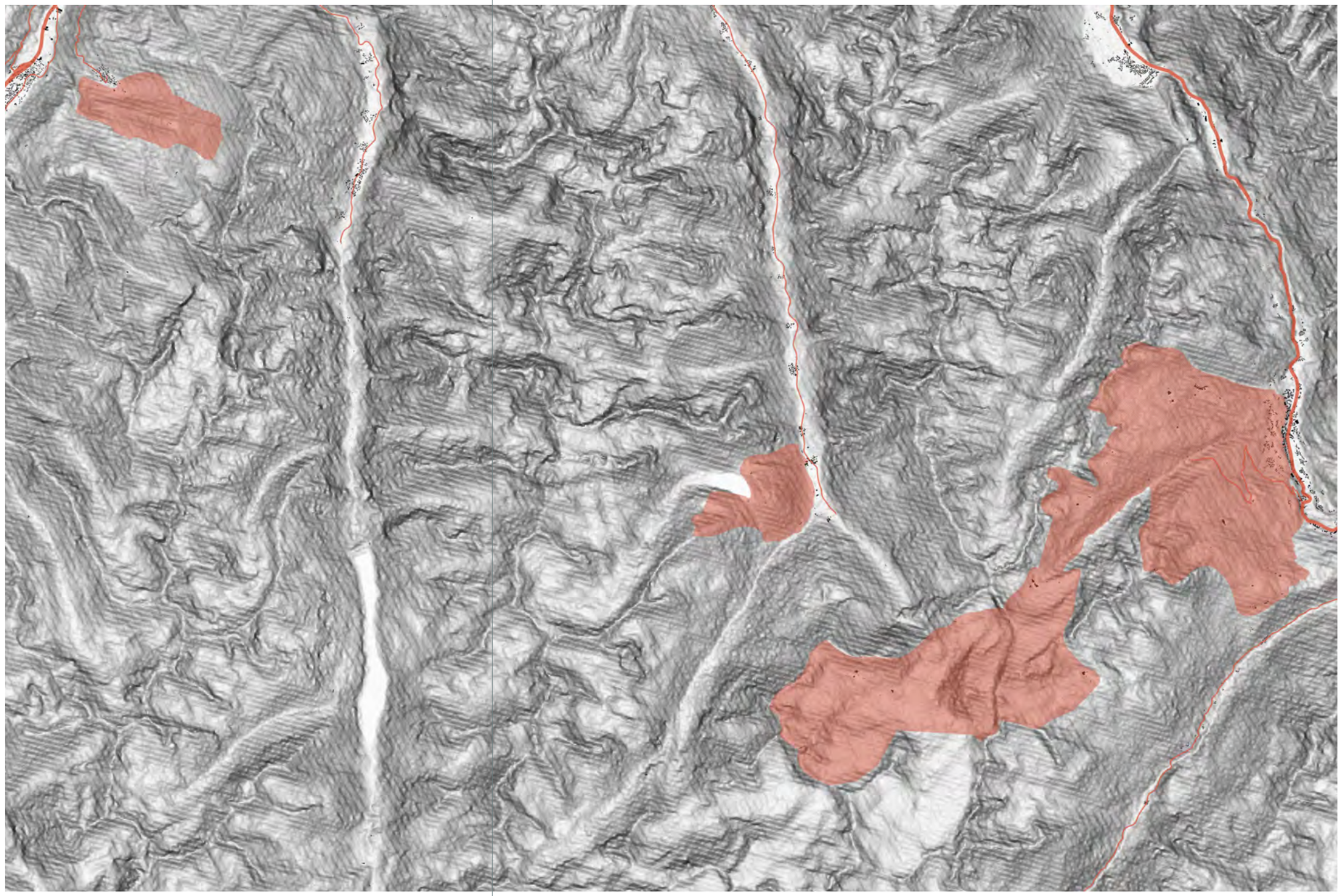




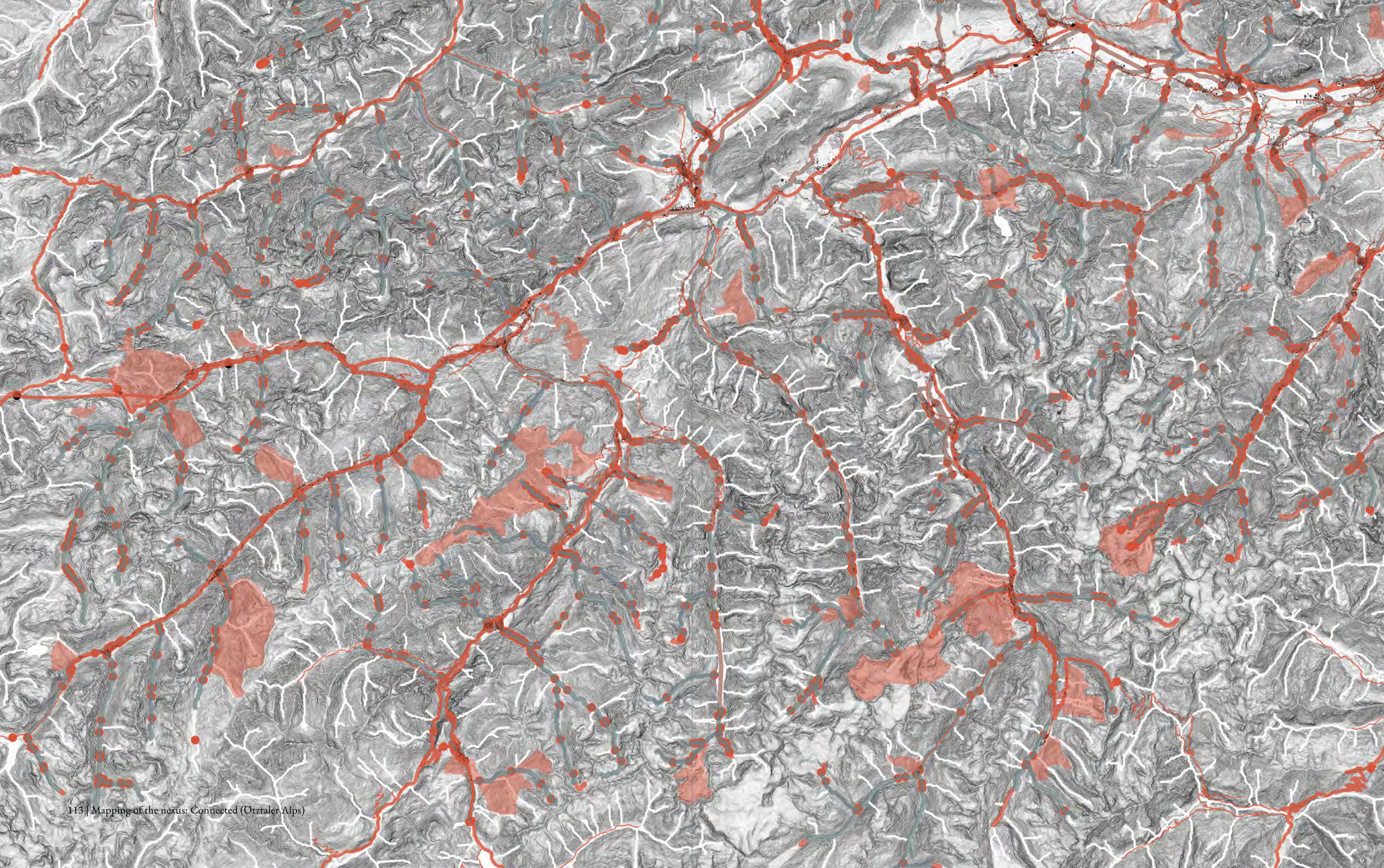

111 | Nexus overview for the mapped elements

## 4.4.1. Connected Networks

The connected nature of the Alps shows the networks and how they are spread throughout the territory. Therefore, it was essential to map the horizontal and vertical connectivity, the water system and the different habitat zones. The folded geomorphology of the Alps causes disruption for human activities, thus, human interventions try to increase their connectedness, where the Alps in their morphological and geological layering create barriers. This results in infrastructural projects and interventions such as tunnels or mountain passes creating a highly accessible region. Furthermore, for example, cable cars try to overcome horizontal barriers. Those human interventions can lead to habitat fragmentation and the proliferation or supersedence of certain species and habitats. However, the exceptional accessibility of the Alps makes them, for example, for research very favorable. Almost no other mountain range in the world is as well researched as the Alps, and this is because they are so highly accessible.

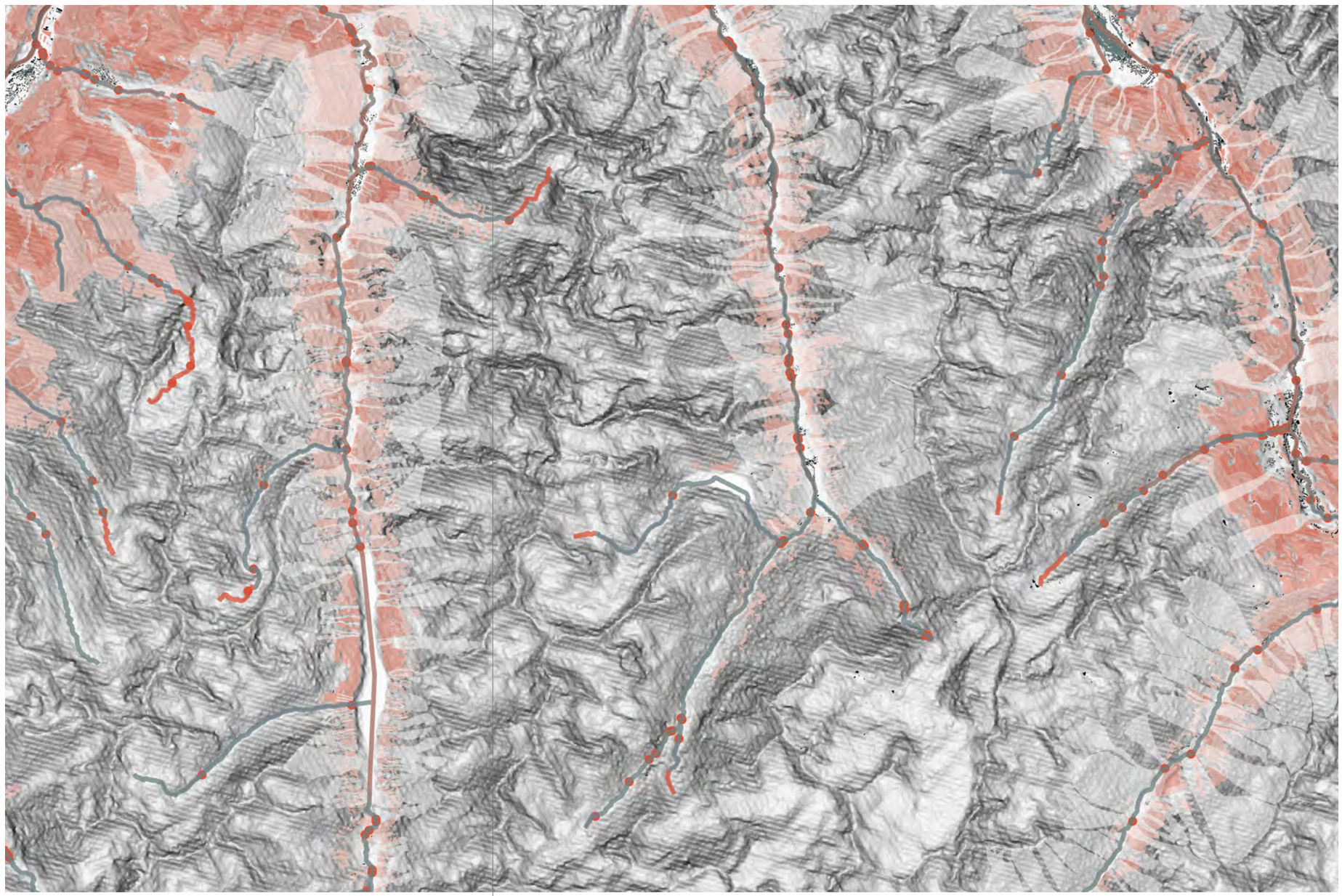


112 | Mapping of the nexus: Connected (Kaunertal, Pitztal, Ötztal)

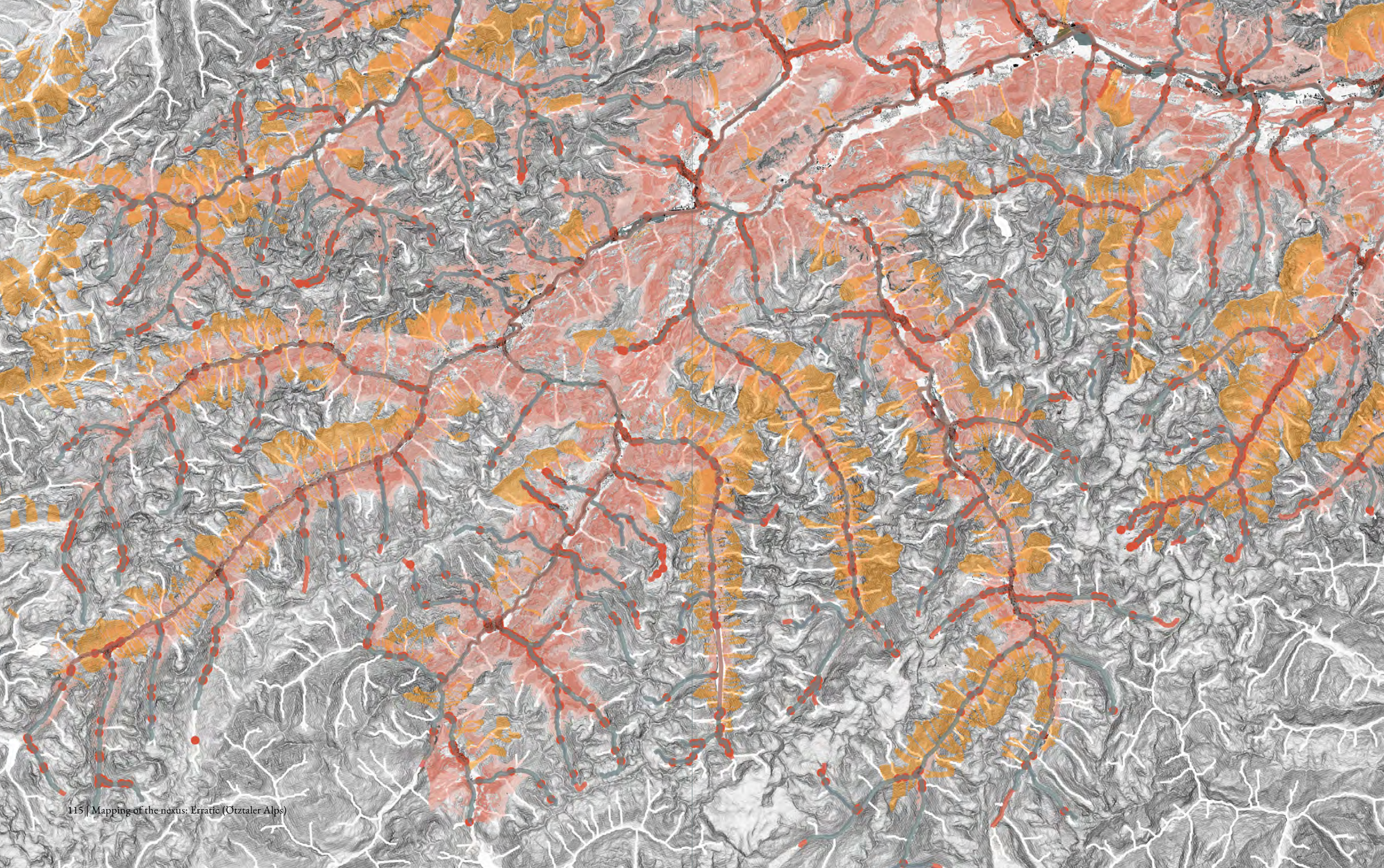


## 4.4.2. Erratic
## Boundaries

The recognition of the Alps erratic nature, results in the need for space and boundaries. The natural dynamics are mostly portrayed as natural disasters, avalanches, floodings, landslides and rockfall, which are prominent events of this characteristic. In order to prevent them from happening, dams have been built, rivers straightened, avalanches and landslide protection erected. In the flooding maps, one can see what happens, when extreme weather events and high patterns of precipitation occur. The environmental disturbance, therefore, results in, especially, flow disruptions and habitat degeneration downstream.

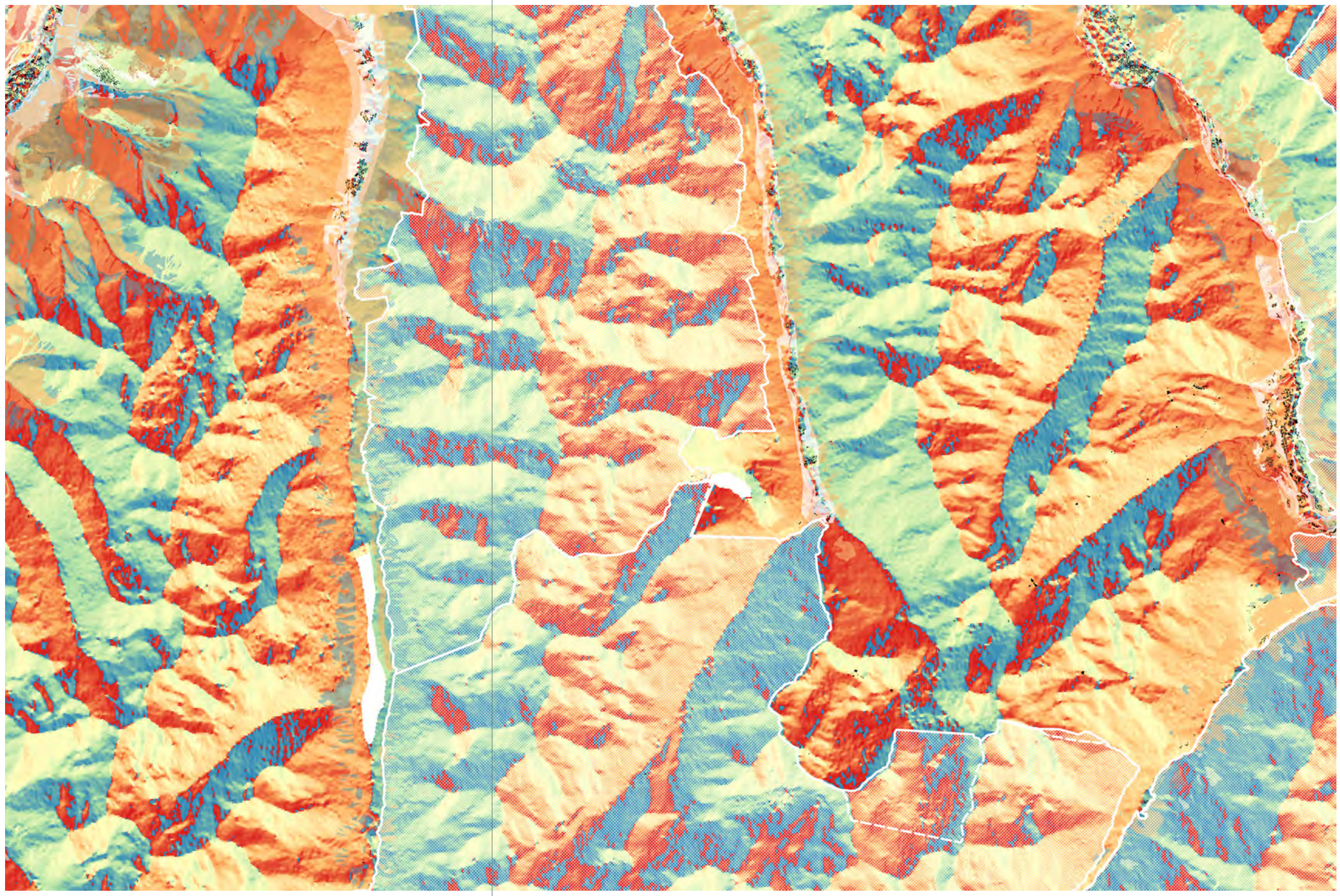


114 | Mapping of the nexus: Erratic (Kaunertal, Pitztal, Ötztal)



## 4.4.3. Mosaic-like Diversity

Looking at the mosaic-like characteristic, one can find the multiplicity of habitats within. Here, the mapping of the orientation of slopes and precipitation patterns were essential for showing the natural identity. Human intervention, monoculture, the cataster plan, which is showing ownership, and national and regional borders indicate where the mosaic-like is possibly disrupted or further enhanced. One of the most prominent biotic responses is the proliferation of invasive species in monocultural landscapes, as well as the shifting of regional and state borders which are based on glaciers due to global warming.

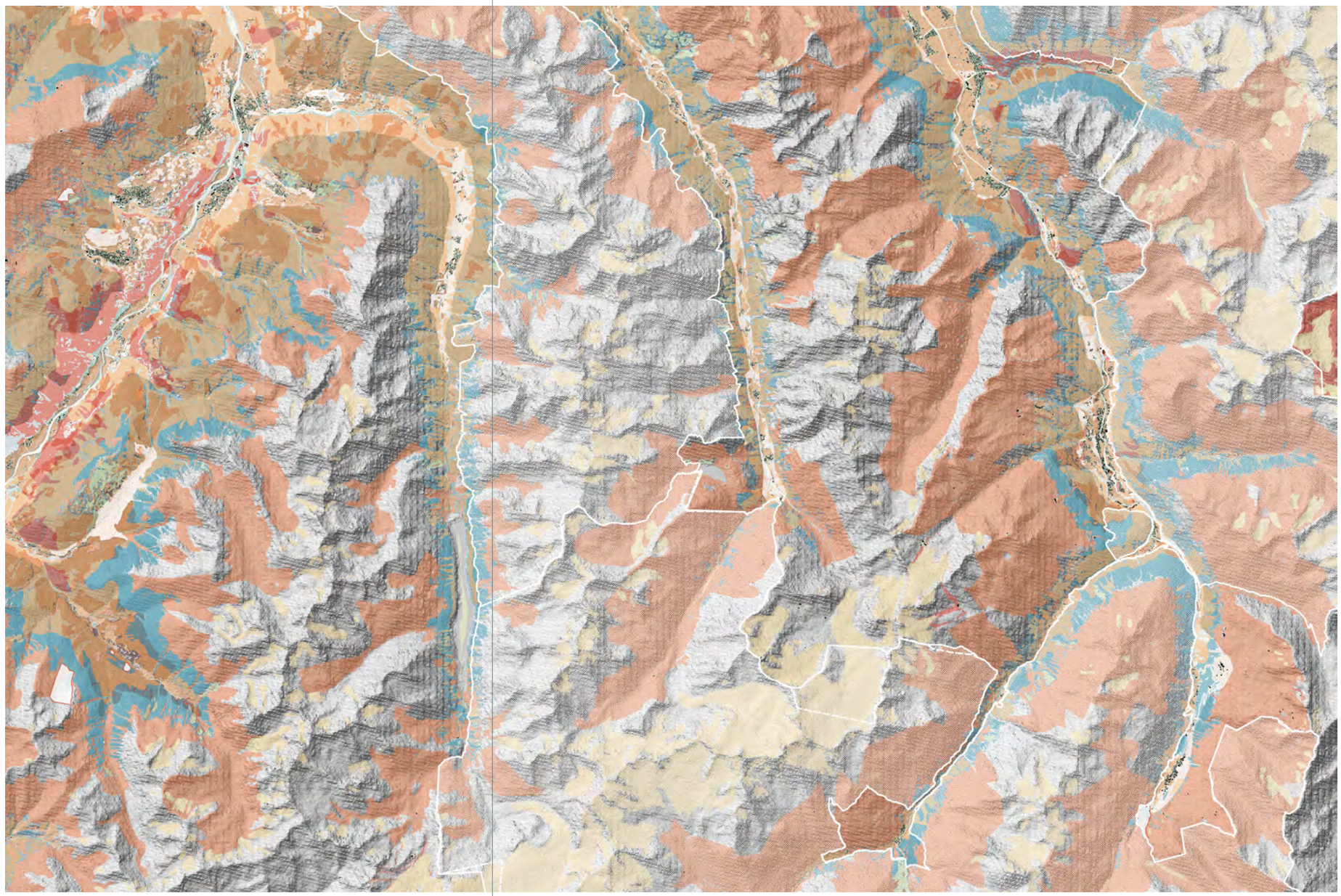


116 | Mapping of the nexus: Mosaic-like (Kaunertal, Pitztal, Ötztal)

117 | Mapping of the nexus: Moasic-like (Ötztaler Alps)

## 4.4.4. Cyclic Processes

The cyclic nature represents different processes. Regeneration patterns, mapping vegetation areas and types, and the identification of valuable ecosystems in relation to the time they need in order to grow, for example in the case of marshes and forests. These show the resources that the territory holds. Humans saw those mostly as commodities, utilizing them through their extraction and consumption. One can map the forests and pastures where the work of nature has been commodified by humans, who have done so, either in order to survive, or for economic profit. The human intervention in the cyclic nature of the Alps results in higher erosion, nutrient deficit and the extinction of species.



118 | Mapping of the nexus: Cyclic (Kaunertal, Pitztal, Ötztal)

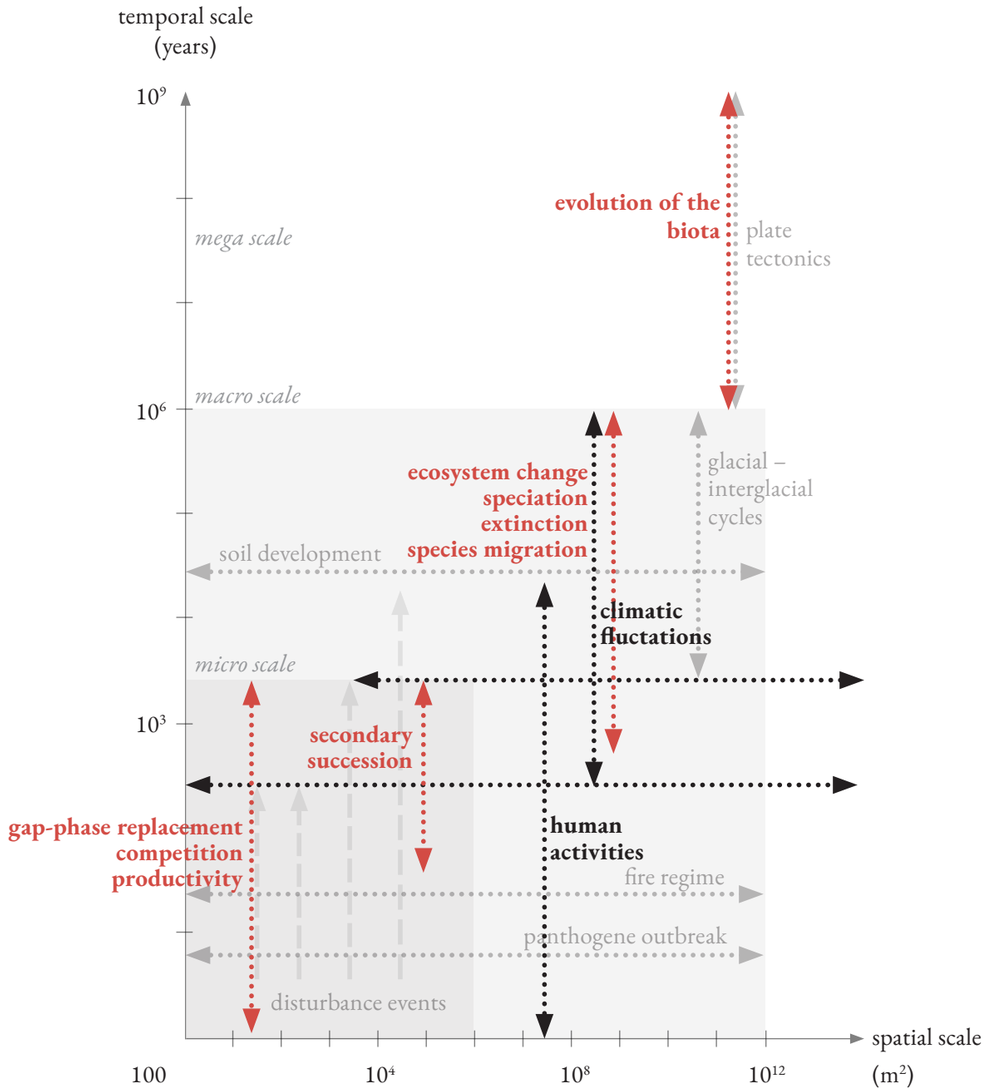
## 4.4.5. Conclusion

With all the different characteristics overlayed, the map reveals where human systems are dependent on natural systems, and where they have to work with each other in order to sustain life within the territory. It reveals the intrinsic connectedness of humans within nature. Sometimes, the centuries-long commodification of natural processes and resources made the biota very sensitive to the fast climatic changes ahead. This exercise can be repeated for different locations within the Alps and new characteristics can be added to the spatial investigation. In order to reveal the full potential of this mapping method the research was focussing on the Tyrolean part of the Ötztaler Alps since the regional tiris database (Land Tirol, n.d.) offered a wide range of information.





# 4. **Negotiating on behalf of the Alps**
a caring Anthropocene




121 | Environmental disturbance regimes and the biotic responses to them in space and time (adapted from Delcourt et al., 1982)



## 5.1 A cultural shift
## Human agency

In this changing climatic context it is important to look at the space and time relations of environmental disturbance regimes and the biotic responses to them, in order to see where and when disruptions are happening. Whereas, for example, the evolution of biota takes place on the same scale as the change of tectonic plates, climatic fluctuations can lead to the biota's extinction (Delcourt et al., 1982). In this whole scheme they're only a few variables that can be influenced by humans. We already changed the climate. Now the only place to take action to support the response of the biotas is in changing the pressure of human activities on them. Rather than increasing pressure, we can decide to support them. This requires a repositioning of our relationship with the planet and with nature. A refoundation of values. How can we restructure values through space? If the planet, the earth, is a project, how do we take care of it when defining the notion of care as maintenance and where does the agency of urbanism lay in this context?

### Deep adaptation

We live in a time dominated by short-term thinking, when humanity is only a blink of the eye in the earths' history. The deep connection of the Alpine culture and the land requires practicing long-term thinking to bring about a change of values. For instance, practicing cathedral thinking (Krznaric, 2020) or reflect on the notion of Jem Bendels (2021) deep adaptation, in order to create a sustainable development "that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland Report, WCED 1987, pp. 43).

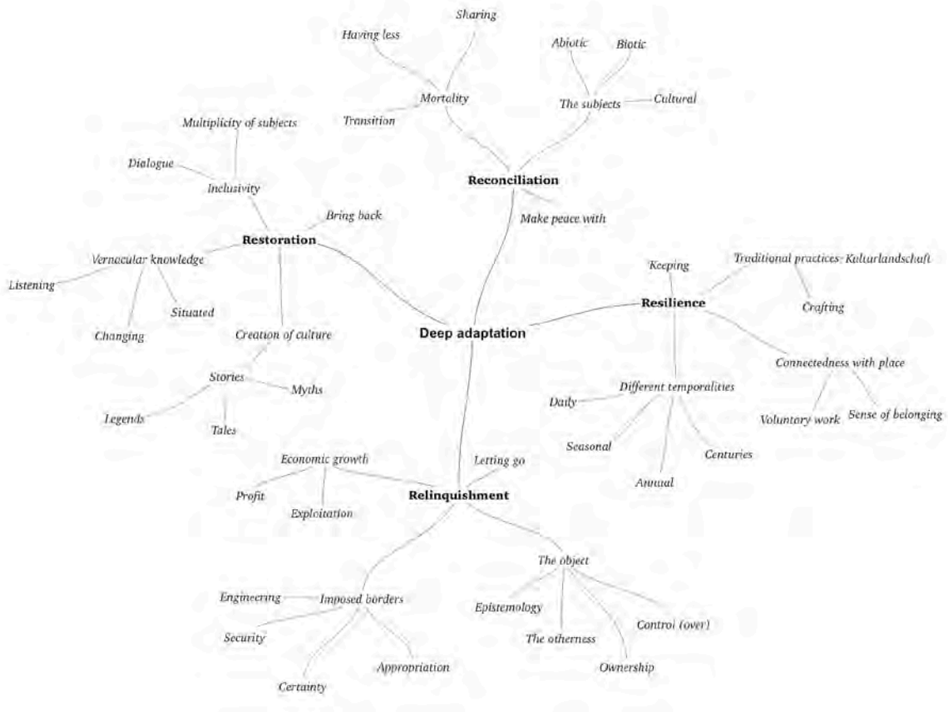
Cathedral thinking suggests the imagination and planning of projects that require work beyond a human lifetime. It is based on the idea of constructing cathedrals which often take generations to be finished, a well known example is the Sagrada Família in Barcelona, and advocates for a shift in the perception of time and the making of projects which can accomplish a transformative change. Roman Krznaric, the author of "The Good Ancestor: How to Think Long Term in a Short-Term World" starts the discussion about a necessary shift in the perception of time with the question: "How can we be good ancestors?" (Krznaric, 2020). This approach was taken further by Jem Bendell (2021) proposing to ask ourselves the four questions of deep adaptation:

**Resilience**
What do we value most that we want to keep, and how?

**Relinquishment**
What do we need to let go of so as not to make matters worse?

**Restoration**
What could we bring back to help us with these difficult times?

**Reconciliation**
With what and whom shall we make peace as we awaken to our mutual mortality?




122 | Brainstorming of the cultural adaptations needed to estabilsh the Alps as active subject



## 5.2 How to live with the erratic?

How can we support the natural dynamics – erratic, mosaic-like, connected, cyclic – of the Alps rather than disrupt them further? Especially important for this is the recognition of the different ways in which these dynamics and characteristics have been portrayed, counteracted, or dealt with so far. The crucial differences lay within the approach towards the erratic.

### Traditional cultural landscape

**Acceptance**

If we look through the lens of the traditional cultural landscape, one can say that the Alps' erratic nature has been treated a lot with repair work, traditions, and maintenance. The suitability and borders for certain land-uses were indicated through the erratic nature of the Alps, for instance if too many trees were cut down, that would result in landslides or avalanches, therefore an increase of the erratic. Accepting those limits allowed them to live there while simultaneously shaping the appearance of the landscape. For instance, the mosaic-like pattern was created by not clearing all forests but only patches of them. The observations about these borders were passed on from generation to generation, resulting in an extensive amount of vernacular knowledge. The people had to rely on the natural process of regeneration in order to survive. This shows the importance of cyclic processes within the economy. Additionally, many cultural practices such as, schwenden which is the act of clearing the pasture meadows from young bushes or other plants, were asking for care-work in the form of maintenance. Furthermore, the people were dependent on each other in times of need, such as sickness, which established a caring relationship for each other. Therefore, connectedness came especially from the land itself and from traditions. But when we look at the whole Alpine range, they have not been spatially connected between each other that well, also influenced by the erratic.

### Until today

**Prevention**

Later, with the emergence of the industrial as well as service economy, the approach towards the erratic nature was, instead of accepting and sensing the limits, sifting towards prevention. Through risk management large scale infrastructures were planned which would prevent floodings or avalanches from happening. The dynamics were described as natural disasters,

instead of being respected as characteristics. These changes turned them into cultural disasters. Through the possibility to exceed the limits posed by the erratic, it became possible to expand production which made the cyclic approach obsolete. Consequently, resulting in the fading of the mosaic-like patterns within the landscape into large-scale mass production. This becomes visible, for example, in monocultural forestry, as well as enormous skiing resorts which cut through the landscape.

### Way forward

**Balancing**

Due to climate change, the erratic nature of the Alps will increase. This brings a lot of uncertainties with it, especially when it comes to the intensity and frequency of the dynamics. In order to work with the Alps' erratic nature, we have to, again, accept the borders posed by the landscape dynamics and let them inform land-use and accessibility. Construction has to be limited to areas that are suitable and protected through buffer zones. This will result in a decrease of available land and at times, decisions have to be made if certain currently inhabited places will be safe enough in a future of high erraticness. By working with natural dynamics, such as plant growth, the increased volumes of water flows or instability of slopes caused by erosion, can be managed. Small-scale and multiplicity are essential when it comes to future Alpine management, not only from a spatial perspective but as well, for instance, in politics. Centers cannot only be around urban agglomerations or the main cities; institutions need to be spread and therefore allow differences in decision-making within the region or within one valley – based on the traditional knowledge, which has been passed on from generation to generation. What results from it is a society based on sharing, commoning, and regeneration.

## 5.3 Values
## For a caring Alpine Anthropocene

The values described here work in conjunction with each other, only aiming for one of them will not make a difference, it may even make matters worse. They are based on the conjoint research of this thesis, one can find their reasoning throughout the previous chapters. Changing these values, I think, can help us reconnect with the land. By basing our projects on them we can find new ways to deal with future challenges and current urgencies.

### Equity
### Exclusive to reciprocal

The first step in reaching an equitable culture within the Alps, is to recognize the Alps as an active subject, and work with their inherent agency. The current anthropogenic Alpine developments are predominantly excluding more-than-humans in present and future decision making which results in projects that weaken their livelihoods and possibilities to prosper. This directly affects humans since we are embedded within nature, interlinked through the web of life, interacting constantly. The characters of natural dynamics (connected, erratic, mosaic-like, and cyclic), as well as the interdependencies which are present due to the web of life, shall be strengthened in order to create reciprocity between more-than-human and human agencies of the Alps. This asks for an active role of humans within the territory in order to support other species in the challenges caused through our rapidly changing climate as well as destructive (infrastructural) projects of the past.

**repair – undo – build backwards –**
**reveal – acknowledge – accept – connect**

## Reversibility
## Disruption to continuity

The projects of (mostly) the last century were destroying the connectedness within ecosystems through the construction of nearly irreversible infrastructures such as dams. When we intervene in the natural landscape, we must always think about the damage it will cause to local as well as distant species and ecosystems which are related to the processes. They may rely on certain resources such as water, nutrients, sediments, fresh air, or other animals or plants in order to live. The aims and actions of the projects have to repair, secure, as well as expand, these networks of connectivity. Therefore, no human structure shall destroy a habitat. On the contrary, the projects should create new places for more-than-humans to thrive. This will ask for a shift in the perception of the value of things. The longer something needs, in order to emerge, the higher its worth. The main goal is, therefore, sustaining and expanding their value over time.

**Connect – extend – reverse – repair – undo – build backwards**

## Regeneration
## Linear to cyclic

During the time of the traditional cultural landscape, the economy was based on regeneration. People were dependent on natural processes of, for instance, the growth of weeds in order to sustain their lives. Throughout the last century, the economy in the Alps shifted towards an industrial and service industry. The invention of, for example, new technologies enabled them to stretch or overpower the limits of the natural dynamics in order to accumulate monetary wealth. This was mostly sustained at the cost of more-than-humans, leading to phenomena such as decreasing biodiversity or habitat fragmentation, degeneration, or loss. By reviving a cyclic perspective on time, we can succeed in reconnecting our lives with the land. Furthermore, long-term thinking, beyond one human lifetime, evokes projects which will be passed on for generations, making people feel connected to it. Furthermore, it enables projects which are unfinished and can grow with natural processes and cycles. The projects increase their value throughout time, not benefiting the ones who finish it, but the ones who participate in it. They are reinterpreted repeatedly through the time of their making.

**Redo – repeat – maintain – repair – ongoing – open – extendable**

## Adaptability
## Restrain to release

The Alps are constantly changing due to their erratic nature. The erratic is one of the main agents in the Alps whose influence will, due to climate change, only increase. Allowing for those abrupt changes to take place will bring about a  change in the current paradigm which is based on preventing them from happening. This changes the relationship from living in the Alps to living with the Alps. The uncertainty and inconsistency of the erratic needs space to unfold. Giving back room to the quick changes will allow a living together and create connected spatial networks. Furthermore, people need to learn about the natural dynamics in order to be able to react and properly assess a critical or dangerous situation. Since the landscape is constantly changing monotonous landscapes should be transformed into diverse and versatile habitats. Creating a mosaic of small scale interventions allows for people to actively participate in the support of the changing Alps, which will create a connectedness of people and land as well as increase and foster the Alps complexities. The places emerging out of allowing-the-erratic are versatile in their nature and can react to the uncertainties of the future as well as meet the needs of future generations. We may not know what is needed, but we can create a space for them to act.

**Retreat – give space to the erratic – support – plant – grow – expand – connect**

## Empathy
## Imposed to situated

The Alps are a living organism, composed out of myriad forms of life. Strengthening their agency asks humans to listen to them, be open, and find their inherent value within the web of life, which always exists. Everything has a right to be and unfold. Everything means something to someone. This asks for acknowledging the living beings that are in a place, sustaining and supporting their lives, and working with them rather than against them. The kind of interventions for a place, therefore, reveal themselves through the involvement with the local communities – human as well as more-than-human. The approach moves from an imposed mindset, which disregards local conditions, to a situated practice. The projects act in the present, growing out of the needs of local communities, while at the same time constantly unfolding and changing with them and their urgencies.

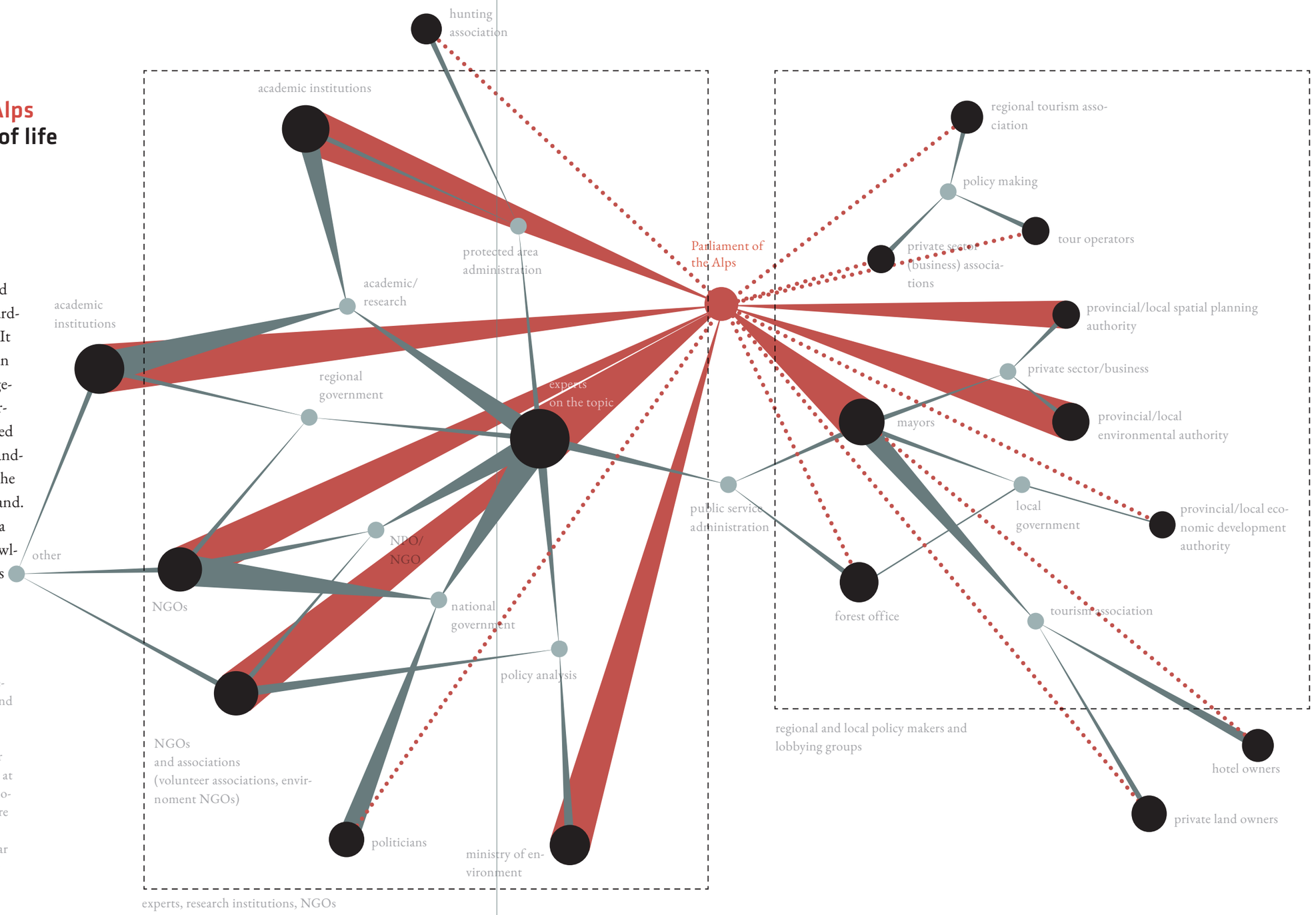
**Ask – listen – read – discuss – propose – change – adjust – reveal – include**

## 5.4 The Parliament of the Alps
### Strengthening the web of life

For the challenges ahead, the Alps are in need of a political body which can act as their guardian. This will be the Parliament of the Alps. It is composed of different stakeholders (human and more-than-human) which are knowledgeable about the Alps and can act in their interest. More-than-human entities are represented through experts, who have a strong understanding of the needs and functioning, as well as the embeddedness of the subject or process at hand. The political body is, furthermore, creating a democratic platform for discussion and knowledge transfer about the wellbeing of the Alps and their diverse abiotic and biotic beings.

123 | Parliament of the Alps: The structure of the Parliament builds upon the existing network of stakeholders for biodiversity within the Alpine territory and suggests new relationships within the structure. The close interaction between the work done by experts in research institutes such as academic institutions or NGO's and local and provincial decision making lies at the heart of the Parliament's structure. This secures local implementation of actions and strategies which are based on the most relevant and advanced knowledge. Furthermore, through their interaction the vernacular knowledge present in the areas at hand can influence research directly which will highly benefit from this additional source of knowledge and their synergy.





# 6. Transforming the Alps
exploring the Alpine Ocean

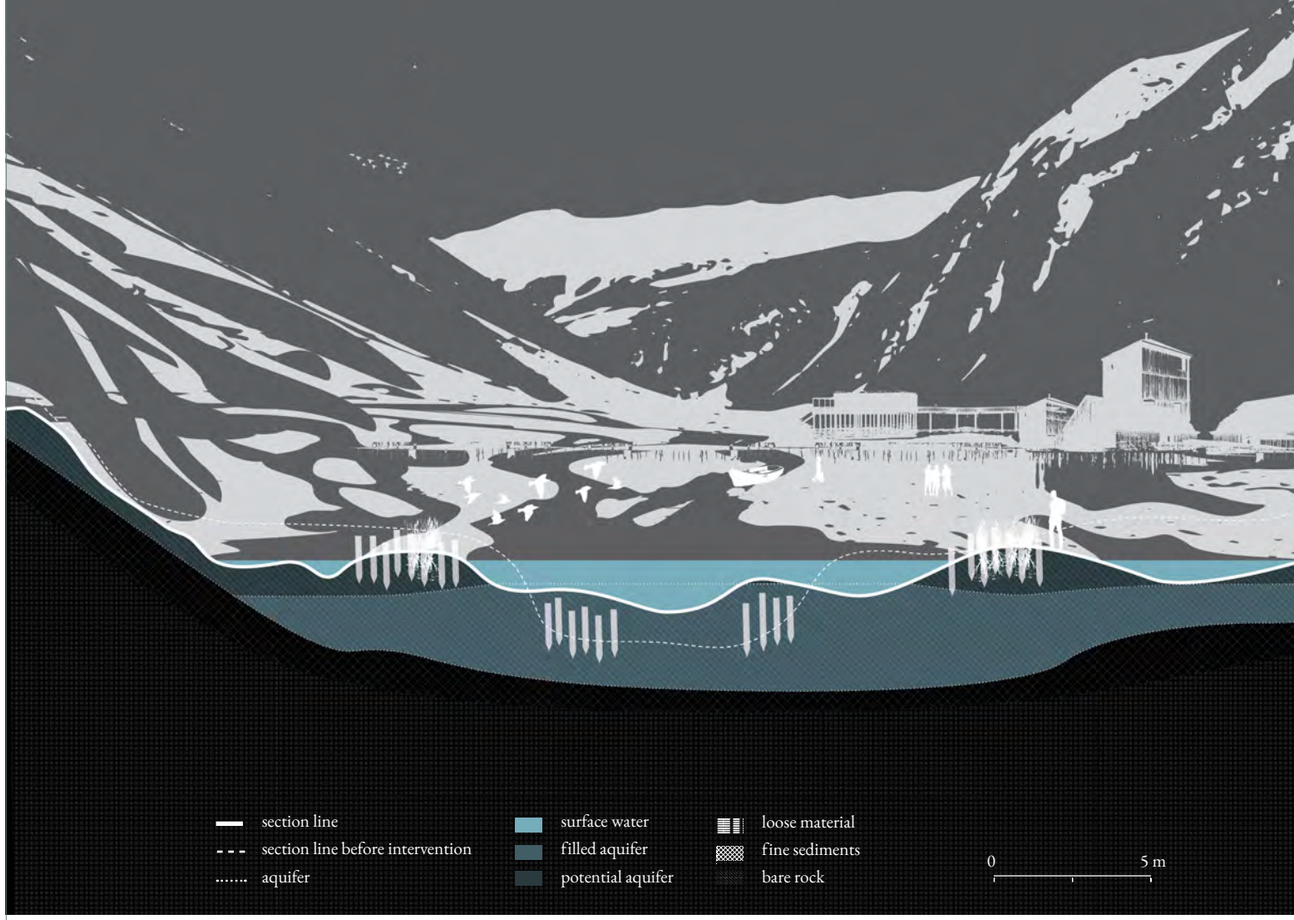
## 6.1 Living waters
### A short story

"... and as the Pacific Ocean feeds the sky with water, so does the Alpine Ocean feed the rivers." I read the sentence once again, "The Alpine Ocean feeds the rivers" Who was the Alpine Ocean? And where was she? At that moment I knew I had to go looking for her.

