

ECOSYSTEM PARTICIPATION & REVERSED ENGINEERING IN WE-FM NEXUS

‘Extraction Ecologies’ in Iceland

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Infrastructure and Environment Design

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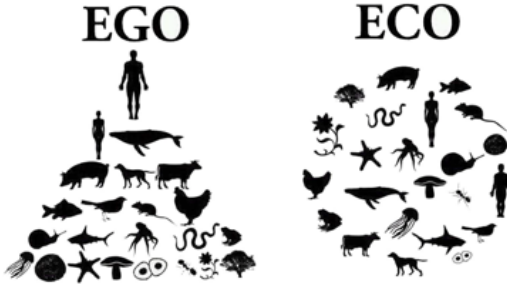
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1.
Introduction

With urgent urban challenges such as climate adaptation, energy transition, the continued extraction of resources and pushing urbanisation, the urgency of integrating planning and design with urban engineering increases. The implementation of new technological interventions and the utilisation of the natural system is hampered by the lack of an integrated approach incorporating urban planning and design decisions. Meanwhile, urban and economic growth increasingly competes for infrastructure and environment, affecting the success or failure of the daily operating systems of cities and regions and thereby urban competitiveness. The challenge is to fundamentally rethink the urban landscape in light of transitions, new concepts and new technologies – as material and ecological practices. The question is how to renew existing urbanised areas by integrating parameters of the natural system and technological innovations directly into urban development opportunities arising from spatial planning and design.
In order to stimulate and design the synergy between design and engineering the course Infrastructure and Environment Design offers the possibility for urban design and landscape architecture students to get well acquainted with the concepts and language of the technical field on the subject of infrastructure and environment.

WE-FM Nexus
The study explored into the global drivers and impact of extraction by positioning the Water Energy Food Mineral Nexus (WEFM Nexus) concept and relating local peri urban landscape scale to the global scale of resources. Globalisation is driven by two networks: transport and communication, both pushing consumerism, consequently pushing extraction of resources. Extraction produces transport routes; that impact the urbanisation patterns juxtaposing into the territory large scale elements that often do not relate to the nature (biotic/abiotic) and culture onsite. Extraction impacts the environment by the removal and disposal of matter, accumulation of chemical substances during and after the extraction process, and disruption of natural cycles and ecosystem properties (structures and processes in its spatial and temporal variability). By reading and mapping ongoing global trends and projecting future change, the course will engage with a main research question which has the purpose to turn the negative effects of extracting ecologies around:

How can the disciplinary knowledge and thinking of urban design and landscape architecture (i.e ecosystem participation and reversed engineering) inform the application of the WEF nexus in Remote landscapes?

It should guide us in answering how to move from considering ecosystems as a service towards going back into the system as a participant. Next result is then how this affects the living in these landscapes.

This study was done in the context of the NWO/NRF Merian project: Longue Durée of WEF in post-extraction landscapes: Learning from Gauteng and Limpopo Regions to develop an interdisciplinary approach. The research group is: School of Architecture and Planning of University of the Witwatersrand, with GCRO, Wits Mining Institute, University of Venda and Iyer urban design. TU Delft Faculty of Architecture and the built environment, research groups Delta Urbanism and History of Architecture and Urban Planning, TU Delft Faculty of civil engineering and geosciences, research group Applied Geology, IHE Delft Institute for Water Education, Studio Hartzema and UrbaniaHoeve. The project focuses on mine closure and responsible mining in South Africa. The goal is to test and apply the WEF nexus - an analytical tool for understanding resource relationality, synthetic design approach that solves residual infrastructure and altered water systems on a regional scale, which also impacts the local energy and food systems. Adding histories of settlements and landscapes to the process of reverse engineering mined areas allows for shared understandings of these places as characterised by WEF asymmetries
The shift of the WEF nexus over time can be made visible by mapping histories of landscape changes and human relations within mined regions. The consequence is to make visible the extensiveness of changes under mining, their ongoing consequences, and the infrastructures that might be redeployed to repair them. The interface of *longue durée* histories, science and activism can also encourage more engaged and informed civil society participation in these disturbed human- and ecosystems. Through this prism, the impacts of reparative applied science can be expanded by historically informed urban design. Such design speculations can bring together histories of extraction and sciences of remediation by visualising what repair in the toxic commons could look like. This will be done by providing a holistic and specific social-ecological systems lens, a *long term strategic extractive landscape planning approach,* an interdisciplinary discourse and most important awareness and composure through design.