The soft rumblings of multiple river streams flowing with each other were my constant companion. With a big backpack on my shoulders, the sound of ocean waves still in my ears, I started my journey all the way from the Danube delta into the mountains. The sound of bees and dragonflies playing with one another in the marsh fields filled my ears and eyes with pleasure. I had to stir the boat carefully, reading the unknown territory, so as to not get stuck in the ground. The river was shallow and wide. There were a dozen different paths for me to choose from as the river was freely flowing through the landscape. One could still see some remnants of the old, once constricting walls the river had been freed from. The broken dams were now covered in wild bushes. The roots of the trees were standing strong in the mud, their leaves dancing in the soft breeze. Some people were trying their luck with fishing, the splashing of the water filled the air as their kayaks were passing by. In the distance some water buffaloes were grazing on the fields, a flock of birds passing by above them.

An old woman was standing at the shore, watching the scene I asked her: "Can you tell me where I can find the Alpine Ocean?" She looked at me and said: "You know, there was a time, just when all glaciers were dying in the Alps, when the river was extremely speedy and fast, all water was lost within seconds. The volume of water and its rapidity was causing floods which were hitting our villages and cities, destroying our livelihoods. At that time, a group of people came together and started to dig-out the river bed. With shovels in their hands, day and night they gave back the space to the river which was rightfully hers. You can still see some of the dams which used to restrict her movement and quicken her up. The more they gave back space to the river the slower the water became. People realized that the floods became less severe and so at one point more and more joined the movement, the whole town, then the whole region, at the end people from the whole river catchment area – everyone came together with shovels in






124 | Section of the intervention "Space-making, spreading river beds"

their hands." Her wrinkly eyes were sparkling as she told me the story. "You can not imagine the feeling, all together unchaining the river. It felt as if we were liberating ourselves."

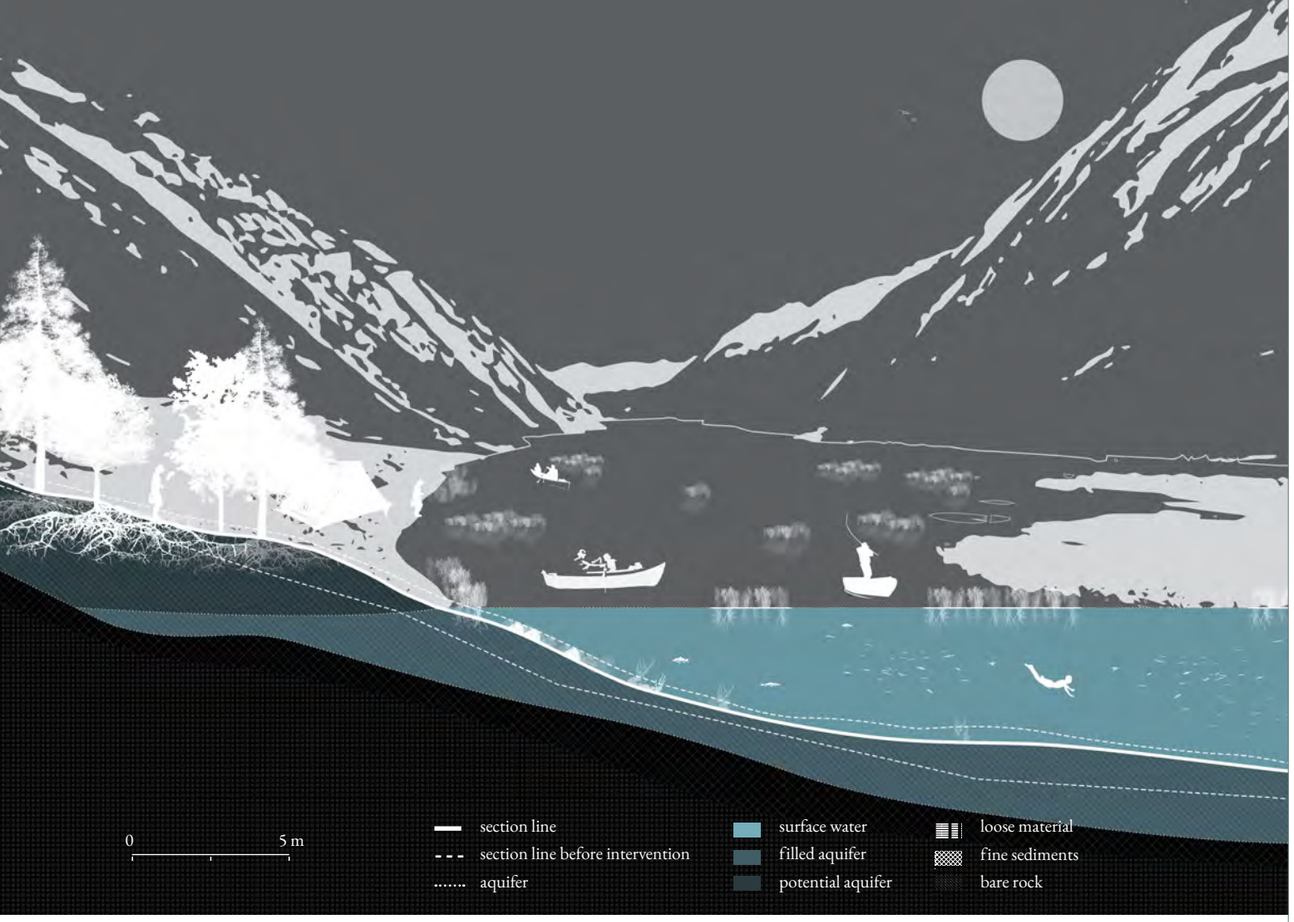
As I reached the first hills at the pre-Alps the vegetation became denser. It was as if one would cover oneself in a green coat. I picked a red and juicy-looking apple from one of the trees and as I bit into it, the sweet, yet sour taste filled my mouth. I heard the wheels of a bike rolling over the stony pathway. The baskets in front and back were filled with fresh fruits from the forest. The girl waved at me and shouted "see you on the market", and made her way along the path I too was following. I could hear the chaotic mess of a vibrant village from afar, the smell of fried potatoes had made its way to the edge of the forest.

At the shoreline of the water, ships were lining up with signs indicating their services – repair, share, swap – especially the swap-boat was already crowded, and people started to line up in front of it. The square was surrounded by bikes and more and more people were arriving on the plaza. Numerous different stands exposed their specialties from berries to potatoes to home-made juices. Piles of millet and other grains and

section line
section line before intervention
aquifer
surface water
filled aquifer
potential aquifer
loose material
fine sediments
bare rock

0 2,5 m

125 | Section of the intervention “Retaining, living slopes”




126 | Section of the intervention “Activating, reviving the industrial landscape”

beans were spread on clothes on the floor. It was a vivid and colorful mixture of all the things the people brought from their homes in the Alps.

A group of children was standing around an elderly, explaining to them how to read their freshly made soil chromatograms correctly. “The more the utmost curve is varying when going in and out the stronger the diversity within the soil you tested.” “Mine is really bad, it is almost a perfect cycle”. “That doesn’t mean it’s bad. Where did you get it from? Maybe it’s just very young soil!”

The air was covered in the smell of wet earth. An assemblage of terraces were covering the sides of the mountains, some offering larger basins, others very small ones. Their surfaces were reflecting the sky. There was a diversity of plants and insects flying around the place. Some birds were playing in the water washing themselves and sprinkling water all around them. On the pathways through the terraces, people were walking and driving on bikes. Some water buffaloes were also making their way along the hillside.

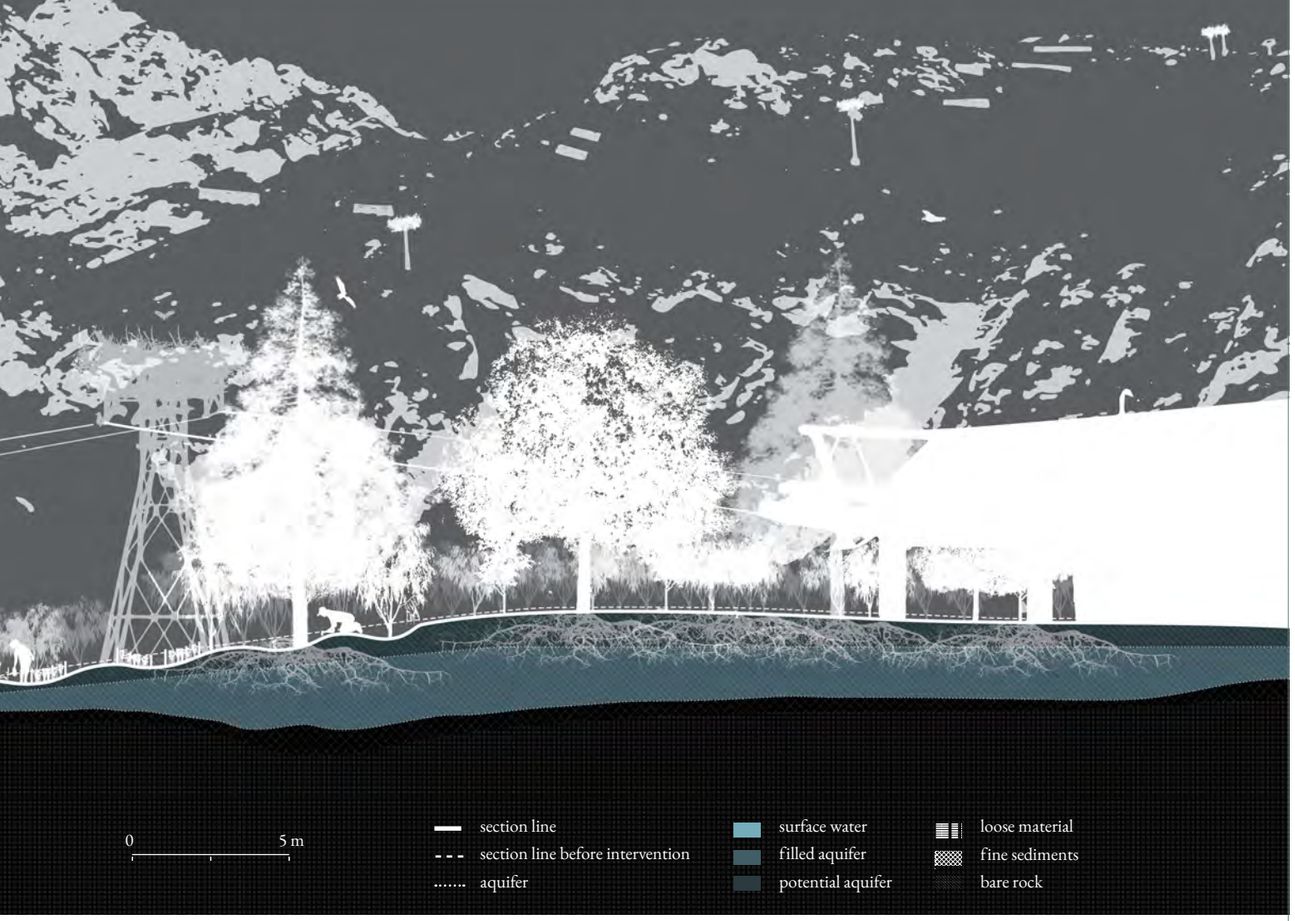
There were different kinds of plants and grains on the borders of the terraces, the dams of the basins were composed out of rammed earth and stones as well as some wooden sticks in order to keep them within place. On the walls one could still detect marks of the feet which were used to form the vertical wetlands. The steps of the terraces were not too high, 80 cm at the most. The majority of these allowed for them to be used as stairs or mingling places. In one area a bunch of people were sitting around discussing the developments of the day, while others were repairing some broken basin that was leaking too much water. The further I went up the hill, the less water filled the basins. There seemed to still be a lot of space left for the next rainfall to be collected. I asked someone who passed by me with a shovel in their hand. “Can you tell me where I can find the Alpine Ocean?” “The Alpine Ocean?” the person replied to me in astonishment, their eyes spoke their not-knowing. So I continued my path up the mountains, looking for this unknown ocean.

Suddenly I was standing in front of a tall wall. When looking up it seemed as if it was from another world. I found a path to the top, and as I was standing there I looked across a huge reservoir. The surface of the lake was uneven from all the fish jumping around. It had a dark green color from the grasses and moss that was growing on its subsurface. The sides of the mountain that encapsulated the lake wore traces of time. The tongues of multiple landslides tipped into the lake. Some of them already overgrown with weeds and trees. Others, rather young, where the stones were still lying naked in the sunlight. Not far away I saw some fishermen trying their luck in the waters, and as I looked closely, I could recognize someone diving in the depth of the lake, discovering the underworld spaces. At the shoreline, some people had put up tents. I assumed they would want to stay for the night. It was only then that I saw the Alpine ibex, standing far above overlooking the scene. I asked them: “Can you tell me where I can find the Alpine Ocean?” They said: “You know, there was a time, just when all glaciers were dying in the Alps, when this jewel, fed by the Gepatsch Glacier, was supposed to be turned into a pumping storage lake. The drastically and constantly changing water levels would have completely destabilized the already fragile and thawing slopes. And the lake would still not have been accessible

section line
section line before intervention
aquifer
surface water
filled aquifer
potential aquifer
loose material
fine sediments
bare rock

0 2,5 m

127 | Section of the intervention “Keeping, protecting sedimentation processes in young deltaic systems”




128 | Section of the intervention “Supporting, moving upwards through kick-starting Alpine soil formation”

or habitable. To build the second storage lake, a wonderful marshland, not far from here, was almost dammed up and flooded! But there was not enough water in the valley so they would have had to build a tunnel through the whole mountain to get the water from the Ötztaler Ach, one of the only untouched rivers in the Eastern Alps, in order to fill the storage lake. Thankfully, they decided to instead rewild the old lake and create this wonderful habitat for all of us. And you should see the Ötztaler Ach, this wonderful wild river. It’s a blessing in the eyes.”

I made my way around the lake and continued my journey over stony ground further into the valley. As the lake merged into the river, a new kind of landscape opened before my eyes. It seemed oddly familiar. Islands of clay and plants were guiding the waterflow of the river. Wooden poles were sticking out of them, helping the sediments to accumulate into islands. Some of them were covered with plants, even willow trees were standing strong in the slow movement of water and soil. Other islands were very young, constantly changing their form, adjusting to the changing flows of water. Suddenly I realized what it reminded me of– my dear home. The delta. I could see it right in front of me and I knew, where the Alpine Delta is, the Ocean cannot be far.

On the field I could see people working, carrying bags of earth into what seemed to be a wooden structure, made out of poles. They put the soil into those basins. Some of them already wore the traces of their work, the heads of small plants were sticking out of the surface. Further down I already had seen those basins with huge willow trees with strong root networks that were clenching to the rocky ground, attracting more soil and holding the ground together. The people working were happy. They were laughing telling stories of old times, yesterday, and about the future – working without stopping, knowing that what they were doing would mean something for their children. It was this urgency, this sincere passion that was tracing their every movement. The groups of people were spread all over the territory, some of them with shovels in their hands, others carrying baskets, and others a tray with small plants that would find a new home up here.

I approached one of them and asked: “Can you tell me where I can find the Alpine Ocean?” He replied to me: “You know, there was a time, just when all glaciers were dying in the Alps, when all of these slopes were covered in artificial snow. Snow machines were transforming freshwater collected in artificial lakes into snowflakes and sprayed them over the slopes. They buried electricity cables underneath the surface and built drainage systems throughout the whole territory. The slopes had to be adjusted in order to create smooth surfaces – at times they even reshoveled parts of a glacier! You can still see the structures they used to automatically drive up the mountain, here in the distance where the eagles have their nests on top. My grandma used to love skiing, the soft snow underneath the planks. But some things we have to learn to let go. So they started to replant the slopes and we have been continuing their work. We support the fragile Alpine species to find new places further up, where the climate is still to their liking. They are too slow to keep up with the speed of the quickly growing plants from the valleys, some of them were just overrun, pushed out of their usual habitats. The roots of the plants also help to calm the erratic nature of the Alps. When permafrost

section line
section line before intervention
aquifer
surface water
filled aquifer
potential aquifer
loose material
fine sediments
bare rock

0 2,5 m

129 | Section of the intervention “Preserving, upscaling the ice stupa project”

was thawing, they kept together the ground and now, when there is a lot of rain, they hold back the landslides which would destroy our villages. When we help each other, we help ourselves."
In the distance I could vaguely make out a building illuminated by the light of the moon. As I approached it I saw an inscription next to its door: "A letter to the future. Gepatsch is the first Austrian glacier to lose its status as a glacier. In the next 200 years all our glaciers are expected to follow the same path. This monument is to acknowledge that we know what is happening and what needs to be done. Only you know if we did it."

Suddenly the weather changed. I could already feel the first drops of water on my skin. As I watched the drops of water falling onto the earth, disappearing in the soil I finally realized, the Alpine Ocean was right there. She was the symbiosis of water and soil making life possible all the way from the top of the mountain to the Delta that I grew up in. The glacier changed her form, giving new life to new habitats. She changed her form and turned into a kaleidoscope of living waters. As I was walking back home I passed by the places I had seen before already and now saw anew. The Ocean is everywhere. She is the trees and the roots of the plants that the people had carefully planted on the slopes, she is the terraces, which form vertical wetlands that are able to capture the drops of water from the sky. She is the rivers making their way through the steep landscape and the lakes formed by rocks that provided a habitat for diverse species. She is the marshlands covering valley floors and the islands in the delta. She is the rain that falls down from the sky. She is me. I am the Alpine Ocean.





130 | Another world

## 6.2 Design framework
## Alpine waters

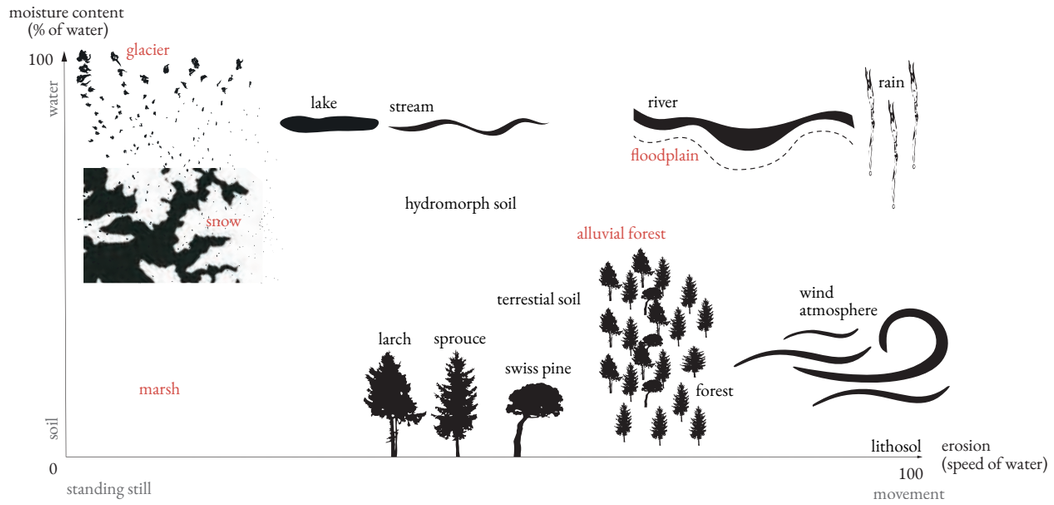
In the web of living organisms in Europe the Alps have the ability and responsibility to collect fresh water, store it for dry seasons, carry it through their veins and share it equitably and steadily with all living beings within their reach. They are our living freshwater source and reservoir. Through their agency they secure a democratic attitude towards water as our shared lifesource.

With the increasing temperature, freshwater is the planet's most valuable resource. At the same time this essential agency of the Alps is at risk due to the changing water system. The change of the state of matter of water, from frozen to fluid, brings with it thawing of permafrost, lack of snow, and impossibility of artificial snow-making,  as well as, most crucially, the disappearance of glaciers. All of them have severe consequences on human and natural systems in place. Eventually, this means that all places connected to the Alpine water system will have to adapt to be non-glacially influenced.

In regards to the natural dynamics, the erratic nature will increase. This is the result of a faster movement of water molecules due to the changing state of matter. Where the water used to be frozen, and therefore (almost) standing still, it starts dissolving and moving downwards through gravity. On its way it destabilizes soil and rocks. The speed of water is further influenced by a higher frequency of extreme weather events with heavy rainfall and longer periods of droughts, resulting in a higher velocity in water bodies. Furthermore, human infrastructures which were built during a period of abundant and balanced water availability, are constructed to discharge water the fastest way possible. Additionally, the abundance led to the commodification of freshwater for uses such as energy generation and creation of artificial snow.

How could design support the Alps, being a living freshwater source and reservoir, in fulfilling their role to sustain future life within their territory and beyond? For this reason, the design expands beyond the usual technicalities. It imagines possible future landscapes by showing how glaciers and snow could transform into a new habitat and a new landscape – highlighting the process of the changing glacier into a different form of water body. The strategy for the design is to slow down the movement of water






131 | Alpine waters



and keep it as long as possible within place in order to slowly and steadily share the water, and buffer the erratic nature. The research by design question, therefore, is: How to slow down the movement of water through terraforming by strengthening present ecosystems and increasing habitat connectivity over time?

### The form of Alpine water bodies

The changing water system from a glacially influenced to an non-glacially influenced brings with it the challenge of a changing state of the matter from frozen to fluid. This results in the release of energy. There are two processes that are the most visible due to the melting of glaciers: erosion and moisturizing. In an effort to bring together different bodies of water, these two parameters are used in order to be able to compare the different forms of water storage and carriage with each other. The horizontal axes of the diagram go from standing-still elements to elements of fast movement. This describes the speed of water and becomes visible through the impact of erosion that the water body has on the landscape. On the vertical axis, the moisture content, described as the percentage of water that the element is composed of, is represented in numbers from 0 to 100 and is visible as either rich in soil matter or rich in water matter. Therefore, we find a diversity of different typologies that can carry water and store it within them. The slower the movement, the higher and longer

the storage capacity. The faster the movement, the higher the erosion.

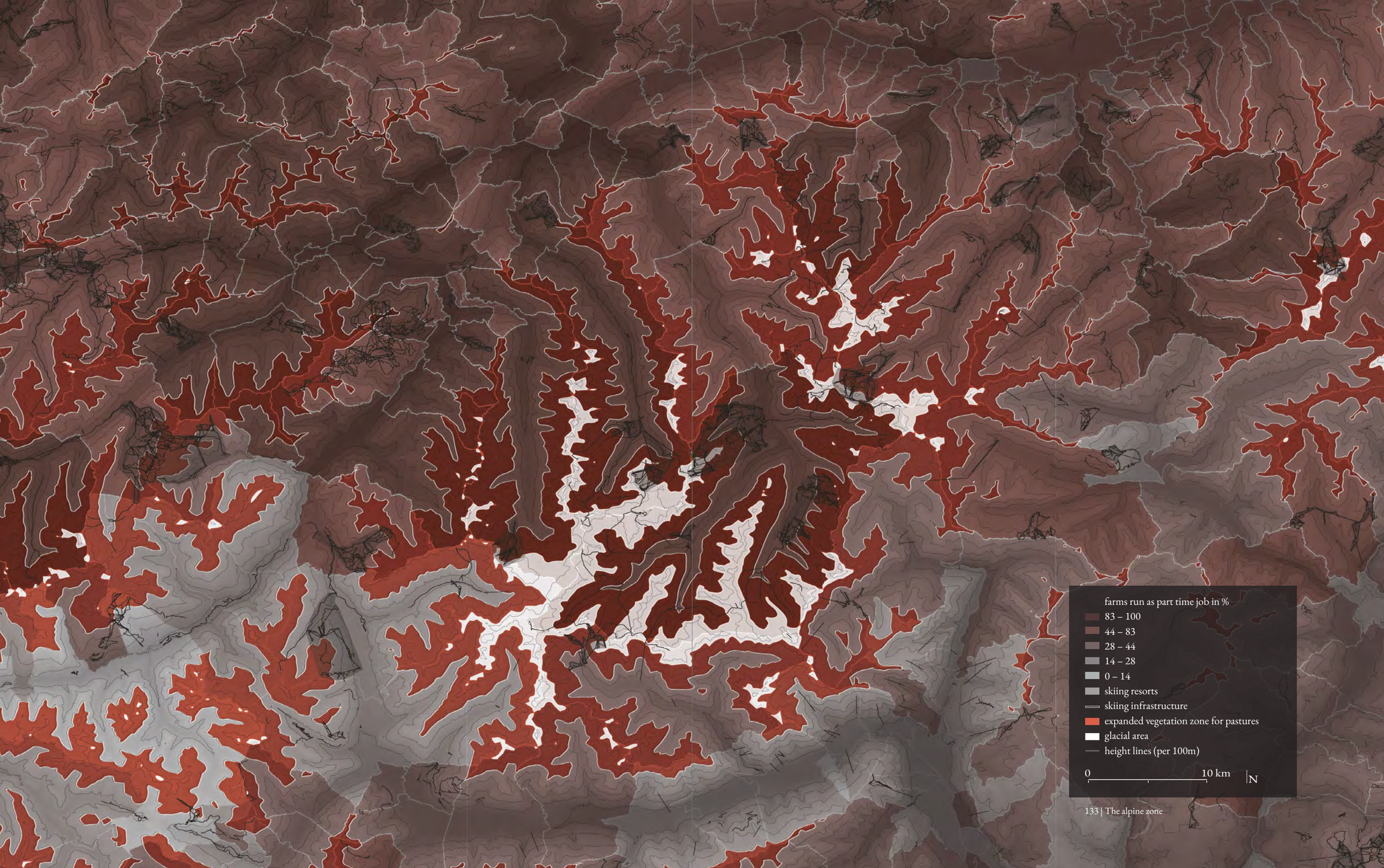
With glaciers disappearing, we are losing standing water bodies with a high percentage of moisture. Due to the loss of snow cover, a similar effect will happen, where the buffering of extreme weather events and high precipitation will be gone and water will flow down immediately through the channelized system. In order to counter this loss, the project proposes to rediscover methods to slow down the movement of water and keep it as long as possible in place.

Indicated in red, multiple types of landscapes have been lost in the past due to human activities or will be disappearing due to future temperature rise. Due to the straightening of rivers and drainage of valley floors since the appearance of the industrial landscape, described in chapter 4.1.3 Factory, many marshlands, for example, are almost nonexistent anymore, as are alluvial forests and flood plains. One element I would like to highlight in this diagram is the capacity of soil to store water. That capacity is expressed through the density and type of vegetation. Soil accumulation follows the growth of vegetation. It is therefore important to find ways to kickstart this cycle. Plants and their soil are very important carriers of water. They are able to absorb water if there is too much and store it for dry seasons, and release it if there is too little (Zhang et al., 2021). The Alpine vegetation, and especially the trees, such as, large spruces, Swiss pines, and others, therefore, account for a large mass of water storage. With the tree line shifting upward, this presents a unique opportunity to let the Alps grow from within.

The project, therefore, suggests a shift from water to soil, putting attention on the molecules of the earth and its capacity to collect and store water over a long period of time while at the same time creating the basis for life to unfold. The different interventions that are proposed in this thesis can be further developed and added, as they are an inspirational tool to open up the question of what is possible and how they will act within this simple graph. The more diverse bodies of water we can find and restore, the better the Alps will be prepared for future changes.



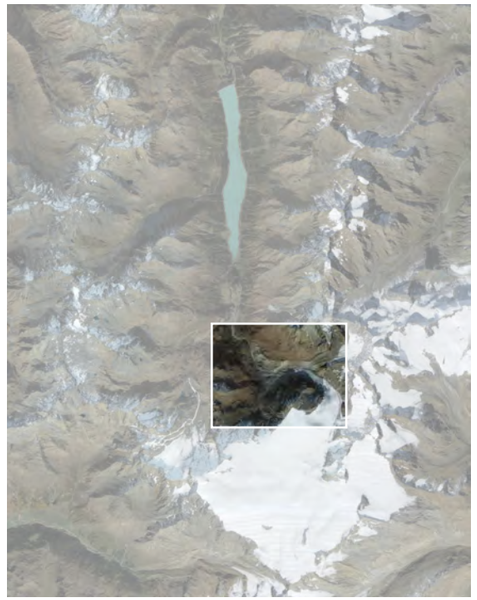
132 | Transformation of the glacier


farms run as part time job in %
83 – 100
44 – 83
28 – 44
14 – 28
0 – 14
skiing resorts
skiing infrastructure
expanded vegetation zone for pastures
glacial area
height lines (per 100m)
0
10 km
N

## 6.3 Focus area
## High elevation zones and their processes

As described previously in chapter 3.3.2 The Gepatsch glacier and 3.3.3 Vegetation Expansion, due to the temperature rise, the climatic zones are shifting upward. The zones which are affected the most by these changes are the ones highest up. Therefore, the design is focusing on the alpine zone, which is highlighted on the drawing in red, and the nival zone, coloured in white, of the Ötztaler Alps.

The alpine zone is defined as the zone in between the tree line and the snow line. This place is home to many indigenous Alpine plants, like the edelweiss, the glacial buttercup, or the Swiss pine. Due to higher UV radiation, colors are often brighter than elsewhere. In a high-end climate scenario, this zone will be completely changed into a montane zone. The nival zone, which is situated above the alpine zone, has been, so far, the home of glaciers. Since the zones are moving upwards the present nival zone will be the habitat for the new alpine zone vegetation and biotic and abiotic entities. Therefore, the alpine and nival zones bring together crucial parts to illustrate how temperature rise is affecting the Alps and how these seemingly far away areas are influencing and shaping downstream habitats.

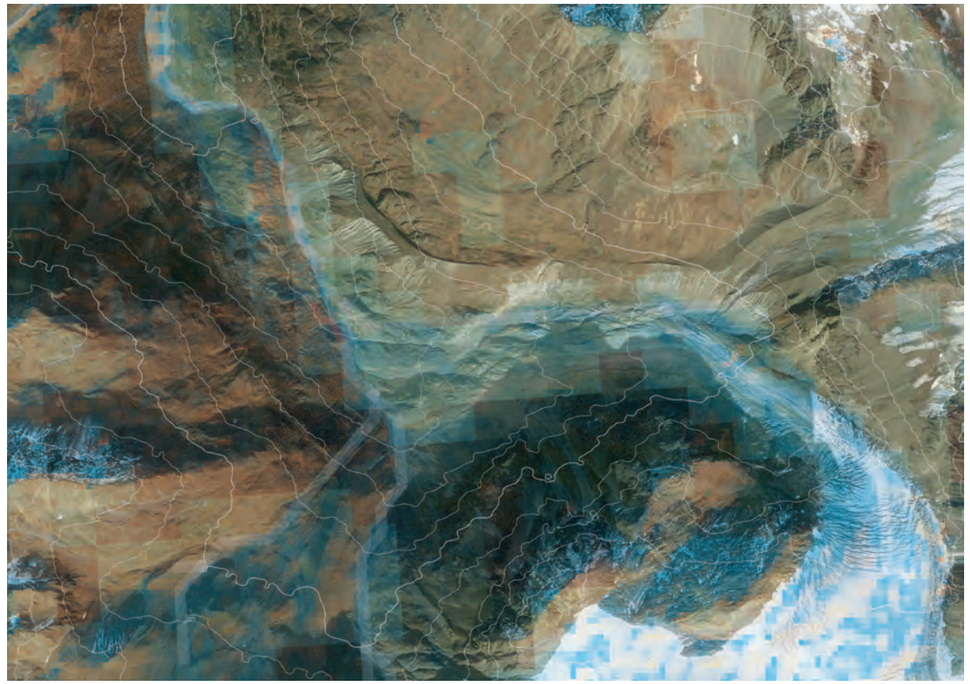


134 | Primary area of the design investigation

### Proglacial Geomorphodynamics around the Gepatsch glacier

The place of study for experimenting with the interventions is at the proglacial area of the Gepatsch glacier. The area around the glacier has been excessively researched by Lucas Vehling (2016). The conclusions and processes I have been investigating are based on his findings and

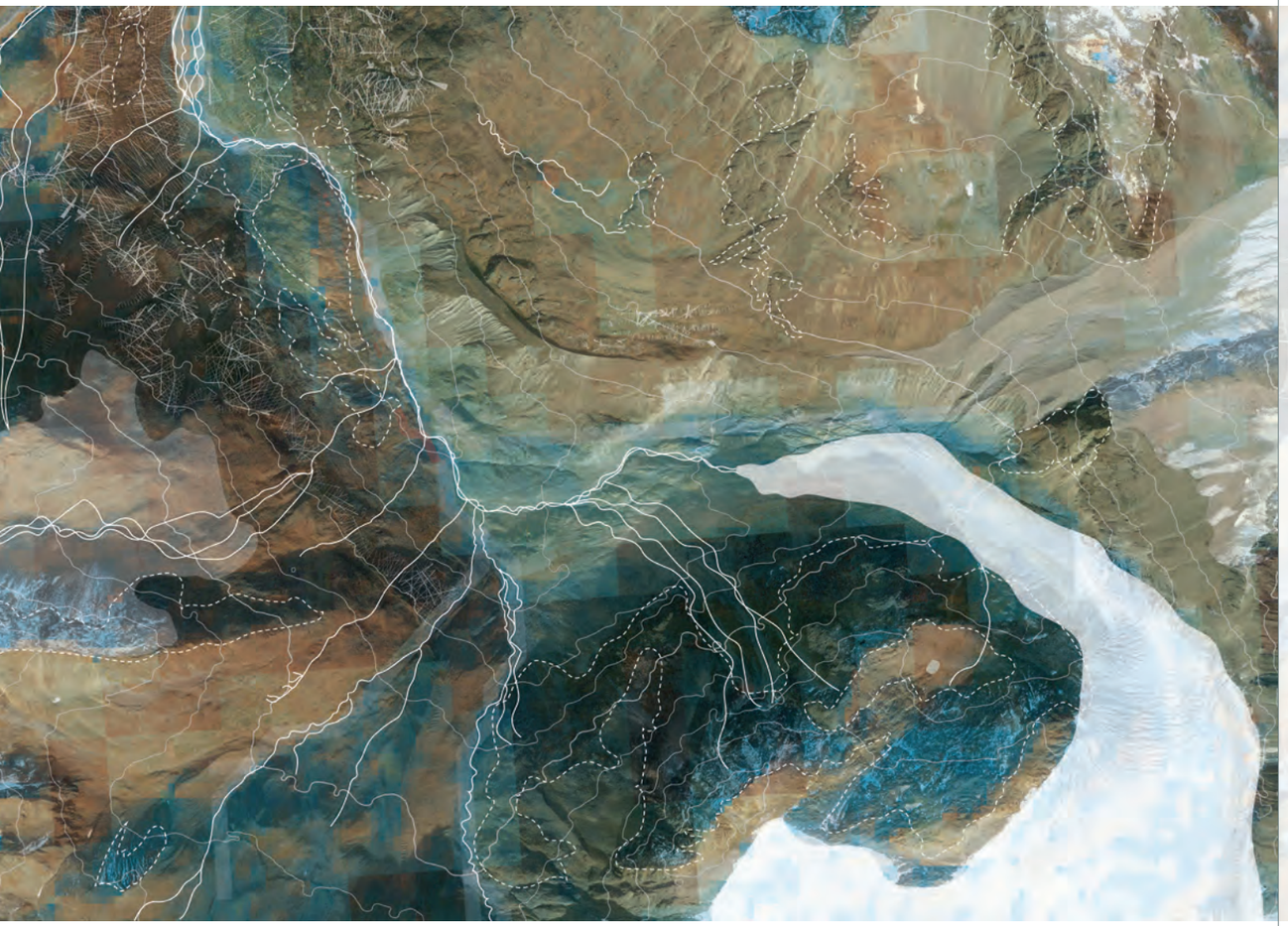




135 | Proglacial area of the Gepatsch glacier

connected to the research presented in this thesis. The area of the Gepatsch glacier is marked by two stable periods within the year, namely the glacier's condition in summer and its condition in winter. In the winter, the area is mostly covered by snow, with the thickness of the snow layer varying, depending on the surface below. Additionally, the steepness of slopes has an influence on their accumulation patterns. Especially important is the fact that the steeper the slope, the higher the risk of avalanches, unless they are too steep for snow to accumulate.

Valleys have been carved out through different phases of glacial advance and retreat, resulting in a composition of one main valley and a few side valleys where other glaciers were joining the mainstream. Therefore, the condition in summer is composed of a variety of different hydrological streams, small rivers, which are accumulating in the bigger riverbed, where one can also find the emergence of deltaic conditions. The omnipresent glacial tongue is retreating further and further. When looking at vegetation patterns, one can find moments of stillness



south oriented slope
north oriented slope
vegetated area
last area of snow
visible bedrock
river
heightline (100m)



snow depth (potential)
shallow
deep

0 500 m N

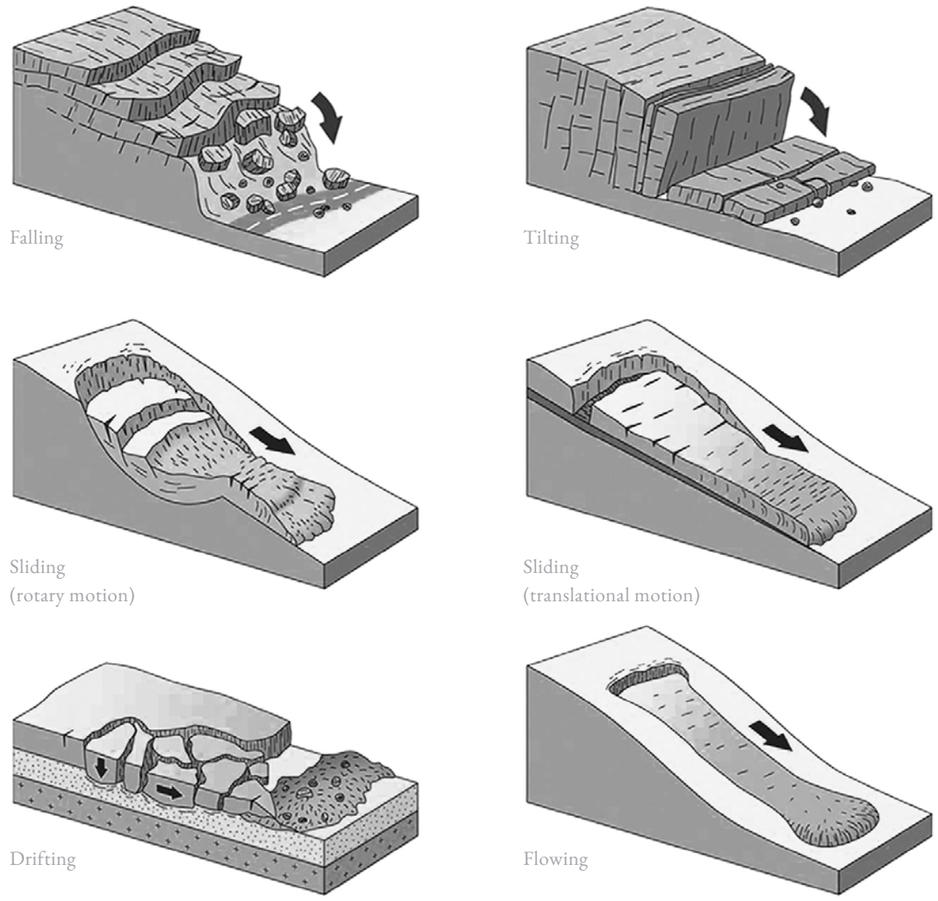
where plants start to grow or rocks are sticking out between the constantly moving sediments and rocks. Furthermore, there are unstable sites with strong processes of erosion, transporting matter downwards into the valley ground.

The moraine, which is the material left behind by the glacier, especially the side moraine, consists of finely grinded matter with a high degree of nutrients due to its paragneiss geological composition. This means that the particles are rich in clay. The places where they accumulate in the rivers are found where many streams are coming together, visibly forming a young alpine deltaic system. This is where the erosion is accumulating nowadays. The places where deltaic systems form and sediment deposits amass, slowly follow the retreating glacier tongue. Therefore, the past, present and future conditions of the landscape, which the glacier and erosion processes shape, are occuring at the same time at different places (Temme et al., 2016).

The processes between the winter and summer conditions, which are happening in spring and fall, are marked by erosion and moisturizing. The process of erosion is very dominant in this area. With thawing permafrost and increasing precipitation patterns, the strength of them will further expand (Nearing et al., 2004). Due to rising temperatures most of the precipitation will change from snowfall to rain. This means that the intensity of erosion processes will also increase, and, therefore, more material will be washed down from the mountain sides into the valleys, accumulating in the horizontal flood plains. If this process accelerates and progressively more water is washed down, the ground will not be able to retain the sediments, which means that they will be washed away further downstream, causing a loss of very valuable resources for the Alpine delta. These sediments will accumulate in the Gepatsch storage lake, however, because of the present usage of the storage lake for energy production the sediments have no place to evolve and, in turn, fulfill their role as life-giving elements that provide nutrients for plants.

The area around the Gepatsch glacier can be seen as a very balanced hydrological and geological system that has been shaped by the forces of water over millennia and found a balance within those changing dynamics throughout the year.



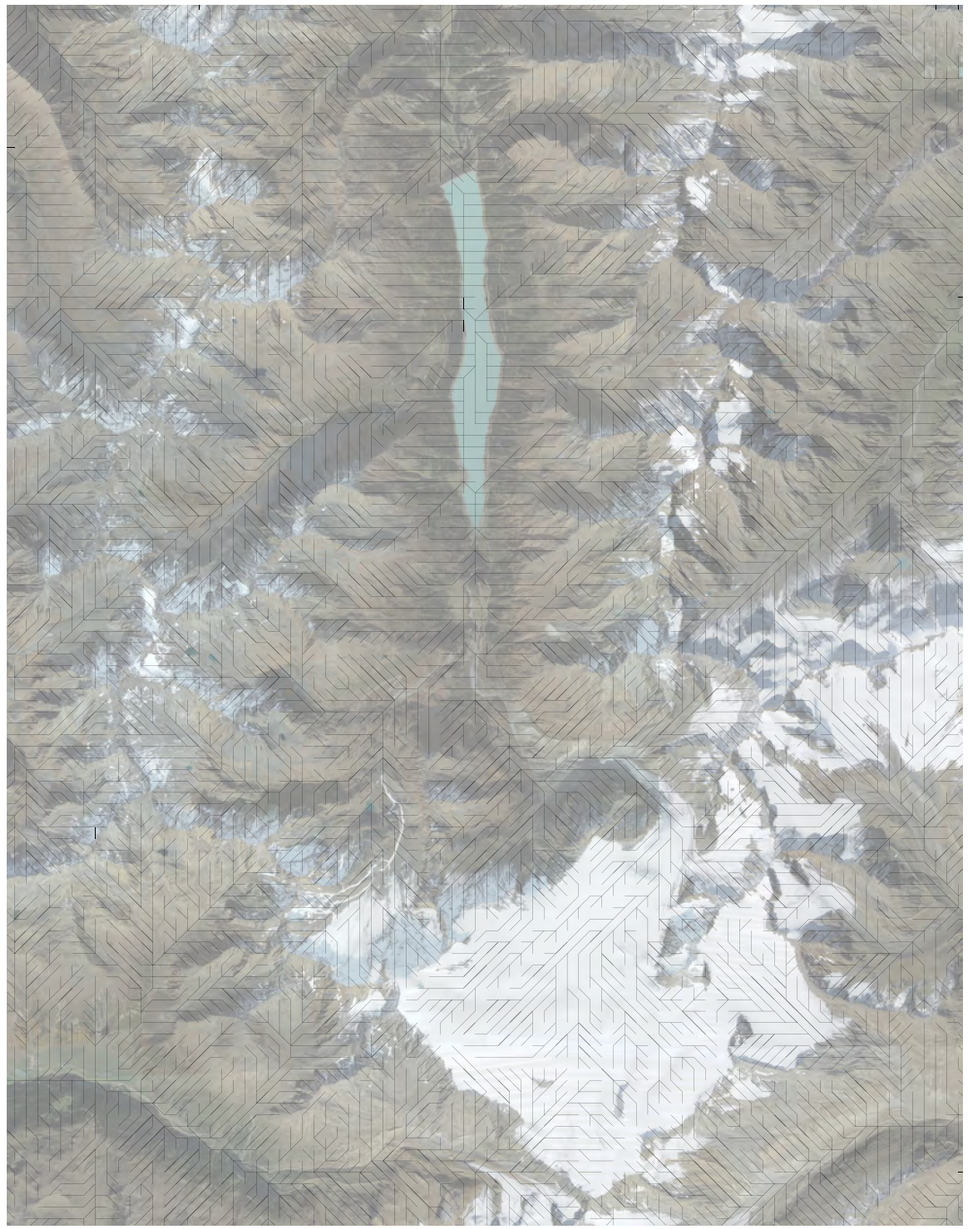



138 |Schematic drawings of different landslide mechanisms (adapted from M. Dziggel/GFZ)

landslide material (old)
landslide material (new)
moraine material
fluvial sediments
mudflow debris (old)
mudflow debris (new)
new mudflow formation
river/stream
height line (500m)
height line (100m)

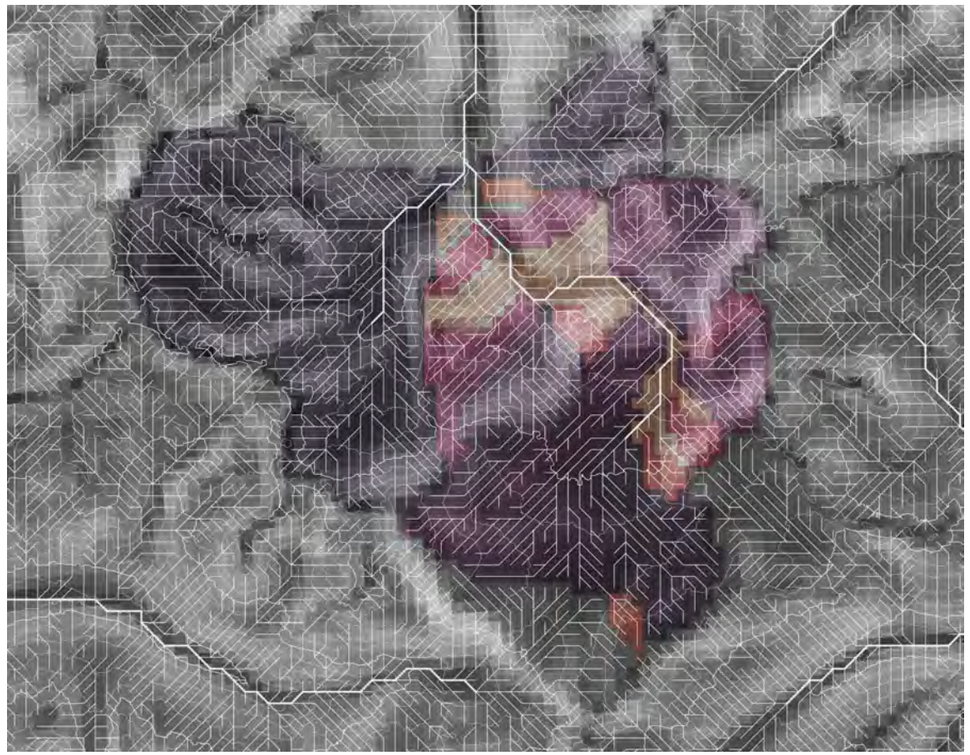
0 250 m N

139 | Geomorphodynamics in the proglacial area around the Gepatsch glacier



140 | Calculated potential river system based on the topography

The small river streams, running off on the surface of the slopes, change the morphology of the land; these are all processes that happened over many, many centuries and millennia. However, due to global warming, this system will be exposed to extreme changes, especially driven by the thawing of ice and changing precipitation patterns (Joep Storms, personal communication, May 9th, 2023). It will change its matter completely, which is where the design interventions come in in order to support the transitions and allow for a new Alpine freshwater source to evolve.



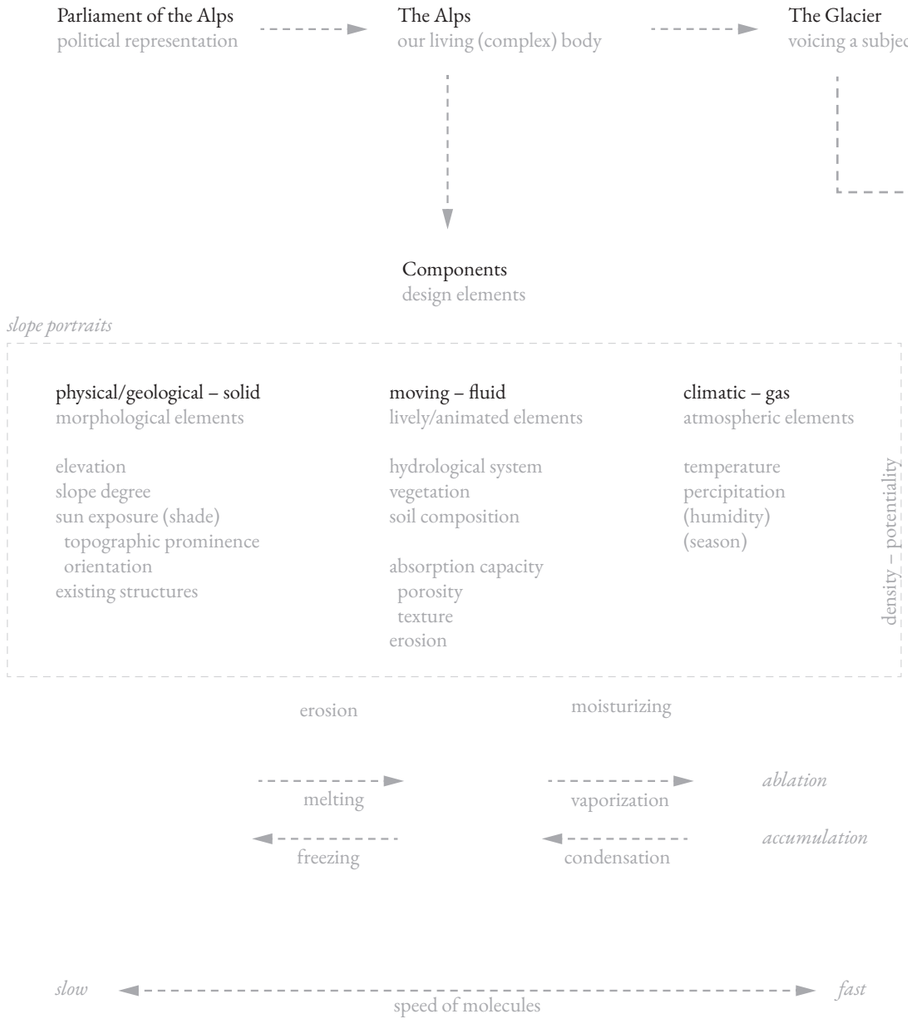
141 | Calculated river catchmentareas and potential river streams around the Gepatsch glacier

catchment area
catchment area (large – small)
catchment flowline primary
catchment flowline secondary
river/stream
height line (500m)
height line (100m)

0 250 m N

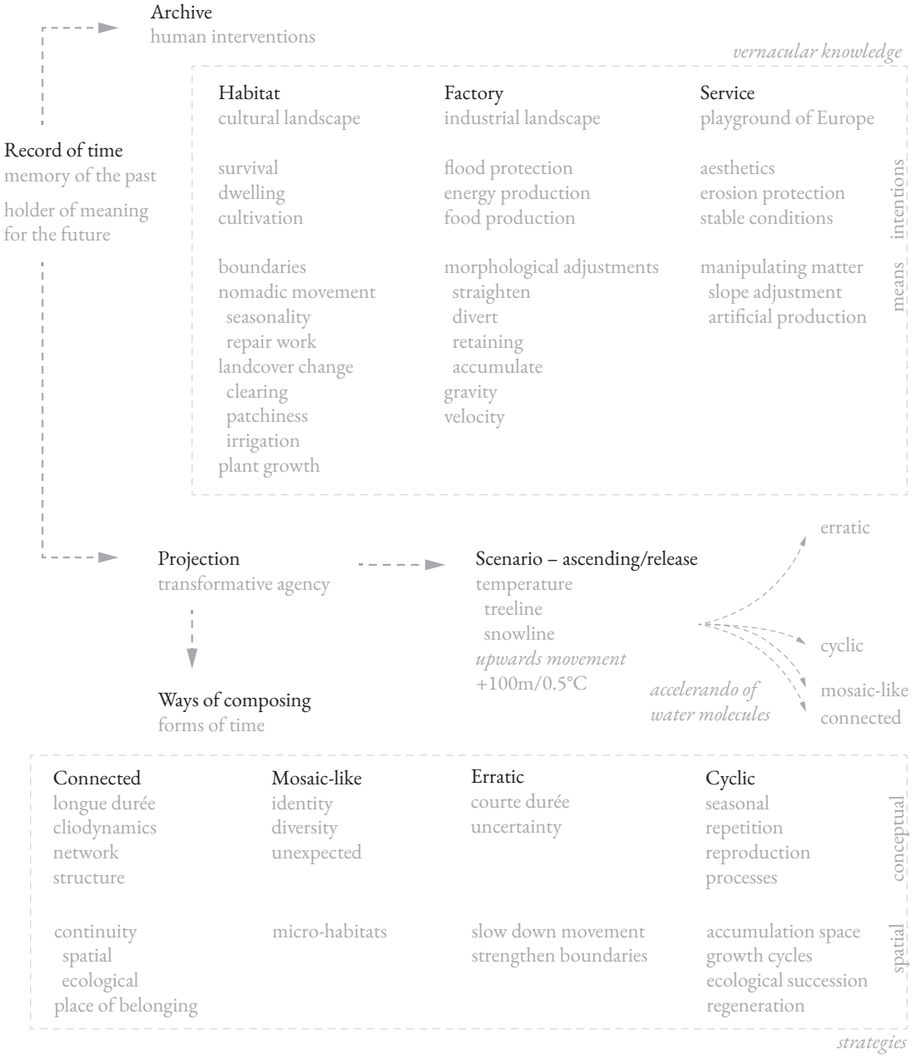
142 | Potetial of moisturization around the proglacial area of the Gepatsch glacier

## 6.4 Reshaping the Ocean
### Imaginaries of possible future landscapes



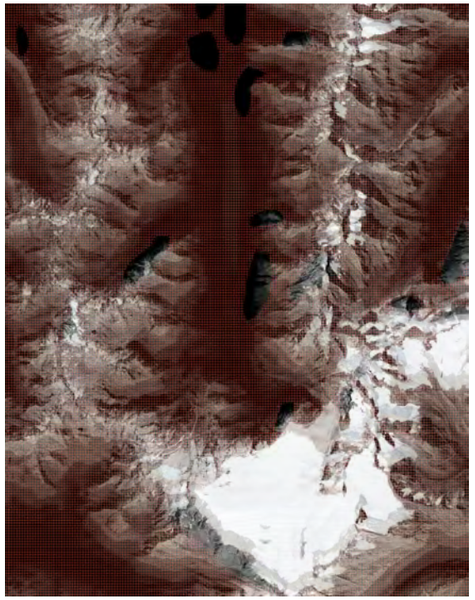




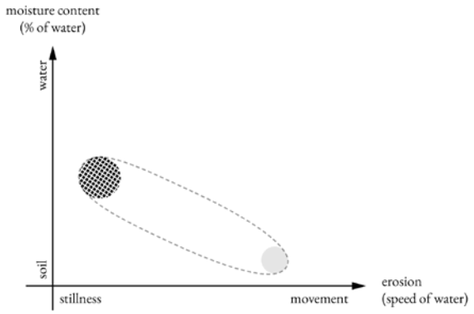



## 6.4.1 Supporting
### Moving upwards through kick-starting Alpine soil formation

The first strategy aims at supporting the natural upwards shift of vegetation due to temperature rise. As described previously in chapter 3.3.3 Vegetation Expansion, the Alpine flora and fauna is being pushed upwards through proliferation pressure of faster growing plants in low-altitude areas towards high-altitude zones. This strategy supports the specialized and fragile Alpine flora in moving upwards following the climate which is suited for them, as well as finding areas where they have less competition. At the same time, this strategy uses the capacity of soil to store water. Through this approach, the inexorable upwards movement, due to human induced climate change, becomes the main strategy in the water storage capacity of vegetation and soil.



145 | Possible areas for interventions in red

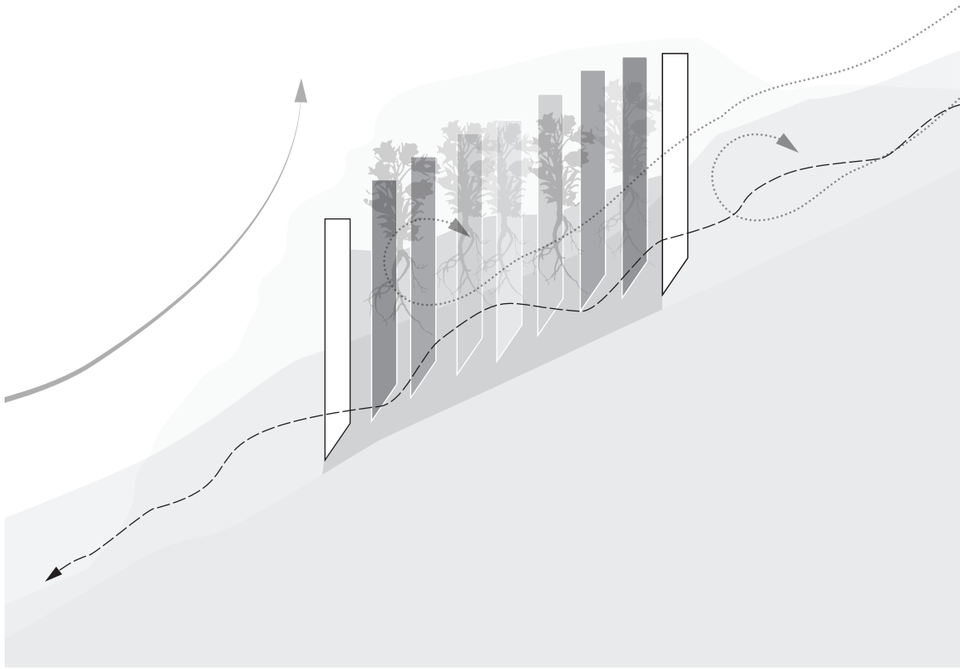



144 | Changing movement of matter and water

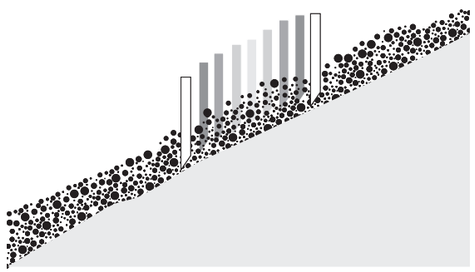
In order to start plant growth within an alpine region that has formerly been dominated by glaciers, and therefore has not been able to grow vegetation, it is important to control the erosion patterns. Usually, the water that flows down



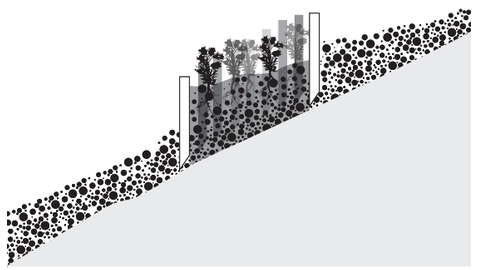

146 | Visualization of the upwards shifting vegetation in time



147 | Functioning (top)



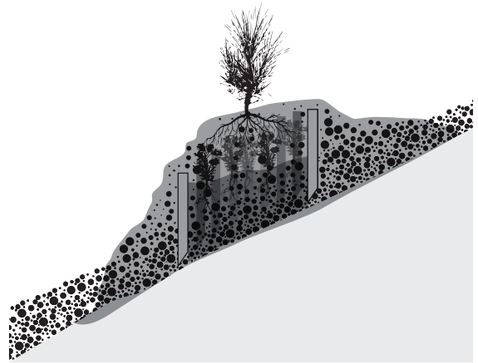
148 | First action



149 | Plantation of the bearded bellflower

the slope washes away accumulated sedimentation, which forms the basis for plants to grow. Therefore, the first strategy aims to retain the sediments within the area, at times also transferring sedimentation from the glacial moraine, which is very valuable, finely ground, and rich in clay material, and securing it with structures that can hold back the erosion processes. Plants manage to capture sediments, and therefore, create a bigger barrier for more soil and sediment to accumulate within their location. This is how, through obstacles and through plants, the design kick-starts the process of alpine soil formation.

By creating circles with several poles an area of little movement is created. Inside this space several bearded bellflowers are planted. The plant has a very strong root network which benefits the stability of the very young soil within this harsh environment.  Therefore, they are the per-



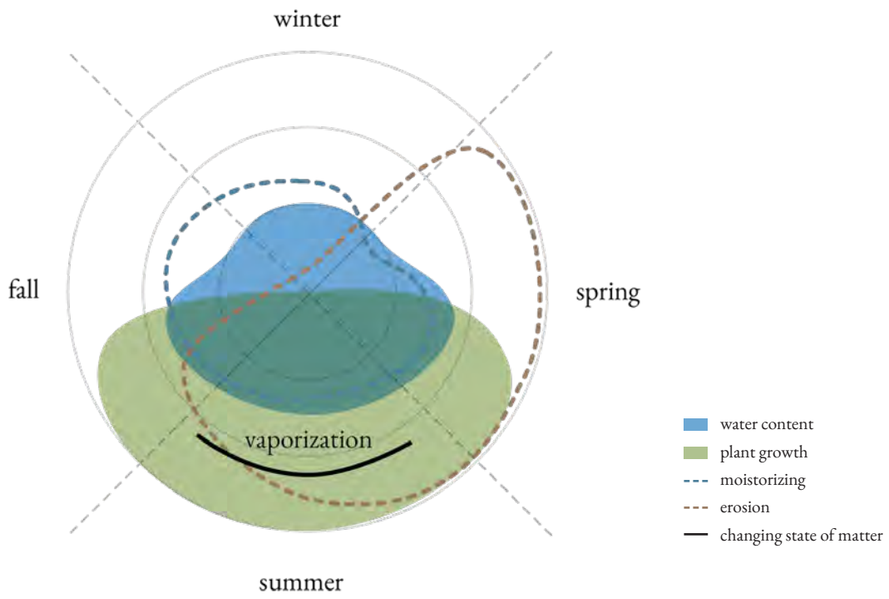
150 | Accumulation of soil overtime

151 | Expansion of vegetation

N

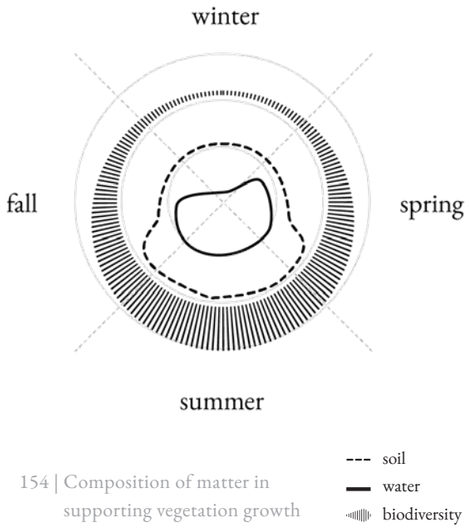
0 50 m

152 | Site map



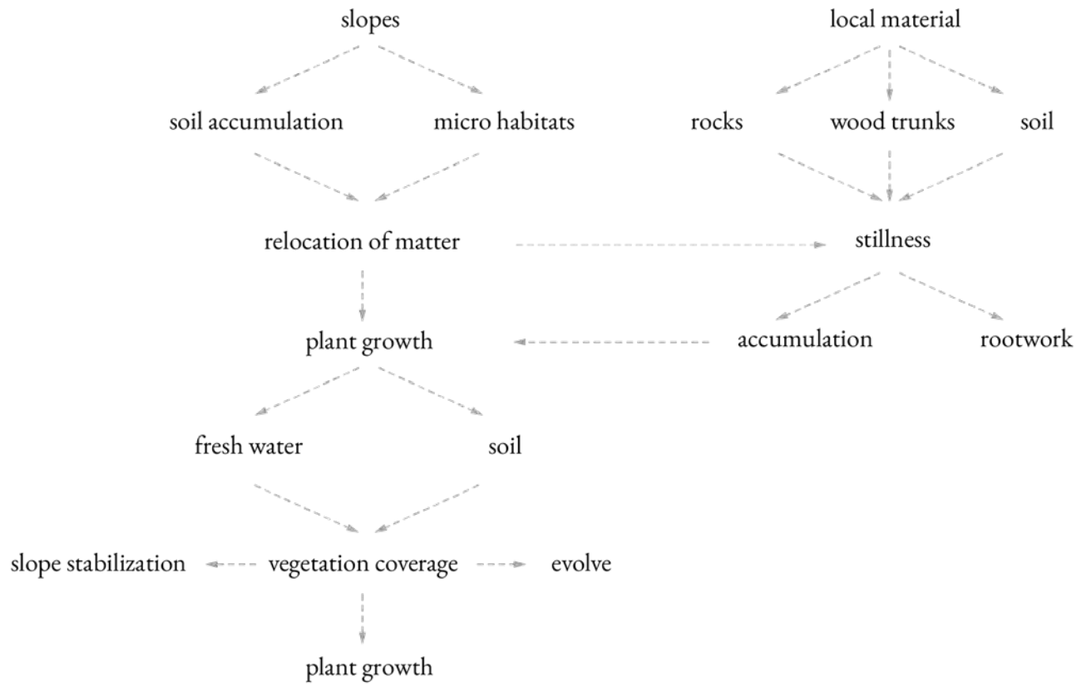

153 | Processes through supporting vegetation growth

fect pioneer plant for soil to accumulate. Once there is a plant, a process is started where larger plants can settle in the growing soil bed. In the exhibition I visited during my fieldwork, there was an installation which showed the experiments some scientists are conducting with the flower in order to find the perfect soil composition for it to grow in the Kaunertal valley.

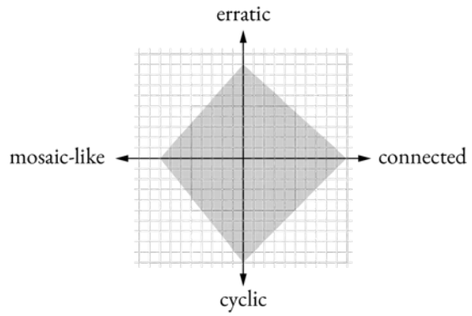



154 | Composition of matter in supporting vegetation growth

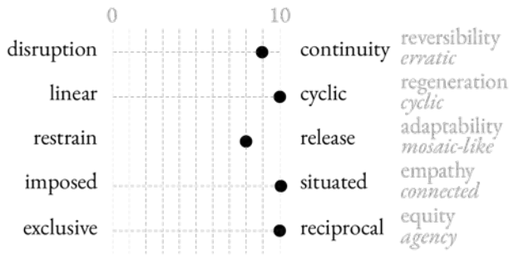





155 | Conceptual diagram of supporting vegetation growth




156 | Influence on Alpine Character by supporting vegetation growth

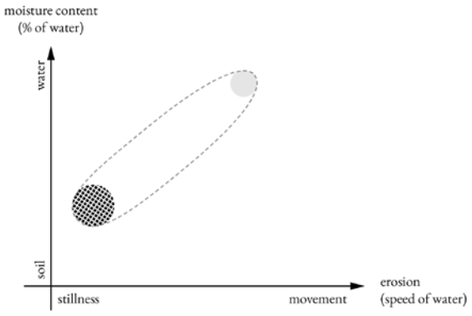



157 | Importance of Alpine values in supporting vegetation growth

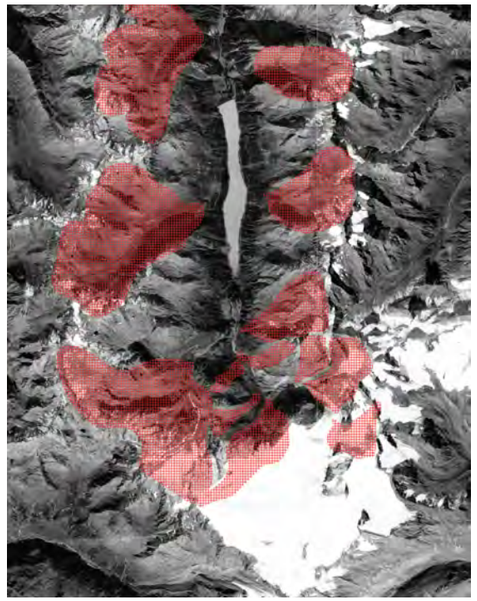
## 6.4.2 Retaining
## Living slopes

The second type of intervention references the traditional method of terracing. This is a method especially used in southern Alpine areas, for example, in South Tyrol, when building vineyards. By merging this traditional way of terracing with the culture of rice terraces, I propose the creation of terraced wetlands, which stabilize the steep ground and keep the water within the place.

Therefore, the melting water of the glacial tongue slowly dissolves, but is retained and slowly distributed over the terraces. In times of heavy rainfall the basins catch the water and slowly release it in dry periods. In those places that are always wet, sometimes more, sometimes



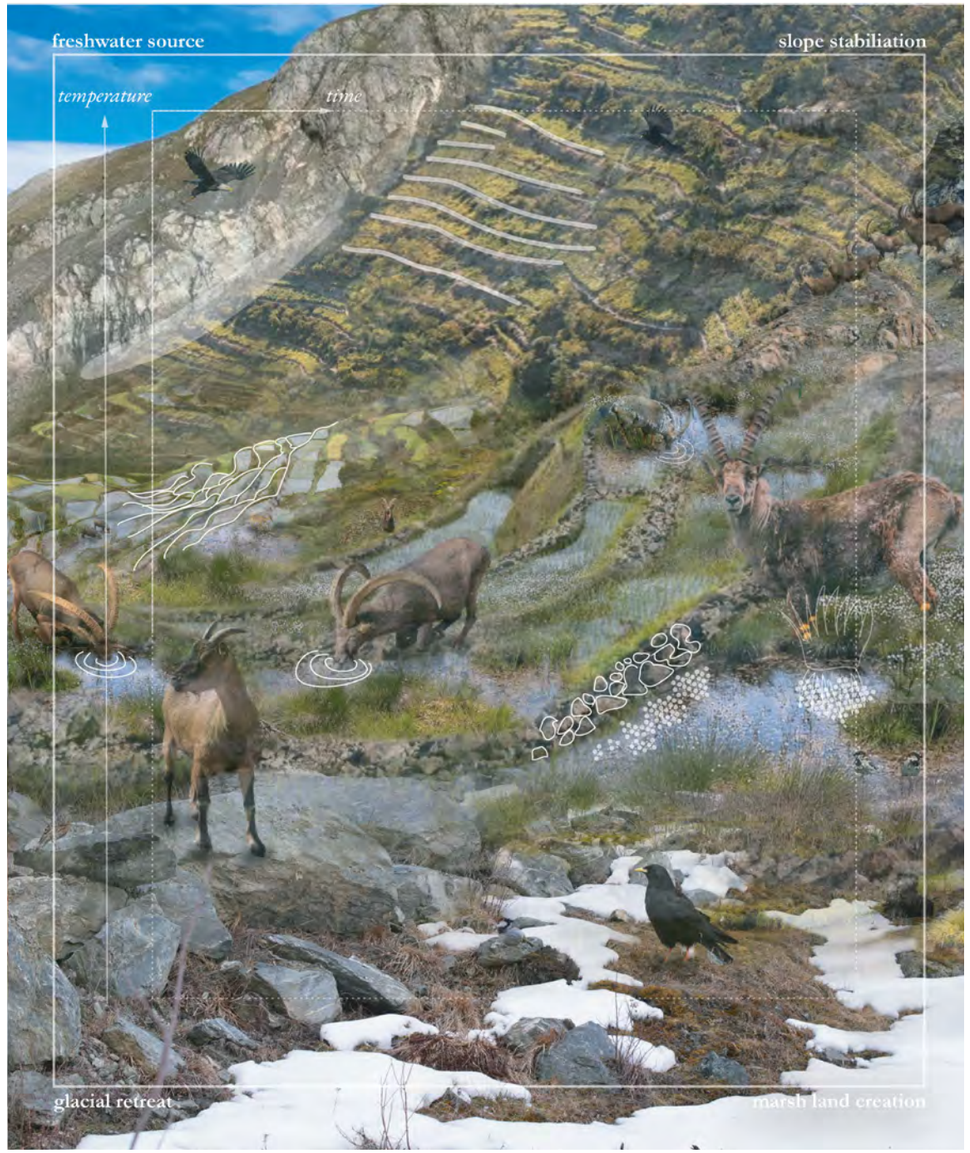

158 | Changing movement of matter and water



159 | Potential locations for terracing: The larger the catchment area and the less steep the slope the better. This condition often occures in hanging valleys

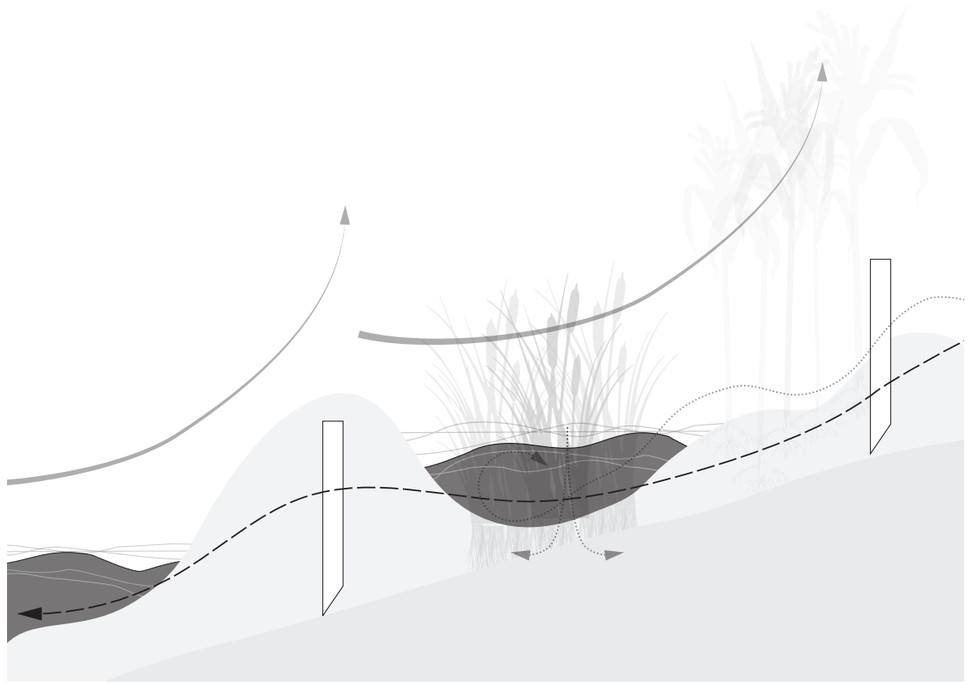
less, a new kind of biosphere forms. Marshlands and small swamps can give life to the bacteria that have been stored in the glacial ice. Those microhabitats create new places for the Alpine flora and fauna to live and evolve. It is a freshwater source for the alpine ibex, as due to climate change surrounding conditions turn dry and



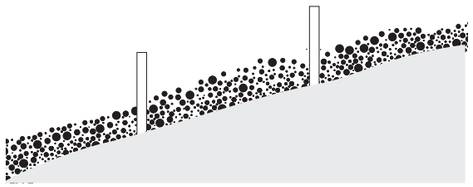



156 | Visualization of the living slopes

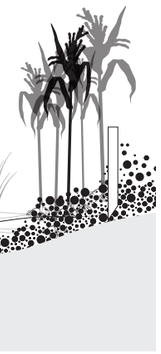

**157 | Site map**



158 | Functioning (top)



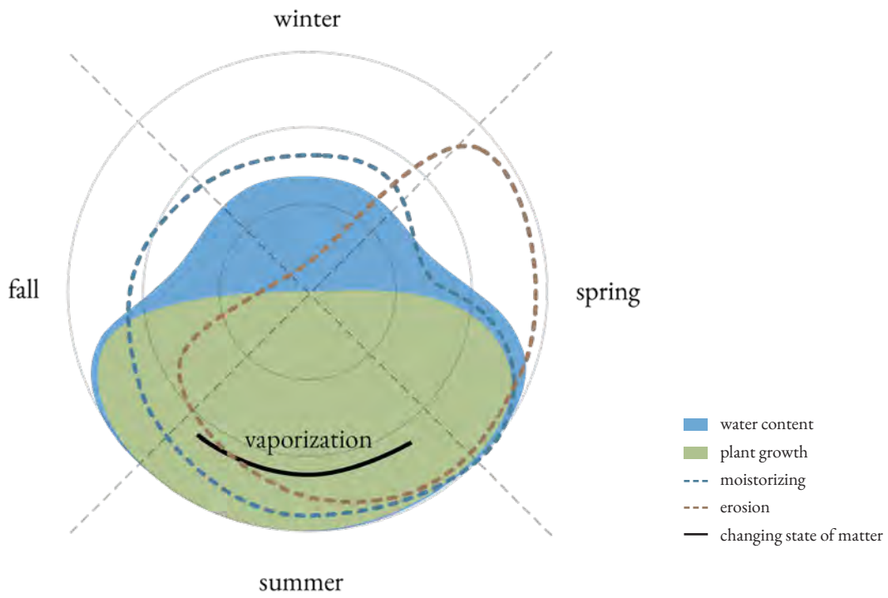
159 | First action



160 | Growth over time

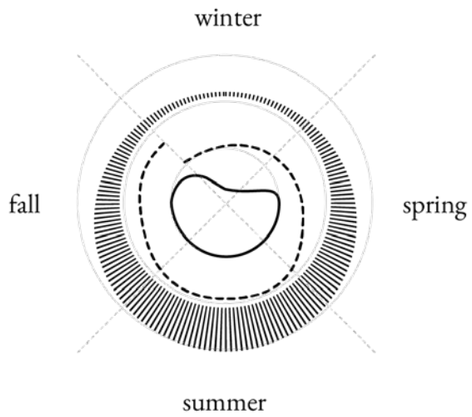
the steady water stream of the glaciers ceases. Furthermore, they offer a place for diverse agricultural practices – from dry conditions on the borders of the terraces and places for crops which like wet conditions in the water basins.

The slopes have to be morphologically adjusted so that they are able to hold water and, at the same time, create conditions for living organisms. This is achieved through the relocation of local matter. By excavating holes and piling up the soil forming containing walls, basins are created. They are reinforced with wood trunks and stones and their maximum height is defined by their ability to be self-supporting. Depending on the width of the borders they offer space for agricultural practices, walking and biking paths or mingling places.



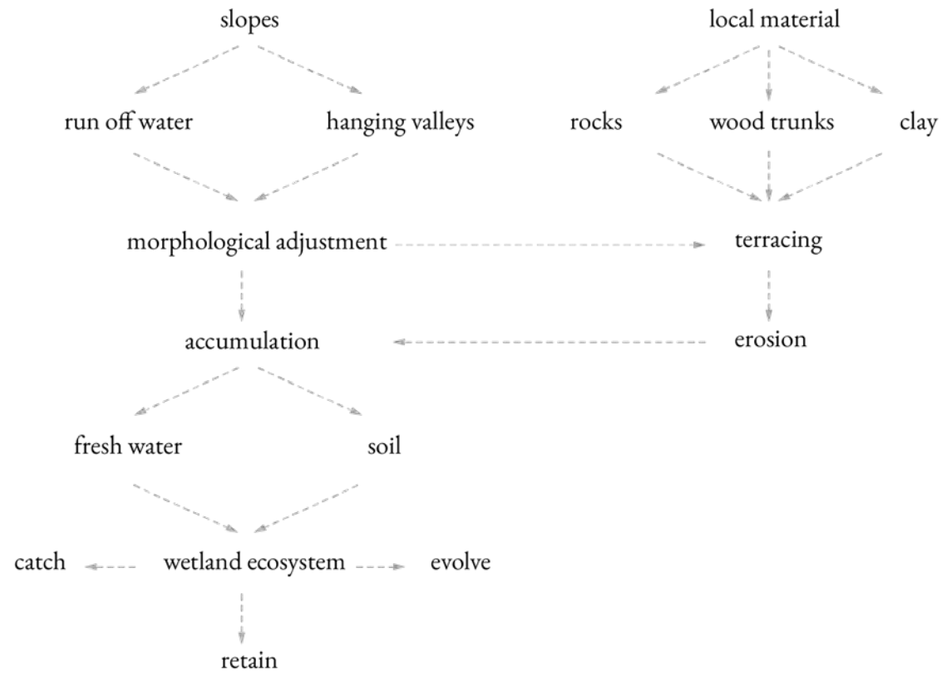

160 | Processes through terracing

The locations of the slopes are also strategic. The terraces are best positioned in slopes with less than 30° – the less the better – as well as a reasonably large hydrological catchment area. Hanging valleys, where during the Ice Age former small glacial tongues merged into the bigger glaciers, are very suitable places since they offer both of the conditions – the slope is not too steep, and water can easily accumulate. There are many of those conditions, within the Gepatsch glacier area, as well as throughout the whole Alpine range.

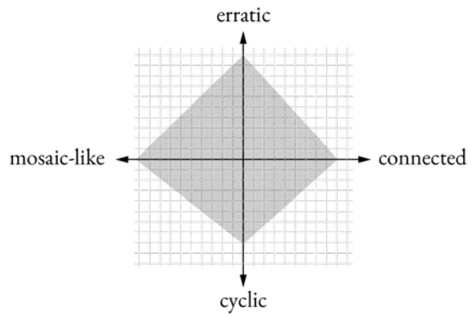



161 | Composition of matter in terracing

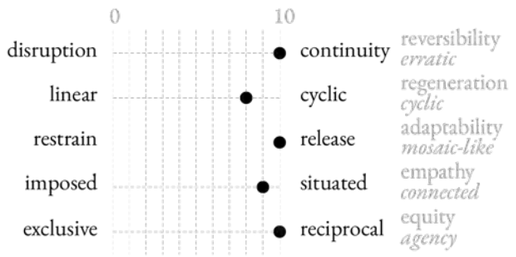





162 | Conceptual diagram of terracing




163 | Influence on Alpine Character through terracing

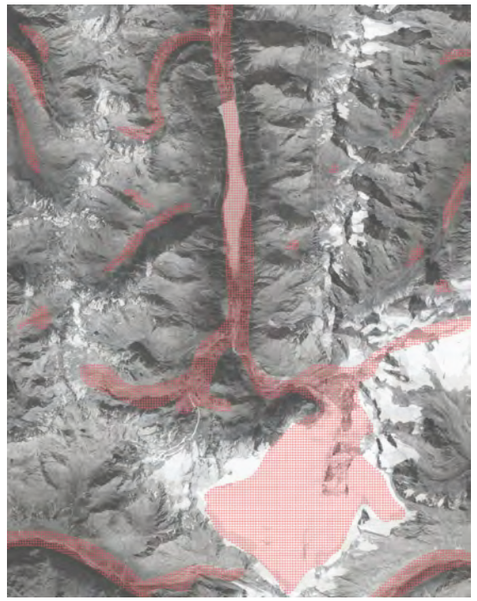



164 | Importance of Alpine values in terracing

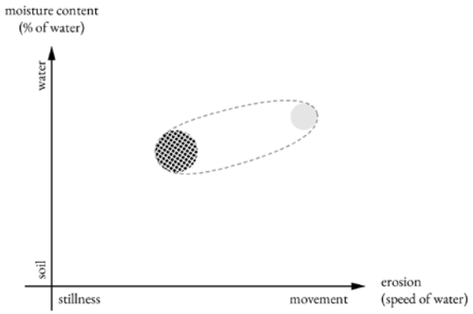
## 6.4.3 Keeping
### Protecting sedimentation processes in young deltaic systems

Where the water of the slopes and the small streams start to accumulate into the larger water streams and rivers, valleys can be found, which have been carved out by glacial retreat. On the valley floors, in those high Alpine zones, one can recognize places that are very similar to deltaic systems. They are formed through the erosion processes of the side moraines, which are moving down the slope, accumulating in-between the rocks, forming a flat surface that allows the water to find its own stream and its own route.

In the Gepatsch area, these valley floors are very rich in nutrients because of the clay that is inside the sediments. Because of changing precipitation patterns, due to a higher velocity of water caused by more extreme weather events, those sediments are in danger of being washed away. It is therefore necessary to try to stabilize the accumulated sedimentation. This is achieved by using poles that are fixed into the ground at a specific distance from one another. The sediments can accumulate around and along them,

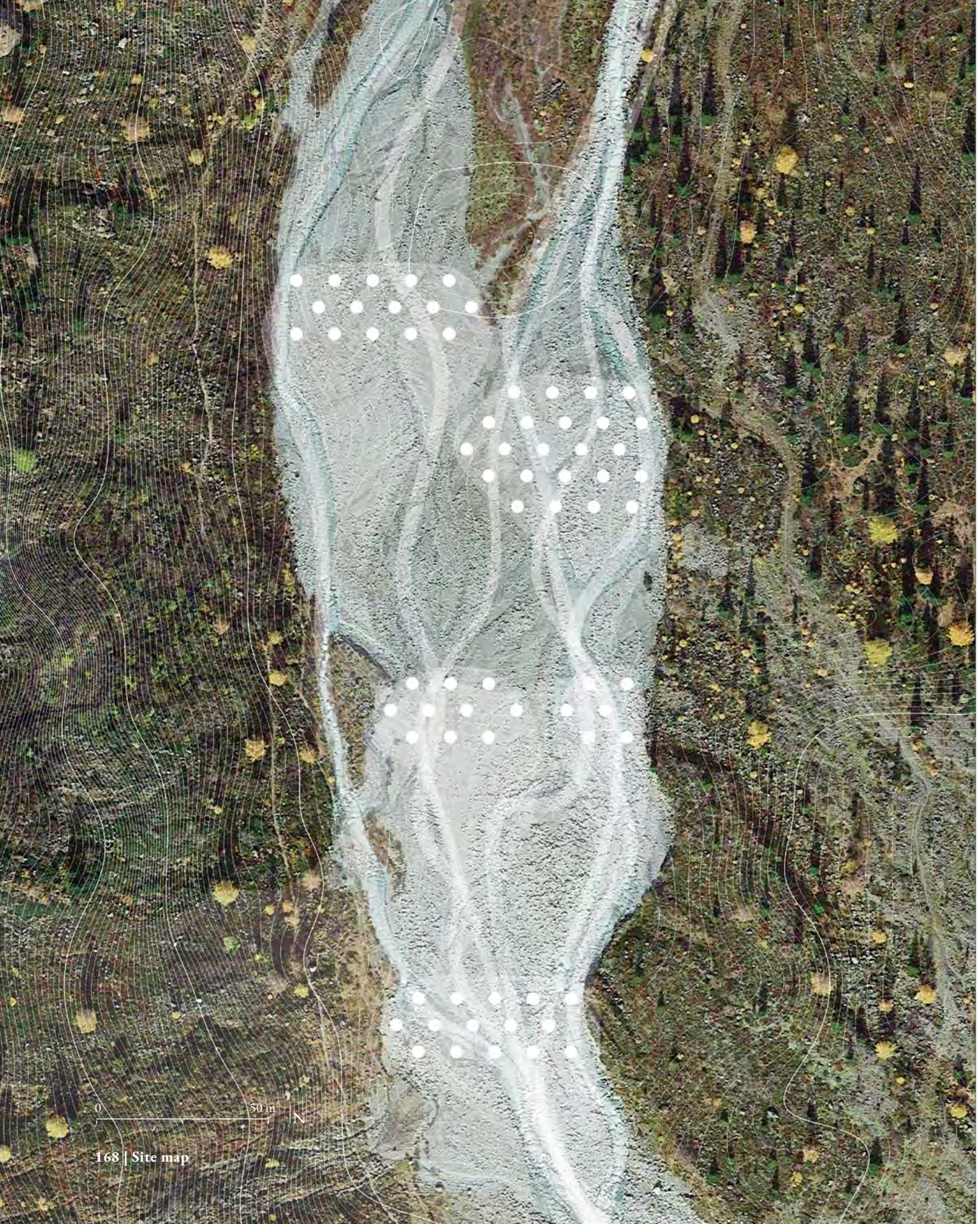


166 | Possible areas for interventions in red

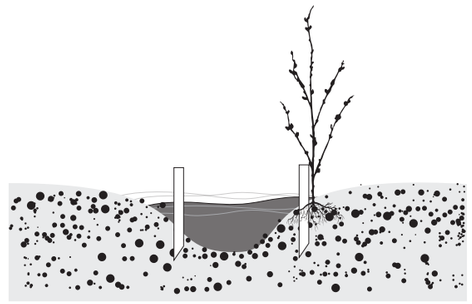



165 | Changing movement of matter and water

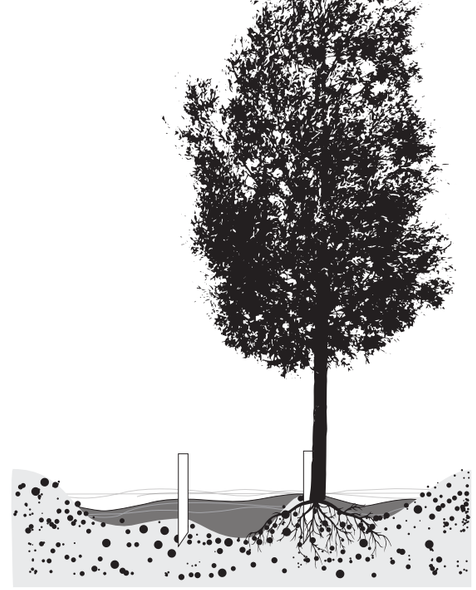

167 | Visualization of the prote4cted delatic system



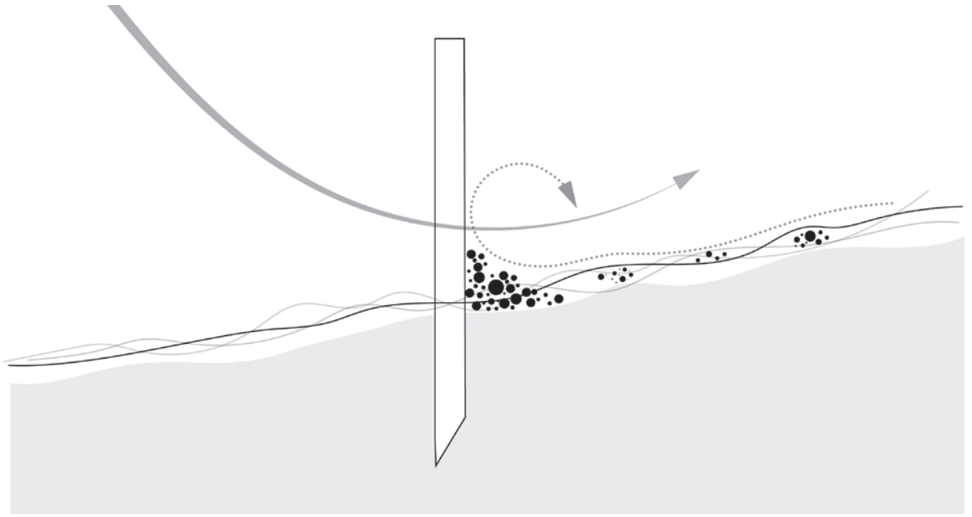

**168 | Site map**



169 | First action



170 | Growth over time

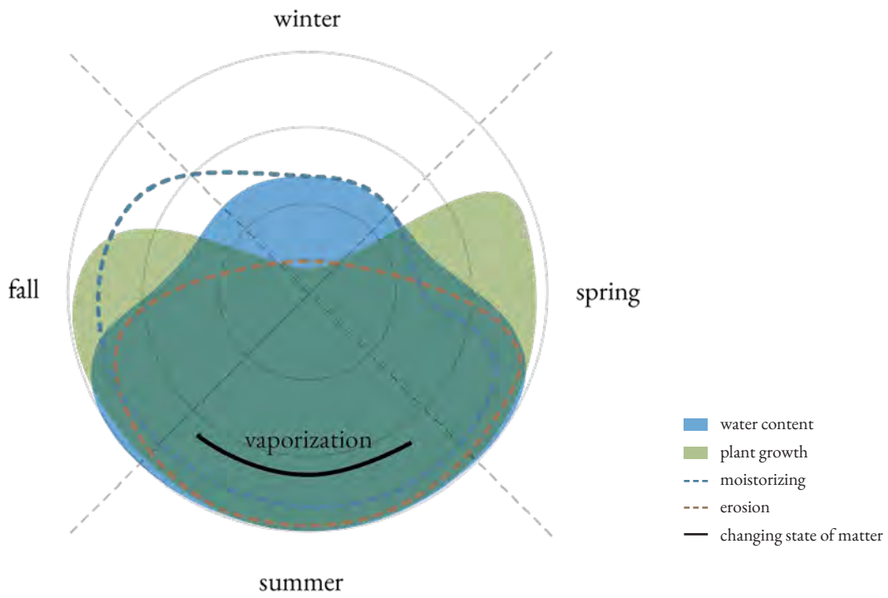


171 | Functioning

forming new islands in the delta and positively influencing the expansion of sedimentation places and, therefore, in the long run, the formation of new habitat zones. The islands grow and may even bear the possibility of vegetated life.

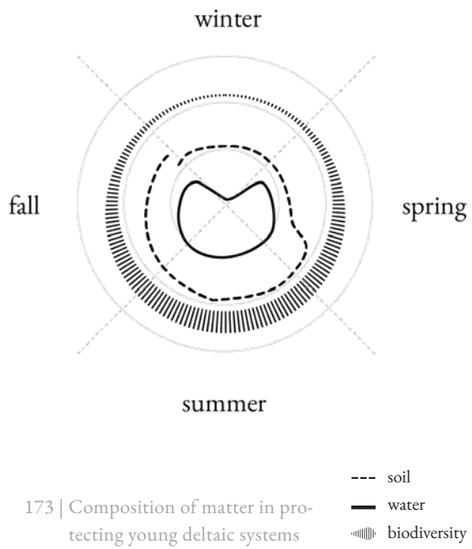
The flow is constantly changing. Whether it is winter, summer, spring, or fall, the stream of water changes, even day by day if there is a lot of rain or less. Therefore, the course the river takes differs every day. This is the beauty of seeing how the landscape changes and vice versa how the intervention may change the landscape.