The eastern fjords of Iceland

Kim Schneider
Stephan Hosie Echeverri
Isamu Goiati
Merel Garritsen

Introduction

This project engages with the multidimensional challenges and opportunities inherent in the eastern region of Iceland, a territory of breathtaking beauty yet shaped by isolation and fragility. At its core, the project seeks to reconcile the competing needs of improving connectivity and preserving the natural environment, embedding resilience against the threats of landslides and erosion.

Drawing on a comprehensive understanding of the complexities within the Icelandic environment, the project proposes an innovative approach. The strategy embraces the art and science of spatial planning to develop and inform environmentally sensitive interventions. An important nuance considered is the perception of Iceland's nature as untouched wilderness. Yet, upon close examination, signs of human influence and intervention are evident. This project acknowledges and learns from this, treating it as a guiding principle rather than an obstacle. The eastern fjords of Iceland, while mesmerizing, pose a unique challenge to connectivity due to their rugged topography. The project aims to surmount this challenge through comprehensive planning that minimizes the impact on the natural environment.

This endeavor is not only about constructing roads or tunnels, but rather, it envisions an intricate intertwining of infrastructural interventions and environmental enhancements. The aspect of reforestation serves as a cornerstone in this grand scheme. Reforestation plays a critical role in this strategy, serving as a pillar in the grand scheme of landscape rejuvenation. The introduction of a sustainable reforestation program would not only increase biodiversity, bring in a wood economy and repair the damaged landscapes but also provide a natural buffer against environmental hazards such as landslides and avalanches.

Underpinning these objectives is the profound respect for the socio-cultural fabric of Iceland. This respect is reflected in efforts to rejuvenate the local economy, a push towards sustainable timber production, and the commitment to leveraging existing resources and infrastructure to bring synergies into practice. Another effort in improving the local economy is looking at the tourism aspect, a cornerstone of Iceland's economy and a potential engine for growth. The objective is to fashion the eastern region into a sustainable destination for tourists, enriched by hiking paths among the mystical narratives of Iceland's famous sagas.

Confronting a myriad of complexities, this endeavour signifies a profound commitment to sustainable, adaptive, and sensitive planning and design. The aspiration is not merely to react to current situations but to proactively shape the region's future, carving out new spatial narratives that balance human intervention and natural preservation. This project exemplifies the power of design and spatial planning as tools for addressing planetary urgencies, demonstrating the possibilities when natural and human elements harmonize for sustainable and inclusive growth.

1.

Conceptual Framework

Context and Problem Field

The eastern fjords of Iceland, with their stunning geography, present a unique set of challenges. The rugged terrain and relative isolation of the region significantly hinder accessibility, creating physical barriers that restrict economic growth and limit social integration.

The local economy, largely driven by traditional industries such as fisheries and agriculture, is closely tied to the region's natural environment. An aluminum smelter also plays a crucial role in providing employment and sustaining the local economy. However, there is substantial potential for diversifying and enhancing the economic Tourism and a sustainable economy centered around timber production could stimulate growth while respecting and enhancing the environmental context.

Culturally, the narratives of the sagas form a deep bond between the community and its landscape. These legendary tales offer a largely untapped resource for developing cultural tourism, providing visitors with opportunities to explore and experience the sagas in their natural settings.

This project is set within these geographical, socio-economic, and cultural complexities. The key challenge to be addressed is the region's isolation, aiming to enhance connectivity without compromising the natural environment's integrity. Furthermore, tackling environmental issues, particularly erosion, is crucial for the region's long-term sustainability. By driving infrastructural development strategically, the project aspires to open up new economic opportunities while preserving the region's unique natural beauty. The ultimate vision is to transform the eastern fjords into an accessible, economically resilient, and environmentally responsible region.