Furthermore, the interventions on the slopes that have been discussed earlier are an essential

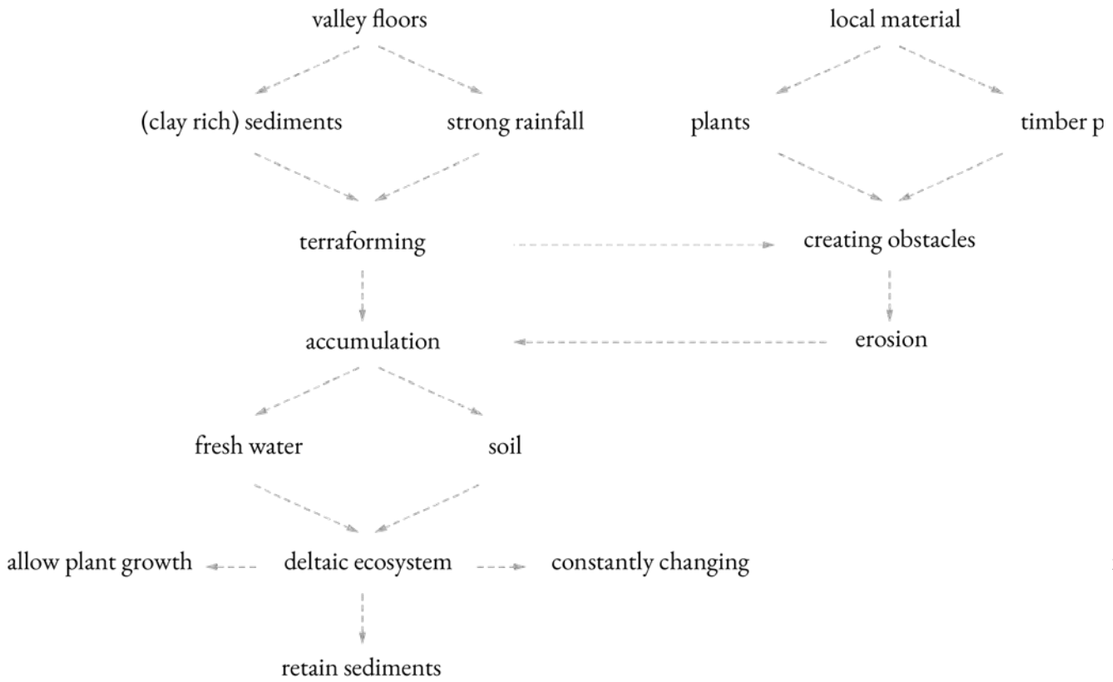



172 | Processes in protecting young deltaic systems

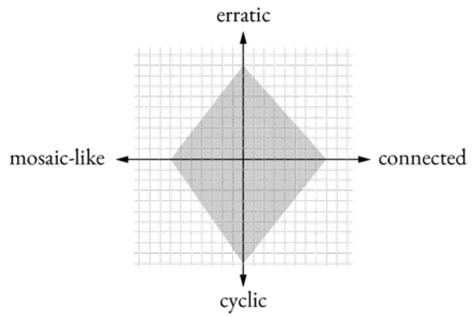
part of this process to slow down the velocity of water on the valley floors and therefore diminish the effect of sedimentation being washed away. This is where the interrelations of all the interventions emerge. They work best when in synergy with each other.



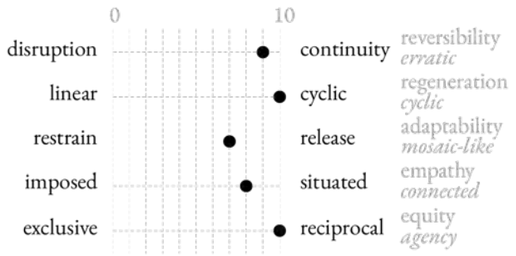

173 | Composition of matter in protecting young deltaic systems




174 | Conceptual diagram of protecting young deltaic systems



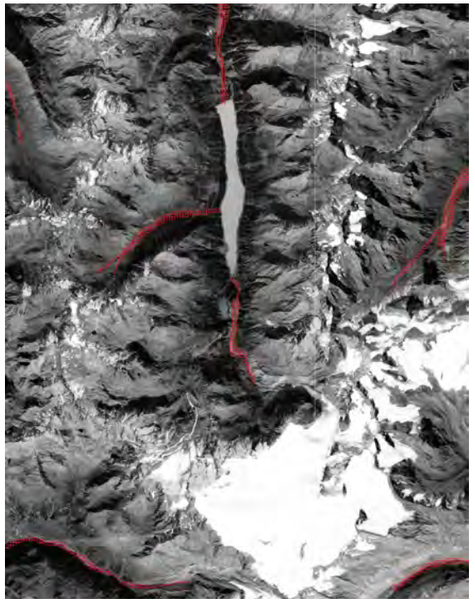

175 | Influence on Alpine Character by protecting young deltaic systems



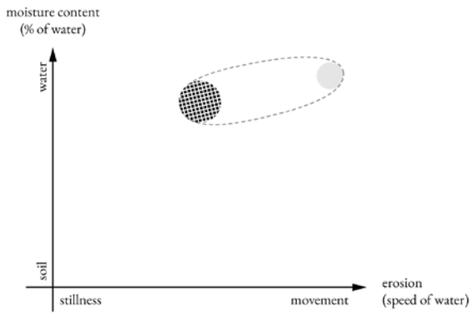

176 | Importance of Alpine values in protecting young deltaic systems

## 6.4.4 Space-making
### Spreading river beds

The previously introduced action is closely related to the space-making intervention. It suggests actions which give back room to the river, referring to the Dutch project (Francés et al., n.d.). By spreading river beds the water is given back space which it was in the industrial Age deprived off. These kinds of interventions can take place in multiple river sections upstreams and downstreams. There, due to existing anthropogenic structures such as dams, the natural flow of water and sedimentation processes gets disrupted. Building back dams, straightened river beds, or renaturalizing flood zones or alluvial forests creates a gradient between the main stream and the dry areas. These in between zones are able to buffer extreme weather events and at the same time offer a wide range of different habitats.

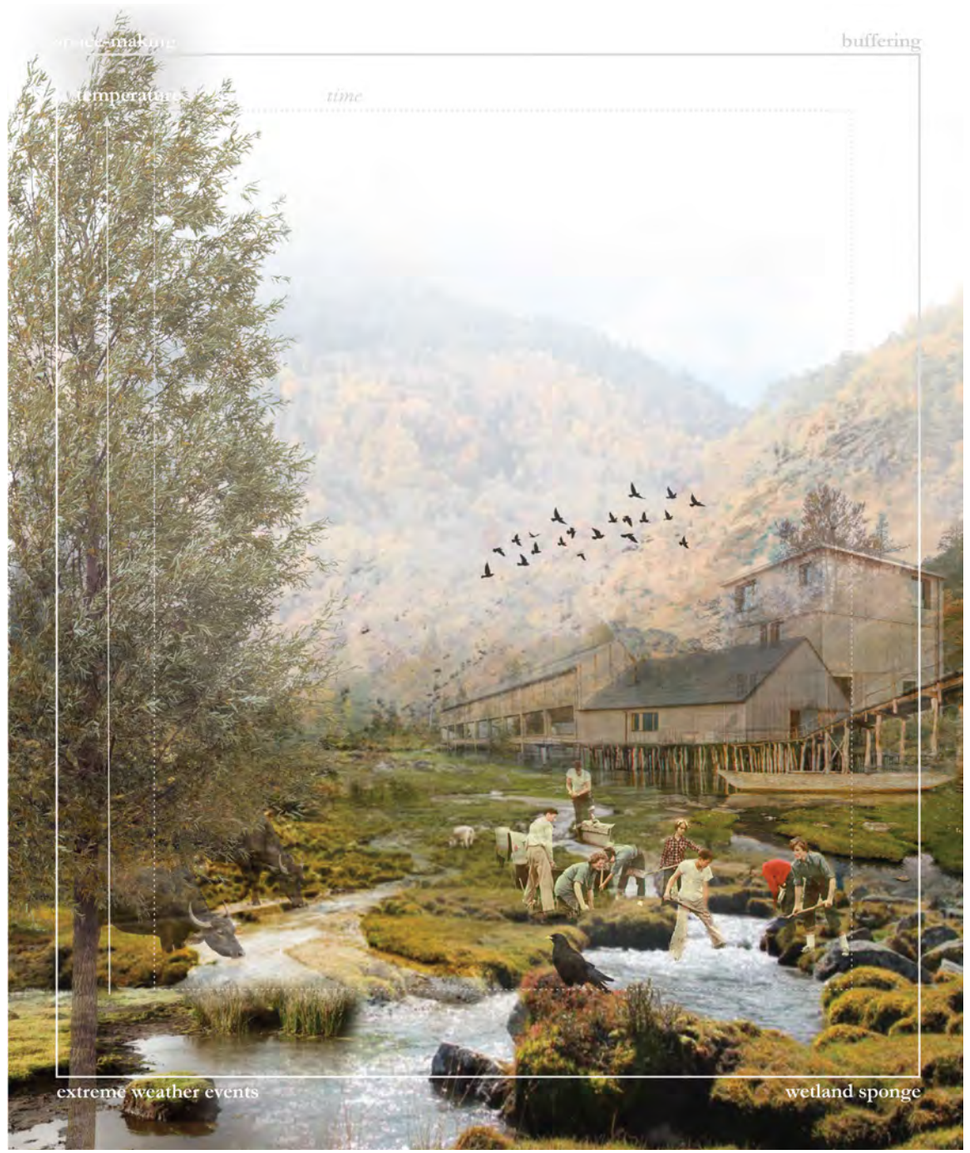


178 | Possible areas for interventions in red



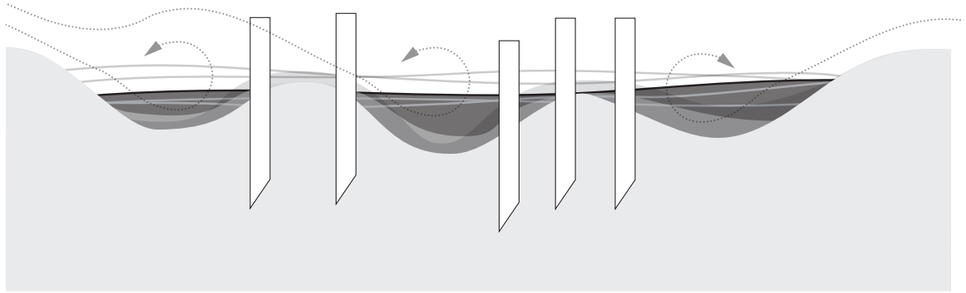

177 | Changing movement of matter and water

The often steep riversides are widened and the deep river beds allowed to fill up naturally with sediments. Artificially constructed wetlands and alluvial forests over time become natural habitats and the river expands into the landscape, taking

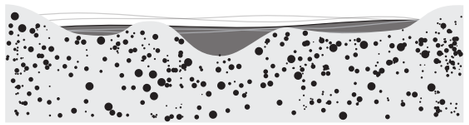



179 | Visualization of the spread river bed

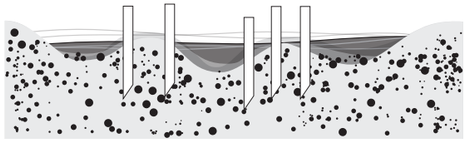

180 | Site map



181 | Functioning



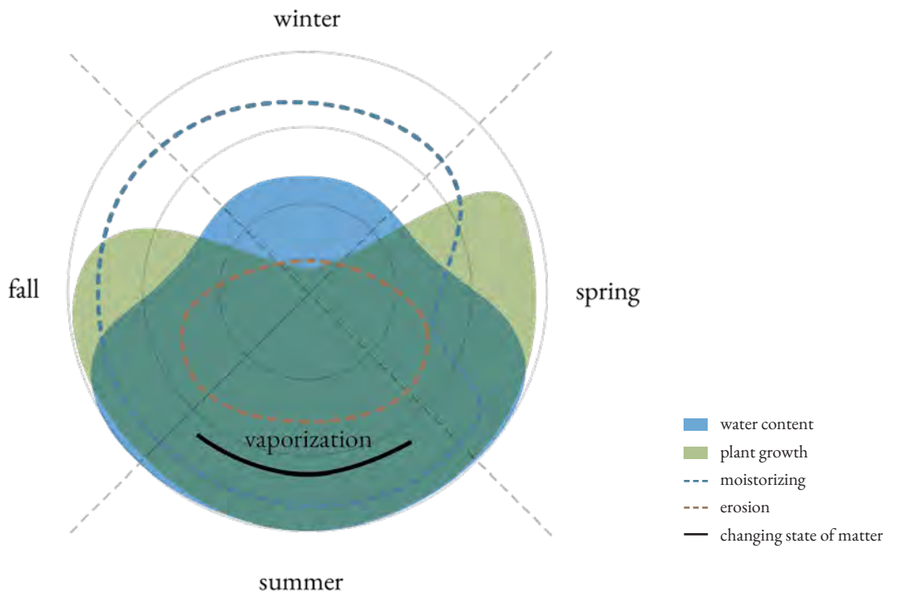
182 | First action



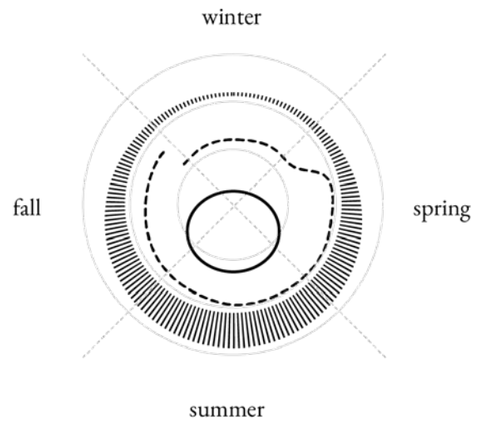
183 | Growth over time

different courses and finding its own path. This will create areas of multi-channeled rivers. In areas of dense urbanization the concept is translated into the urban by creating buffer zones and infrastructures, allowing the water to gently enter.

The different gradients of water and land habitats offer a wide range of activities. In steep waters ship transportation is possible, connecting the cities with each other as well as creating space for fish habitats and recreational activities such as kayaking, fishing or swimming. In the wetlands and swamps birds find places to nest and insects thrive. For humans the wet conditions offer places for paludiculture or aquaculture.

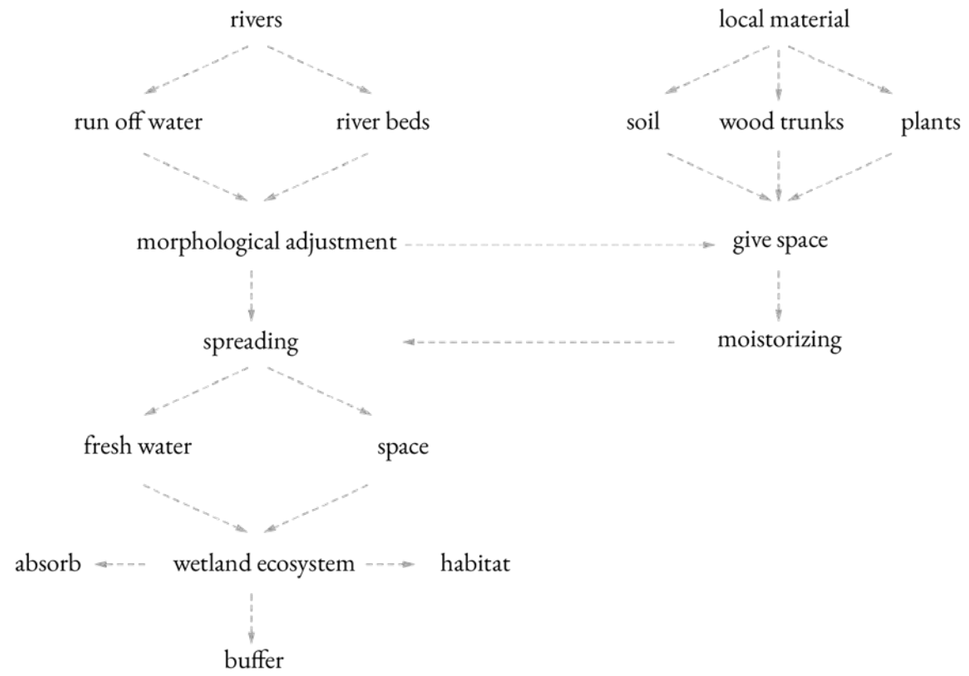



184 | Processes in the spread river bed

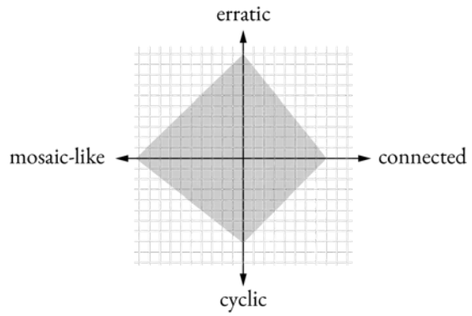



185 | Composition of matter
the spread river bed

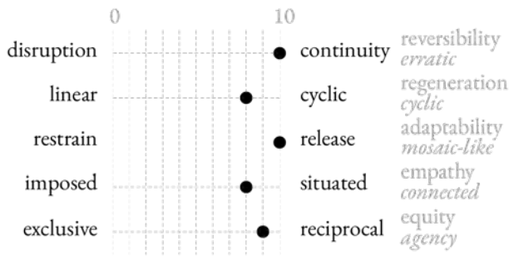




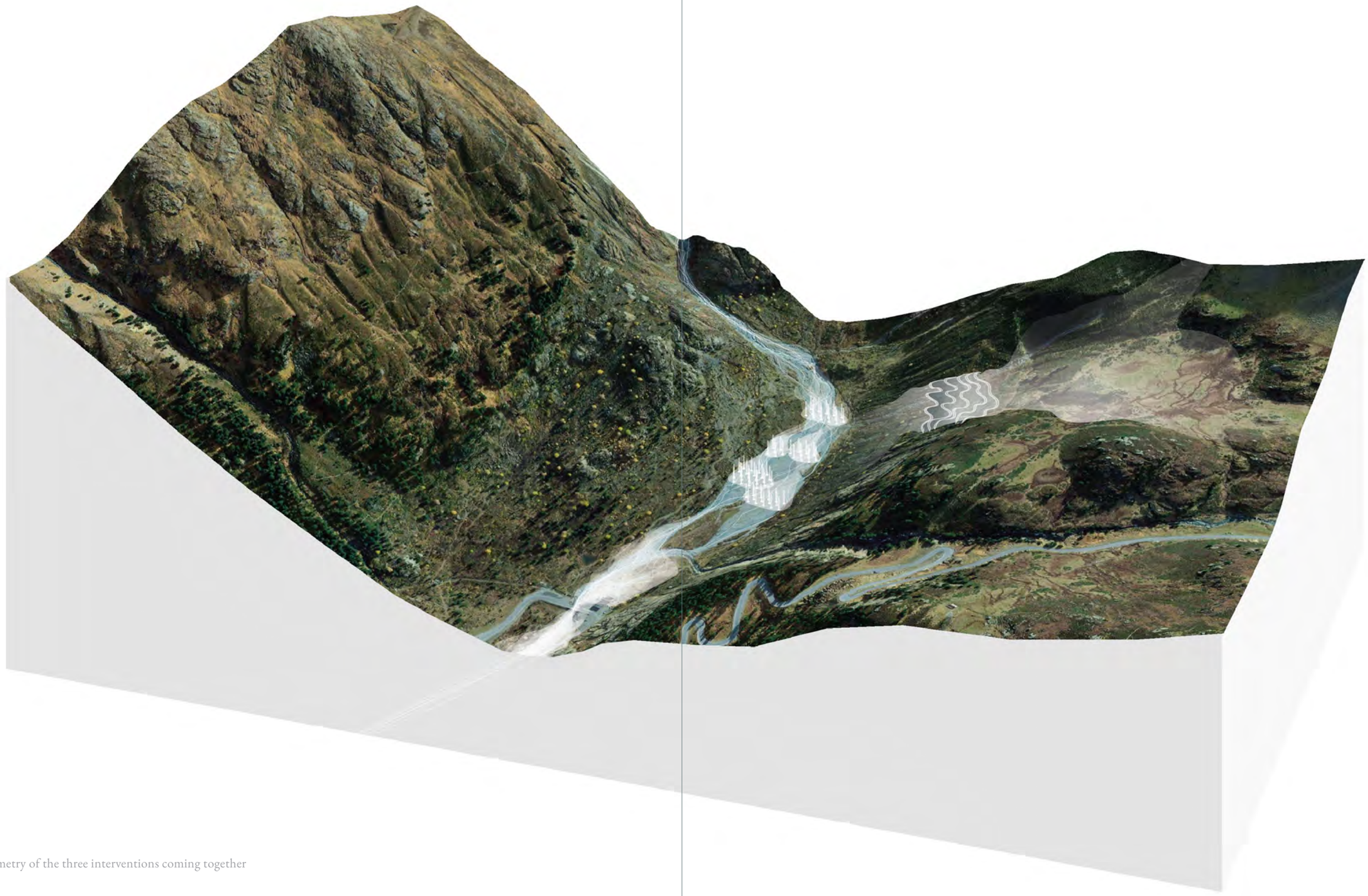

186 | Conceptual diagram of the spread river bed




187 | Influence on Alpine Character by
the spread river bed




188 | Importance of Alpine values in
the spread river bed

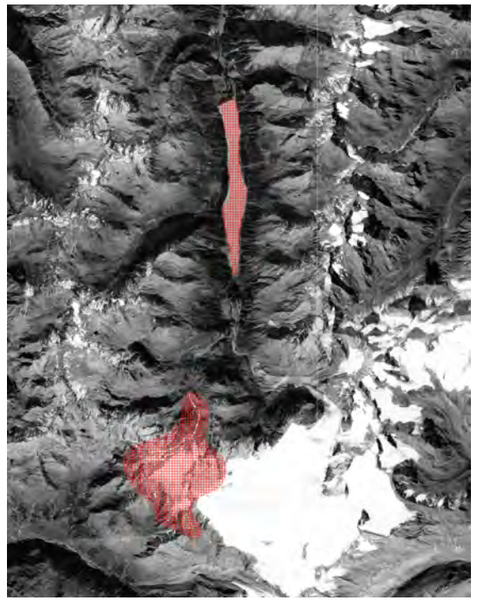


189 | Axonometry of the three interventions coming together

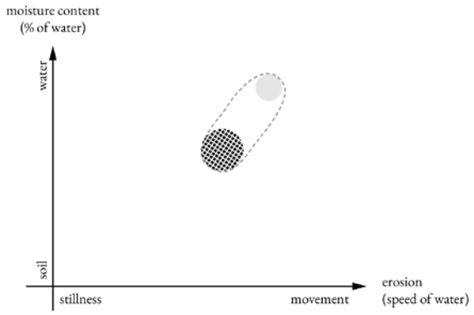
## 6.4.5 Activating
## Reviving the industrial landscape

This action targets the projects undertaken in the industrial and service Age, described in chapter 4.1.3 Factory and 4.1.4 Playground. There are a wide range of diverse projects which are based on a glacially influenced system, such as storage lakes, skiing resorts, or water intensive agricultural practices. In a changing climate, they have to adjust to the new non-glacially influenced conditions. Furthermore, they often redistribute freshwater which oftentimes harms the ecosystems dependent on its availability.

One of the most prominent subjects of the industrial landscapes within the Kaunertal valley is



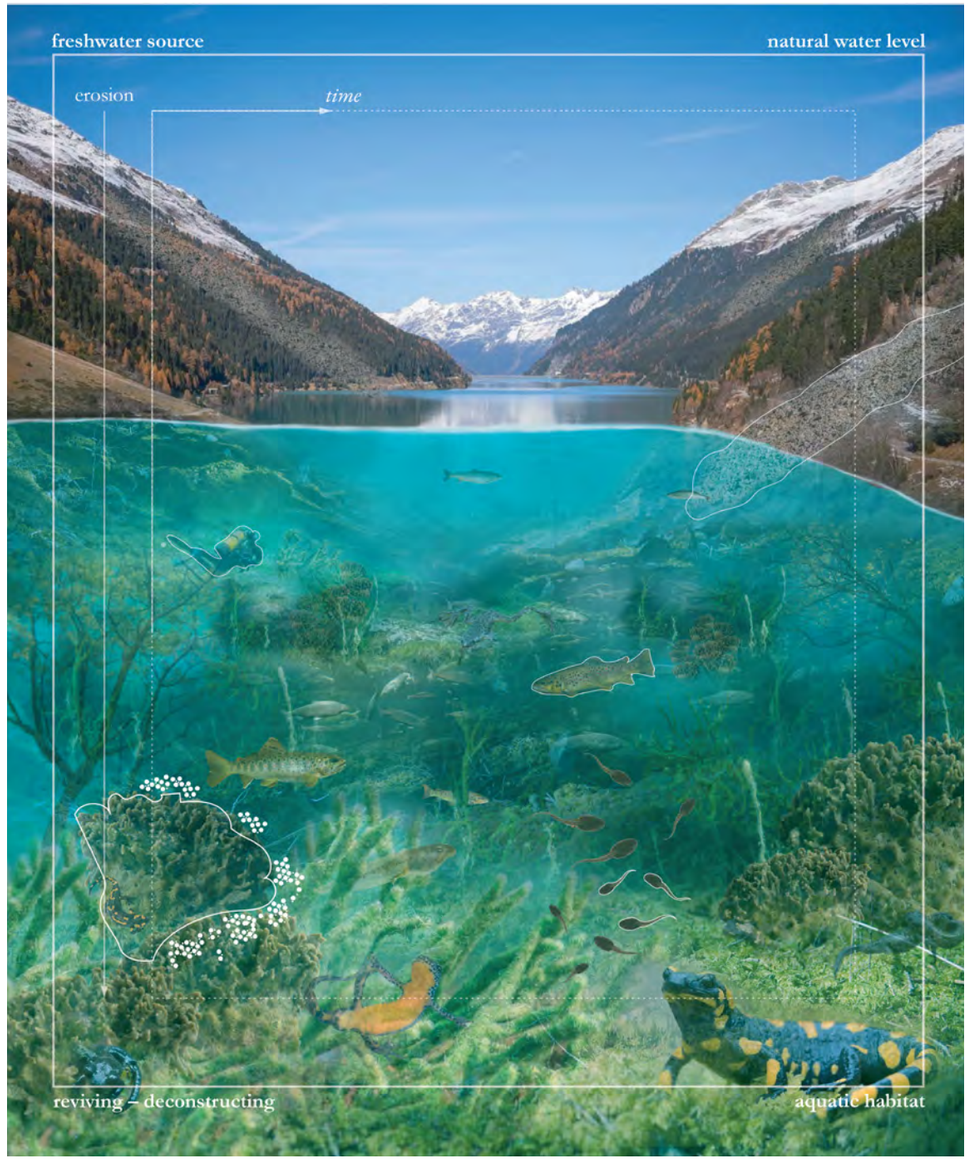
191 | Possible areas for interventions in red




190 | Changing movement of matter and water

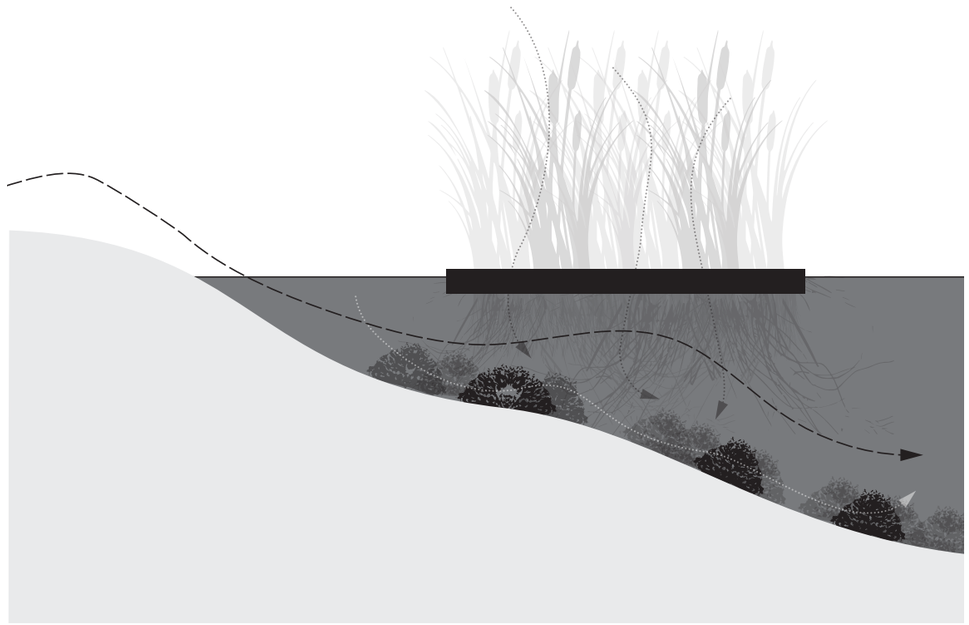
the Gepatsch storage lake which I will use as an example for the activation of the industrial landscape. The lake has previously been described in chapter 4.3 Path dependencies. Next to many other issues described, due to a constantly changing water level for the momentary energy demand and an externally controlled velocity of its water, there is almost no possibility for life





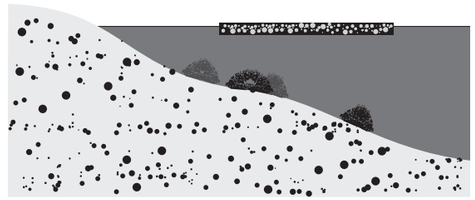

192 | Visualization of the revived storage lake

**193 | Site map**

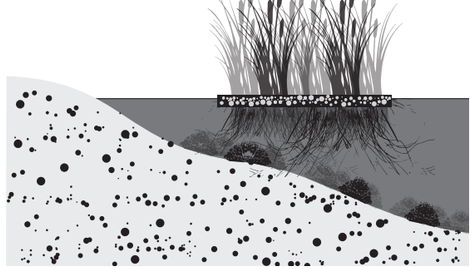


194 | Functioning





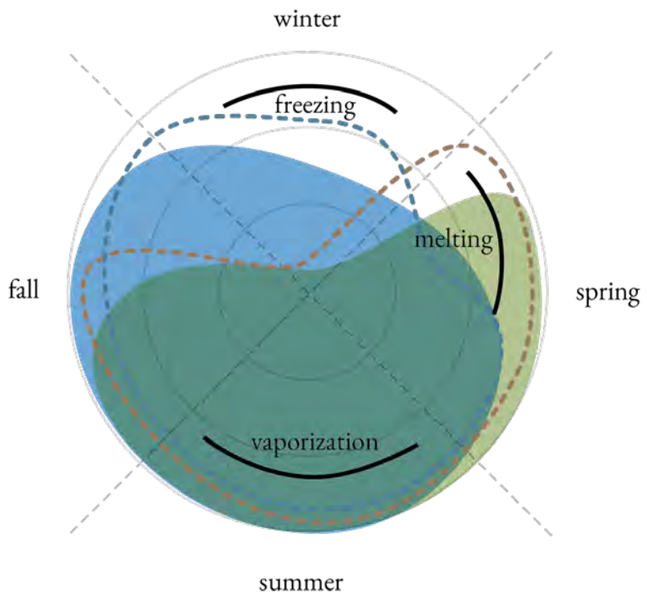
195 | First action



196 | Growth over time

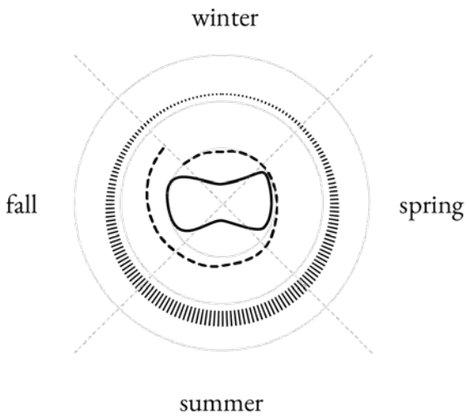
to settle within the lake (Normyle & Pittock, 2020).

By transforming the energy lake into a drinking water storage lake, the place can finally carry life. Allowing landslides to wash into the water provides the place with minerals and an almost constant and only seasonally changing surface water level. A diversity of fish and other aquatic ecosystems and life forms can occur. The start of this new paradigm of the storage lake is the establishment of a freshwater sponge. By colonizing the surface with these different freshwater sponges, the lake gains the ability to hold water during dry seasons as well. Additionally, artificial floating wetlands are constructed in the lake and at its borders. By softening the border condition and creating wetlands around it, the range of possible habitats for more-than-humans is increased.



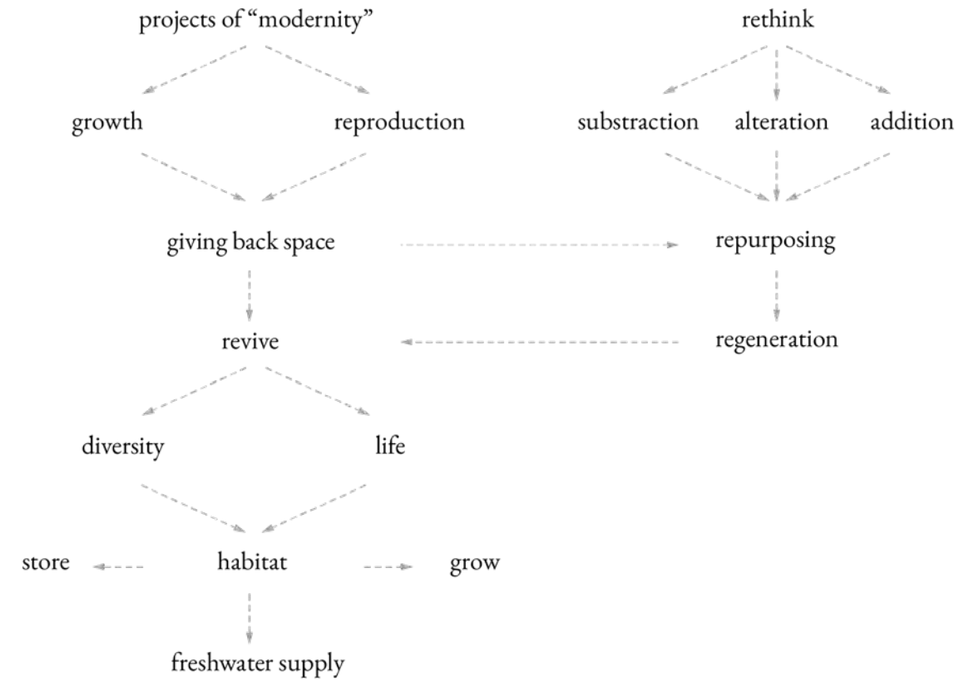

197 | Processes through reviving the industrial landscape of the Gepatsch storage lake

The lake can be enjoyed recreationally as for example for swimming, diving, boating, or kite-surfing in and on its water, as well as, camping or hiking along its shore. Instead of only serving one purpose, the multiplicity of uses strengthens the identity of the place. Many storage lakes in the Alps are fed by glaciers, once they are gone they lose their energy source. Therefore, these methods can be applied to other storage lakes within the Alps as well.

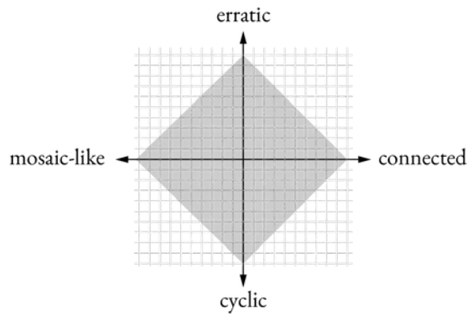



198 | Composition of matter in reviving the industrial landscape of the Gepatsch storage lake

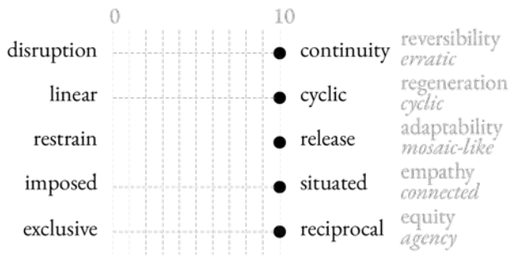





199 | Conceptual diagram of reviving the industrial landscapes



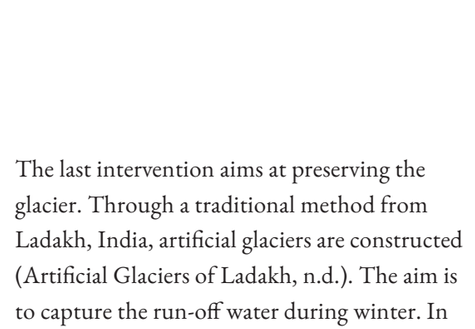

200 | Influence on Alpine Character by reviving the industrial landscapes



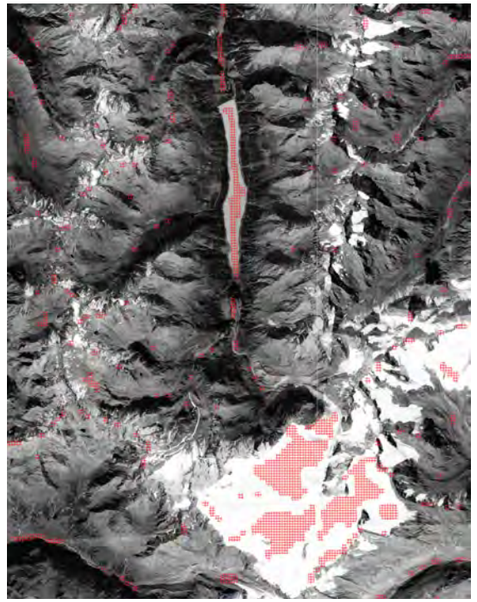

201 | Importance of Alpine values in reviving the industrial landscapes

## 6.4.6 Preserving
### Upscaling the ice stupa project

The last intervention aims at preserving the glacier. Through a traditional method from Ladakh, India, artificial glaciers are constructed (Artificial Glaciers of Ladakh, n.d.). The aim is to capture the run-off water during winter. In warmer periods, their frozen water starts melting, which sets free fresh water at a time when plants are in their growth phase providing water for agricultural practices at high altitudes. In the context of the Alps, the same strategy can be used in order to store water for a longer period of time. I suggest, to upscale this project by multiplying them in as many different suitable locations as there are.




202 | Changing movement of matter and water



203 | Possible areas for interventions in red

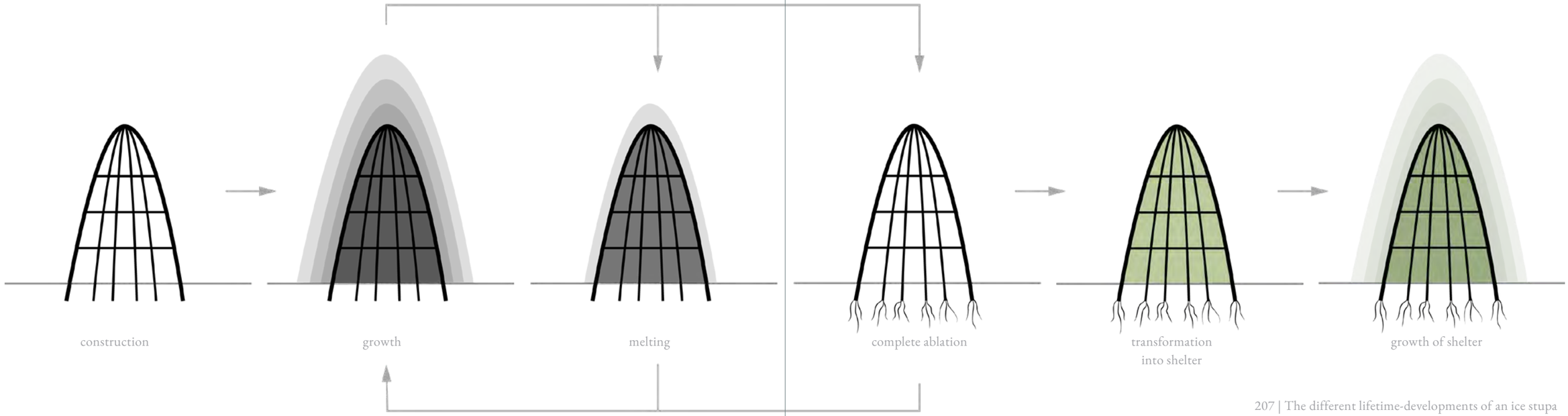
The system works as follows: A structure of willow trees acts as the basis for the stupa to grow. On its surface finely dispersed water is distributed. The source of the water lies higher where it is redirected from with a pipe. Since water is always leveling out, gravity pushes the water through the pipe and does the distributing work over the wooden structure. This is done during



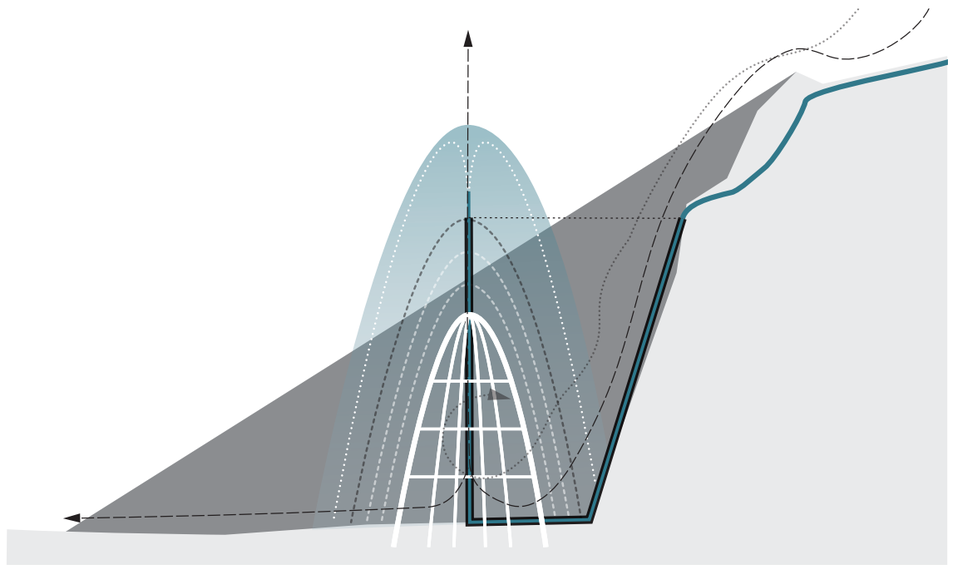

204 | Visualization of building the ice stupas

N 0 50 m

**205 | Site map**




207 | The different lifetime-developments of an ice stupa

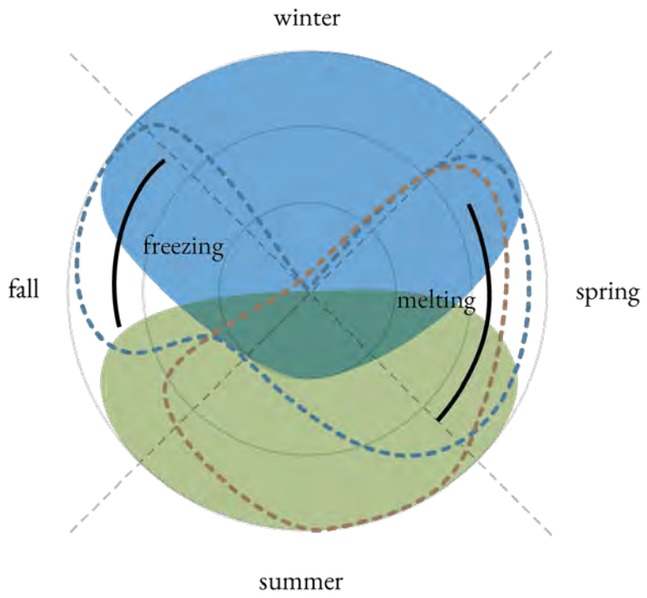


206 | Functioning

the time when temperatures are already low enough for the water particles to freeze. Therefore, over many weeks, the ice structure grows continuously until it reaches a limit, which is defined by the height difference between the source of the pipe and the point where the pipe starts to disperse the water over the structure.

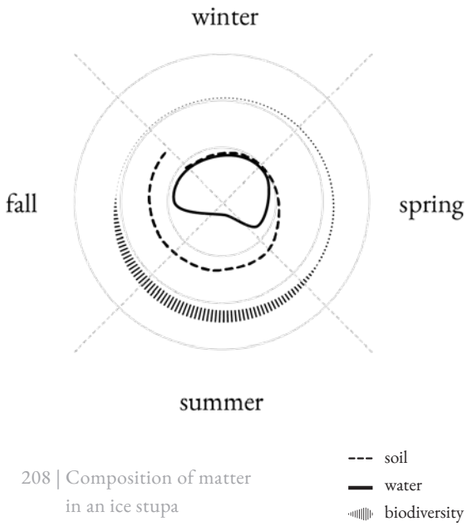
The willow tree structure is prepared earlier in the year. It is a simple construction method which can be done with a group of people. In a communal effort they gather to build the stupa-like structure. Strong willow branches are pushed into the ground, and smaller branches are braided between them. Together, they form a stable circular cone-shaped structure. When the ice slowly melts again and the soil starts to defrost, the willow trees can occasionally start to grow themselves. The water that the ice stupa releases flows downslope and provides fresh water for the plants as well as for cultural practices, such as pasturing or permaculture, in times when there is not enough rainfall.

The construction of those willow trees is carried out in strategic locations. The locations are defined by specific conditions, such as the slope being at an angle smaller than 5 degrees and at best shaded by a nearby mountain. Furthermore, they are situated at elevations defined by the snow line. The more the annual temperatures rise, the higher altitude the ice stupas need to be

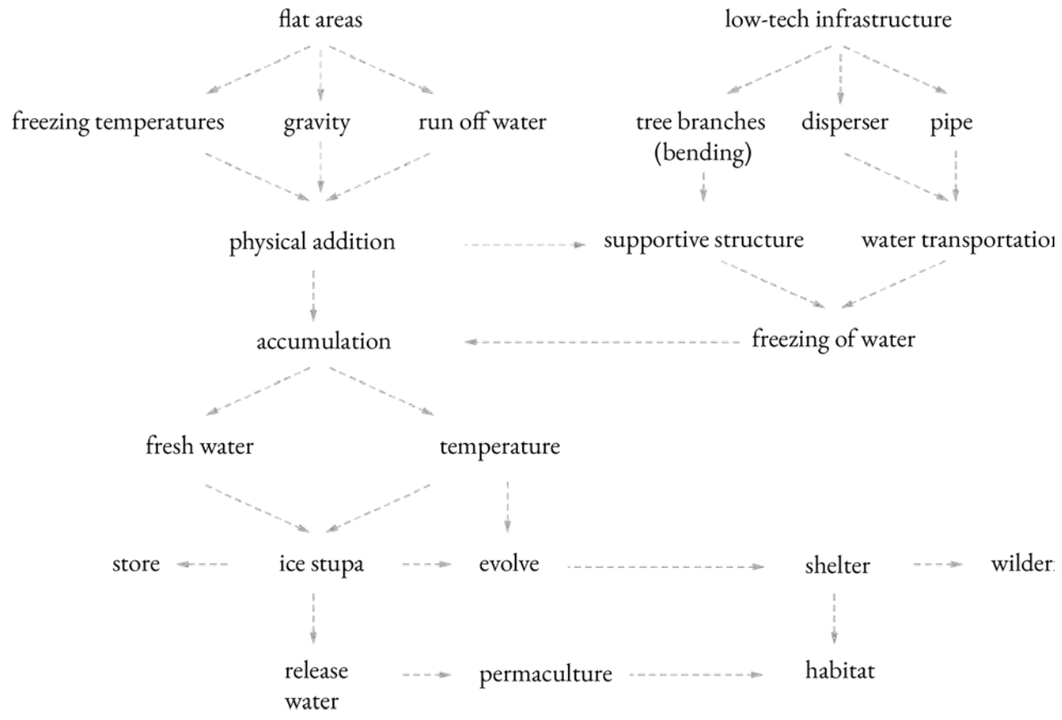



207 | Processes in an ice stupa

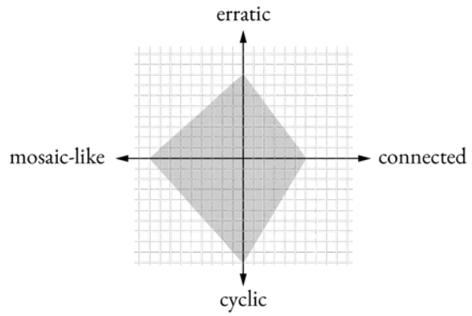
built. Hence, if a structure is within an elevation zone that is not frozen anymore, the next year a new structure has to be built at a higher elevation for the conditions to be fulfilled. This will result in traveling ice stupas. The traces of the past structures are left behind in their primary sites. There, the former ice stupas transform into shelters for animals – wilderness condensed into one place. Contrary, if the perfect spot for an ice stupa can be found, it can grow into a small glacier. The only condition for this to happen is that the ice never fully melts away.



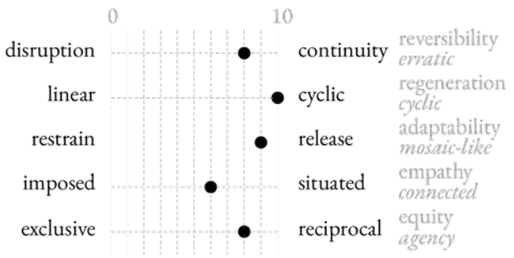

208 | Composition of matter in an ice stupa



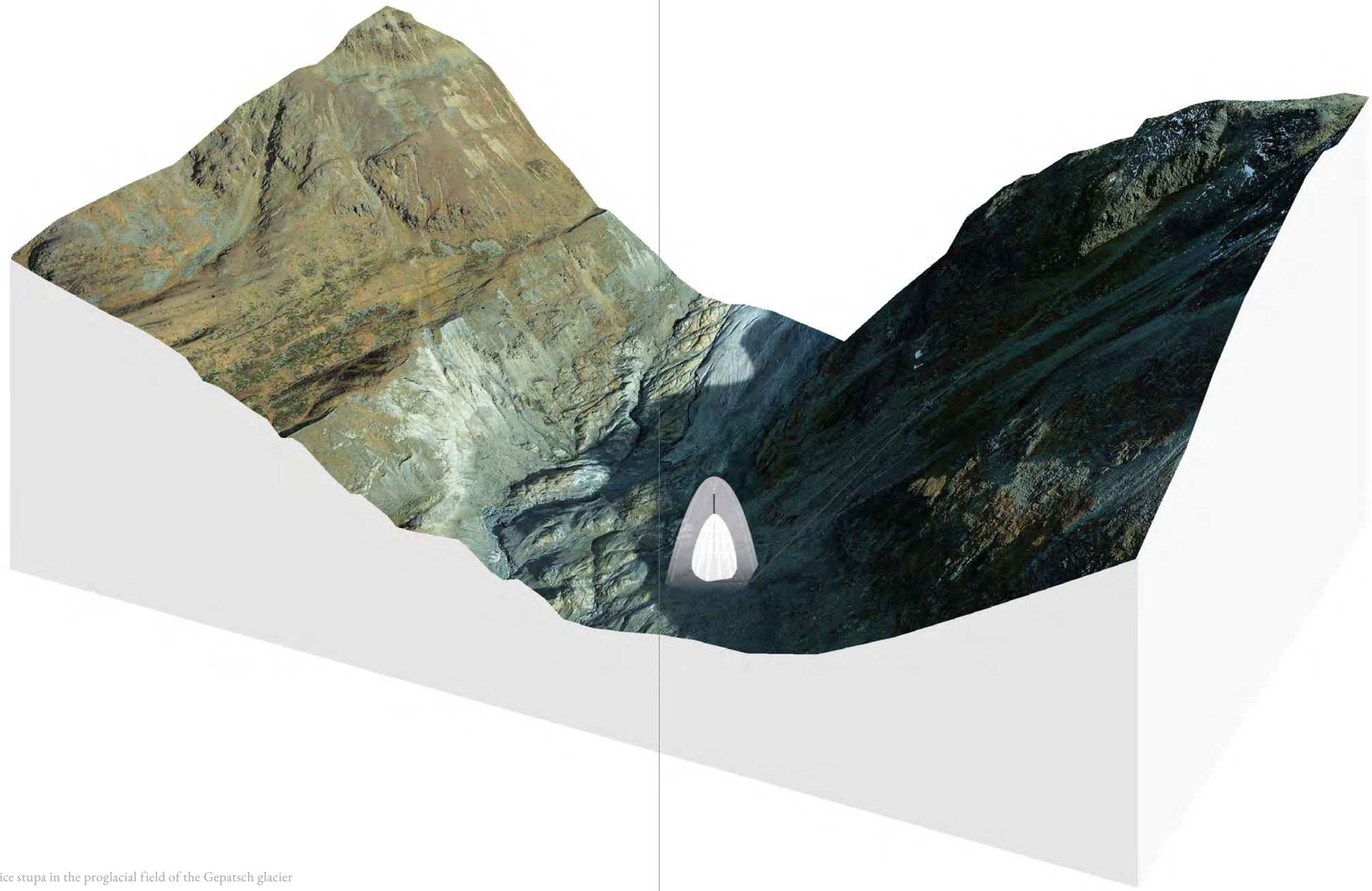

209 | Conceptual diagram of building ice stupas




210 | Influence on Alpine Character by building ice stupas




211 | Importance of Alpine values in building ice stupas



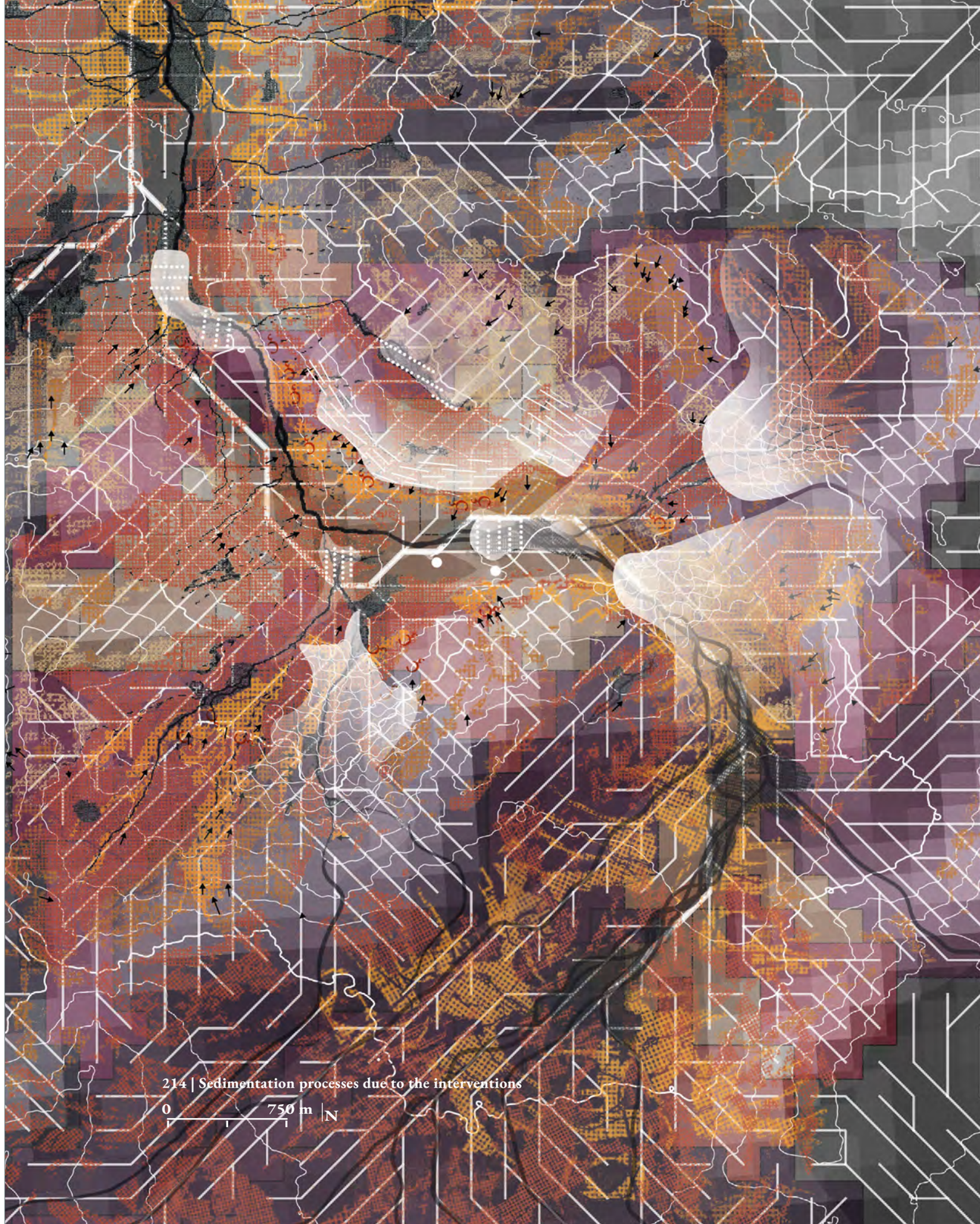
212 | Axonometry of an ice stupa in the proglacial field of the Gepatsch glacier


213 | Scenario of possible geomorphodynamics after the disappearance of the Gepatsch glacier

**Erosion processes**
- landslide material (old)
- landslide material (new)
- moraine material
- fluvial sediments
- mudflow debris (old)
- mudflow debris (new)
- new mudflow formation

**Moistorization processes**
- catchment area
- catchment area (large – small)
- catchment flowline primary
- catchment flowline secondary
- river/stream
- height line (500m)
- height line (100m)

**Interventions**
- delta sedimentation
- vegetational growth
- terracing
- ice stupa




214 | Sedimentation processes due to the interventions

## 6.5 Shaping the Alpine Ocean
### An imaginative landscape

The Alpine Ocean is an imaginative landscape. In order to sustain, support and expand her, the actions described in the previous chapter are applied and explored on various scales. The first step of the imagination process is developing slope portraits in order to investigate the potentiality of the local conditions. These slope portraits are divided into three phases of the state of matter in water – solid, fluid, and gas-like water. All of the different components of a complete slope portrait are indicating the slopes density of water, expressed as moisture content, and its potentiality to absorb it. Together they indicate the conditions of the Ocean and its character.

The investigation takes place in the Ötztaler Alps. A circular section (image 222) set around the glacial agglomeration in the center of the mountains shows the potential of this kind of analysis and its possibility to apply in other areas of the Alps since it cuts through various landscape types. The qualities have been investigated mainly through google earth as well as a variety of open source (geo)data sets and climate forecasts.

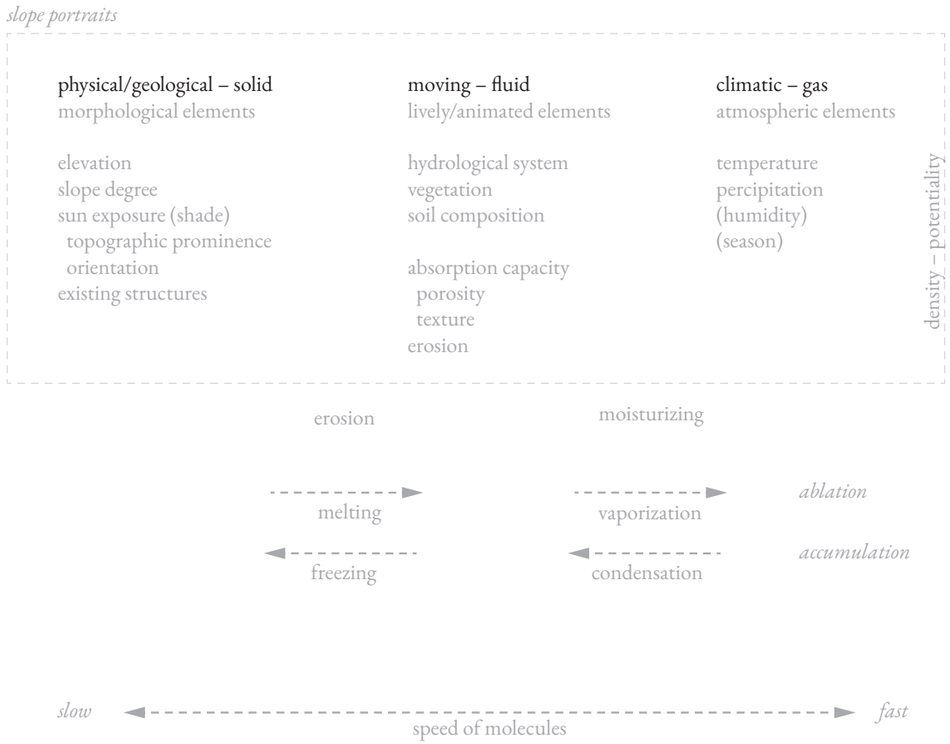
#### Atmosphere

The first category refers to gas-like waters, the climatic conditions, and therefore contains atmospheric elements. Here I investigate the temperature, precipitation patterns, and humidity throughout the seasons, days and years. In section these are indicated through the tree line (trees are able to grow until that line – approximately +6°C annual mean temperature) and snow line (above which snow does not melt all year long – mostly below 0°C) which are indicating certain temperatures and their potential upwards shifting at a temperature increase of +4°C. Furthermore, the precipitation patterns for a RCP 8.5 scenario indicate the level of rain- or snowfall for the area under investigation.

#### Movement

The second category is relating to fluid waters. These indicate moving and lively elements. It shows the level of vegetation and the composition of the hydrological system. At best it would also indicate the soil composition but due to data availability this could not be done for the area of investigation, nevertheless, the type of vegetation indicates the maturity of the soil and the geological rock type analyzed in the third category gives insight into the probably most dominant soil components. The elements are



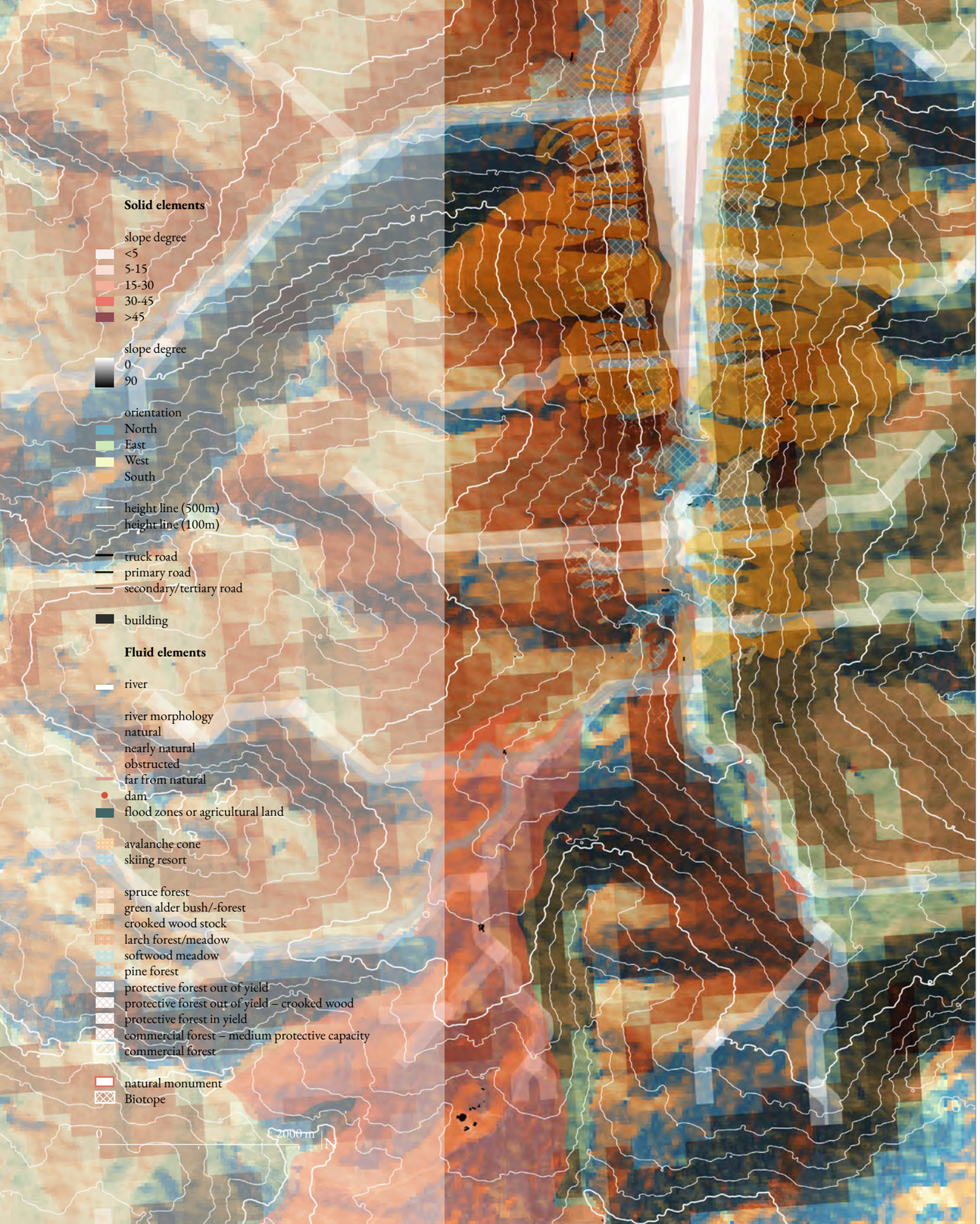


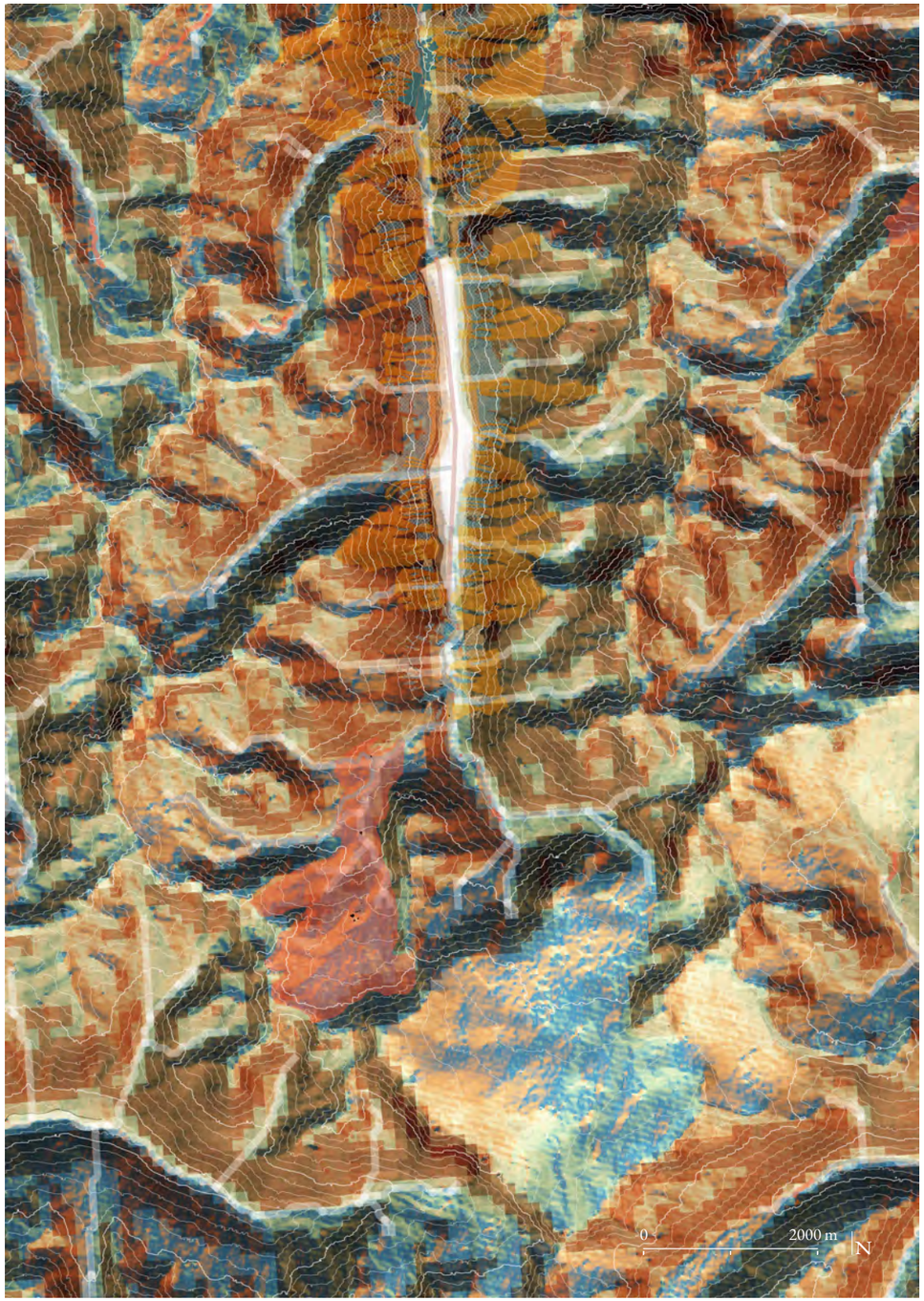

215 | Attributes of the slope portrait

especially formed and influenced by their water storage capacity, which is defined through porosity, texture, and their degree of erosion.

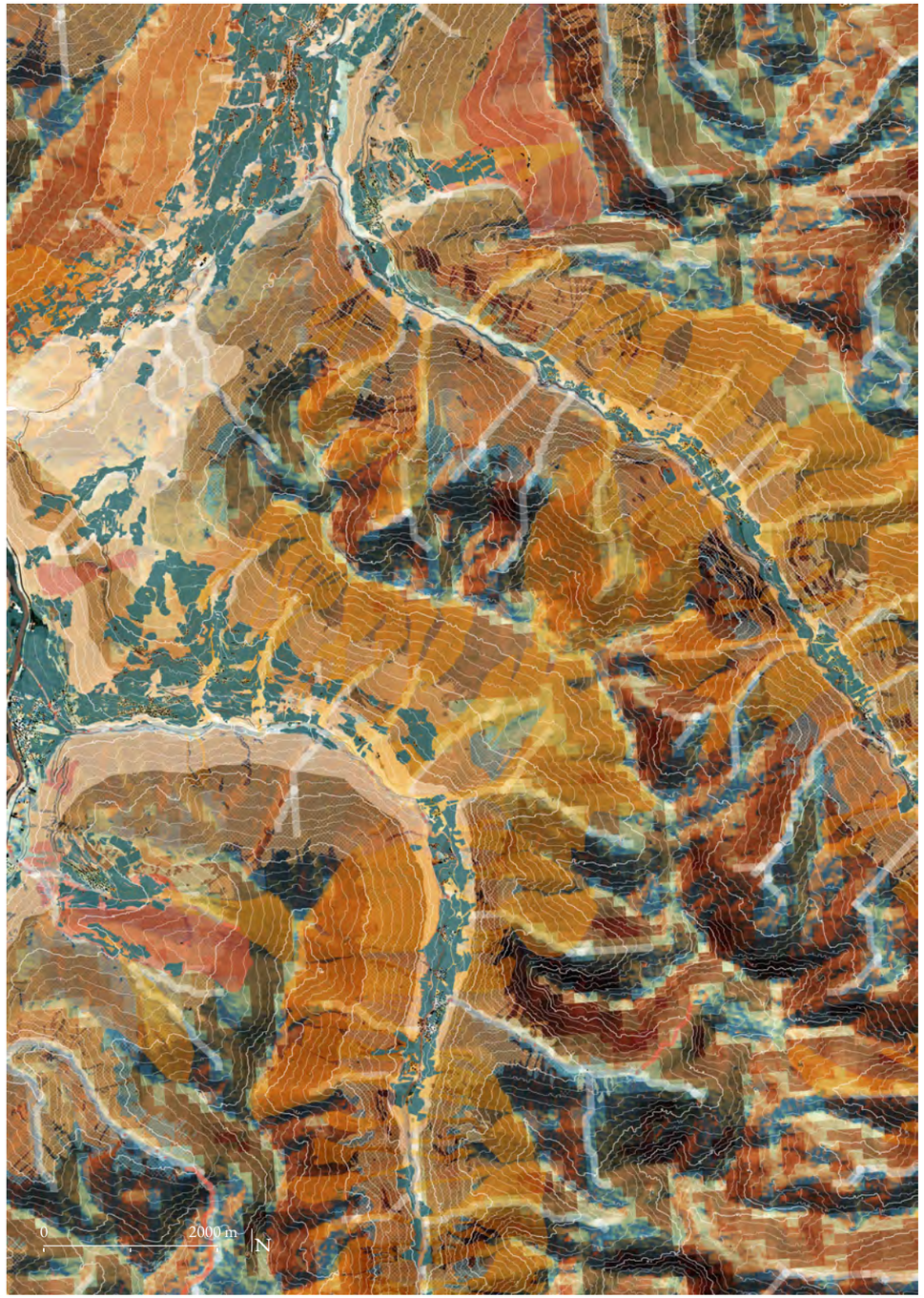
#### Morphology

The third category – solid water – includes the physical and geological layers. It recognizes the morphological elements of the slope. These are composed of elevation, slope degree and orientation, sun exposure, which indicates how shaded the area is, and is influenced by topographic prominence – for example, an East-laying mountain that, in the morning, shades the places West of it, and the geological bedrock type. As mentioned before, the bedrock can indicate the predominant sediment composition in the area due to glacial activity which grinds off the rock surface. Furthermore, anthropogenic structures, existing buildings, and so forth, form the composition of the morphological elements. They for instance shade slope areas or disrupt flows.



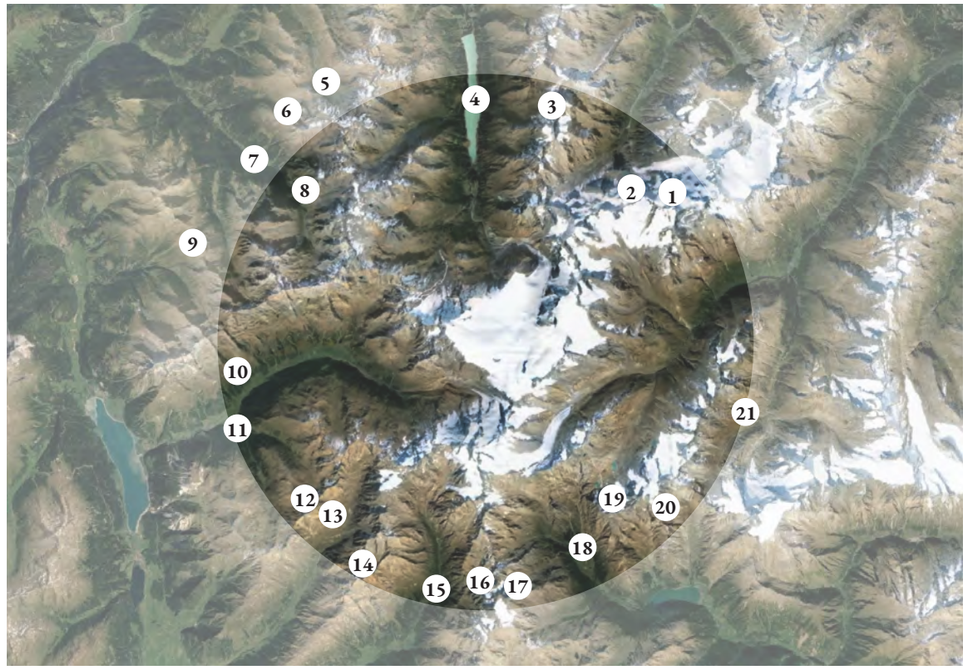




216 | Slope qualities in planview, upper Kaunertal zoom (left)
217 | Slope qualities in planview, upper Kaunertal (top)

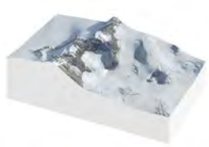




218 | Slope qualities in planview, lower Kaunertal (top)
219 | Slope qualities in planview, lower Kaunertal zoom (right)




220 | Locations of the spatial quality axonometries



1 Pitztal glacier

2 Pitztal skiing resort

3 Kaunergrat Marsh

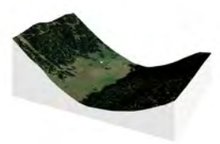
4 Gepatsch storage lake

5 Platzertal

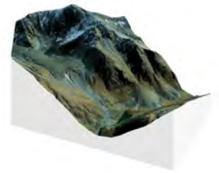
6 Wildmoos - Hochjoch

221 | Spatial quality axonometries of the diverse slopes



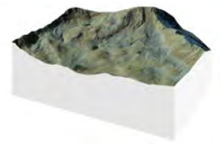


7 Wildmoos pasture



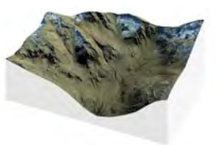
8 Wildnörderer

9 Nauderer - Tscheybach

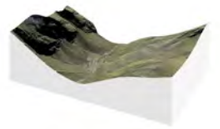


10 Melago lakes

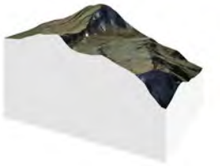
11 Tiergartenspitze pastures



12 Tiergartenspitze catchment



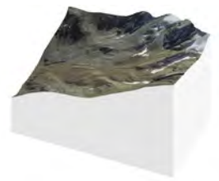
13 Planeiltal delta



14 crest between Planeiltal and Matschertal

15 Matschertal pasture

16 Lagaunspitze lake landscape



17 Lagaunspitze Maso Corto oriented

18 Maso Corto skiing resort valley

19 Maso Corto skiing resort

20 Ötzi the ice man place of discovery

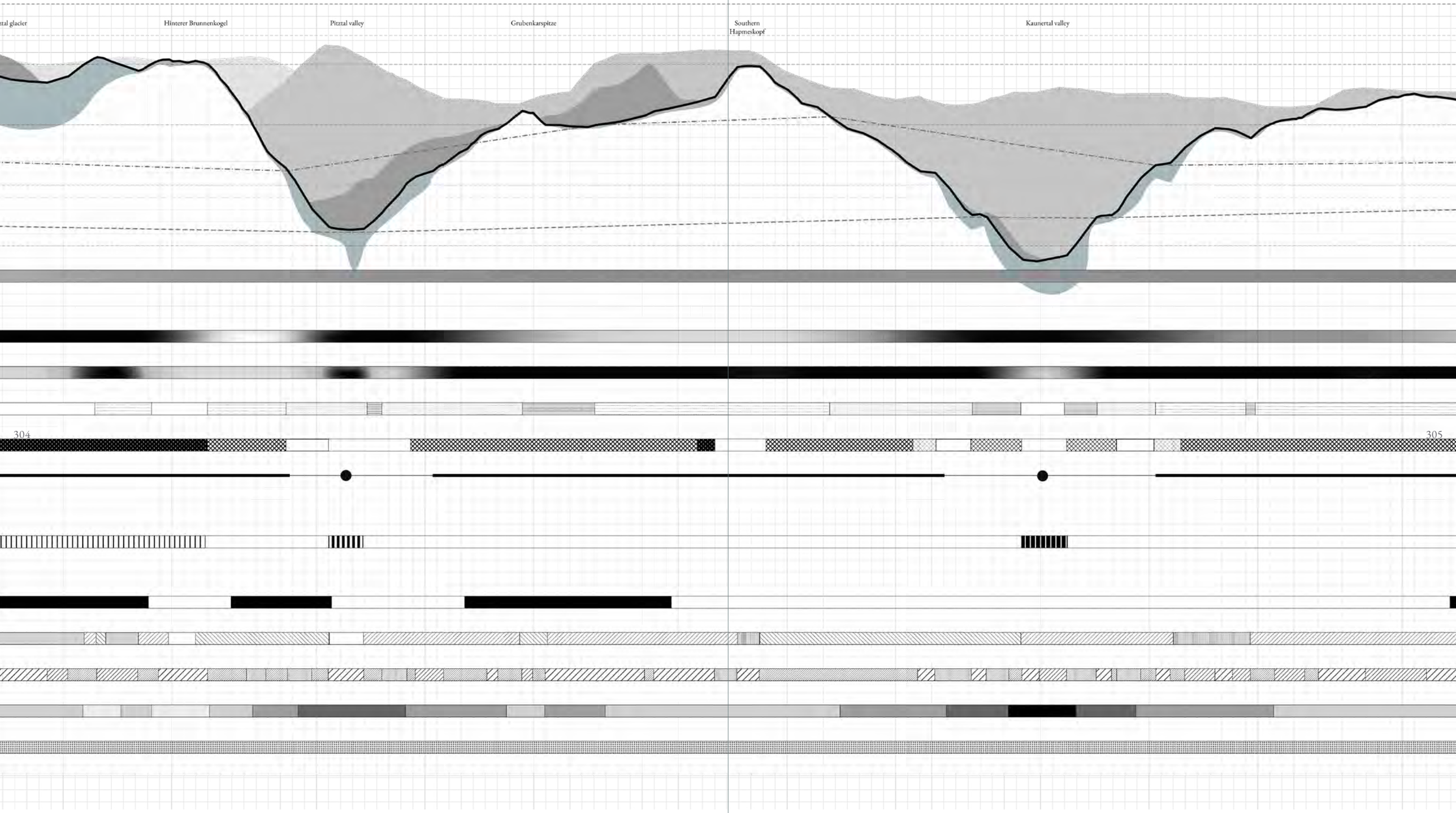
21 Kreuzkamm mountain crest, Niedertalbach stream

## 6.5.1 Circular section
### Local slope conditions

221 | Location of the circular section




222 | Critical mapping of the slope qualities in section


ztal glacier
Hinterer Brunnenkogel
Pitztal valley
Grubenkarspitze
Southern
Hapmeskopf
Kaunertal valley

Platzertal valley

Hochjoch

Wildmoos
Radurschlbach

Wildnörderer

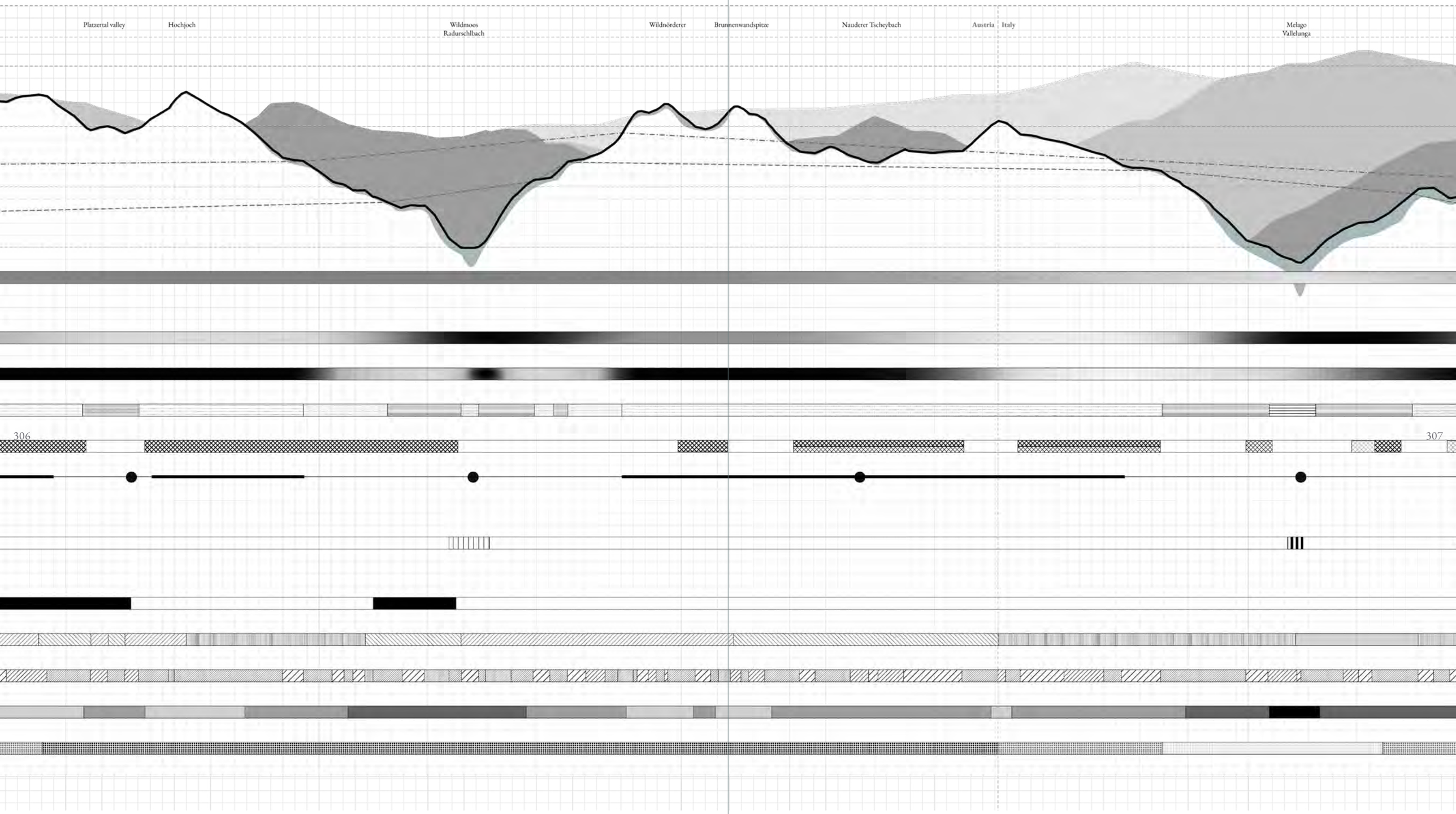
Brunnenwandspitze

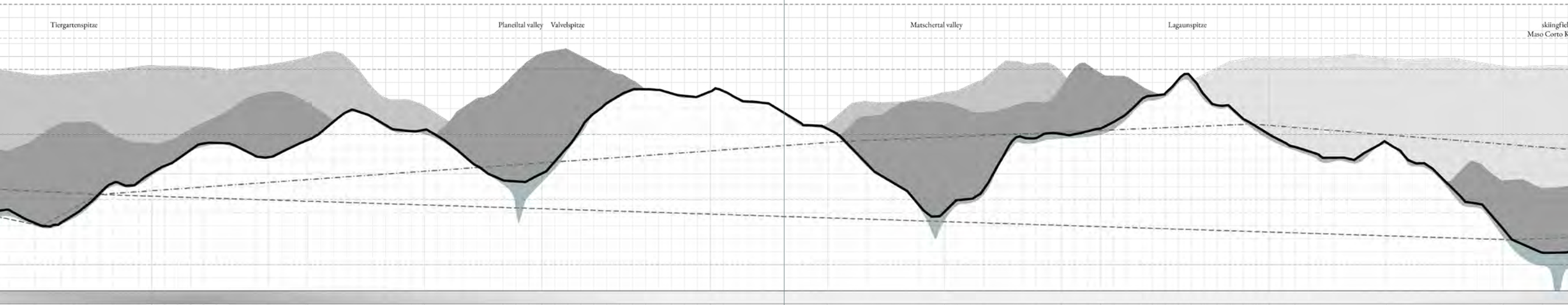
Nauderer Tscheybach

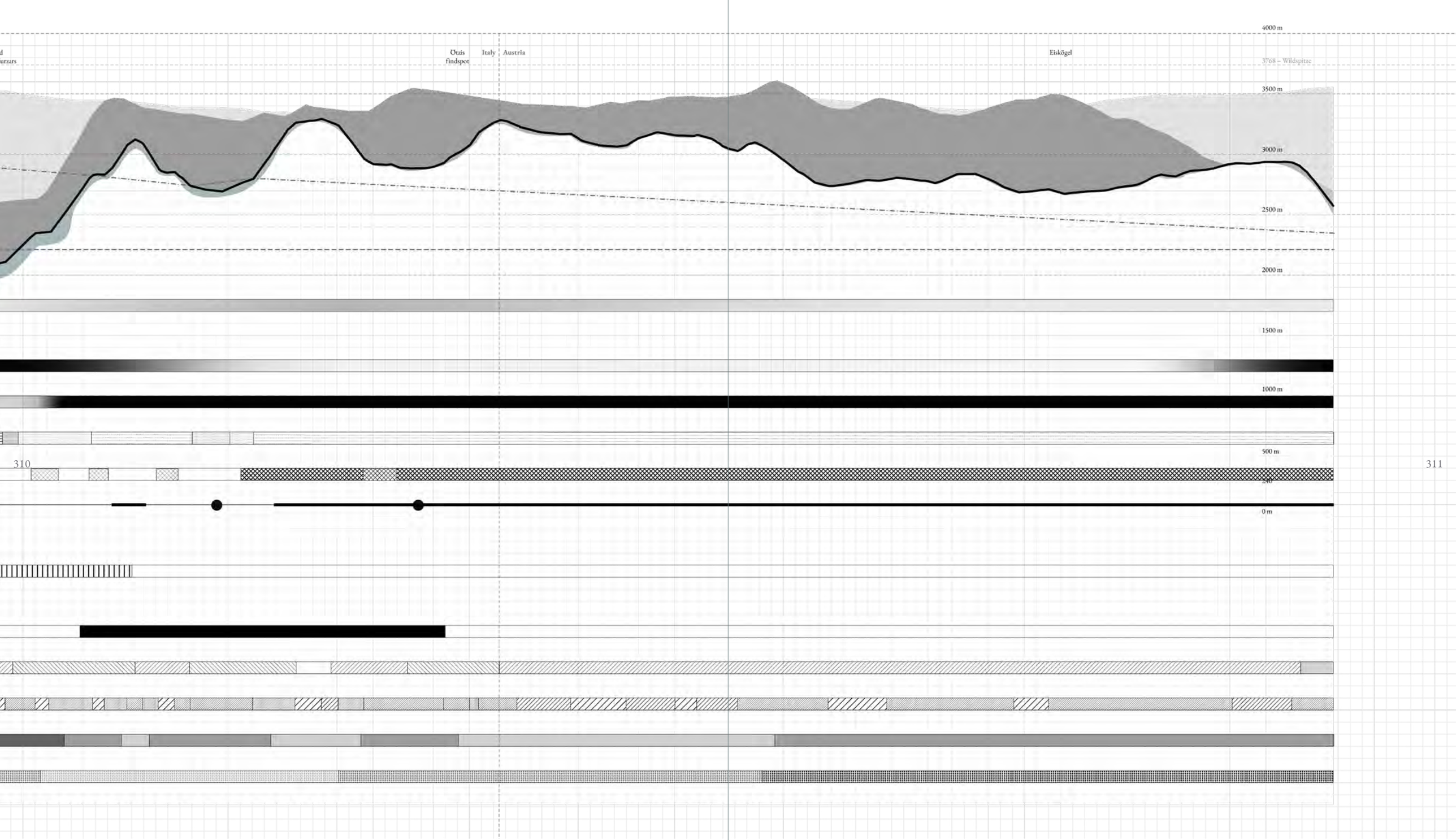
Austria

Italy

Melago
Vallelunga




Tiergartenspitze
Planeiltal valley
Valvelspitze
Matschertal valley
Lagaunspitze
skiingfiel
Maso Corto K


d
urzars
Ötzis
findspot
Italy
Austria
Eiskögel
3768 – Wildspitze
4000 m
3500 m
3000 m
2500 m
2000 m
1500 m
1000 m
500 m
240
0 m

**Ocean depth**

shallow

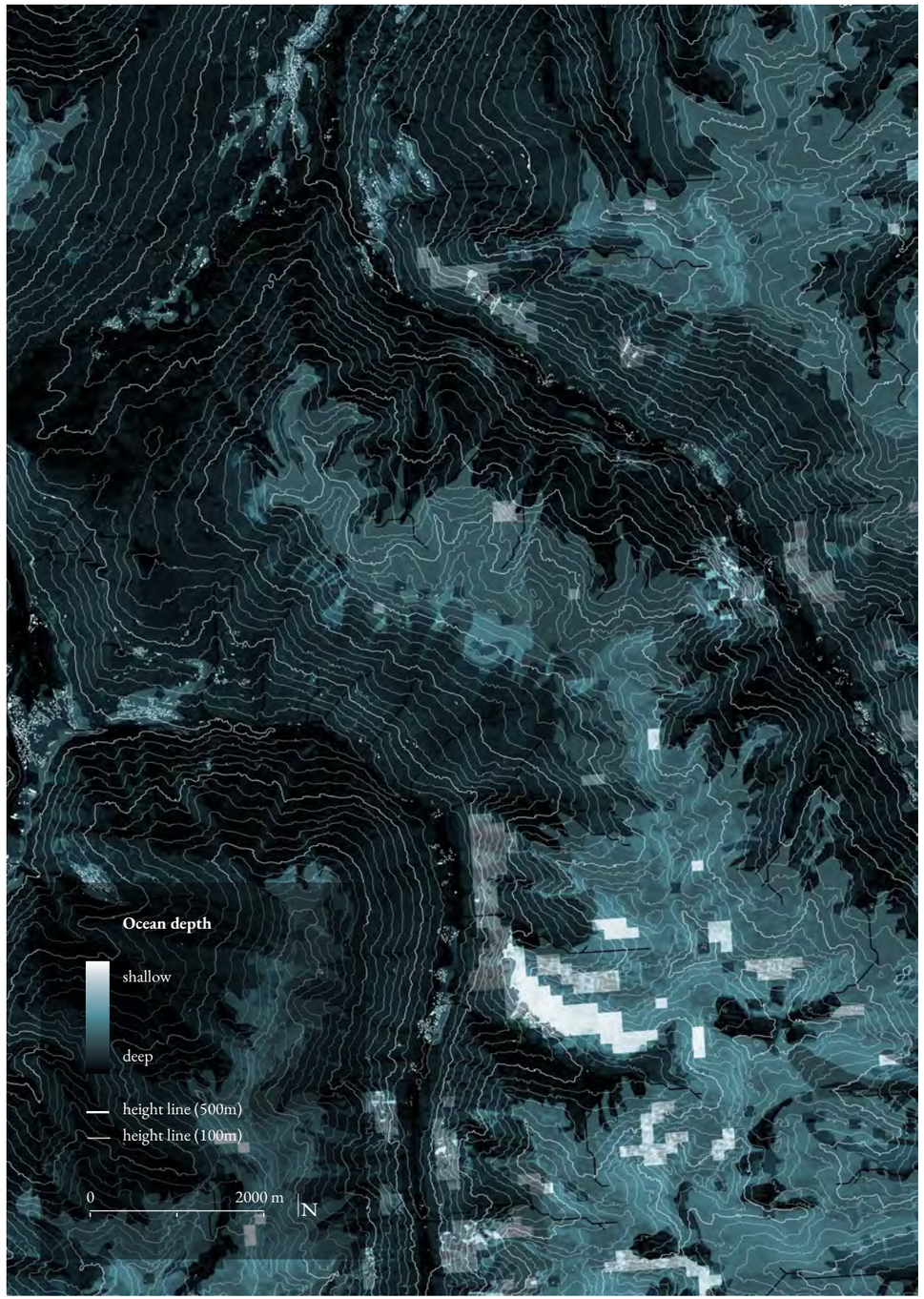
deep

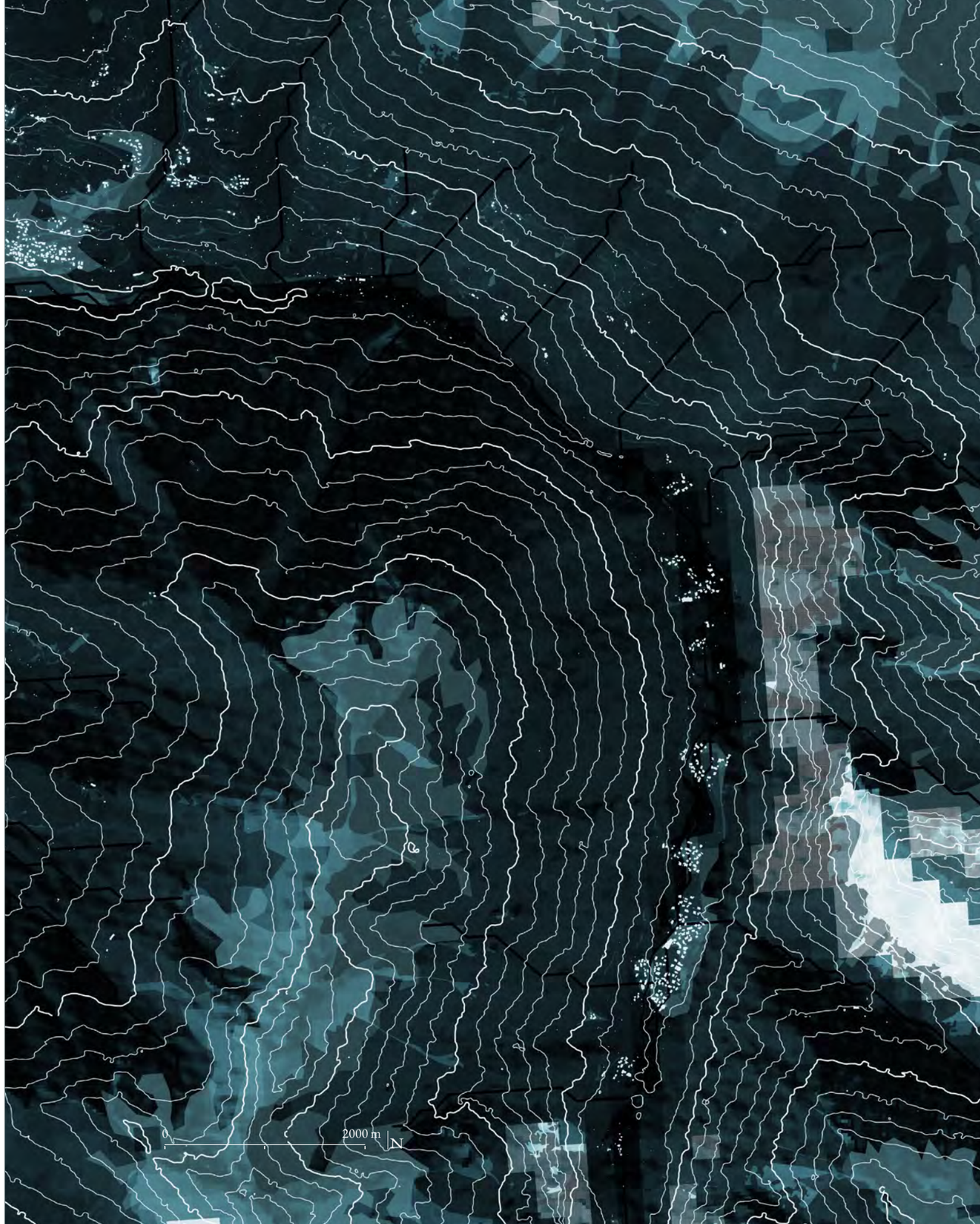
height line (500m)

height line (100m)