Problem Statement

The eastern fjords of Iceland face a twofold challenge of geographical isolation and environmental degradation. The area's rugged topography and remote location have created significant barriers to connectivity, limiting social and economic opportunities. Simultaneously, the majesty of the landscape fuels the need to respect and preserve its natural character while addressing the region's challenges.

Environmental threats such as erosion, landslides, and avalanches are becoming increasingly prominent, threatening the local communities and wildlife. Although the fjords appear resilient, their biodiversity and the stability of their ecosystems are actually under threat, because of human(related) activity that takes place now or a long time ago. These environmental challenges risk accelerating landscape degradation and biodiversity loss.

This project focuses on resolving this complex challenge: how to balance the need for human interventions with the preservation of the area's natural beauty and ecological stability. The primary goal is to improve connectivity and stimulate sustainable economic growth while maintaining a firm commitment to the integrity of the region's natural environment. The project seeks to reconcile the need for improved accessibility, which can spur economic growth, with the imperative of environmental preservation. The aim is to design a future where human presence and natural beauty exist harmoniously, fostering a sustainable, resilient, and vibrant eastern fjords region.

Aims of the Project

The primary aim of this project is to provide a comprehensive perspective on the challenges and opportunities inherent in the eastern fjords of Iceland, a region less explored yet holding immense potential. By addressing the unique geographical, socio-economic, and environmental intricacies of the region, the project endeavors to contribute valuable insights into Iceland's future development discourse.

At a fundamental level, the project aims to show the complex issues the region faces, including geographical isolation, environmental threats, and the need for sustainable economic growth. It aspires to demonstrate that while these challenges are considerable, they are not insurmountable. By envisioning and proposing innovative, feasible solutions, the project contributes to an understanding of how such issues can be tackled effectively.

The project's pivotal focus is on striking a balance between nature and human intervention, a recurring theme in contemporary urbanism globally. By highlighting this aspect within the unique Icelandic context, it provides a case study that can offer lessons to other regions grappling with similar challenges.

The project aspires to stimulate thought and inspire action. It outlines the potential for improved connectivity in the region, the economic benefits of leveraging local resources and waste products, and the transformative role of reforestation programs. By doing so, it offers a blueprint for a future where economic growth and environmental preservation coexist and mutually reinforce each other.

Overall, the project hopes to spark conversation, catalyse change, and serve as a stepping-stone towards a sustainable, resilient, and vibrant eastern fjords region. It showcases a future where the natural beauty of the Icelandic landscape is preserved and cherished, and where the communities residing within it are thriving and connected, both locally and globally.

Concept of the project

The project conceptualizes the eastern Icelandic fjords region through three interlocking scales - the territorial, urban, and local. Each scale offers a different perspective, enables distinct insights, and informs the strategic interventions proposed, thereby providing a holistic, layered understanding of the region and its dynamics.

Territorial Scale

The territorial scale captures the overall geographical expanse of the eastern Icelandic fjords. It offers a macro view, revealing the landscape's interconnectedness, the flow of processes across its territory, and the distribution and connectivity between towns. It provides a broader picture of the area's geospatial features, accessibility challenges, and opportunities for enhancing regional connectivity.

Urban Scale

The urban scale delves into the intricate workings of individual fjords. It is at this scale that the interplay between various processes and the local geography becomes apparent. By examining the physical and environmental aspects within each fjord, patterns begin to emerge that highlight unique opportunities and constraints. This scale provides an in-depth understanding of the region's specific contexts, informing strategies that are sensitive to the distinct character of each fjord.