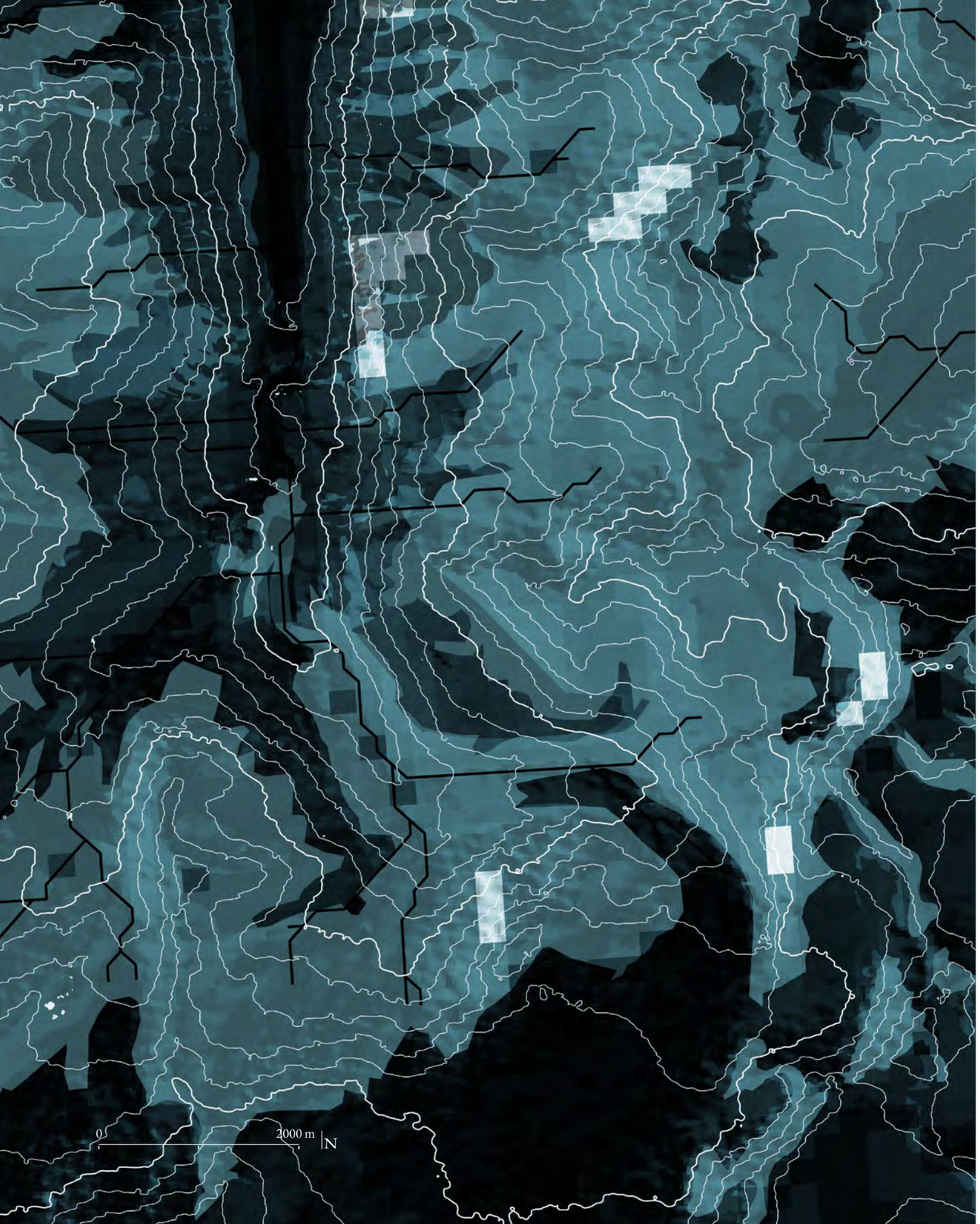
0 10 km N

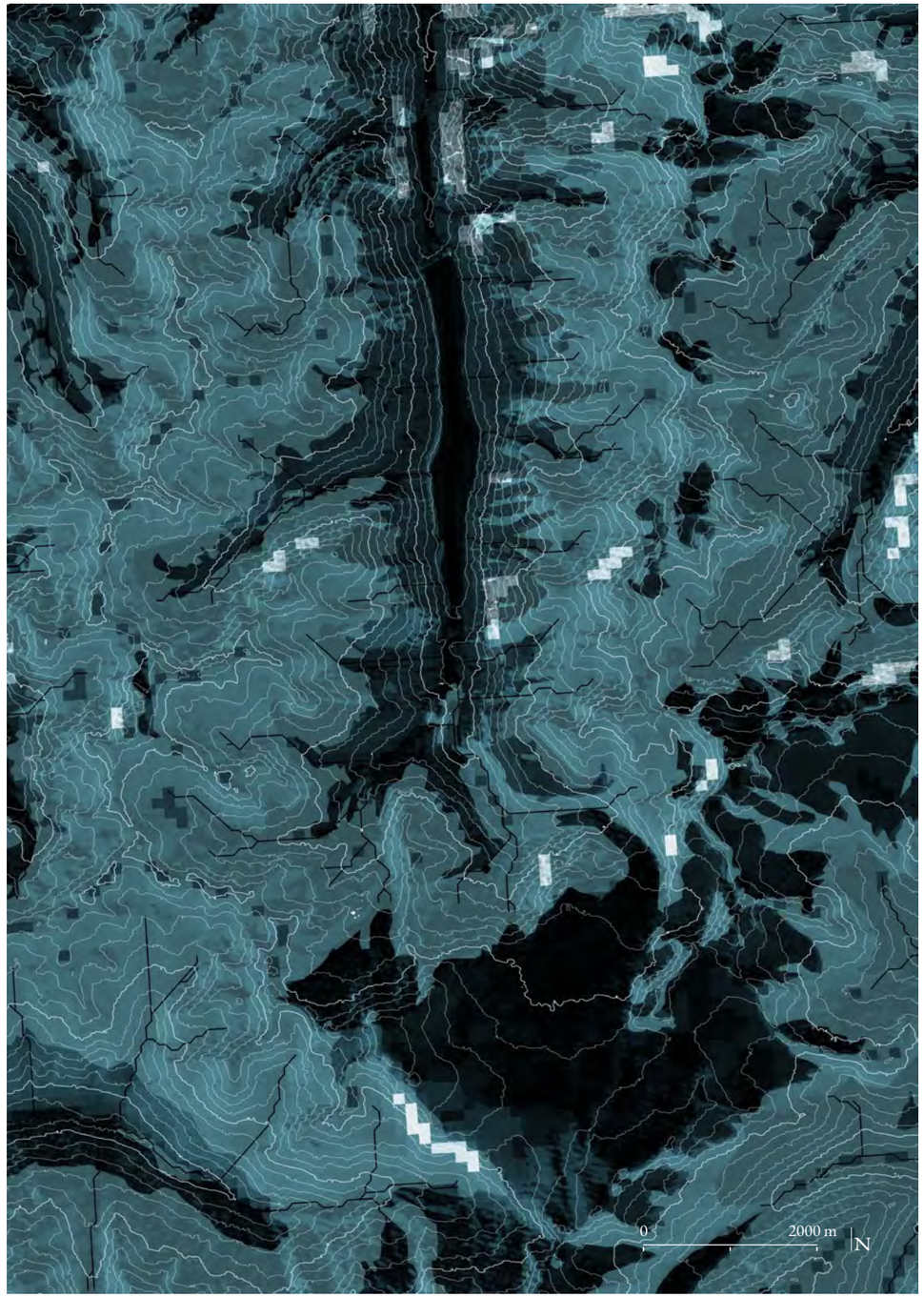
223 | The ocean in the Alps, Ötztaler Alps




224 | Ocean in the Alps of the  lower Kaunertal in planview (top)
225 | Ocean in the Alps of the zoomed in lower Kaunertal in planview (right)




226 | Ocean in the Alps of the  upper Kaunertal in planview (top)
227 | Ocean in the Alps of the zoomed in upper Kaunertal in planview (left)

## 6.6 Potentiality
### To secure water and habitat

The potentiality of the implementation of the previously described actions starts with the assumption of a potential upward shift of the snow line, the limit of the Alpine zone, and the tree line by 1000m, following an increase of +5°C. The individual interventions unfold their potentiality when combined together. In synergy they support, create and transform the Alpine Ocean. Only then, the full potentiality of the Ocean is reached. The slope portrait section, (see page 240) which analyzed the different slope conditions in the Ötztaler Alps, was used in order to indicate the potential of each intervention at a specific location on the slope. Some of the conditions are beneficial for multiple actions. In this case a combination of different actions can be put forward or one can decide on one action based on local cultural, biodiversity or economic importance.

The locations which have the highest potential for an intervention are highlighted as core areas in the drawing. Through the analysis of potentiality, the diversity of the implications becomes visible. The adaptability of the strategy and the freedom of choice for present and future generations has the ability to create a multiplicity of future Alpine Oceans. Using the method of potentiality the Alpine Ocean becomes visible.

#### Supporting upward shifting vegetation

Supporting the upward shifting vegetation has its highest potential in areas which are below the new tree line and a medium potential in areas of the new Alpine zone. This is indicated through the plant productivity on different altitudes. Therefore, it means that on the one hand water storage capacity is higher in lower areas but at the same time in low potential zones there is a different kind of vegetation which may not store as much water but is not less important. Since plant growth is constantly shifting upwards with increasing temperature, areas of low potentiality overtime may turn into high potentiality, therefore, they play an important role in kick-starting the described soil accumulation process. Furthermore, the slope orientation is important when indicating plant productivity.

#### Retaining runoff water

This intervention has the highest potential and where slopes are the flattest. At the same time water availability in the form of precipitation or other water bodies play a crucial role. Terracing is not possible at a slope angle of more than 30°.

#### Protecting sediment accumulation

The formation of Alpine deltaic systems is mostly happening in valleys which are embedded into an active sedimentation process, visible through high erosion in their close proximity. Especially high altitude valleys are bearing a high potential for the implementation of this strategy.

#### Spreading flowing water bodies

This action is easily identified through the presence of rivers. Their potentiality increases with the size of the river and the space available in the surrounding valley, indicated through the shape of the section as well as the presence of existing structures.

#### Reviving the industrial landscape

This strategy is focusing on identifying skiing resorts and storage lakes, many of them can be found throughout the whole territory of the Alps. In the slope portrait they are visible through anthropogenic structures.

#### Preserving melting glaciers

This intervention has its highest potential at the highest altitudes. This often falls together with the locations of glaciers. Furthermore, the potentiality is indicated through the availability of water as well as the topographic prominence which potentially gives shade to the structures. The Ice Stupas can best be built in areas with less than 5° of slope.

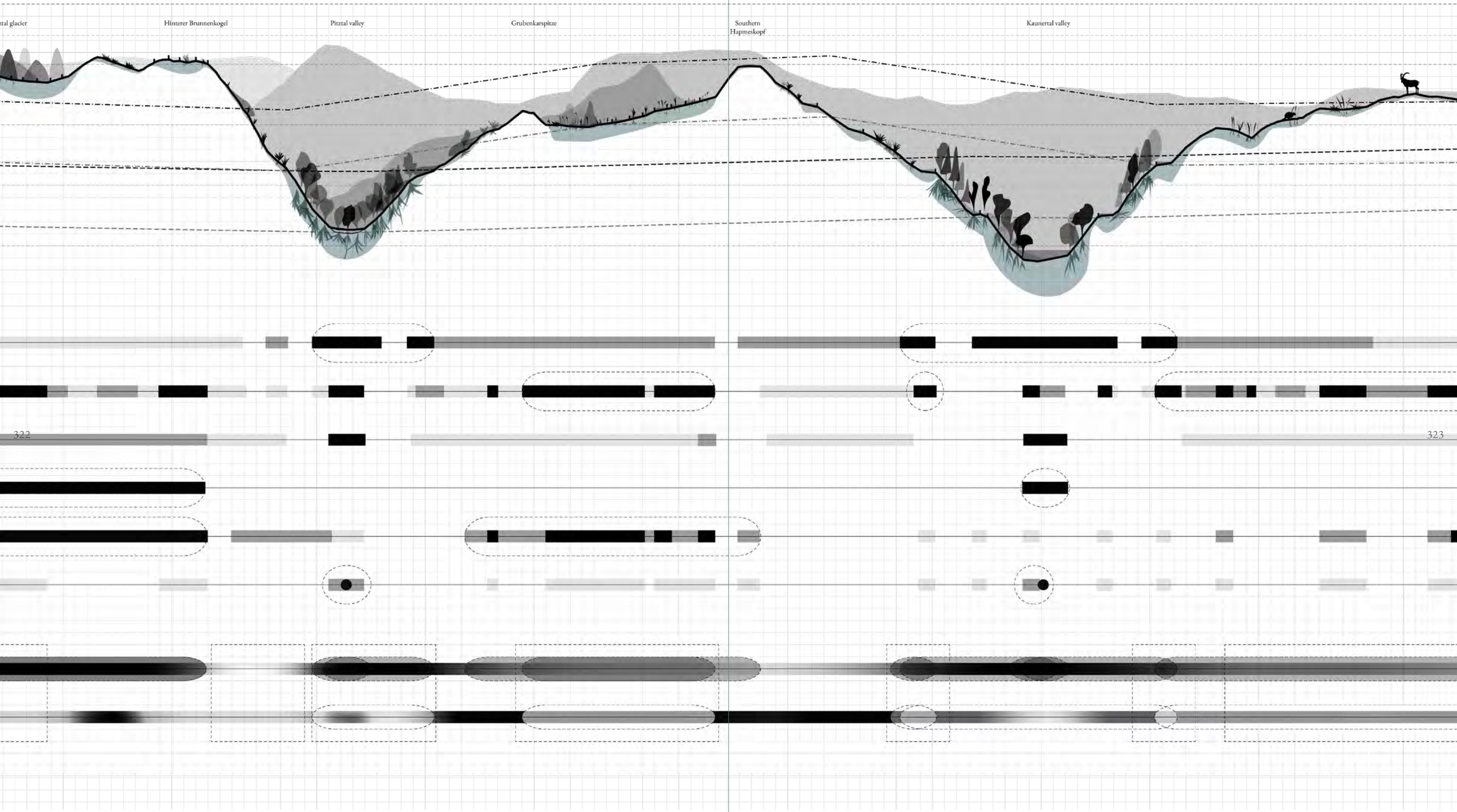
Together interventions for the Alpine ocean. In conjunction they indicate the water level and the need for supportive action in order to sustain the ocean. The character of the Ocean can be identified, ranging from capricious to serene. This indicates the places which need balancing action, in order to counteract the erratic nature of the Ocean. Furthermore, the synergy of actions highlights potential islands of habitation and shelter.

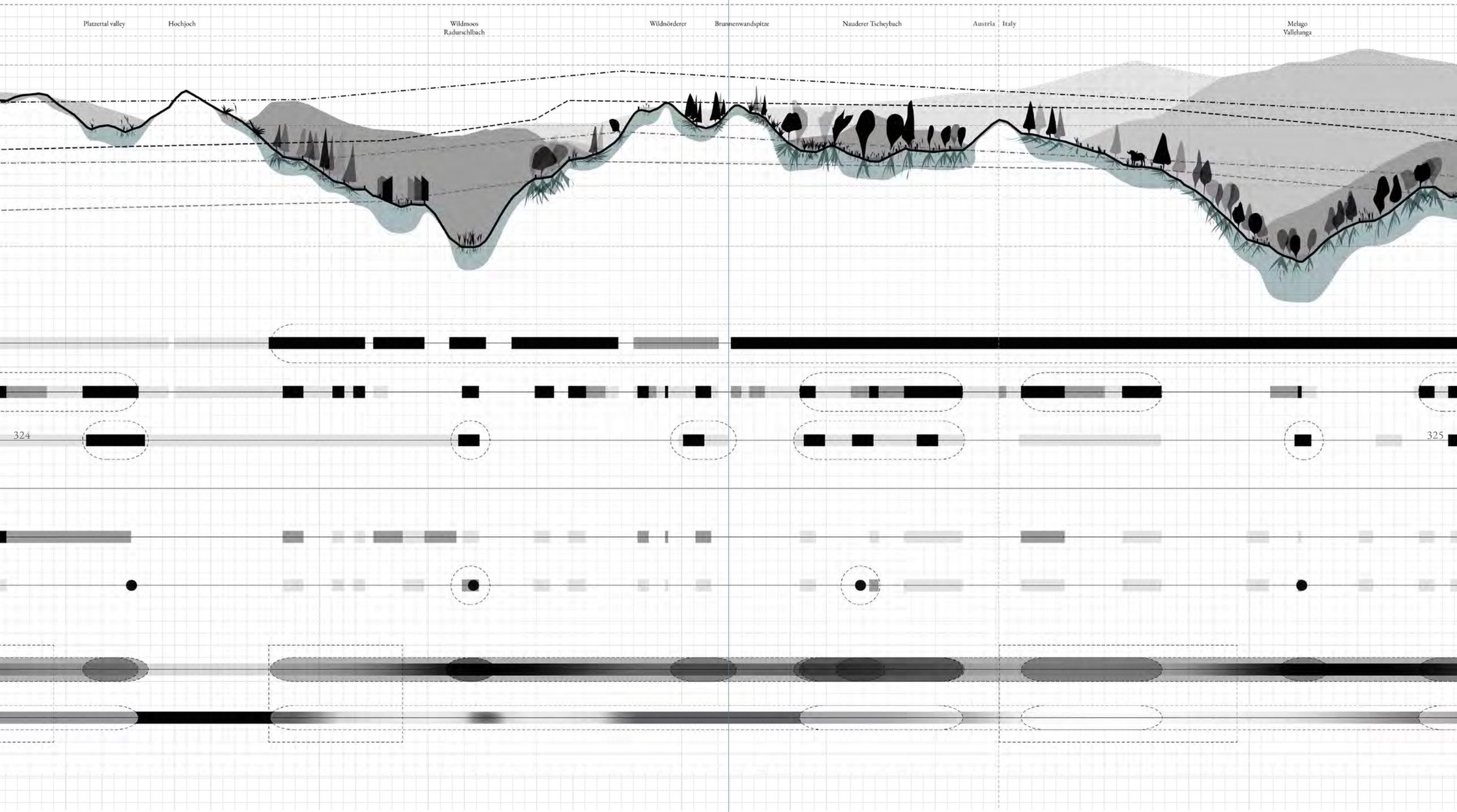
## 6.6.1 Circular section
### Potentiality of the Alpine Ocean

228 | Location of the circular section




229 | Critical mapping of potentiality of the proposed interventions in section


tal glacier
Hinterer Brunnenkogel
Pitztal valley
Grubenkarspitze
Southern
Hapmeskopf
Kaunertal valley


Platzertal valley
Hochjoch
Wildmoos
Radurschlbach
Wildnörderer
Brunnenwandspitze
Nauderer Tscheybach
Austria
Italy
Melago
Vallelunga

Tiergartenspitze
Planeiltal valley
Valvelspitze
Matschertal valley
Lagaunspitze
skiingfiel
Maso Corto

d
urzars

Ötzis
findspot

Italy

Austria

Eiskögel

4000 m

3768 – Wildspitze

3500 m

3000 m

2500 m

2000 m

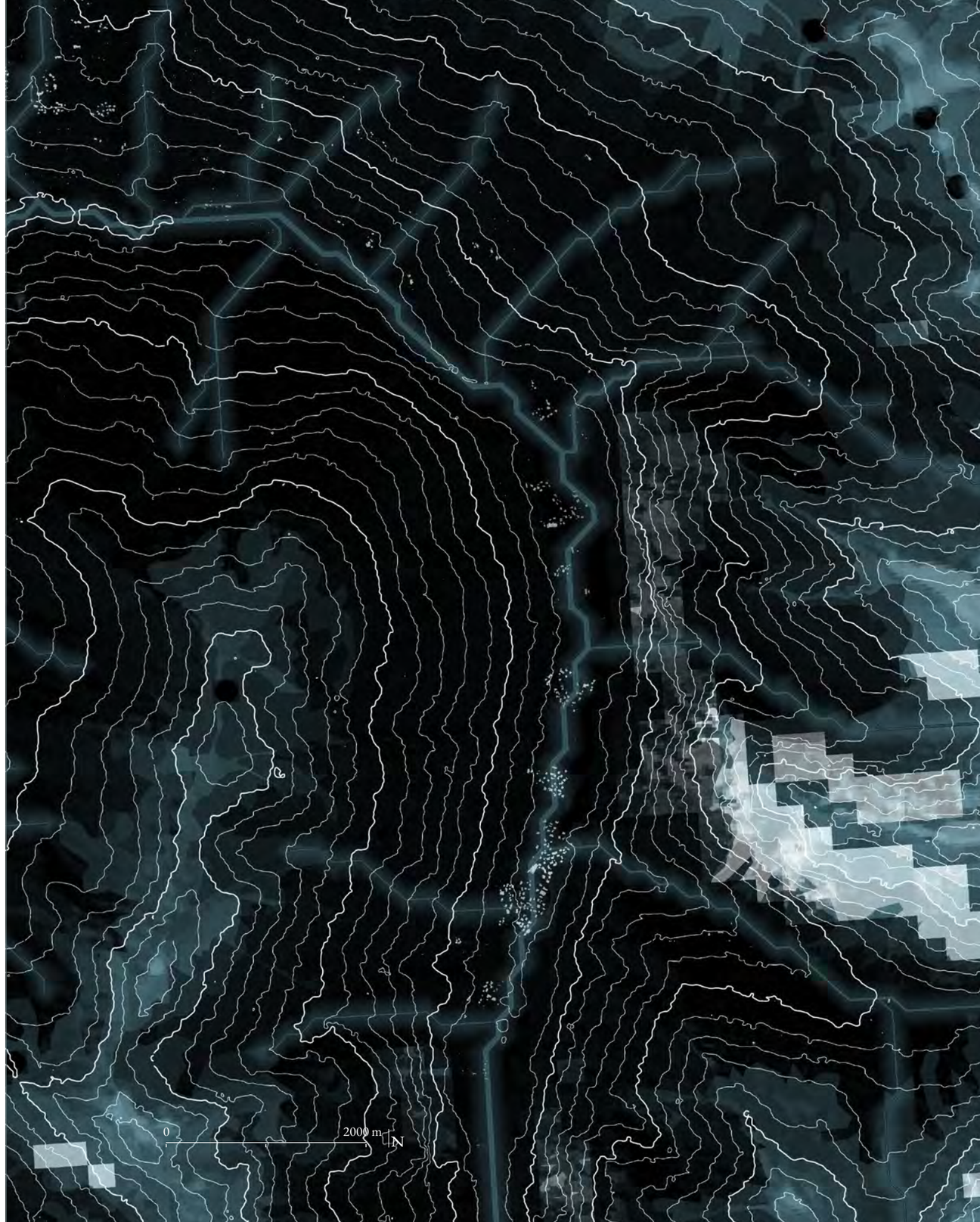
1500 m

1000 m

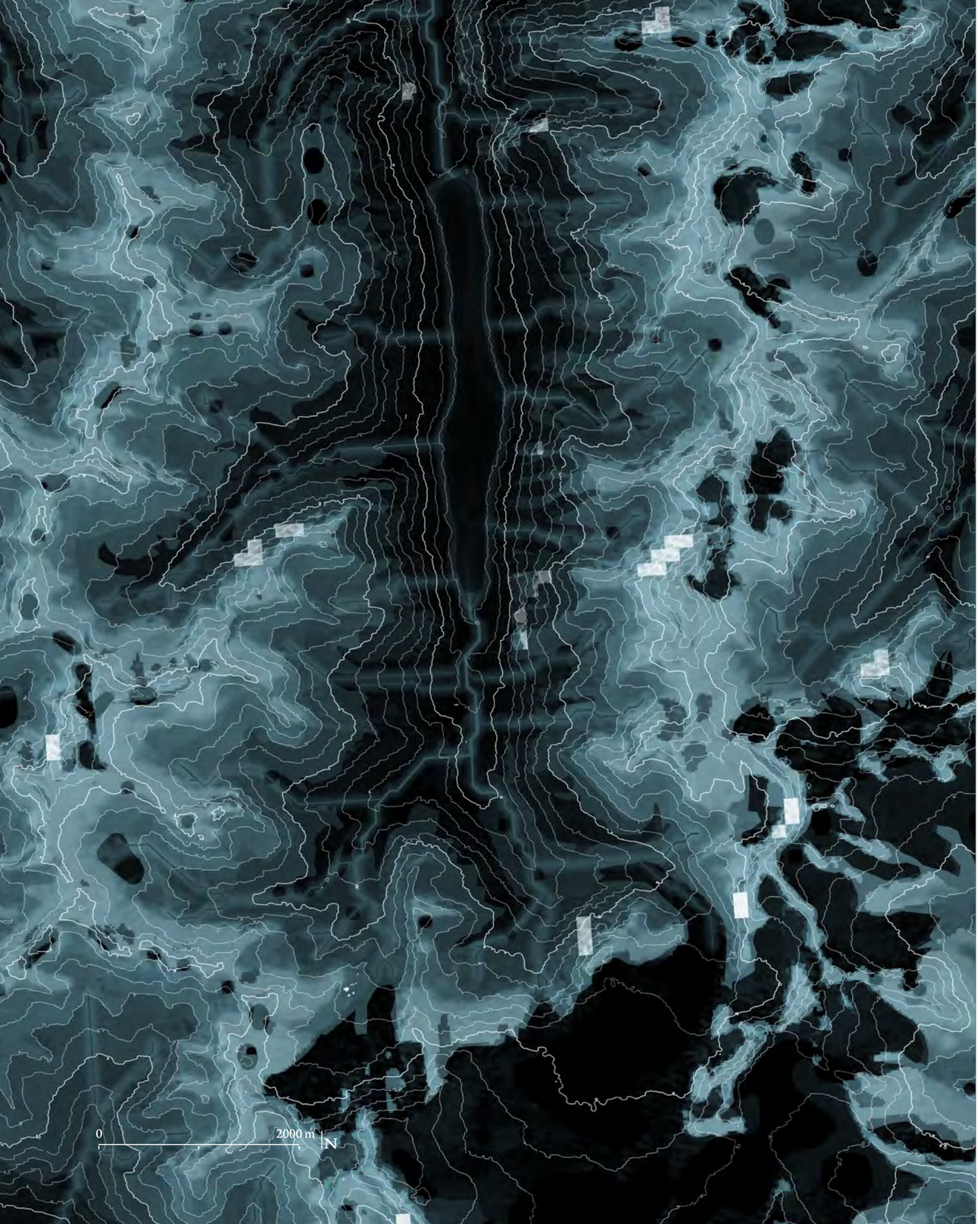
500 m

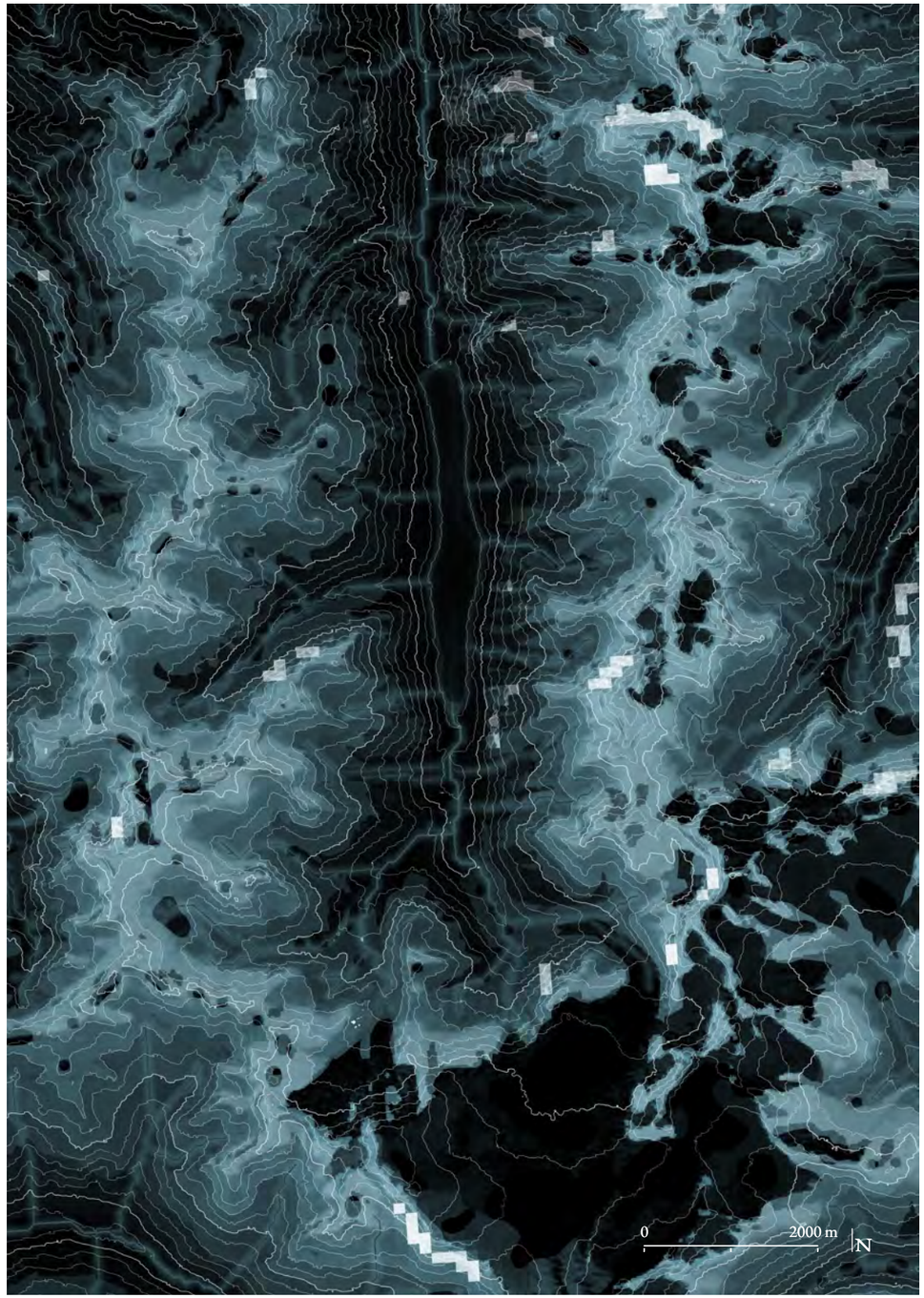
240

0 m


230 | The growing ocean in the Alps mapped in the lower Kaunertal (top)
231 | The growing ocean in the Alps mapped in the zoomed in lower Kaunertal (right)




232 | The growing ocean in the Alps mapped in the upper Kaunertal (top)
233 | The growing ocean in the Alps mapped in the zoomed in upper Kaunertal (left)

## 6.7 Shelter and water security
### A European perspective

**Interscalarity**

The interventions are taking place on three different scales which are all based on different river catchment areas. The different scales are embedded within each other through their catchment areas. The three levels are the Kaunertal valley catchment area, the Inntal valley catchment area and the Danube catchment area. Each of them also indicates a level of management and decision making. This includes production of resources such as water, food, waste, or energy, as well as their flows. Furthermore, the maintenance and caretaking of vital infrastructure such as the diverse components of the Alpine Ocean.

I suggest urban development which is based on freshwater availability. This freshwater guided urbanization is led by The flow of water, from the spring of the rivers to the deltas of Europe. The biggest cities along the main rivers are important islands of human habitat. They benefit from the availability of freshwater and are at the same time connected through the river system for transport. Through the interventions in the Alpine Ocean they are protected from severe floodings which potentially could cause a lot of harm. The water buffer capacity of the synergy of all actions provides a stable condition of water levels within those urban areas. At the same time they are in need of buffering capacity. Meaning the ability to store stormwater surges as well as provide water in times of drought.

**Shelter**

Through the multiplication of the given interventions, The islands of habitation can host people who are being pushed out of their homes due to climate emergency. In areas of increased temperatures which are dealing with heavy droughts, loss of harvest, or sea level rise, these islanders act as hosts and as new homes for the arriving. They are a welcoming harbor, which offers a place in Europe for the world.



234 | The network of the Alpine Ocean, Alpine scale with the Inntal valley catchment area highlighted

People take responsibility for their smallest river catchment area, supporting it and making the best out of itself and therefore together with the others, emerges a combined system which can sustain life on a larger scale. It is in the smallest unit, that the change takes place and it is there, where the people care for the land. They become part of something bigger, they become part of the whole. They have responsibility beyond themselves, yet it is only a small place they have to take care of. Together they transform the Alpine Ocean, together they create a habitat which is able to host the climate diaspora.



235 | Section (1:1) from the Rhine river delta (NL) to the Po river delta (IT) with the Alps in between

236 | Kaunertal valley catchment area


237 | Kaunertal valley calculated potential river system




238 | Expansion of the Ocean through supporting the vegetation upwardes shift


239 | Expansion of the Ocean through the combination of all interventions in symbiosis


Alpine Ocean
shallow
deep
capricious ocean
interventions
urban islands
water sheds
rivers
growing cities
shrinking cities
strong economic cluster
movements towards growing urban areas
strong urban connectivity
0
75 km
N

**Alpine Ocean**

shallow

deep

delta

capricious ocean

interventions

urban islands

water sheds

rivers

growing cities

shrinking cities

strong economic cluster

movements towards growing urban areas

strong urban connectivity

0 10 km N

# 7. Conclusions

# 7.1 Results

**Main research question:**

**In light of historical objectification and increasing pressure on the body of the Alps due to local and global changes, how can the emerging 'new order' of the Kulturlandschaft be formed by the Alps as an active subject?**



## 1. How have the Alps been manipulated, appropriated, and colonized over time, and how did it change their identity and agency?

**Aim:** finding current path-dependencies and patterns of appropriation, discovering the pressures of local changes, and the anthropogenic influences on the territory
**Methods:** Historical literature research, spatial analysis, photographic comparisons between now and the past, interviews with experts and locals
**Outputs:** photographic essay, timeline of object-subject dichotomy, text, analysis maps

The Alps have gone through different phases of appropriation. In the era of the traditional cultural landscape, people focused mainly on forest clearing. Their economy was based on a symbiosis with the natural systems. They had to recognize the limits of the natural landscape, and its impermanence, work with the regenerative processes of the vegetation, and at different altitudes to maintain their livelihood.

This changed abruptly with the onset of the industrial age, when the valleys, in particular, underwent major changes associated with the drainage of valley floors, the straightening of rivers, and the further expansion of urban areas. The intensification of agricultural practices led to water-intensive systems and a high demand for energy, which was reflected, for example, in the introduction of hydroelectric power plants and the flooding of valleys, sometimes disregarding the present villages, to build dams and generate electricity. During this period, the Alps gained great economic prosperity due to the availability of water and energy.
In addition, the Alps have changed significantly in terms of their use as a tourist attraction. The "Playground of Europe", as they are called, has undergone a major shift in its image and landscape shape. This happened due to the construction of vast ski resorts and the transformation of small villages into tourist hotspots. The changes to the playground tended to take place at higher elevations, while guests demanded stable conditions, which led to the creation of artificial snow. Furthermore, summer tourism is becoming more popular, which leads to high traffic levels throughout the year.

In conclusion, in the industrial age, the Alps have been deprived of their agency by being turned from an active player in shaping the traditional cultural landscape, recognized by the local population, to a place of commercialization and appropriation for economic profit. The characteristics of the Alps, some of which have been identified in this thesis, have had less and less influence on the shaping of the place and have been constructed mainly in terms of coping with, or rather preventing, disasters. This is most evident in the unpredictable, erratic, nature of the Alps, which has evolved from managing and directing human settlement and appropriation patterns to huge infrastructure projects, preventing them from occurring.



## 2.1 How will the current vertical and horizontal borders change due to climate change?

**Aim:** understand the spatial effects of climate change; researching the landscape changes, understand growth and migration patterns and processes of ecology
**Methods:** critical mapping of accumulation - with focus on deglaciation: matter, tops, habitat, geopolitics - each of them looking at the current composition, the alterations due to diverse social, economic, environmental influences, and the limits of the topic under investigation
climate scenarios, IPCC, natural sciences papers

The main cause of change in the boundaries due to climate change is the increase in temperature. This will lead to an increase in the erratic nature of the Alps. This is mainly reflected in the shift of the tree line and the snow line, which indicate the limit of tree growth and the altitude limit where snow is present throughout the year. Both of these lines will shift upward. With them will also come all the habitat zones divided by specific elevations throughout the area. This will turn the Alps from white to green. The vertical boundaries will shift upward, causing certain

habitat zones to be displaced and species to proliferate, pushing fragile alpine ecosystems further up as well as decreasing the areas of snow. Since mountains have less surface higher up than at lower altitudes, this phenomenon is decreasing the total surface area of habitats as well as the total volume of snow significantly.

Horizontal boundaries will change, for example, as certain landscape features disappear. The increase in heavy precipitation or other extreme weather events will also reshape the flood zones and risk areas of the Alps. And the need to store water within the Alps will further alter the horizontal boundaries of the landscape. National borders shift if they are based on now-changing landscapes such as glaciers or rivers. Temperature rise will lead to habitat fragmentation and create the need for connectivity within biodiversity hotspots or other ecosystems to ensure their diverse reproduction.

## 2.2 What are the environmental, cultural, economic, and spatial consequences of temperature rise?

**Aim:** research dependencies and relationships between human and natural systems; understand interdependencies of global changes and the alpine human and natural systems, understand the environmental, social, economic and spatial consequences of deglaciation
**Methods:** critical mapping of accumulation - with focus on deglaciation: matter, tops, habitat, geopolitics - each of them looking at the current composition, the alterations due to diverse social, economic, environmental influences, and the limits of the topic under investigation
climate scenarios, IPCC, newspapers, natural and social sciences papers
**Output of 2.1 and 2.2:** maps, sections, spatio-temporal diagrams, climate and/or societal scenario(s), idea for an action to spatially reposition the Alps as a subject

These changing landscape conditions will have significant impacts on current economies and cultural practices. The most obvious example is winter tourism, which will become obsolete within the next decades. Only with an enormous amount of artificial snowmaking can the economy be sustained, which will result in an ever-increasing demand for energy, which in turn will lead to habitat destruction through the construction of dams and other hydroelectric power plants. In this regards, it is of outmost importance to prepare a shared value system between the different nations in order to collectivly stir the Alpine future.

From a European perspective, the rise in temperature will increase the value of agricultural land in the Alps. This may affect the number of people living in the Alps, which could ultimately mean an influx of people into the area, either permanently or during periods of very high temperatures from neighboring major cities such as Milan, Vienna, Munich, Zurich or Lyon. This influx of people will lead to higher pressure on the Alpine area and especially on the already fragmented and fragile ecosystems. In order to preserve the quality of life for the different species present in the territory, whether human or more-than-human, strict decisions are needed to protect the life of these species. This can lead to the creation of certain biodiversity protection zones or corridors that counteract the fragmentation of species‘ habitats. This is another aspect of future research that will be very important for the future of the Alps.

From an ecological point of view, the temperature increase will lead to habitat fragmentation, as already mentioned, and it will lead to the loss of glaciers. Depending on the climate scenario, Alpine glaciers will have disappeared by the end of this century at the latest, except for a few ice fragments. This will lead to the need to transform the system from a glacially influenced to a non-glacially influenced area. Research under the “Room for the River“ project in the Netherlands already shows promising projects and forms of intervention for plain landscapes.

There is a lack of imagination in the study of mountain landscapes. A place that has benefited from an abundance of water in the past, with all human-made systems accustomed to this condition, will have to adapt to new climatic patterns. Geomorphological adjustments to existing infrastructures will be required. Especially those built during the industrial and service era. These infrastructures were aimed at moving water masses out of the area as quickly as possible, draining them from the ground and channeling them through pipes into large river courses protected by dikes or dams.

The natural ability of the landscape to absorb water and buffer the effects of extreme weather events such as droughts or rainfall is being lost. These characteristics of the landscapes need to be restored, renatured, and repaired so that the systems can adapt to these new conditions. This requires extensive repair work at all elevations in the Alpine region.
In particular, slopes are an important landscape feature of alpine areas. Their condition and characteristics can help to understand their potential for change and their water retention capacity. In current cartographies, slopes often disappear from cartographic representations. Further research into the ways in which slope landscapes can be represented could help to understand their potential. This research is a first step in showing the potential of certain slope qualities, divided into the different forms of water and their response to the landscape. Especially slopes with less a than 30° angle are promising places for enhancing water retention capacity as well as supporting biodiversity.

## 3. What methods can be used and/or developed throughout this project to aid listening to more-than-human subjects present in the Alps?

**Aim:** engage with the Alps, finding their identity and their 'Nature', developing methods for Urbanists that can be used further when working with more-than-human entities, redefine the agency of design, including more-than-humans into the practice of Urbanism
**Methods:** ethnographic research, posthuman methods of listening, non-representational methods (investigating relations between subjects), photographic and film documentary, research into art, interviews, fieldwork
**Output:** film, photographic essay, mind maps, stories

The variety of research methods available to listen to more-than-human subjects in the Alps, especially the natural history methods dealing with the geological processes of the formation of the Alps, and the study of natural dynamics helped to understand and reveal the character of the Alps. Methods aimed at looking at interrelationships were also very helpful. Through them, I developed a link between natural dynamics, human interventions, and biotic responses, which led to the creation of four maps, each describing one of the revealed characters of the Alps. By using critical cartography to visualize these features, the density of their interaction became apparent. Therefore, the act of mapping also became an important tool in the process of listening to the Alps. In addition, the studio's research method, which resulted in a critical mapping of matter, topos, habitat, and geopolitics aimed at revealing the process of deglaciation, contributed to revealing the current processes and impacts on life and ecosystems within the area. The use of posthumanist approaches and decolonial research methods helped to understand how the Alps were shaped by human appropriation and where their character was suppressed.

During the field research, the method of developing a video documentary was very helpful in getting in touch with the people and the landscape. It required choosing certain angles and focusing on specific places. In this way, my limitation in videography also helped me listen to the places, in the sense of exploring and experiencing the landscape. Since I was working with video stills that were only a few minutes long at a time, I had to choose the location and framing carefully. While I was waiting to shoot, not much was happening with the camera, but it still required me to be present. Those were the moments when I could really immerse myself in the landscape, its sounds and images which I was able to observe during the shoot.

This is also related to the pedagogical and experimental learning methods that aimed at framing the landscape and carefully selecting a certain set of components and their composition that would highlight an aspect that was important to me at that moment. Therefore, a careful selection of places and a deeper connection to those landscapes through the shooting of the video brought forth a different understanding of place.

In addition, on one hand, the need to record the voice for the documentary was a great challenge, as not everyone agreed with the recording of the voice. On the other hand, if I had only taken notes of the conversations, it captures something different than mere memory or reproduction. However, due to my injury, I have not been able to bring the footage together into an actual narrated documentary yet. Nevertheless, videography played an essential role in observing and gathering knowledge.

## 4. What are the spatial, cultural, environmental and economic implications if one projects the findings of the natural identity of the Alps onto their territory?

**Aim:** let the Alps speak, start a discussion about what the future of the Alps is and how we can support their sustainable development, imagine an alternative to the current path-dependencies, reposition the Alps as active subject
**Methods:** imaginative mapping, experimental model making, layering, deconstruction, reconstruction
**Outputs:** speculative drawings, territorial projection map, actions, strategies

Through the methods of listening, it became apparent that there are four characteristics of the nature of the Alps that are the most present or the ones that I could identify. Those characteristics are the connectedness, the mosaic-like, the cyclic, and the erratic nature of the Alps. All of them require different kinds of strategies, but I suggest integrating them into future projects in the Alps. It could also be that another person would interpret the results of the listening differently, finding other characters that are equally valuable as the ones that I am putting forward. Therefore, it would have been interesting to involve more people in the process. This would be, from my point of view, an important role of an urbanist – to bring together different views and knowledge and develop ideas with each other.

The mosaic-like appearance suggests the composition of the place in a patchy way, allowing for versatile landscapes. The connectedness asks for counteracting the fragmentation of the places and therefore also a situated practice that shows empathy towards the myriad life forms that are present and that the projects shall not be an imposed structure but grow out of the place itself. The cyclic and erratic nature of the Alps is more related to the management of the place. The cyclic is especially concerned with the regeneration capacity of the landscape and looks at the cyclic nature of time. Where past, present, and future come together at once and things repeat themselves. The erratic deals more with the disruptive, unexpected, and uncertain nature of the

Alps. So how does the intervention or project react to short-term events? It, therefore, asks for reversibility and a temporary approach for intentions, implications, or interventions that are not irreversible or permanent.

Together, the different characters create reciprocity between the different life forms and economies that are present and, therefore, create equity within the system. The strong character of the Alps and their agency have also been discovered to be closely related to the availability of water. Therefore, the active role of the bodies of the Alps and the species living within them, biotic and abiotic, is to democratically and equitably share freshwater with all forms of life that are dependent on it within their reach. This goes from the top of the mountain to the mouth of the delta. Therefore, there is a need for special treatment of the Alps as a body of water and a source of life. Another consideration is how this role and this agency within the web of life can further be sustained through the help of interventions from a human perspective in order for future generations to also benefit from them.

The project, therefore, suggests slowing down the movement of water through soft infrastructure, and the processes of a changing condition from white Alps to green Alps. Therefore, the value of plants and soil to retain and store water is an essential asset to bridge this transition, as are the traditional methods of engineering, such as terracing, in order to create conditions for, on one hand, storing water and, on the other hand, supporting the creation and growth of new, lost, or existing ecosystems and cultural practices.

If this approach is multiplied within the territory and towards the deltas, this very valuable freshwater resource can be fostered and made available in dry seasons for the local communities. The glacier turns into something else. It is an agent of time, showing us past practices of water management and indicating future conditions of the landscapes and the cultures and life forms connected to its source. By reviving the transition from frozen to fluid, the glacier changes its form but does not disappear completely. It is a part of a transformation process, fostering life and sustaining the diversity thereof.

Throughout the project, it became evident, that the Alps are in need of a political representation. One, which is not aiming for economic profit, but sustaining the diversity of life within the Alps. Due to current path-dependencies, valuable common resources of the Alps such as the precious freshwater is currently used mainly for economic benefits. In order to secure a democratic sharing of water in the future, there needs to be an independent institution. Therefore, the project suggests the founding of a Parliament of the Alps, which protects the Rights of Nature. A range of Guardians are the representatives thereof, together supporting the wellbeing of the Alps in the quickly changing conditions due to climate change.



# 7.2 Discussion

## 7.2.1 Interpretation of results

The results of the research suggest that all adjacent lifeforms to the water system of the Alps have to adapt to being non-glacially influenced. Since the majority of infrastructure is created with the abundance of water in mind, it needs to be adapted. Furthermore, the research shows the importance and value of integrating multi-species research methods into urban planning and design and shows how it can lead to a different quality of space and the visualization of another future. It also highlights the urgency of acting upon climatic changes within the Alps and the limited time available to plan for those changes to happen. The sooner we start, the better we will be able to navigate and the less dependent we will be on our current systems. Path-dependencies have to be broken in order to sustain the future livability of the Alps and beyond.

There has to be a political representation independent of market-oriented economic or individual national goals. This political representation needs to be composed of different fields of knowledge, from artistic to research to on-site to the patterns and processes of ecology. By bringing them together, the changes that are happening nowadays can be communicated, visualized, and acted upon properly. Furthermore, species and ecosystems which are vulnerable can be protected. Future research therefore implies a new political agenda that recognizes the Alps as an active subject within the forms of life in Europe and their agency and importance, especially when it comes to the role of freshwater security, and sensitivity.

## 7.2.2 Avenues for Future Research

This thesis, therefore, calls upon political agents, lawyers, and other eager activists who have the ability to reach that goal. It opens up new pathways for art to show the changes of the landscapes and use its capacity to evoke emotion within the people, therefore shaping awareness for the condition at stake. It asks economists to rethink their current paradigms and propose new ways of adopting a more symbiotic or regenerational attitude towards the economy. This thesis is only a small part of the excessive knowledge of traditional practices present within the territory. It would be of immense importance and value to conduct research from an anthropological or ethnographic point of view into the traditional practices of the cultural landscape in

order to revive those practices, which have been built on a regenerative economy, without doing harm to the Alps‘ ecosystems. By uncovering those practices, which are Europe‘s or the Alps‘ indigenous knowledge systems, future practices of situated design and research and other knowledge practices can aid and inspire the future cultural landscape that we will be living in and shaping together.

The thesis also calls upon the people living in the Alps, asking them to build a connection and share their sense of belonging – their very strong connectedness to the place – with others. Because what we feel connected to, we care about, and what we care about, we tend not to destroy. And this attitude towards the Alps, this sense of belonging that they evoke in almost everybody that I have been talking to during this research, is very strong and can help us substantially in navigating those changes. It is therefore essential to reach out to the people living there and make visible what they feel and how they feel, what the Alps mean for them, and who they are to them. We often do not ask ourselves this question and the people that I asked mostly reacted very surprised. But when they started to explain what the Alps meant to them, there was a firework happening within them – deep care. And therefore, I want to encourage others to ask those questions – to ask about the relationship we have with the earth, to ask about how we feel about it – in order to make us think about not just what the Alps, in this case, but what planet earth means to us. By speaking it out loud, it becomes real. By speaking it out loud, we start to care.

The changing condition from white to green Alps, asks for a shift of the economies which are dependent on the resources connected to this process, such as the winter tourism industry, to the new condition. The strong dependency of many Alpine villages on winter tourism, due to the last decades developments, will pose many challenges, from the economic foundation to the shape of the changing landscape. How can people stay in their villages? Or should they stay there to begin with?

The immense amount of infrastructures such as skiing lift will open up new field of research and design in order to deconstruct, reuse or recycle the various elements. In this regard it will also be important to decide early on which places should be accessible for humans, especially when it comes to tourism, and which transportation infrastructures have to be dismantled. Since a few years, the growing use of electric bikes allows people to travel further than before. This increases the radius of human activities, simultaneously reducing the areas of wildlife. The skiing transport infrastructure allows a similar expansion of movement which could be interesting to investigate from a spatial perspective.

The thesis provides a first attempt in understanding slope spaces as potentialities for urbanism in Alpine regions. The orthogonal perspective of maps dismisses steep angles through which it often disregards the slope as large surface. There is an urgent need of finding methods of representation which allow a more accurate understanding of the slope-space. I started an endeavor to create chromatograms composed of slope degree and land-use, this may be a way forward. One of their qualities lies in their retention capacity of water, as shown in this thesis. In order to transition from a glacially influeced to a non-glacially influenced region understanding and uncovering the full potentiallity of the slope will be of great value for the future support of the Alps as living water source and reservoir.

The active agency of the Alps has been neglected and deprived through large infrastructures and landscape adujstments, such as river straightenings, the construction of dams, and the drainage of valleyfloors. This resulted in the Alps being a source of environmental struggels everywhere else around Europe, for instance by causing a lack of sediments and increased risks of flooding. How can the Alps be a positive agent again and support sustainable natural processes within Europe?

By recognizing the Alps as the source of fresh water and positioning this at the core of European sustainable development goals, the Alps could serve as a place of refuge in a changing climate with increased temperature and sea-levels, thereby providing conditions for life to unfold, for humans as well as more-than-humans. This could sustain habitats within and around them, help address the displacement of many people caused by rising sea-levels, wildfires or draughts, and ensure the continuation of life in Europe in the face of climate change.

### 7.2.3 Ethical considerations

**Professional and scientific relevance**

As urbanists we are used to talk about human habitats and design for them. In the light of the climate emergency, this is not enough. We have to figure out how to include more-than-human agencies in to our work and how they can make urbanism projects more grounded and diverse on multiple levels. We have to reposition ourselves as designers and be at the frontier of a new way of living together. Furthermore, there are more and more projects which are trying to establish the Rights of Nature all over the world, and with design being one of the most important political instruments, it is essential to figure out how to bring about and establish those rights in space. Because only once the legal rights get a form manifested in space that will protect them throughout time, one can assure their effective implementation.

**Societal relevance**

Climate change is posing unforeseen challenges to society as a whole. The project tries to find a way to negotiate through them. Nature and culture are one and we need projects that show this.

Furthermore, we need projects that not only find (technological) solutions but a different approach that grows out of the context. Through developing such projects we can show that a different future is possible and that in the end, we will manage to reshape a post-capitalist world, where value can emerge from sources other than the exploitation of natural resources and the destruction of our planet.

Without the water storage capacity of the Alps, which they are losing due to multiple reasons, Europe will face unforeseen challenges. They are the water tower of Europe, or rather the Alpine Ocean, steadily collecting and sharing freshwater. To be able to have such a relationship with the Alps and a comfortable way of living with them, being able to use their resources, is a great privilege. In a climate with rising temperatures, multiple places which are connected to the Alps water system will suffer from heatwaves and a lack of rainfall. There is a lot of research and built infrastructures dealing with too much water, but this thesis suggests that we should rather shift our focus to the issue of having too little. Especially in the Alps, there is almost no awareness of this changing condition which results in a lack of available research, projections, and proposals as well as political and societal concern. This project shows the consequences and the need for action.



## 7.3 Limitations

Within the current paradigm, sustainability is often addressed and is trying to be dealt with from an engineering perspective. With this thesis, I try to show a different path. This, of course, does not mean that this is the best way. It has many unresolved questions that are very important to consider. Therefore, it opens up a lot of pathways for further research. Especially when it comes to the economies of life, the thesis lacks concrete outcomes. How will people react to this new or different landscape? Since it also only intervenes in the most upstream territories, it neglects the effects those could have downstream. A holistic approach to the whole water system is needed in order to make a difference in the long run. This has been consciously limited in the research since it would need way more in-depth research and the time frame of the master‘s thesis did not allow for further deepening into downstream water systems.

It was extremely challenging to develop an understanding of the consequences of climate change in the Alps because of the multiple uncertainties. The implications of sea-level rise are comparably easy to understand, since one can work with different scenarios of increasing water levels. It is one thing to assume glaciers will be gone, this is one of the visible symptoms, however it is connected to a wide range of different phenomena which are invisible. When it comes to the Alps, the erratic nature is very difficult to foresee. There is no evidence on how severe the consequences will be. Especially in the alpine and nival zones due to unknown amounts of permafrost which holds together the mountains themselves.

Most of the assumptions the thesis builds upon are simplified abstractions of the real, complex condition. From one point of view, this allows to take decisions and react to the questions at hand, but on the other hand, it also limits the impact and liability of the project itself. When dealing with ecology, we as Urbanists are dependent on the knowledge we can find in a short time. The thesis would greatly benefit from the integration of different fields of research, which could bring further input into the understanding of and reaction to the situation at hand. The Alpine flora and fauna are highly complex. Each area of the Alps is unique; therefore, each part is very specific, different, and special in its own way.

Furthermore, the thesis was limited by data availability due to the different nations being involved. This demanded a lot of effort to bring together the data in order to show a concrete picture. Especially on the territorial scale the thesis was dependent on planetary or European data sets, where often Switzerland was not included, as well as the existing work of the Alpine convention. I would suggest further research into the creation of a detailled data base, especially when it comes to natural dynamics, for all nation states together.



## 7.4 Reflection

**A change of matter touches upon different aspects of transformation – water, agency, values, space. It is a project of advocacy, trying to overthrow solutionism. Here is my reflection on the making of it.**

### 1. What is the relation between your graduation project topic, your master track (Ar, Ur, BT, LA, MBE), and your master programme (MSc AUBS)?

I chose the studio Transitional Territories, especially for their approach and the scale of their projects. Since I wanted to work with the Alps, a territorial approach was necessary. Furthermore, the theory-driven studio gave a lot of input for my positioning and my personal interest in developing design methods within the Anthropocene that are not mainly influenced by economic profit, but seek another kind of value. The paradigm shift is sustained by different values wich are based on, for example, ecological diversity or the designs transformative agency. I believe this will help us navigate the climate crisis.

The method of listening to the Alps, and therefore using a posthumanist and multi-species research approach fitted very well into the design approach of Transitional Territories. Nowadays, in urbanism, we have the urgent challenge of designing and advocating for the transformation of the current, economically driven system, to one which is so far largely unknown, but hopefully will provide different answers to the climate emergency and manage to shape conditions of planet earth that also future generations will benefit form. By developing new methodologies, my project aimed to rethink our current design agenda. Considering such vast elements as mountains as agents and stakeholders could influence the agency of urbanism and architecture as a profession. We have to rethink who we include in the design, how we include them, and what sustainability really means when it comes to design. Particularly, the act of listening is an element which connects all fields of design. The better an architect is able to grasp what their clients want, the more pleased they will be. The same counts for the landscape or the city. If they are the client, and I believe they should be because they are entities which outlife human lifetimes, we need to be able to carefully listen to them, and the actors and actants they are composed of. I think we can do that by integrating

diverse knowledge systems into our design.

The questions that my thesis addresses are all present in different design fields, as well as other social, economic or political agendas. Throughout the research and design I have been touching on several science fields. Especially natural sciences are an important part. Starting from a geographically large context which is influenced by a changing climate and has been shaped through diverse geological processes, the project eventually deals with processes of geomorphology, such as erosion and enteres biology and ecology while addressing vegetational changes due to rising temperatures as well as their potentially transformative agency, for the changing water system from glacially to non-glacially influenced. Most importantly, the work of several glaciologists deepend my understanding of this changing conditions as well as the glaciers themselves. Furthermore, the project touches upon anthropology and sociology. The changing Alpine cultures and the values sustaining them were particularly critical in order to understand current path-dependencies, as well as traditional knowledge systems.

Therefore, my project is positioned at the intersection of different fields of science. Additionally, those fields were essential when conducting fieldwork. Antonia Futscher, a good friend of mine, who studied politicial sciences and is currently finishing her master in sociology, supervised me on the interview questions. This showed me the importance of phrasing and, at times, persevering the silence after the first sentence – the jewels are yet to come. This, I believe, is the essence of Urbanism. Being able to connect the different knowledge systems in order to imagine future conditions and possible paths towards them. I think the strong influence design can have, lies in its ability to shift the focus and expose a condition which is invisible until that point. The agency of my project and me as urbanist, therefore, does not lay in the concrete form of the design, but rather in uncovering the existing knowledge of a wide range of researchers, artists or inhabitants, and translate it into spatial transformations. I did that through the means of visualizations, when for instance drawing the ecosystems of the glacier or storytelling, by turning the glacier into the main subject. Eventually, political, cultural, climatic, or ecological processes, all will become visible in a physical form. As architects and designers we can organize and shape the processes and configurations, the more we know about the conditions we are working with, the more value the proposal will have.

**2. How did your research influence your design/recommendations and how did the design/recommendations influence your research?**

The project started from a very long period of intense research on the territory of the Alps, the process of deglaciation of the Gepatsch glacier, posthumansit and anthropocene theories, as well as fieldwork in the Ötztaler Alps. The knowledge I gathered through thoses revealed the necessity for acting upon fresh water as the most urgent resource of the Alps which is under thread due to temperature rise and human water system appropriations. This led to the proposal of guiding the transformation of the Geptasch glacier into a new landscape form. Through the research, the project moved from a territorial scale, which I first intended to design upon, to an architectural scale. Traditional practices, which I first encountered during the fieldwork further informed the form of the design.

However, the highly dynamic geological processes present in proglacial areas, which by far exceeded the knowledge I had gathered so far, were demanding further research and expert knowledge. Throughout the thesis, speaking to experts, such as in this case Joep Storms, were crucial moments of recongnizing urgencies and potentialities. Storms is a geologist and the Head of Section of Applied Geology at the TU Delft. He is an expert of sedimentation, especially when it comes to changing dynamics due to climate change. For the interventions this revealed for example the limits posed by the slope. The interventions I proposed, I learned, were only going to work on a maximum angle of 30°, furthermore, he highlighted the importance of water catchment areas. This asked for further research into slope conditions and showing how design will react to them. The thesis is, therefore, a dialogue between me, who is coming forward with a proposal or assumption, and the suitable experts of the questions at hand. Their input further influenced the design and often raised new questions. Narrowing the constantly expanding fields of knowledge down to its essence was probably in hinsight one of the most challenging tasks in this dialogue between research and design.

In the beginning I was constantly pulled towards how the lack of snow will influence the winter tourism industry, since there is such a strong path-dependency and economic loss connected to it. Until at one point I realized that the essential question resolves around the availability of fresh water. Undoubtedly, the skiing industry needs further research on what it is going to imply once there is no snow anymore. It is probably going to change into an elite sport which is going to cost a fortune due to the ever growing need for artificial snow and the increasing energy demand connected to it. Only a few people will be able to afford it. However, the real urgency and agency of the Alps, as an active subject, lies in democratic share of freshwater throughout Europe. Although now it seems obvious, it was difficult to grasp this essence.

I was only able to uncover this by going back to the very first expert interview I had with Herbert Formayer, a climatologist and metereologist at the University of Natural resources and Life Sciences in Vienna, in the beginning of Octo-

ber 2022 – the very start of my thesis. He said that one of the biggest challenge of the future will be the changing condition from glacially to non-glacially influenced. Revealing what this implies, is the result of my thesis.

I was shocked when I first heard about the extension of the Gepatsch storage lake. From my point of view, it should not even be an option to considere this endeavour. There is such an abundance of evidence how destructive hydropower plants are to the ecosystems – upstreams and downstreams – and destroying one of the last untouched rivers in the Eastern Alps as well as a valuable marsh, both of them causing irreversible intrusions, while knowing that the slopes of the Kaunertal valley are instable, as well as most likely hold together by permafrost which will thaw within this century, is foolish and short-sighted. This is why I propose a different purpose for the storage lake, which transforms it into a fresh water lake, this implies, firstly, the necessary change of (economic) value.

**3. How do you assess the value of your way of working (your approach, your used methods, used methodology)?**

The project considers humans within nature and questions the omnipresence of human perspectives in urbanism. Therefore, I conciously decided to focus on the more-than-human perspective in order to deal with the urgencies posed by climate change. This becomes visible in the structure of the report, which starts the research with the identity of the Alps, as well as in the design part, which only slightly touches upon the emerging economies of human life due to the interventions. The thesis consideres humans as assistants of the changing and disrupted natural processes due to climate change, which has been evoked by human self-centeredness and inaction, and aims at supporting biotic and abiotic entities in their challenges ahead. Therefore, the project is positioned contrary to the mainstream and advocates for the need of other perspectives than the human. This approach, naturally but consciously, limits itself, which brings with it the lack of a holistic view. I argue that there is an urgent necessity to do so in order to be able to reposition ourselves within the earth and the web of life. For too long have humans positioned themselves above nature. Thus, I started my research by listening to the Alps.

Throughout the project I focused on three different episodes: listening to the Alps and speaking with the Alps in order to find the agency of them, and as a result, be able to negotiate on behalf of the Alps. I found making the distinction between listening and speaking chapters in my project difficult. I decided to use listening as a method of exploring the posthumanist perspective, focusing on more-than-humans, while speaking centered around the economies of life, cultural landscape, and how humans have been appropriating the Alps. This structure occasionally limited the coherence and creation of the narrative.



The first act of listening to the Alps was diving into their natural history, by looking into their formation processes and discovering the geomorphological dynamics of the territory, some of their most important characteristics got revealed – the erratic, mosaic-like, connected, and cyclic. One other multi-species listening method which especially proved itself valuable was the investigation of different interdependencies and networks. It assumes, that everything has an influence on something. By revealing those effects, one can identify the agencies of the subjects present. This resulted in the making of the maps which show the characteristics of the Alps. The nexus between natural dynamics, human interference, and biotic response, showed the interdependencies and the density of the interaction between the different systems.

This method could be transferred to other locations within the Alps, unless it gets limited by data availability, which was for me also the reason to focus the mapping on the North Tyrol and exclude the South Tyrol. The method could highly benefit from a unified Alpine database – especially when it comes to Switzerland since it is often excluded in European collections. I used the same method of dependencies in order to listen to the Gepatsch glacier. By closely investigating one subject and the consequences of its changing condition the most urgent condition of the Alps to be acted upon was revealed. This was done through the methodology of the studio – investigating the lines of inquiry matter, topos, habitat, and geopolitics, each of them proposing a specific view on the matter at hand. The different angles showed the severe impact deglaciation will have, from a local scale questioning winter tourism to a European scale highlighting the interdependent water system between glacier and delta. It furthermore, shifted the focus from the matter of water and ice to the soil as an important actor in the changing system. Although I did not use the exact sequence of the drawings within the report, their content composed the narrative of it.

Unfortunately, many of the onsight listening methods, such as the soil chromatogram, I could not try because the ground was frozen. Hopefully, I will get another opportunity to work with them. One I did use, was an adjusted method of the experiential pedagogy methods which asks for selecting visual frames in order to build a relationship with the landscape. I used videography to help me immerse into the landscape and understand the place. By working with still videos the attention focused on one frame which I carefully chose. This urged me to have a very close look at the scene and select the composition of elements. Furthermore, the recording of interviews added in depth information which often gets lost when only taking notes. Despite my injury, which kept me from finishing the documentary, the way of researching for a documentary played an important role.

I would like to highlight that the visual approach of my thesis was a very important aspect of its development. And this brings me to the other side of my methodology, which is closely connected to personal limitations. Of course, there was the time scope that put limitations on the thesis, but for me especially, it was an injury. For three-quarters of my thesis time, I was suffering from a tendonitis on my right wrist due to an overuse of the mouse while drawing maps. This made it impossible for me to draw maps in CAD, Illustrator or layout things. I was not able and I am still not able to use my mouse. And this had a major influence on the methods that I used and how I was using certain tools. Apart from the use of programs, I especially developed a different way of thinking. I never realized how much the right hand is connected to the way we, as visual people and designers, express our thoughts. Since I was not able to write with a pen for almost four months, I was not able to pin down the thoughts that were floating in my mind and synthesize them. So I was forced tp find different methods for doing that. This is also why the written word and the making of the report became very important for me because it was a way of voicing what I was thinking, connecting thoughts, and putting it down in something different than a drawing or diagram, which I usually would have done.

What helped me a lot were certain technologies. I started using voice recording, which is also how I have written, or rather spoken, this reflection, which was a completely new challenge for me. And I never imagined how different it is to dictate thoughts rather than be able to type or write them. The way we think, especially very theoretical and academic thoughts, develops more constantly in the spoken form, whereas in the written form we can constantly change and edit what we are about to say. We give ourselves more time to grasp a thought, use the right words, and fine-tune certain aspects. In the spoken form, thoughts are often formulated while speaking, simultaneously; therefore, when it comes to complex issues and trying to synthesize thoughts through speaking, I had to learn to first think about what I was about to say, already trying to connect elements with each other, and only then speak it out loud so that the voice recording and the voice dictation would only recognize the things that I was certain I wanted to say. This made every sentence way more complicated to formulate, and at the same time, it required me to really find the essence of what I wanted to say. Sentences became shorter, and vocabulary got less jargon. This was something that, in the beginning, was very frustrating because I really appreciated the way my written language sounded. It was my academic language, but now that I had to speak everything out loud and immediately think of the words that I wanted to say in the moment, not after a few seconds, I had to realize how much my language also changed through it.

Another very important aspect is how much focus it requires. Whereas in the written form, we can see the output immediately, in the spoken form, the words are floating in our heads. We therefore cannot just simply go back, but we have to remember how we started the sentence, the aim of a paragraph, and the narrative that develops while speaking. This was one of the biggest limitations that I faced during this thesis. Fortunately, when at times the pain was manageable, I was able to draw or write a word on paper. And fortunately, I had friends and family, whose support throughout the duration of this thesis was crucial.

This limitation also showed me the possibilities of exploring certain visual aspects. Since I was not able to use the mouse, I stopped using Illustrator for mapping and instead explored the possibilities of QGIS, which then developed into a new visual style of layering different colorful drawings. They,  on one hand, lack the interpretation of the map, because my ability to draw conclusions was limited, but at the same time highlight how, through existing material and its layering and playing with certain attributes, it already voices out and shows certain qualities of the place. And this really broadened my view on the use of other media. I went back to handmade clay models and used them as frames in order to sketch on top of them as a background image in order to have a physical 3D view which I was missing from not being able to use CAD.

All in all, it showed me my resilience and I am proud of the project and the process. Although it was very hard at times, I managed to develop new methods and grow as a professional and person. There are many things that I am taking away from it. The voice recording and voice dictation tools really helped me to better sort my thoughts and maybe also develop a more academic speech than only the written form. And also the graphics, developed out of these new methods, I will continue using.

**4. How do you assess the academic and societal value, scope and implication of your graduation project, including ethical aspects?**

When it comes to discovering a reimagined anthropocentrism, a different way of developing projects, and dealing with the planet than we have in the last few decades, since the beginning of the Anthropocene, there is always an ethical question connected with it. There is always the discussion of how much one can step into the shoes of a more-than-human and how much correctness or truth there is within it. Do we need to retreat completely from natural areas, or is there human agency in helping and supporting natural phenomena? And what does it mean to support them? How is it measured? Can we really guess what has positive and what negative effects? Can we distinguish between the need for action and the need for non-action? I believe it is about time to turn to action. We have to take up the agency and the power we as human species have, but not in order to further exploit the resources and the species we are living with on

this planet, but on the total opposite, to support them, to create diversity and complexity, and to shape connections so that life can flourish.

Therefore, we have to reject, but we do not have to reject our actions in support. We have to reject economic profit. We have to reject the neoliberal capitalist system. We have to reject colonial practices, and we have to reject wanting more. Our future lies in wanting to have less and seeing the beauty within that, in seeing the agency of rejection, material rejection, in this very economic, wealth-driven society we are living in nowadays. Rejection as action can take many different forms—a myriad of forms. We can go on the streets and protest. We can block events that, for example, support the further extraction of fossil fuels. We can write letters to ministers, politicians, and commissioners – and we can be guardians. We can use our voice to give voice to those who do not have one in our current system. We have to jump forward. We have to reimagine the way we live together. We have to reimagine what it means to share a planet, what it means to be alive, only when we are able to visualize this other future, a future that is not based on the extraction, commodification, or colonization of the ones who do not have a voice. Only then can we develop a future together. And this is where, from my point of view, the agency of design lies.

We can imagine. And it‘s not only the agency of design; it‘s also the privilege we have as students in academia, doing a master‘s, bachelor‘s, or doctorate program. We can imagine and create projects that would, outside of academic institutions, not have a client for the next decades or years. Through that, we can create a shift in importance. We can open up the imagination of the broader public. We can open up the possibilities for another world. And like Extinction Rebellion always screams, „we are unstoppable; another world is possible“. And that is what I believe in: that design has agency, has the power to reimagine, and has the power to change. My thesis tries to show a different way to navigate the climate crisis. Not by following our current path-dependencies and adapting to the new systems, but by starting a transformative change, by re-establishing boundaries, by re-establishing connection. And I hope that it may inspire others to also take up a different value system, a different view of life, and the agency of design so that it may spread.

It is ethically and professionally difficult when taking the position of an entity that is not a relatable human being. Therefore, certain assumptions I am making and certain decisions are based on my personal understanding of the Alps  which I connected with the theoretical background of the studio and with the theories of posthumanism. This is why, for me, the link between theory, research on site and the critical cartography were very important. Especially, the method of layering within cartography became a very valuable tool in order to show the density of entanglements. It is a privilege that I had the honor to grow up within the Alps, getting to know them in a certain way and daring to take them up as the theme for my thesis, where others may be intimidated by such a huge force that they are, I was as well.

Growing up there, I am also biased, at times, by my personal experiences. I have collected many beautiful memories throughout the years, which is why I have such a positive view of the Alps, which reflects in my thesis. However, at times they have also caused me great pain, especially due to their erratic nature. The Alps are unpredictable, which let me grow up with great respect for them and for other natural forces, such as the ocean. At times, I think, some people who have not lived with those impacts, because they grew up in, for example, cities that isolate them from natural phenomena, underestimate the power of nature. When I moved to the Netherlands, I was surprised by the cultural differences. Here, nature seems to be something that can be tamed. In the Alps we know, that you always have to be careful, every step in the mountains can be deadly. This taught me about caution and awareness, and to listen, with open eyes and ears, to everything around me.

Apart from that, the changing condition that I have been describing in my thesis, the one from a glacially influenced region to a non-glacially influenced region, will bring huge challenges within this century. And I hope that my project will show the urgency of this change but also, as mentioned before, the need to approach it from a different angle. There are millions of lives dependent on freshwater. Europe has for now been granted an abundance of freshwater supplies. A shortage was never an issue. But now, with the rapidly changing climate, this becomes a new reality. And we can already see the change every summer when rivers turn dry and lakes become shallow. We can only imagine what it will mean in the future and how it will affect all the systems from the top of the mountains to the deltas of Europe.

Therefore, my thesis touches on a wide range of research topics and design investigation possibilities in various sectors. Due to the limited time frame as well as already existing research and projects in valley floors and lowlands, I focused on the Alpine and Nival zones of the Alps, especially the glacial areas and the extent of landscape in their immediate proximity, the proglacial fields. This meant putting into focus the importance of the slope as an agent in storing water, the importance of vegetation, and especially the root system that can capture the soil and bind the water to its molecules. These elements and the developed slope portraits can be further investigated for a deeper understanding of the geology of the place.

What other areas of research require more attention? In light of the limited time frame, I largely concentrated on explorations of approaches or

interventions that can slow down the movement of water, disregarding various aspects related to the economies of life. To address this matter in more detail, more research is needed to discover how people will be living in this transformed environment, what kind of economies will take shape, how the people of the Alps will connect with the land, how tourism will be affected, and what kinds of agricultural practices will emerge. Maybe this could lead to farming practices, which are based on water and the introduction of new species of animals. The scarce water in southern Europe could attract more inhabitants to the Alpine area, making it an attractive place to reside or visit, that accounts form humans as well as more-than-humans. This element, water in its life-giving form, will become increasingly more crucial in the forthcoming centuries.

What if the water tower of Europe is not only viewed from the energy perspective but really from the perspective of freshwater supply? If, in the future, this is the main role of the Alps to share water and provide it to everyone who needs it, then their positioning within the web of life grows in importance through the changing climatic conditions. They are the source, the arrival point of water, how do we treat this source? How can their abilities be encouraged? So that we can shape a territory which will be liveable in an extreme climate? It could be a safe place for humans and more-than-humans, a refuge for all the ones whose water taps will turn dry, and whose homes will be washed away by the ocean or consumed by wildfires.



**5. How do you assess the value of the transferability of your project results?**

There are different possibilities for transferability within the project. The method itself, since it is very open and starts from a theoretical understanding of multi-species research, can be transferred to many different locations. Depending on the location itself, there are different marginalized groups and different vernacular knowledge systems that have to be investigated and which will be the subject of the listening. Since the project starts with the Rights of Nature movement, which is already present throughout the whole world, the methods can be used in order to give more agency to other projects that try to do the same and recognize the Rights of Nature. The theoretical transferability is limited by the western view. Depending on the history of the place and the present modes of exploitation, commodification, or other forms of suppressing marginalized human and more-than-human entities, there has to be a profound understanding of the local values and cultures, especially when it comes to (post)colonial contexts. This is particularly important when it comes to indigenous communities, who play an essential role in the sharing and creation of vernacular knowledge, as well as understanding the inherent value of nature and all species on this planet.

The Alps, situated in Central Europe as a prominent mountain range, is of particular significance due to its transitioning from a glacially influenced to a non-glacial condition. This transition process in the Alps, and their significance as a source of freshwater for many rivers, can be used to inform strategies in other mountainous regions dealing with extreme weather events or drought. Rising sea-levels seem more of a direct threat, however the Alps are equally as important to consider in the transition into new climate conditions. In this regard, it is very important to mention that the specific local conditions will be very different from the conditions at hand in the Alps, and although there will also be slopes present, they will have different criteria or different outlooks on what the conditions mean in the context. The mapping methods may follow a similar structure, but due to differences between local conditions, the outcome of the strategies needed to address them should also vary. What can be transferred from the Alps is the situated practice of the project in order to gain insight into how to approach the issues differently.

Through this text I also reflected on the two additional questions:
**What is the agency of design/urbanism?**
**How can urbanism integrate the agency of more-than-human entities?**

## 7.5 References


Adler, C., P. Wester, I. Bhatt, C. Huggel, G.E. Insarov, M.D. Morecroft, V. Muccione, and A. Prakash, 2022: Cross-Chapter Paper 5: Mountains. In: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 2273–2318, doi:10.1017/9781009325844.022

Agency, E. E. (2009). *Regional Climate Change and Adaptation: The Alps Facing the Challenge of Changing Water Resources*. https://www.eea.europa.eu/publications/alps-climate-change-and-adaptation-2009

Ait-Touati, F., Arenes, A., Gregoire, A., DeMarco, A., & Latour, B. (2022). *Terra Forma: A Book of Speculative Maps*. The MIT Press.

*Alpenconvention*. (n.d.). Alpconv. Retrieved February 21, 2023, from https://www.alpconv.org/de/startseite/

*Alps*. (2021, May 24). PeakVisor. Retrieved February 21, 2023, from https://peakvisor.com/range/alps.html

Altvater, E., Crist, E. C., Haraway, D. J., Hartley, D., Parenti, C., McBrien, J., & Moore, J. W. (2016). *Anthropocene or Capitalocene?: Nature, History, and the Crisis of Capitalism (KAIROS)* (1st ed.). PM Press.

Ambassade van de Noordzee. (2021, February 15). *Embassy of the North Sea*. Retrieved February 24, 2023, from https://www.embassyofthenorthsea.com/

Árnason, A., & Hafsteinsson, S. B. (2020). A funeral for a glacier: Mourning the more-than-human at the edge of modernity. *Thanatos*, *9*(2), 48–71. http://aura.abdn.ac.uk/bitstream/2164/16058/1/arnason_funeral_for_glacier_VOR.pdf

Artificial Glaciers of Ladakh: The Ice Stupa Project. (n.d.). Ice Stupa. Retrieved September 18, 2023, from http://icestupa.org/

Austria-Forum, das Wissensnetz. (2018, September 3). *Alpen: AEIOU*. Retrieved February 21, 2023, from https://austria-forum.org/af/AEIOU/Alpen

Bascompte, J. (2009). Disentangling the Web of Life. *Science*, *325*(5939), 416–419. https://doi.org/10.1126/science.1170749

Bätzing, W. (1991). *Die Alpen. Entstehung und Gefährdung einer europäischen Kulturlandschaft*.

Bätzing, W. (2015). *Die Alpen: Geschichte und Zukunft einer europäischen Kulturlandschaft*. Beltz Verlag.

Bätzing, W. (2021). *Die Alpen: Das Verschwinden einer Kulturlandschaft (German Edition)* (2nd ed.). wbg Theiss.

Bavay, M., Grünewald, T., & Lehning, M. (2013). Response of snow cover and runoff to climate change in high Alpine catchments of Eastern Switzerland. *Advances in Water Resources*, *55*, 4–16. https://doi.org/10.1016/j.advwatres.2012.12.009

Belanger, P. (2016). *Landscape as Infrastructure: A Base Primer*. Routledge.

Bendell, J., & Read, R. (2021). *Deep Adaptation: Navigating the Realities of Climate Chaos*. Wiley.

Bergier, J. (2013, July 17). *Alpen*. hls-dhs-dss.ch. Retrieved February 22, 2023, from https://hls-dhs-dss.ch/de/articles/008569/2013-07-17/

Berkes, F., Colding, J., & Folke, C. (2000). Rediscovery of Traditional Ecological Knowledge as Adaptive Management. *Ecological Applications*, *10*(5), 1251. https://doi.org/10.2307/2641280

Binder, F., & Höllerl, S. (2017). Bayerische Alpen – ein denkbares Rückzugsgebiet für die Fichte im Klimawandel? [LWF-Wissen]. In *Beiträge zur Fichte* (80th ed., pp. 108–113). Bayerische Landesanstalt Bezugsadresse für Wald und Forstwirtschaft (LWF). https://www.lwf.bayern.de/service/publikationen/lwf_wissen/171223/index.php

Bohleber, P. (2019). Alpine Ice Cores as Climate and Environmental Archives. *Oxford Research Encyclopedia of Climate Science*. https://doi.org/10.1093/acrefore/9780190228620.013.743

Boyd, D. R. (2017). *The Rights of Nature: A Legal Revolution That Could Save the World*. Amsterdam University Press.

Brundtland, G. H., & Khalid, M. (1987). Our common future. *Elsevier eBooks*, 29–31. https://doi.org/10.1016/b978-0-7506-1049-0.50009-5

Cambridge University Press & Assessment. (2023). knowledge. In *Cambridge Dictionary*. Retrieved May 16, 2023, from https://dictionary.cambridge.org/dictionary/english/knowledge

Care2 Petitions. (n.d.). *Sign Petition: Be the voice for Mother Earth, Say yes to Rights of Nature*. Retrieved February 24, 2023, from https://www.thepetitionsite.com/de/take-action/826/567/703/

Carson, R. (2000). *Silent Spring*. Adfo Books.

Casanova, H., & Hernandez, J. (2015). *Public Space Acupuncture*. Actar D.

Chadwick, R. (2020). Methodologies of voice: Towards posthuman voice analytics. *Methods in Psychology*, *2*, 100021. https://doi.org/10.1016/j.metip.2020.100021

Chwałczyk, F. (2020). Around the Anthropocene in Eighty Names—Considering the Urbanocene Proposition. *Sustainability*, *12*(11), 4458. https://doi.org/10.3390/su12114458

*CIPRA (e)*. (n.d.). CIPRA. Retrieved February 22, 2023, from https://www.cipra.org/

Corboz, A. (1983). The Land as Palimpsest. *Diogenes*, *31*(121), 12–34. https://doi.org/10.1177/039219218303112102

Crutzen, P. J., & Stoermer, E. F. (2000). "The 'Anthropocene'" (2000). *Global Change Newsletters: The International Geosphere–Biosphere Programme (IGBP): A Study of Global Change of the International Council for Science (ICSU)*, *No. 41*, 17–18.

Cumming, G., & Norwood, C. (2012). The Community Voice Method: Using participatory research and filmmaking to foster dialog about changing landscapes. *Landscape and Urban Planning*, *105*(4), 434–444. https://doi.org/10.1016/j.landurbplan.2012.01.018

Cupers, K. (2016). *Bodenständigkeit*: the environmental epistemology of modernism. *The Journal of Architecture*, *21*(8), 1226–1252. https://doi.org/10.1080/13602365.2016.1254271

*Datensatz - data.gv.at*. (n.d.). https://www.data.gv.at/katalog/dataset/?q=kataster&organization=land-tirol&sort=score+desc%2C+metadata_modified+desc

De Bruin, D. C., Milieufederatie, S. G., & Van Ooij, D. (1987). *Ooievaar: de toekomst van het rivierengebied*. Stichting Gelderse Milieufederatie.

De Jong, R., & Shields, J. A. (1988). AVAILABLE WATER-HOLDING CAPACITY MAPS OF ALBERTA, SASKATCHEWAN AND MANITOBA. *Canadian Journal of Soil Science*, *68*(1), 157–163. https://doi.org/10.4141/cjss88-015

De la Bellacasa, M. P., & De La Bellacasa, M. P. (2017). *Matters of Care: Speculative Ethics in More than Human Worlds*. Amsterdam University Press.

Delcourt, H. R., Delcourt, P. A., & Webb, T. (1982). Dynamic plant ecology: the spectrum of vegetational change in space and time. *Quaternary Science Reviews*, *1*(3), 153–175. https://doi.org/10.1016/0277-3791(82)90008-7

Deutscher Alpenverein. (n.d.). *Höhenstufen der Alpen*. Retrieved February 24, 2023, from https://www.alpenverein.de/natur/naturschutzverband/die-alpen/hoehenstufen-pflanzen-vegetation-alpen-klima_aid_27614.html

Dobler, C., Salcher, P., Egg, J., Satzinger, L., Allinger-Csollich, E., Seyrling, R., Schnitzer-Osl, T., Traxl, M., Thaler, F., Gassner, M., Bürger, M., Obenaus, S., & Horn, L. (2021). Leben mit Zukunft – Tiroler Nachhaltigkeits- und Klimastrategie. In C. Bidner (Ed.), *Land Tirol*. Amt der Tiroler Landesregierung. Retrieved May 29, 2023, from https://www.tirol.gv.at/fileadmin/themen/landesentwicklung/raumordnung/Nachhaltigkeit/Nachhaltigkeits-_und_Klimakoordination/Publikatio-

nen/Nachhaltigkeits-und-Klimastrategie_2021.pdf

Dominati, E. J., Patterson, M., & Mackay, A. D. (2010). A framework for classifying and quantifying the natural capital and ecosystem services of soils. *Ecological Economics*, *69*(9), 1858–1868. https://doi.org/10.1016/j.ecolecon.2010.05.002

Farge, E. (2022, July 26). *Exclusive: Glaciers vanishing at record rate in Alps following heatwaves*. Reuters. https://www.reuters.com/business/environment/exclusive-glaciers-vanishing-record-rate-alps-following-heatwaves-2022-07-26/

Fetting, C. (2020). The European Green Deal. In *European Sustainable Development Network (ESDN)*. ESDN Office. Retrieved May 29, 2023, from https://www.esdn.eu/fileadmin/ESDN_Reports/ESDN_Report_2_2020.pdf

Filmmaker, G. I. |. (2020, March 31). *The Rights of Nature: A Global Movement - Feature Documentary*. YouTube. https://www.youtube.com/watch?v=kuFNmH7l-VTA&feature=youtu.be

Fisher, M. (2022). *Capitalist Realism: Is There No Alternative?* Zero Books.

Francés, F., Bos, M., Schasfoort, F., & Janssen, S. (n.d.). *Room for the river*. STOWA. Retrieved February 24, 2023, from https://www.stowa.nl/deltafacts/waterveiligheid/waterveiligheidsbeleid-en-regelgeving/room-river

Frey, G. N., & Linke, D. M. (2002). Hydropower as a renewable and sustainable energy resource meeting global energy challenges in a reasonable way. *Energy Policy*, *30*(14), 1261–1265. https://doi.org/10.1016/s0301-4215(02)00086-1

Fuchs, T. (2021). The Cyclical Time of the Body and the Linear Time of Modernity. *In Defence of the Human Being*, 217–236. https://doi.org/10.1093/oso/9780192898197.003.0011

Garcia-Lopez, E., & Cid, C. (2017). Glaciers and Ice Sheets As Analog Environments of Potentially Habitable Icy Worlds. *Frontiers in Microbiology*, *8*. https://doi.org/10.3389/fmicb.2017.01407

GARN. (2022, December 27). *Global Alliance for the Rights of Nature (GARN)*. Retrieved February 24, 2023, from https://www.garn.org/

Girot, C. (2018). *Melting Landscapes: Sight and Sound observations of the Morteratsch Glacier*. Professor Christophe Girot. Retrieved May 19, 2023, from https://girot.arch.ethz.ch/series-publications/books/melting-landscapes-2

Giuffrida, A. (2023, February 17). *Italy faces another year of severe drought after little winter rain or snow*. The Guardian. Retrieved February 24, 2023, from https://www.theguardian.com/world/2023/feb/17/italy-faces-another-year-severe-drought-little-winter-rain-snow-po-river

Goralnik, L., Dobson, T., & Nelson, M. P. (2014). Place-Based Care Ethics: A Field Philosophy Pedagogy. *Canadian Journal of Environmental Education.*, *19*, 180–196.

GRDC (2020): WMO Basins and Sub-Basins. Global Runoff Data Centre. 3rd, rev. ed. Koblenz: Federal Institute of Hydrology (BfG).

Gunderson, L., & Holling, C. S. (2002). *Panarchy: Understanding Transformations in Human and Natural Systems*. https://ci.nii.ac.jp/ncid/BA55772345

Habersack, H., & Piégay, H. (2007). 27 River restoration in the Alps and their surroundings: past experience and future challenges. *Developments in Earth Surface Processes*, 703–735. https://doi.org/10.1016/s0928-2025(07)11161-5

Haider, S., & Küffer, C. (2011). Pflanzeninvasionen in Gebirgen – (noch) keine Gefahr? In *Landschaftsökologie. Grundlagen, Methoden, Anwendungen* (pp. 105–110). Bayerische Akademie für Naturschutz und Landschaftspflege (ANL).

Hamilton, L., & Taylor, N. (2017). *Ethnography after Humanism: Power, Politics and Method in Multi-Species Research* (1st ed. 2017). Palgrave Macmillan.

Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies*, *14*(3), 575. https://doi.org/10.2307/3178066

Haraway, D. J. (2008). *When Species Meet*. Amsterdam University Press.

Haraway, D. J., & Goodeve, T. (2018). *Modest_Witness@Second_Millennium. FemaleMan_Meets_OncoMouse: Feminism and Technoscience* (2nd ed.). Routledge.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, *162*(3859), 1243–1248. https://doi.org/10.1126/science.162.3859.1243

Hartl, L. (2010). The Gepatschferner from 1850 - 2006 - Changes in Length, Area and Volume in Relation to Climate. *EPIC3Innsbruck, Institute for Meteorology and Geophysics, University of Innsbruck*.

Hartl, L., Helfricht, K., Stocker-Waldhuber, M., Seiser, B., & Fischer, A. (2021). Classifying disequilibrium of small mountain glaciers from patterns of surface elevation change distributions. *Journal of Glaciology*, 1–16. https://doi.org/10.1017/jog.2021.90

Heidegger, M. (1927). *Sein und Zeit*. Max Niemeyer.

Hemmer, R., & Meßner, D. (2022, August). *GAG360: Unglück am Matterhorn*. Retrieved February 20, 2023, from https://open.spotify.com/episode/1rvwr7vym-qXzuVSVDMi8us

Hohensinner, S., Egger, G., Muhar, S., Vaudor, L., & Piégay, H. (2021). What remains today of pre-industrial Alpine rivers? Census of historical and current channel patterns in the Alps. *HAL (Le Centre Pour La Communication Scientifique Directe)*. https://doi.org/10.1002/rra.3751

Hruby, D. (2022, August 12). *500-year-old "goatelope" mummy found in melting European glacier*. National Geographic. Retrieved February 24, 2023, from https://www.nationalgeographic.com/environment/article/500-year-old-goatelope-mummy-found-in-melting-european-glacier

*INSPIRE Geoportal Österreich*. (n.d.). https://geometadatensuche.inspire.gv.at/metadatensuche/srv/eng/catalog.search#/metadata/e55f1573-b4cf-4542-a5ae-a5e7e-570e24d

Institute for Economics & Peace. (2022). *Ecological Threat Report 2022: Analysing Ecological Threats, Resilience & Peace*. Sydney. http://visionofhumanity.org/resources

Internationale Rheinregulierung. (n.d.). *Hochwasserschutzprojekt Rhesi*. Retrieved February 22, 2023, from https://rhesi.org/

IPCC. (2000). Emissions Scenarios. In N. Nakicenovic & R. Swart (Eds.), *https://www.ipcc.ch/report/emissions-scenarios/*. Cambridge University Press.

IPCC. (2019). *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate*. Retrieved February 24, 2023, from https://www.ipcc.ch/srocc/

IPCC. (2022). Summary for Policymakers. In *Global Warming of 1.5°C* (pp. 1–24). Cambrideg University Press. https://doi.org/10.1017/9781009157940.001

*IPCC — Intergovernmental Panel on Climate Change*. (n.d.). IPCC. Retrieved February 22, 2023, from https://www.ipcc.ch/

Jaccard, P. (1912). THE DISTRIBUTION OF THE FLORA IN THE ALPINE ZONE.1. *New Phytologist*, *11*(2), 37–50. https://doi.org/10.1111/j.1469-8137.1912.tb05611.x

Kampmann, D., Herzog, F., Jeanneret, P., Konold, W., Peter, M., Walter, T. R., Wildi, O., & Lüscher, A. (2008). Mountain grassland biodiversity: Impact of site conditions versus management type. *Journal for Nature Conservation*, *16*(1), 12–25. https://doi.org/10.1016/j.jnc.2007.04.002

Kariel, H. G. (1989). Socio-Cultural Impacts of Tourism in the Austrian Alps. *Mountain Research and Development*, *9*(1), 59. https://doi.org/10.2307/3673465

Katholische Universität Eichstätt-Ingolstadt. (n.d.). *SEnsitivity of High Alpine Geosystems to climate change since c. 1850*. SEHAG. Retrieved February 27, 2023, from https://sehag.ku.de/en/our-project/

Keeble, B. R. (1988). The Brundtland report: 'Our common future.' *Medicine and War*, *4*(1), 17–25. https://doi.org/10.1080/07488008808408783

Krznaric, R. (2020). *The Good Ancestor: How to Think Long Term in a Short-Term World*. Random House.

Kuzniecow Bacchin, T. (2022, October). *Topos: sitio*. Studio Essentials Transitional Territories, Delft University of Technology, Netherlands.

Laar, K. & art {at} artcircolo.de. (n.d.). *Call me!* Retrieved May 19, 2023, from http://www.callme.vg/Glacier/E/project.html

Land Tirol. (n.d.). *tiris: Tiroler Rauminformationssystem*. Retrieved June 10, 2023, from https://mapsmobile.tirol.gv.at/

Latour, B. (1993). *We Have Never Been Modern*. Harvard University Press. (Original work published 1991)

Latour, B. (1994). We have never been modern. *Choice Reviews Online*, *31*(09), 31–4888. https://doi.org/10.5860/choice.31-4888

Latour, B., & Porter, C. (2017). *Facing Gaia: Eight Lectures on the New Climatic Regime*. Amsterdam University Press.

Latour, B., & Weibel, P. (2020). *Critical Zones: The Science and Politics of Landing on Earth* (Illustrated). The MIT Press.

Leopold, A. (2021). *Think Like a Mountain*. Adfo Books.

Lerner, J. (2016). *Urban Acupuncture* (Reprint). Island Press.

Levi, P. (1975). *Il sistema periodico*. Torino : Einaudi.

Li, H., Ding, L., Minglei, R., Li, C., & Wang, H. (2017). Sponge City Construction in China: A Survey of the Challenges and Opportunities. *Water*, *9*(9), 594. https://doi.org/10.3390/w9090594

Lovelock, J. E., & Margulis, L. (1974). Atmospheric homeostasis by and for the biosphere: the gaia hypothesis. *Tellus B: Chemical and Physical Meteorology*, *26*(1–2), 2–10. https://doi.org/10.1111/j.2153-3490.1974.tb01946.x

Lydon, M., Garcia, A., & Duany, A. (2015). *Tactical Urbanism: Short-term Action for Long-term Change*. Island Press.

*Main climates of Europe*. (n.d.). European Environment Agency. Retrieved February 22, 2023, from https://www.eea.europa.eu/data-and-maps/figures/climate

Maixner, F., Turaev, D., Cazenave-Gassiot, A., Janko, M., Krause-Kyora, B., Hoopmann, M. R., Kusebauch, U., Sartain, M. J., Guerriero, G., O'Sullivan, N. C., Teasdale, M. D., Cipollini, G., Paladin, A., Mattiangeli, V., Samadelli, M., Tecchiati, U., Putzer, A., Palazoglu, M., Meissen, J. K., . . . Zink, A. (2018). The Iceman's Last Meal Consisted of Fat, Wild Meat, and Cereals. *Current Biology*, *28*(14), 2348-2355.e9. https://doi.org/10.1016/j.cub.2018.05.067

Marchi, M., Castellanos-Acuña, D., Hamann, A., El-Kassaby, Y. A., Ray, D., & Menzel, A. (2020). ClimateEU, scale-free climate normals, historical time series, and future projections for Europe. *Scientific Data*, *7*(1). https://doi.org/10.1038/s41597-020-00763-0

Marty, C., Schlögl, S., Bavay, M., & Lehning, M. (2016). How much can we save? Impact of different emission scenarios on future snow cover in the Alps. *The Cryosphere*, *11*(1), 517–529. https://doi.org/10.5194/tc-11-517-2017

Mathieu, J. (2005). *Die Alpen! Les Alpes!: Zur Europaeischen Wahrnehmungsgeschichte Seit Der Renaissance - Pour Une Histoire de la Perception Europ□enne Depuis La Renaissance*. Peter Lang Gmbh, Internationaler Verlag Der Wissenschaften.