Local Scale

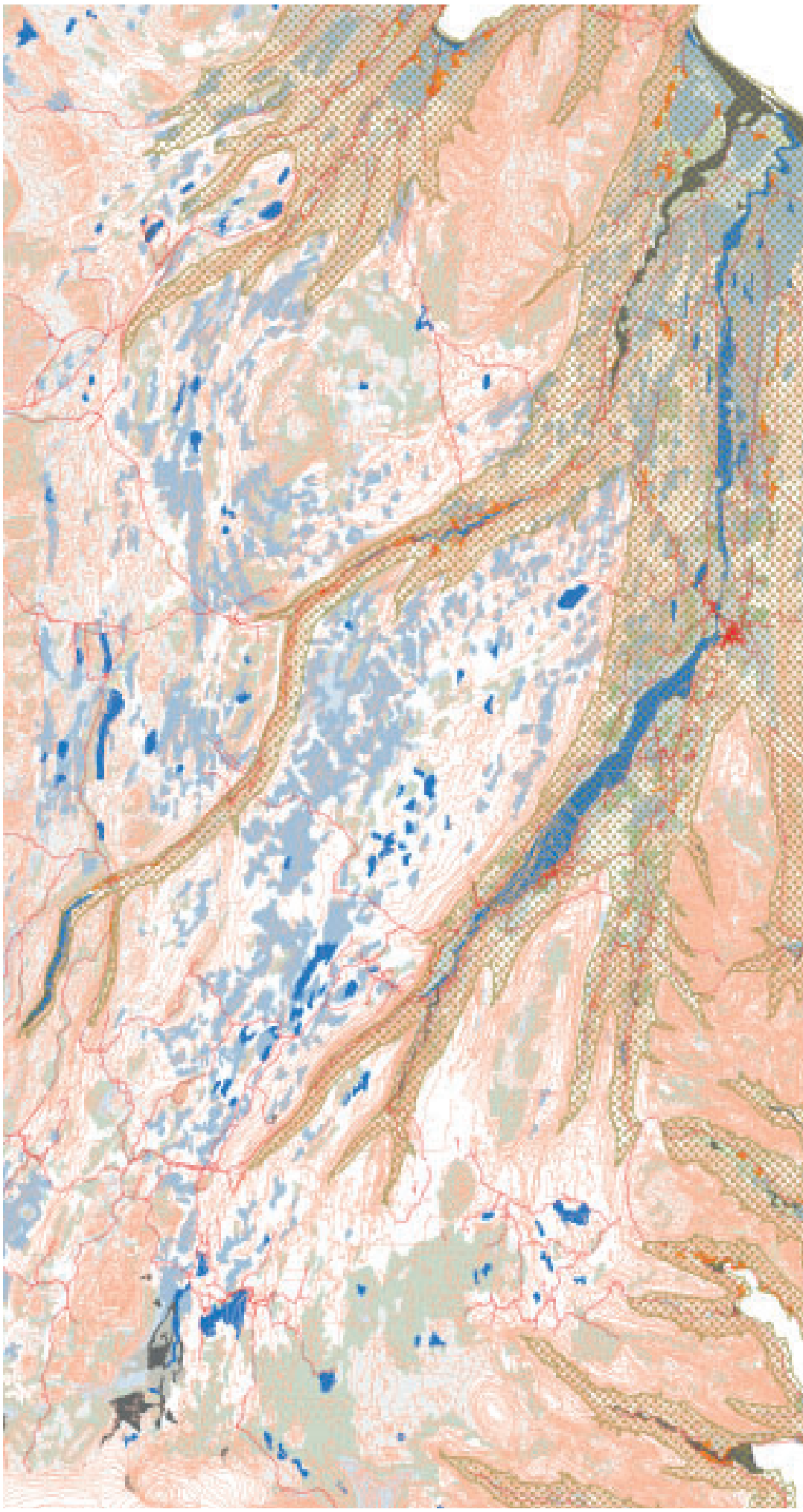
The local scale provides a granular look at the impacts of proposed physical interventions. Here, the focus narrows down to the specific design elements, the particularities of infrastructure development, and the immediate implications of landscape modifications. It is at this scale that the tangible effects of decisions taken at the urban and territorial scales are evaluated. The local scale enables a close examination of the effectiveness of interventions, ensuring they align with the overarching objectives and are sensitive to the area's unique environmental and cultural attributes.