Mathieu, J. (2013, March 4). *Der Alpenraum — EGO*. EGO | Europäische Geschichte Online. Retrieved February 22, 2023, from http://ieg-ego.eu/de/threads/crossroads/grenzregionen/jon-mathieu-der-alpenraum

Mathieu, J. (2015). *Die Alpen: Raum - Kultur - Geschichte*.

Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). The Limits to Growth: A report for the Club of Rome's Project on the Predicament of Mankind. *Potomac Associates – Universe Books*. https://doi.org/10.1349/ddlp.1

Mendonca, D. (2023, August 7). Slovenia floods kill at least six in 'worst natural disaster to ever hit' the country, says PM. CNN; CNN. Retrieved September 11, 2023, from https://edition.cnn.com/2023/08/07/europe/slovenia-floods-intl/index.html

Middlebury Environmental Geology. (2016, March 21). Glaciers and Ice Sheets (class 5 -v1) [Video]. YouTube. Retrieved September 13, 2023, from https://www.youtube.com/watch?v=Lym-QEAEjhA



Moore, J. W. (2015). *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. Verso Books.

*Multispecies Urbanism: Interview with Debra Solomon*. (2019, December 8). Who Is We? Retrieved May 19, 2023, from https://whoiswe.hetnieuweinstituut.nl/en/multispecies-urbanism-interview-debra-solomon

Nearing, M. A., Pruski, F. F., & O'Neal, M. R. (2004). Expected climate change impacts on soil erosion rates: A review. *Journal of Soil and Water Conservation*, *59*(1), 43–50. https://pubag.nal.usda.gov/download/6819/pdf

Nejeschleba, T. (2019). Petrarch's Ascent of Mont Ventoux and Philosophy. *Archiwum Historii Filozofii I Myśli SpoŁecznej*. https://doi.org/10.37240/ahfims.2019.64.5

Normyle, A., & Pittock, J. (2020). A review of the impacts of pumped hydro energy storage construction on subalpine and alpine biodiversity: lessons for the Snowy Mountains pumped hydro expansion project. *Australian Geographer*, *51*(1), 53–68. https://doi.org/10.1080/00049182.2019.1684625

Oliveros, P. (2005). *Deep Listening: A Composer's Sound Practice*. https://ci.nii.ac.jp/ncid/BA78961879

*Open GIS Government Data - Tirol/tiris*. (n.d.). https://data-tiris.opendata.arcgis.com/datasets

Österreichische Akademie der Wissenschaften. (2021, August 18). *Many of Austria's glaciers are melting faster*. Retrieved February 23, 2023, from https://www.oeaw.ac.at/news/many-of-austrias-glaciers-are-melting-faster

Ötztal Tourismus & Bergbahnen Sölden. (n.d.). *Sölden: Heartbeat of the Alps*. Retrieved February 24, 2023, from https://www.soelden.com/

Petrarch, F. (1336). *Ascent of Mont Ventoux* [Letter].

Pinkowski, J. (2022, January 26). *Ötzi the Iceman: What we know 30 years after his discovery*. National Geographic. Retrieved February 24, 2023, from https://www.nationalgeographic.com/history/article/tzi-the-iceman-what-we-know-30-years-after-his-discovery

Plassmann, G., Kohler, Y., Badura, M., & Walzer, C. (2016). *Alpine Natur 2030: Creating (ecological) Connectivity for Generations to Come*. Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

Rehfeld, M. (2023, January 27). *Kaunertal: Schlagabtausch zwischen WWF und Tiwag um Gutachten | Tiroler Tageszeitung Online*. Tiroler Tageszeitung Online. Retrieved May 29, 2023, from https://www.tt.com/artikel/30844349/kaunertal-schlagabtausch-zwischen-wwf-und-tiwag-um-gutachten

Retter, M. (2023, February 15). Megakraftwerk Kaunertal: Tausche Hochmoor gegen grünen Strom. *DER STANDARD*. Retrieved May 29, 2023, from https://www.derstandard.at/story/2000143574803/megakraftwerk-kaunertal-tausche-hochmoor-gegen-gruenen-strom

Rumpf, S. B., Gravey, M., Brönnimann, O., Luoto, M., Cianfrani, C., Mariethoz, G., & Guisan, A. (2022). From white to green: Snow cover loss and increased vegetation productivity in the European Alps. *Science*, *376*(6597), 1119–1122. https://doi.org/10.1126/science.abn6697

Sajjad, W., Rafiq, M., Din, G., Hasan, F., Iqbal, A., Zada, S., Ali, B., Hayat, M. Q., Irfan, M., & Kang, S. (2020). Resurrection of inactive microbes and resistome present in the natural frozen world: Reality or myth? *Science of the Total Environment*, *735*, 139275. https://doi.org/10.1016/j.scitotenv.2020.139275

Salomon, D. (n.d.). *Soil - Life - Relations*. Who Is We? Retrieved May 19, 2023, from https://whoiswe.nl/works#solomon-multispecies-urbanism

Schelakovsky, A. (2020). *Methodensammlung für naturbezogene Pädagogik*. https://tiefenoekologie.at/

Schmidt, U. (2017). Die Fichte in der Wald- und Forstgeschichte – eine soziokulturelle Betrachtung [LWF-Wissen]. In *Beiträge zur Fichte* (80th ed., pp. 35–40). Bayerische Landesanstalt Bezugsadresse für Wald und Forstwirtschaft (LWF). https://www.lwf.bayern.de/service/publikationen/lwf_wissen/171223/index.php

Schmied, A. (2021, March 20). *The Rhine and Rigi should be allowed to go to court!* Rights of Mother Earth. Retrieved February 24, 2023, from https://www.rightsofmotherearth.com/post/the-rhine-and-rigi-should-be-allowed-to-go-to-court

Seguinot, J., Ivy-Ochs, S., Jouvet, G., Huss, M., Funk, M., & Preusser, F. (2018). Modelling last glacial cycle ice dynamics in the Alps. *The Cryosphere*, *12*(10), 3265–3285. https://doi.org/10.5194/tc-12-3265-2018

Sijmons, D. (1990). Regional planning as a strategy. *Landscape and Urban Planning*, *18*(3–4), 265–273. https://doi.org/10.1016/0169-2046(90)90014-s

*Sonic Topologies*. (n.d.). https://sonictopologies.com/about/

Statista. (2023, February 12). *Österreich - Pro-Kopf-Stromverbrauch 2021 | Statista*. Retrieved June 9, 2023, from https://de.statista.com/statistik/daten/studie/325785/umfrage/pro-kopf-stromverbrauch-in-oesterreich/#:~:text=Im%20Jahr%202021%20verbrauchte%20ein,Vorjahr%20um%20etwa%20160%20Kilowattstunden.

Stecher, E. (2023, April). Feel what you see. *BNIEUWS: The Independent Periodical of the Faculty of Architecture and the Built Environment at the Delft University of Technology*, *56/04*.

Steffen, W., Richardson, K., Rockström, J., Schellnhuber, H. J., Dube, O. P., Dutreuil, S., Lenton, T. M., & Lubchenco, J. (2020). The emergence and evolution of Earth System Science. *Nature Reviews Earth & Environment*, *1*(1), 54–63. https://doi.org/10.1038/s43017-019-0005-6

Steiger, R. (2010). The impact of climate change on ski season length and snowmaking requirements in Tyrol, Austria. *Climate Research*, *43*(3), 251–262. https://doi.org/10.3354/cr00941

Stengers, I. (2015a, April). *Cosmopolitics: Learning To Think With Sciences, Peoples and Natures: On Reproduction: Lectures by Federici, Rolnik, and Stengers*. Art & Education. Retrieved February 21, 2023, from https://www.artandeducation.net/classroom/video/66077/isabelle-stengers-cosmopolitics-learning-to-think-with-sciences-peoples-and-natures

Stengers, I. (2015b). *In Catastrophic Times: Resisting the Coming Barbarism* (A. Goffey, Trans.). OPEN HUMANITIES PRESS. http://openhumanitiespress.org/books/download/Stengers_2015_In-Catastrophic-Times.pdf

Stephen, L. (1871). *The Playground of Europe* [Book]. Longmans, Green, and Co.

Stephen, L., & Young, G. W. (1946). *The Playground of Europe*. B. Blackwell.

Stone, C. D., & Hardin, G. (1974). *Should Trees Have Standing?: Toward Legal Rights for Natural Objects*. W. Kaufmann.

Strudl, M. (2021, March 19). *Climate Change and Cryosphere – What can we learn from the smallest, most vulnerable glaciers in the Ötztal Alps?* Cryospheric Sciences. https://blogs.egu.eu/divisions/cr/2021/03/19/small-glaciers-otztal-alps/

Summary for Policymakers. (2022). *Global Warming of 1.5°C*, 1–24. https://doi.org/10.1017/9781009157940.001

Temme, A., Comiti, F., & Harlaar, P. (2016). Silent play in a loud theatre — Dominantly time-dependent soil development in the geomorphically active proglacial area of the Gepatsch glacier, Austria. *Catena*, *147*, 40–50. https://doi.org/10.1016/j.catena.2016.06.042

Thambinathan, V., & Kinsella, E. A. (2021). Decolonizing Methodologies in Qualitative Research: Creating Spaces for Transformative Praxis. *International Journal of Qualitative Methods*, *20*, 160940692110147. https://doi.org/10.1177/16094069211014766

*Tiefenökologie Netzwerk Österreich*. (2020, October 19). Tiefenökologie Netzwerk Österreich. Retrieved May 19, 2023, from https://tiefenoekologie.at/

*tirisMapsMobile*. (n.d.). https://mapsmobile.tirol.gv.at/

TIWAG. (2021). *Energiewende Nachhaltigkeitsbericht 2020/21*. TIWAG-Tiroler Wasserkraft AG. Retrieved May 29, 2023, from https://www.tiwag.at/unternehmen/energiewende/nachhaltigkeitsbericht/

TIWAG-Tiroler Wasserkraft AG. (n.d.-a). *Ausbau Kaunertal*. TIWAG. Retrieved June 9, 2023, from https://www.tiwag.at/unternehmen/unsere-kraftwerke/ausbau-vorhaben/ausbau-kaunertal/

TIWAG-Tiroler Wasserkraft AG. (n.d.-b). *Kraftwerk Kaunertal*. TIWAG. Retrieved June 9, 2023, from https://www.tiwag.at/unternehmen/unsere-kraftwerke/kraftwerk/kraftwerk-kaunertal/

Tourismusverband Tiroler Oberland. (n.d.). *High mountains. Big moments.: Standing on top of the world*. Retrieved February 24, 2023, from https://www.kaunertal.com/en

Tourismusverband Tiroler Oberland. (2022). *Kaunertal: Best tourism village by UNWTO*. Kaunertal Tourismus. Retrieved February 24, 2023, from https://www.kaunertal.com/de/Nachhaltigkeit/Gelebte-Nachhaltigkeit/Best-Tourism-Village

Tsing, A. L. (2021). *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Amsterdam University Press.

Turner, J. J. (2010). Ontological Pluralism. *The Journal of Philosophy*, *107*(1), 5–34. https://doi.org/10.5840/jphil201010716

Ulmer, J. B. (2017). Posthumanism as research methodology: inquiry in the Anthropocene. *International Journal of Qualitative Studies in Education*, *30*(9), 832–848. https://doi.org/10.1080/09518398.2017.1336806

UNESCO. (2022, September 19). *Danube Delta Transboundary Biosphere Reserve, Romania/Ukraine*. Retrieved June 8, 2023, from https://en.unesco.org/biosphere/eu-na/danube-delta

*United Nations Development Programme*. (n.d.). UNDP. https://www.undp.org/

University of Natural Resources and Life Sciences, Vienna. (2020). Tierökologie 10: Offen bis halboffene Lebensräume [Slide show].

Van Passel et al. (2019). *Predicted Climate Change Impact on Land Values (2100)*. European Environment Agency. Retrieved February 22, 2023, from https://www.eea.europa.eu/data-and-maps/figures/predicted-climate-change-impact-on

Van Vuuren, D. P., Edmonds, J. A., Kainuma, M., Riahi, K., Thomson, A. M., Hibbard, K., Hurtt, G. C., Kram, T., Krey, V., Lamarque, J., Masui, T., Meinshausen, M., Nakicenovic, N., Smith, S. M., & Rose, S. P. R. (2011). The representative concentration pathways: an overview. *Climatic Change*, *109*(1–2), 5–31. https://doi.org/10.1007/s10584-011-0148-z

Vehling, L. (2016). *Gravitative Massenbewegungen an alpinen Felshängen: Quantitative Bedeutung in der Sedimentkaskade proglazialer Geosysteme (Kaunertal, Tirol)* [PhD dissertation]. Friedrich-Alexander-Universität Erlangen-Nürnberg.

Waldheim, C. (2022). *Landscape as Urbanism: A General Theory*. Princeton University Press.

WWF Austria. (2023, April 24). *Kaunertal - Nein zum Ausbau des Kraftwerks Kaunertal*. Retrieved May 29, 2023, from https://www.wwf.at/kaunertal/

ZEIT ONLINE GmbH. (2023, May 25). Erst Dürre, nun Hochwasser: Blick nach Italien zu Pfingsten. *ZEIT ONLINE*. Retrieved June 8, 2023, from https://www.zeit.de/news/2023-05/25/erst-duerre-nun-hochwasser-blick-nach-italien-zu-pfingsten?utm_referrer=https%3A%2F%2Fwww.google.com%2F

Zekollari, H., Huss, M., & Farinotti, D. (2019). Modelling the future evolution of glaciers in the European Alps under the EURO-CORDEX RCM ensemble. *The Cryosphere*, *13*(4), 1125–1146. https://doi.org/10.5194/tc-13-1125-2019

Zhang, Y., Wang, K., Wang, J., Liu, C., & Shangguan, Z. (2021). Changes in soil water holding capacity and water availability following vegetation restoration on the Chinese Loess Plateau. *Scientific Reports*, *11*(1). https://doi.org/10.1038/s41598-021-88914-0

Zimmermann, P., Tasser, E., Leitinger, G., & Tappeiner, U. (2010). Effects of land-use and land-cover pattern on landscape-scale biodiversity in the European Alps. *Agriculture, Ecosystems & Environment*, *139*(1–2), 13–22. https://doi.org/10.1016/j.agee.2010.06.010

# 8. Appendix

# 8.1 Appendix
# Fieldwork

## Fieldwork
## Day 1

### Morning – Partl

I was still getting some last interview tips from my cousin who is a filmmaker, while picking together all the things I may need. Camera, microphone, tripod, two of them for microphone and camera. Printing the agreement form for my interview partners so that I can use the video and audio for the documentary, if I'll be able to do it. I wasn't so sure about it at that moment. It was all a lot to organize and I've never done something like that. Of course I've done interviews and also a bit of filming, but doing research with the aim of turning it into a documentary is something different. I couldn't wait for Antonia, my childhood friend who accompanied me, to arrive and for the journey finally to start. We didn't have a place to stay yet. Didn't even know what the day would hold. But that's why she was the perfect companion for this endeavor. We just let ourselves fall, getting lost in the Alps. Following the traces and flows of water and the pull of the valleys. Up and up we drove.

We left the highway at Imst turning to the Kaunertal. The only destination we had was Ernst Partl, the director of the Kaunergrat Nature-Park, with whom I had planned an interview for that morning. And up we wind towards Fließ. Where Ernst Partl is living with his family. When I reached out to him he said "sounds interesting, let's call!" And on the phone invited me to his place for the following day. We just had to be there before 12:30 because he had to prepare lunch for his kids coming home from school.

Fließ is a small village built on the side of a mountain with one small church in the center, only one church tower, and another big church, with two towers, a little bit down the hill. We were a bit early and so we sat down in the sun, next to an archaeological museum and waited for Partl to call us and describe the way to his house. "At the hotel Taube, turn left up the hill at the crossing right and then there's a one family house street on the left. I left the door open so you know where to come in" I asked what the address was, "224" and the street? He laughed, "we don't have street names here", he said. Only shortly distracted by the castle and hugely affected by the view we were not at all able to follow his description. Guided by intuition we were happy when we finally found number 224 with an open door. The valley was so far down and the other side of the mountain seemed so close one could almost touch it. This should give us a first impression of the closeness of the Ötztaler Alps. I've never driven so high up on a mountain side unless it was a pass. The topography is so steep. Everything seems so far, yet so close, it awakened the urge of wanting to discover.

During the interview the sun was warming the veranda, it felt like spring had arrived. His house is built with old Roman techniques. One side of the building touches the cooling earth and the other has the open glass facade, quickly warming up. Through use of an arched ceiling the air circulates, balancing warm summers or cold winters. Because of this architecture they only have a small wood-fired oven for exceptionally cold days. Partl was constantly smiling. He's a very calm person. He knows what he believes in and what is worth fighting for. He seems satisfied with himself and his life. One can feel how he's grounded through the mountains right next to him. It's something I recognized more often the next few days. A calmness which seems to root people, making them very steady. They are where they are and who they are and that's okay. They just are.

He was very excited about the work he is doing at the nature-park Kaunergrat. With the project, they bring culture and nature together. When I asked him how he would describe the Kaunertal to someone who has never been here he said that it was a collection of different places and a dead end where everyone knows everyone. Sometimes it is difficult to find connections when coming from outside. With his work he wants to give people a voice, create networks, work together within the valley - that was very important for him and throughout the interview he emphasized it.

He thought it problematic that decisions are often projected from the outside, from the urban to the rural. Whereas most of the guidelines for development are made for urban centers, the people in the country are not allowed to live how they would like, they have to maintain the aesthetic landscape, the expectations of the urban visitors. The construction of the Gepatsch storage lake is another one of those impositions from outside for the benefits of the urbanities. It seemed important to him to think of the changes that are being done in their level of irreversibility. Whereas skiing slopes can be built backwards quite easily, big infrastructure projects, like the storage lake, are never going to be able to be reversed. Sometimes there are such unique conditions that will never be able to unfold again, or at least in a very long time. The way he was speaking about the project felt as if he had already given up hope to stop the project.

He saw the ideal way to live with nature in the

traditional way of a reproductive economy, so that give and take form a balance. Although he said that this ideal within our current society was impossible, it still felt like he was dreaming of it. The most important thing in order to achieve this ideal would be to ask humans to get rid of their fear. The fear of not having enough, still present from the fight for survival, and the fear of having less than the others, envying them for it. If someone starts to cheat or make profit out of something that was always communal, the others follow. Therefore, the Kaunertal should be seen as a living space. By strengthening the local networks and community, and fostering exchange, the people should together create common goals which set the boundaries for certain developments from outside. He asked me if the Rights of Nature, therefore, should also include the rights of the people living there? So that decisions cannot be made by Europe, Austria or Tyrol for the valleys?

Even though time was running short, he wanted to share his view on the climatic challenges ahead. The glacier melting did not not seem to be so bad for Kaunertal itself - rather for Europe. Nevertheless, he stressed the  importance of keeping water in the region. Because he believes that extreme weather events will become more frequent, especially dry seasons. He was also very concerned about the spreading of invasive species, especially because the slopes of the Kaunertal are covered mostly in monocultural spruce forests, very prone to bark beetles.

When I asked him what the Alps meant to him he could not stop talking. First I thought he would only say one thing, but after waiting for a moment after every pause there came another association.

“The Alps? Home. That’s where my stories are. That’s where my life is. That’s where my family lives. That’s where we simply move. That is home. That’s where we have our contacts. That’s where our dreams and memories are.“ Ernst Partl, personal communication, February 1st, 2023

## Afternoon – Kaunertal and it’s hydro energy plant

After the interview, we continued our way into the Kaunertal. The further we drove along the mountainside, the more we could see into the valley. Along the many curves, every now and then we saw a castle on top of the hill. The mountain slopes were covered with trees, and on top, the peaks were covered in snow. We took the windy road up to Feichten, the last town in the valley. The place lies approximately at 1500 m, bordered on both sides by steep mountain crests. The peaks go up to over 3000 m, which feels even steeper and higher because of how thin the valley floor is. It feels as if the mountains are going straight up, and one has to turn the gaze up to the sky in order to see the top of them. The villages are spread along the road, one after another. The thing that Partl said that I couldn’t get out of my head was that in order to get somewhere, either in the valley or outside, you have to go past all the other towns since the street is a dead end. One cannot escape it. This feeling of somehow being trapped stayed with me. And I could see why he was saying that the good thing about tourists was that they brought new views from outside into the valley.

Since we had already been on our way for quite some time, we thought it best to grab some food. Strolling through the town center looking for places to eat, I realized after checking Google Maps that the only two places that were open were further up the scenic “Glacier Road.” Therefore, we decided to take our chances and drove to the checkpoint, where we purchased a ticket for the street. The street is part of a tourism attraction where they created a podcast that leads one through all the vegetation zones of the Alps and tells stories about the different places along the road. So we turned on the sound and drove up. Looking into the distance, we could suddenly see a wall popping up. It didn’t take long until we realized that this wall was the dam of the artificial lake for the Kaunertaler hydroelectric power plant. The closer we got, the more it grew. On one side of the mountain, we could see a huge mine; later, in an exhibition, we learned that it was the source for building the dam. One thing that really fascinated me was the silence that was surrounding us. Every time I stepped out of the car in order to film something or experience the landscape, I could hear frogs and birds. It has this mystical vibe that snow-covered landscapes tend to have. The size of the dam was so huge that I could barely grasp it. And the closer we got, the bigger it got, and once we were right in front of it, it was just unimaginably big. Apart from the street that goes along the artificial lake, the whole valley is filled with water. The frozen surface felt endless. It was very hard to imagine the place as it looked before; according to the stories after the podcast we were listening to, there used to be a pasture right there.

Right next to the dam, we found the lakeview restaurant. Overlooking the artificial lake, we finally could grasp a little bit how far it was reaching into the valley. The restaurant had a panoramic view; all facades were made out of glass. There were only two other people in the room who were putting some folk songs on the jukebox. We ordered our first original Tyrolian Schlutzkrapfen and Apfelstrudel. The owner of the place was probably in his 50s and a really cute guy. After we told him that we were from Vorarlberg, he told us that he was also living there. Funnily enough, he is the founder of two restaurants in the region, which we know very well. How small the Alps are. He is living in one of the oldest houses in the valley. His family has been living there for generations. It dates back to the 14th century and has been renovated recently. Back then, he told us, the glacier was reaching all the way down to where we are standing right now. The retreat of the glacier can be felt by everyone. There is still a picture of his

grandpa standing at the Gepatsch house, which is situated at the end of the lake, with the glacier at his feet. And also, he himself remembers that when he was a child, the walk to the glacier was only half an hour, whereas now it is 2 and a half. It was fascinating to see how the glaciers shaped the valley and how they are still so present among the people.

In a room next to the restaurant, we found an exhibition by the Tyrolean electric power firm TIWAG. There they presented their new plans for the extension of the Gepatsch-storage. In a model, they highlighted the places that would be affected by it, and by pushing certain buttons, the visitors could turn on light bulbs that highlighted the places of intervention. Only then did I realize how serious they were about their plans. According to some research I did beforehand and what Partl said in the interview, the extent of the endeavor was for the first time graspable in the exhibited model of the firm. They want to take the water from the source of the Ötztaler Ach and guide it through the mountains all the way to a side valley of the Kaunertal. The second leak would turn the Kaunertaler storage into a pumped storage plant, which would provide electricity during peak times. Nowadays, there is an ecologically valuable marsh in the valley that would be completely destroyed by the artificial lake. On the exhibited posters, they presented the project as a green and necessary endeavor for the sustainable future of energy in Tyrol. With as little intervention into the ecological system as possible. Again, I had to think of what Partl said, considering which changes are reversible and which are irreversible.



### Evening – Glacier Road

We continued our journey up the glacial road along the lake, which seemed endless. When we reached the end of the lake, the shape of the water changed. Where the river meets the basin, the water flows freely. It reminded me of a delta; it looked so beautiful how it was running into the water body. Changing its form throughout the day, hour by hour. When we were driving up the mountain at the end of the valley, we came through a forest with only Swiss pines. In weird shapes, they were plunging onto the rock, sometimes seeming as if they could fall off any minute.

The higher we got, the more scattered the vegetation became. It was fascinating to imagine the place in the summer and how the colors would change. Finally, we could see the skiing fields. Because it was already after four, there was no one there. We could see the empty cablecars and left-alone constructions in the winter landscape. They felt very lonely and somehow very calm. I don't know if this feeling is coming from personal experiences, but empty skiing fields have something within them that manages to really calm me down. Maybe it's the memory of a hectic day – a place with a lot of movement that suddenly turns calm and slow, as if it were standing still.

As we were further making our way up the mountain sides, we suddenly saw something blue shimmering through – the Gepatsch glacier. It was so beautiful how it was just hiding there underneath the white layer of snow, ancient and yet somehow from the future. And it somehow made me sad, for I know it will not have a future. As the snow groomers started their night shift, our day came to an end. The white landscape was reflecting the moonshine as we made our way back down into the valley.

## Day 2

### Morning – The people

It's Thursday, March 2nd, our second day in the Kaunatal. We spent the whole day there, and in the morning, after breakfast, we had our first talk. It was with the hotel owner that we stayed overnight. The guy was very friendly, and he has been living in the Kaunatal for his whole life. It seemed a little bit as if he wanted to go somewhere else and live there for some time, but then didn't get the chance and had to take over the family business. The hotel has been in his family for a few generations. I think he said it was about the 70s that they started the hotel, so from almost the beginning, when the tourism in the Kaunatal started, he really liked the place, and as a child, it was very fun to be around and hike in the mountains, go on adventures, and stroll through the woods. Everyone in the town knows each other, and that really connects. After the talk, he advised us to go on a hike along the forest paths. Since it was sunny, we went up to that wood, and it was so beautiful how the sun was shining into the forest and the moss on the ground. The light was just magical somehow, very soft, and the green tones were so intense. There were some birds that were playing on the ground and in the trees. After doing some filming there, we decided to do interviews. We went down into the city, or town, rather, and were looking for people to talk to.

Since the town of Feichten is very small, it was very hard to find people to talk to. When we finally found a supermarket and thought, "Well, here for sure there will be people living in the place that we can ask questions to", we saw our chance and went straight inside. Fortunately, it was also the only café in the town. So we took a coffee break and started to talk with the cashiers. The women were quite reserved; they didn't really want to talk to us. Also, after I explained what I was doing and that it was important to get female voices, I almost got them, but then there was a long queue in the supermarket, and I lost my chance again. They further advised me to talk to the shop owner of the sports shop right next door. The guy was very open, and we talked for a very long time about his experiences in the place, how he is living there, and how he likes it. It was very interesting getting this inside view from someone who has been growing up here and also still lives there. I gained a lot of

new information and good insight. Afterwards, I still wanted to have this female voice. I was going outside and checking to see if I could find some more people from the town, but the only people that I encountered were two children. So I started talking with them, and they were very well educated. They immediately told me, "I don't know if my mom likes it if we talk to you", so I asked if I could accompany them to their place, and they were fine with that. I walked with them, and they were telling me about school and about their sister, just like children talk. They were very cute, and they really liked the place. Unfortunately, their dad always has to travel back and forth, so he is not home that often. Then we arrived at their house, and funnily enough, their grandma was at home, and she is from Vorarlberg, from the same place as I am from. Again, the world is so small, and the Alps are so connected. So I asked them, after getting their approval, what the Alps were for them, and the guy was like, "Cool."

I asked them what people should know about the mountains—what's the most important thing? What really struck me was that they were around; maybe the girl was a little bit younger than the guy, so the girl was maybe around 6, and the guy maybe 10. They just had a course about avalanche security in school, so they told me all about how important it is to be secure and to know your limits, that you have to take water with you, and that you have to be careful. They even knew how to use avalanche-saving gear. That was really fascinating that at this young age they already learned how to understand the mountain and how to deal with it. So the talk was rather successful, and after I continued, I went back to the café in the supermarket.

Looking for some more voices, I entered a sports shop and started talking with one of the women working there. She didn't want me to record the talk, but what she said was very insightful. She studied forestry in Vienna for five years, and now she wants to move to the Kaunertal. Her parents used to go here for holidays, and she fell so much in love with the place that she now decided to stay. She said that the people were actually very open to others from outside and that she was very much looking forward to being here. And she told me quite a lot about forestry and the state of the forests in the Kaunertal. What was very interesting is that she said that, actually, everything has to do with risks. There are certain areas that are dangerous in each valley, and they are marked through a risk plan by the government. It is prohibited to build in those places. There can be exceptions made, but usually they don't really take place. What is also happening is that the areas of risk are getting smaller and smaller due to engineering practices. For example, if you have avalanche or landslide protection, you can build underneath that place. So the risk zone gets smaller. This will make people want to move there, which again asks for a decreasing risk zone. It's kind of like a spiral that continues. She compared this to the spiral in tourism, where you have the bed and the number of ski lifts. If you increase the availability of pists, you want more tourists to come. So you provide more beds for the hotel, which then again asks for more space in the ski resort. These comparisons, these circles that are happening in these places, were very fascinating for me.

One more interesting thing she mentioned was that the forests have been maintained for centuries. So if one now abandons maintenance on those forests, it would not be possible to live there anymore. Because those forests don't have the capacity to regenerate themselves. If there were one landslide or other natural hazard, the danger would be way too great. And the forest would be destroyed completely. So in order for people to live there, they also need to maintain these forests. Especially if no hazard happens, because the forest has kind of a similar age. This makes it very vulnerable to pesticides, especially beetles. This is an increasing risk with climate change because the beetle can come higher up and eventually feed on the trees. And then they may lose their protection or their ability to protect.

## Afternoon – Mit aller Kraft

Then it was time to go to the exhibition in the Quellalpin, a centrally situated building that has a swimming pool, tourist information center, bouldering hall, restaurant, and a space for an exhibition at the same time. Lots of people go in and out there on a daily basis, and they have an exhibition about glaciers. It's called "Mit aller Kraft," and it has been exhibited for approximately one year. The curators, who I'm going to talk to in the following days, are Niko Hofinger (I'm going to talk with him tonight in Innsbruck) and Petra Paolazzi. I'm going to talk with her also the following days. They made a really good exhibition that is very touching and well communicated. The exhibition starts with a glacial cave where the visitors are surrounded by the sounds from the glacier.

The exhibition was all about the Gepatsch glacier and how it is growing, or rather melting, how it is changing, how it is behaving, and how climate change is also affecting the glacier and the systems that are connected to it. Then, also from different scientists, projects that they are doing on the glacier. There was also a place about the hydroelectric plant and the Gepatsch storage lake that we visited yesterday. You can see all the construction images showing how it came about and how huge that influence was on the valley. Also, they had different interviews with different people having different opinions on the artificial lake of the hydroelectric plant, including the TIWAG responsible person. Ernst Partl was talking as well, so the guy I've been talking to yesterday and people from other nature-representative initiatives. It was a wide range of different voices, and it was very interesting to see how they translated this scientific knowledge into approachable topics, kind of digesting it. They also had images of how Kaunertal used to be historically.

What I found quite interesting was that they had some left-open spots where the people from the Kaunertal themselves could bring objects or images that they found would be interesting for the exhibition to be represented there. After we read all the texts in the exhibition, accidentally ran into Ernst Partl again, and finished looking at everything and absorbing it, we went back upstairs from the underground and started our way back to Innsbruck, where I would have the interview with Nico Hofinger, one of the curators of the exhibition we had just visited.

### Evening – Niko Hofinger

The ride out of the Kaunertal was a completely new experience for me. It was refreshing to get out of this very dense area with the high mountains. Only when I got out of them did I realize how much they had taken over my view. And although I also felt very safe there, I was also somehow relieved when I saw a bit more horizon.
I've never seen anything like the Kaunertal, with those steep mountain sides. It was really intense, and it wasn't just a frame that went around you, but also something that limited your view.
Then as we drove out into the Inn Valley, I took another deep breath. And I started to prepare for the interview with Nico Hofinger. When we arrived in Innsbruck, the sun was just setting, turning the peaks of the mountains a light purple. Innsbruck is just so cute, with all the row houses and the northern mountain wall in the back of everything. It's like a scene. It also always feels really nice to be back in Innsbruck, even though I haven't spent much time there yet. But it feels very familiar.

Nico Hofinger was very open. He immediately welcomed me with open arms. We talked mainly about the Ötztal valley because he knows it very well. It was really interesting what he had to say and how he described the place because he has worked a lot with the locals. He's done a lot of cultural work with exhibitions in the place, including with Petra, the second curator of the exhibition that we visited today. So he has a really good insight into the human perspective and the historical perspective of the place. He's also a very critical thinker. He's also kind of an activist, at least that's how it felt to me. That was really nice to see, especially because in the last few days, this projection of the urban onto the rural has kept coming up. The rural population is basically not allowed to live because the urban population wants to preserve the rural landscape and traditions as they are. That's this romantic projection. He also said that he doesn't quite see the connection between culture and nature and how they've shaped each other, because what he's noticed very strongly in his work in this place is this greed. And that people also need some kind of inspiration from the outside because they live in their own world and sometimes they don't really see the big picture. That was very interesting, and we talked for a very long time.

Finally, he told me about a journalist he works with who lives in Sölden. Apparently, Nico and the journalist created a homepage where they publish unpublished manuscripts in which TIWAG sells certain elements of the energy system to an American investor. This made the journalist quite prominent, as well as the website, so people started feeding him information. Apparently, they had a pretty strong voice and managed to expose a lot of problems, especially from a political point of view. As for the new dam that TIWAG wants to build, Nico was pretty sure - sadly sure - that it was going to be built and that there was no way to stop it. And I could really feel the sadness he had inside about the Ötztalerach and what that would mean for it. What was very interesting is that he also described the Ötztaler Alps, the place in the middle where the glaciers are, and the end of the valley, which has been described before as a dead end. He turned it around and described it as the meeting point - the place where people used to cross first, because it was easier to go through the mountain than all the way through the valleys. So it went from being a dead end to being a connection, and I thought that was beautifully described.

## Day 3

### Morning – Ober Sölden

So when we drove up to Obersölden, it was like we were entering Lech am Arlberg. Luxury, expensive cars, expensive clothes, five-star hotels, a view onto the skiing slope, a pool right next to the skiing field – it was crazy. It was a different world again. And the people that we've been talking to were also saying, "Yeah, this is nothing compared to Sölden". Like the owner of a restaurant, she was telling me that the place had been in her husband's hands for three generations. So again, since the start of the skiing tourism in this place, and it all started because the grand-grandmother got pregnant without having a husband. So the people from Sölden told her to go up to Obersölden, kind of pushing her out of the place because she was bearing a man's child that was not her husband's. And that's how the restaurant and the hotel that they now have came to life. So it kind of gives a hint of this traditional thinking and the very religiousness of the place. And when the woman that we were talking to told their family back in Germany—she was from Germany—that she was going to live in Sölden, they were like, "No, isn't this this party place, this Mallorca in the Alps?" And then she was like, "No, it's Obersölden; it's something completely different." This perception was also repeated by the hotel staff that we talked to. A man who had been working there for 25 years, was again saying how different this place was from Sölden.

I can understand what they mean. It is really a luxury instead of a party. Another thing that we noticed during our time there was that there were so many helicopters. It was insane. I mean, it is now the period where the snow is really

bad, it's very warm, and there are a lot of people on the skiing fields. But it was really every 10 minutes that the helicopter was coming and going; it was basically constantly in the air. It's so dangerous. And that was also what other people told us—that people would just not care about the place, like they don't really respect nature, and they overestimate themselves over and over again.

### Afternoon – Vent

So at one point, it was time for us to continue our journey, and again, pushed away from Sölden, we took our turn to reach the far end of the valley. So we drove all the way to Vent. Vent is the last village in the Ötztal. And it's this very small, cute village with a church, of course, and some farming houses and some hotels; the tourism is very family-based. And it has one lift. And the road there is extremely beautiful. It was along a small river, which was half covered in snow, and the road would just go in curves along the mountainside, and we would now and then enter a half-open tunnel. It was really extremely beautiful in its most extraordinary way. These people have such a jewel in their hands. No wonder they are so confident. It was stunning. And when we reached Vent, we really wanted to see the place from above, so we took this gondola and drove all the way up the mountain, and we could see the valleys, how they were reaching into the back, and how the rivers were making their way out of them, kind of almost imagining the glaciers that have been shaping this place.



And it was such a great view that it will stay with me forever, I guess.

### Evening – Sölden

After all, it was time to go to Sölden. We couldn't escape it anymore. But before we even came close to it, we got stuck in a huge traffic jam. We completely forgot about the fact that it was half past four. It's time for tourists or daytrippers to go back to their hotels or to the places where they live. So Sölden was, as always, very welcoming. And as I finally managed to hop out of the car to see the place by walking, the only thing that I immediately noticed was the stink of the cars. It was really gross. I have rarely had such a bad smell of gasoline in my nose. And it was so weird, all those places that were there in Sölden. You had at least three or four table dance bars right on the street, with big signs and topless girls. And there are, of course, Hüttengaudi, Stadels, and other apres-ski umbrellas. So everything you would expect from the place.

I also found some things that I didn't expect. For example, there was this small farm right next to the street. And there were chickens and cows in there. And as I was watching through the window, you could see the hay falling down from the top of the storage. And it was somehow so obscure how these traditional practices were embedded in these tourism playgrounds that it felt more out of place than the hotels themselves. Especially here, finding people to talk to became a real challenge. I wanted to hear the voices of the people living here and not the tourists who were everywhere. And also not the people who were here working only for the season. So I was looking for places that would provide me with those kinds of people. And what I found was a library.

So I went to the public library and talked to the librarian. She was also very open. She told me about different things that I already knew. For example, she didn't live in Sölden, but she moved to Längenfeld, which is a little bit further down the valley. Because there are no available plots to build or apartments to live in. This was also something that Nico mentioned yesterday. That people are forced to move out of Sölden. They cannot live here anymore. And she also said that she was in love with the place, which was very fascinating for me because the connection that they must have to nature is so strong that although they are selling their home, they still feel very much part of the place. And you could really see the smile on her face when she was describing the beauty of the different seasons and how much she was in love with all of them. Each of them has their own pearls, like the golden forests in autumn. And although there were so many tourists, and she also said there were a lot, she didn't dislike them because she saw the value in them bringing jobs to the place and providing the infrastructure that they otherwise may not have. And that was very refreshing to see, especially because of my first impression of the place, that it was extremely crowded, and how Nico described it yesterday as "growing organically in its ugliness", which I could really confirm. But then there is still this very intense connection between the people and the place.

## Day 4

### Morning – hiking Bergisel

Today we spent the whole day in Innsbruck. To get a proper view of the city, we went up the Bergisel. The Bergisel is a small hill close to Innsbruck, where there is also the skiing jump, designed by Zaha Hadid. Here, some of the biggest competitions in ski jumping are taking place. And we got the chance to talk to some people and walk around the area. First, we hiked up the small mountain. It was really nice to see how the vegetation changed on the northern and southern-facing sides. You could really see how there was way more Mediterranean vegetation on the slopes that were facing south. And also, already, some flowers were coming out very early for this time of the year. It was actually quite funny because we couldn't find the entrance to the skiing slope, which is one of the main tourist attractions in Innsbruck. So we were walking all around the hill, all around the fences, until we realized that we had actually, in the very beginning, taken the wrong route. So when we finally reached the entrance, we came across two women, and they were tourist guides.

## Afternoon – Jumping into the cemetery

When I was approaching them and telling them that I wanted to give voice to the Alps, they reacted very defensively, as if I wanted to take something away from them. They said, "Of course, we are pro-Alps", but they themselves also go skiing and are using all the things that are there. And of course, she would not reject using cars because they are living off them. They need it to work, and if they wouldn't work, they couldn't pay taxes. So it was a very defensive position in the beginning. And also, they said, "on 2200 meters, the electric car also doesn't work anymore". And that tourism was very important for Tyrol because "70% of the people were living off tourism", and that they were very happy if they would come.

And then I asked them what the Alps were for them, and that's when the tone changed. She started to explain how earlier in the days the Alps had been covered by a sea and that you can still see the salt crust and the sediments. She gave me a very geological description of the Alps and talked about how many 3000-meter peaks there were in the Alps where she lives and that she would really not want to live somewhere else, that she misses them when they're not there, and that they have this connection between culture and nature, and then she started talking about all the hikes that she is making and this extremely important and very valuable link between city and nature that makes it really livable. And she also appreciates that people are coming here who are not good on foot, so you have the airplanes bringing them in.

And when I asked her what the most important thing was that one should know about the Alps, she said that she was also a hiking guide and that one should not underestimate the Alps. And she was talking about Americans who were not taking into consideration that when you're hiking up a mountain and you're very tired, the real thing only starts when you go down. And so for her, it was very important to have respect for and not underestimate the Alps. And apparently, visitors and tourists, especially Germans, often have the feeling that one has to break records. For example, going down black skiing slopes doesn't make sense. There are so many more beautiful, nice pistes; why ruin the black one? And she also continued by saying that many people who did not grow up in the mountains feel that they are enclosing them, but she doesn't see it like this. She sees it as having more options—a spectrum of possibilities. And all the places that she could go through, just by looking at the mountainside, she can see from the city. So already from her sleeping room, she can see the Nordspitze out of her window, and it makes her feel free. And this also made her think of, she called it the ironing effect: if you take the surfaces of the mountains and iron them, you actually have way more surface space than in a flat area, and that opens up possibilities, and that's what's making her feel free and full of opportunities. It's kind of the opposite of feeling enclosed by the mountains.



And that's what I found really interesting and very inspiring somehow.

Another theme that was important to her was garbage. Apparently she got many compliments from friends that it was so clean where they lived, and she didn't quite see that. She still feels like people are leaving behind way too much dirt. And the topic of pollution actually turned into a quite interesting aspect of airplanes. I had already recognized that there were many airplanes landing in Innsbruck, but apparently it also pollutes the air a lot, and that's why the wind is so important for Innsbruck because it takes away all the polluted air. And she found it very important to note that only 12% of the land in Tyrol is suitable to build upon, and so that's why the city itself, Innsbruck, is not really green because you need every square meter to build housing.

When I was asking her about the ski jump slide, she was telling me about the historical development and how important it is for Innsbruck. It really made the city world-famous, and one of the competitions was one of the first ones that had been streamed via television, and millions of people were watching it. That event really made Innsbruck as popular as it is right now. On another occasion, there was a huge mass panic in which quite a few people died. And she told me how her son was also at that event that day, and it must have been quite an extreme experience. And then she added something that was quite funny because of how the skiing slope is situated, so "if you jump, you immediately see where you would land". And I was confused about what she meant by that, but later I could see that when you jump off the slope, you're actually facing exactly the cemetery. So that's what she meant by you see where you end up if you make a mistake. And she showed me some crazy images of skiing professionals jumping onto the cemetery. So although the two women were very defensive in the first place, the question of what the Alps mean to them really opened them up, and we had a wonderful talk.

When we went inside, we took the cable car going up, and there was a really nice restaurant with a view on top. I mean very exclusive and expensive because first you have to pay an entrance fee, then you can enter the restaurant, and you pay 3.50 for an espresso. But it's worth the view. And then there is also a rooftop terrace. You can see all over Innsbruck with the Nordkette in the back. And it was really insane how dense the city is and how invisible the natural systems within it have become. The river, for example, was almost disappearing between all the houses. You can barely see where it's going. And I could see what she meant when she said the city didn't have a square meter to lose.

## Evening – Innsbruck

The day ended with a series of talks with different people. First, I was talking to a student of geology, Lukas Loacker. He has been studying

in Innsbruck for one year and previously did his bachelor's in Vienna. We were talking about the nature dynamic of the Alps and how it was quickly changing and how special they were, especially in regards to their complexity. What makes them so special is that, as scientists and researchers, we have the possibility, because of their accessibility, to get everywhere quite quickly. That's something that is very unique about the Alps. Usually, you don't have such a wide range of access. That makes the first step of research quite easy.

We continued talking about nature's dynamics and how, especially with this movement of the glacier, they are reshaping the Alps again and again. For example, he brought up Mont Blanc in France. This summer, it was almost impossible to hike the Mont Blanc because of the melting of the glaciers and all the dangers it brings. For example, landslides or, especially, rockfalls, especially in the high alpine region. Particularly in the last few years, there has been a high dynamic and a lot of movement. For example, these extreme weather events kind of show what is happening. Especially in the case of risks, one can see what is actually going on and how to go about dealing with those extreme events. Of course, climate change will bring more and more of those to the surface. The plans on which risk is now based upon are based mostly on 100-year events. Whereas now these periods are getting shorter and shorter because you have extreme weather events that are reoccurring more and more often. When I was asking him about the limits of using the Alps, he actually said that this limit had already been reached. Everything that is somehow usable in the Alps is being used. No matter if those are forests, meadows, mountains, or the high alpine regions themselves, everything is being used. Each lift that brings you up and all the other infrastructure that provides access. Even if, at some places, human use is not visible at first sight, it is still present. This is especially true in regards to other mountain regions around the world. There is such a high density of anthropogenic use in the Alps that it is really unique.

Walking through the city, I encountered some people whom I asked my regular questions. The first woman I encountered lived very close to the airport, and this was actually also her main concern. Apparently, especially in winter, there is an airplane every ten minutes. And because she is living so close to the place, she doesn't only hear the airplane approaching like we did in the city, but she also hears the start of it and the braking. And she was very annoyed by that. She was asking why there have to be so many tourists and why the place cannot be a little bit more livable for the people who actually live here. Covid apparently showed how else it would be possible and how life could be, but very quickly it all went back to mass tourism. And this really struck me: also in the city of Innsbruck, apparently, there are so many tourists. Or it's the collection point, and then they spread out into the valleys like the Ötztal that I have been visiting. So the people who are living there really don't enjoy all the tourist jams and traffic approaching. She is from Poland, and apparently Innsbruck has been described to her way differently than she imagined it and how it actually was. She was very impressed by the mountains and found them beautiful, but at the same time, she said, she wasn't someone who would go up there all the time. So she said it was very hard if you're not skiing to actually get out and do something. But she really likes hiking and going out into nature. And the reason she wasn't skiing was also that she just couldn't afford it. Something that was very beautiful that she said was when I asked her who owns the Alps, and she said, "No one. It's like the sky. No one can own it."

While she was describing all those things, there were at least two or three airplanes in that time, and from that moment on, I just couldn't not recognize them anymore. In the other talks I had later, we were constantly disrupted by the airplanes. Overall, it was really interesting to see how Innsbruck is so manifested through skiing. Wherever you go, there are people going out to ski or coming back from it. In the morning, when I was going there for the first time and walked around in the city, I could already see multiple people waiting at bus stations to go up the mountains. And also in the evenings, coming back from the Bergisel, people were coming back, and you could see them walking with skis and snowboards through the city. So it was very, very present—this proximity to the Alps and to this playground. And also, for many people, it was the reason why they actually chose Innsbruck to live here. Also, many of my friends come to Innsbruck because they want to be in nature and because they want to not only study but also be able to ski.

I also talked to a Ukrainian refugee, and she said that people were actually very friendly and helpful, that they were very open towards foreigners, and that she really liked it. She considered Innsbruck to be very beautiful. And when I asked her what the most important thing is that one should know about the Alps, she said that the bigger picture was really important and should get more attention, referring to climate change, and that she saw that this could be more addressed. At the end of our talk, she gave me a sweet from her workplace, where she just got it. That was very cute. While I was strolling through the city, I encountered one last person for that day, and she was coming from South Tyrol. She also studied in Innsbruck and just came back. And again, the topic of the airplane was very present. She said that the Alps were home for her and that since she was living in South Tyrol and there were also the Alps, it was something that connected everybody. And I really liked that view, and I could relate to it a lot.

## Going back home

So all in all, I had a lot of new experiences during those times. And when I was driving back to

Vorarlberg, it struck me how people were so open and how I felt very connected to the place, although I only spent such little time there. But it really made me feel connected to my home, to Vorarlberg as well, and to the Alps, especially because I was able to talk in my dialect. Everyone understood me, which I didn't think would happen. And also these small moments, like the woman in the library who would ask me what I was doing, and I told her that I'm from Vorarlberg, and she was like, yeah, that's obvious, of course, with your dialect. So I never had such a feeling of belonging before, and that was very, very interesting for me to experience. And also, the sublimity that people are bearing within themselves is very strong. Actually, I experienced this feeling of the sublime when we were driving into the Ötztal all the way back to Vent. And I carried it with me, and I hope that I will keep it, because it really gives one strength and something to hold on to. It's really this feeling that people were describing to me: how they felt so connected to the place, how it balanced their emotions, and how it gave them strength. And I guess I always kind of had this in myself, just because I was also born there. But then in Tyrol, with the mountains that were just higher and more impressive, that became even more apparent, and I realized it more being there. Maybe also just all the encounters and talking about the Alps constantly and what they mean to people. The connection between nature and culture is really strong in that place.