2. Critical Landscapes & Tectonics

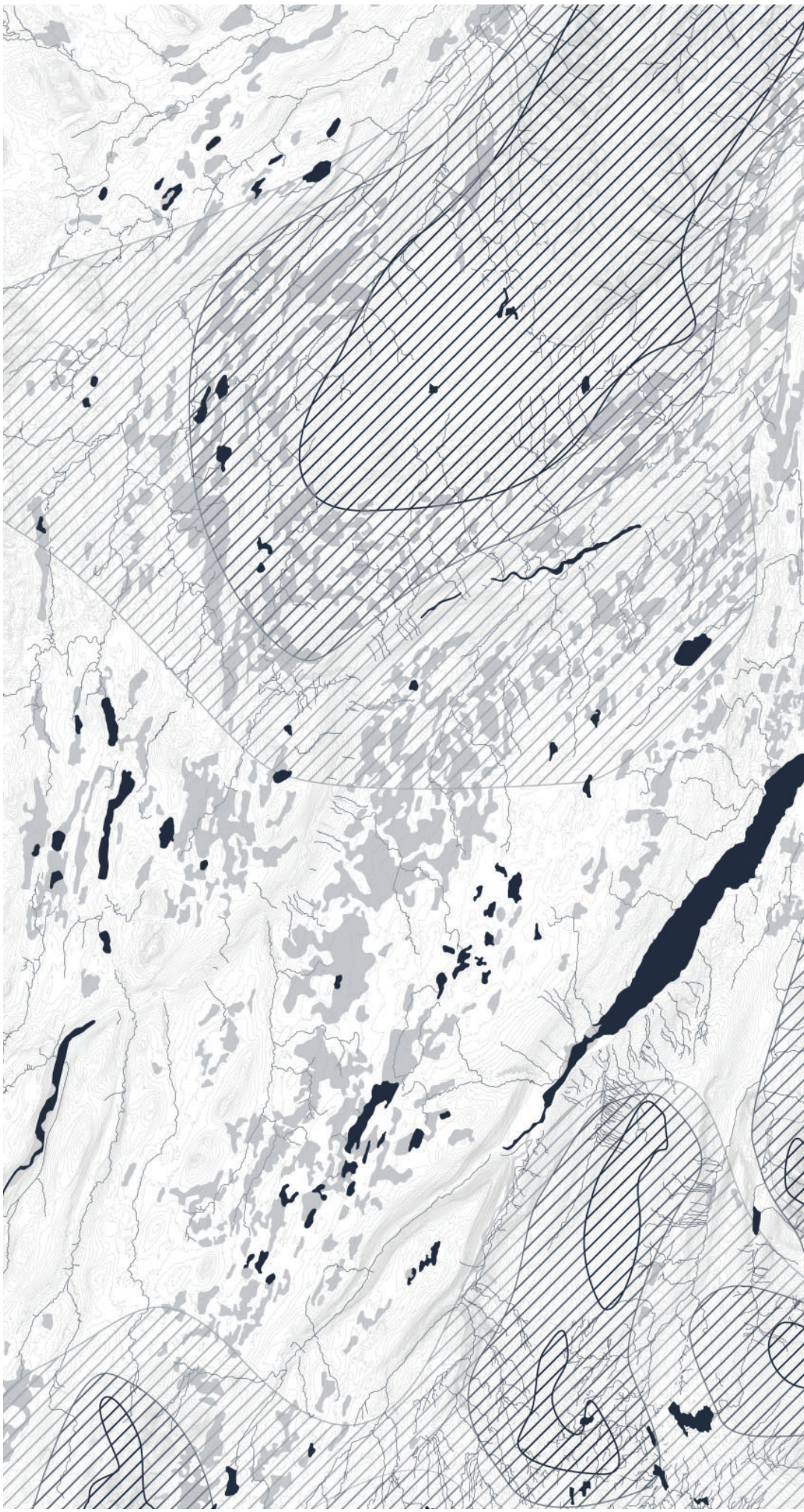
Palimpsest

This map shows the topography and the different types of soils present in the area. The soil is related to the way the island was once cast and has changed over time. The lowlands, below 400 meters, were once covered in a dense birch forest, the highlands covered in a thick layer of ice.

- topography lines
- 400 meter mark
- water
- peat bogs
- marshes
- glaciers and permefrost
- bare rocks
- sands
- wetlands
- sparsely vegetated areas
- recreational forest
- shrubs
- mixed forest
- agriculture with natural vegetation
- pastures
- urban fabric
- roads
- birch forest 874





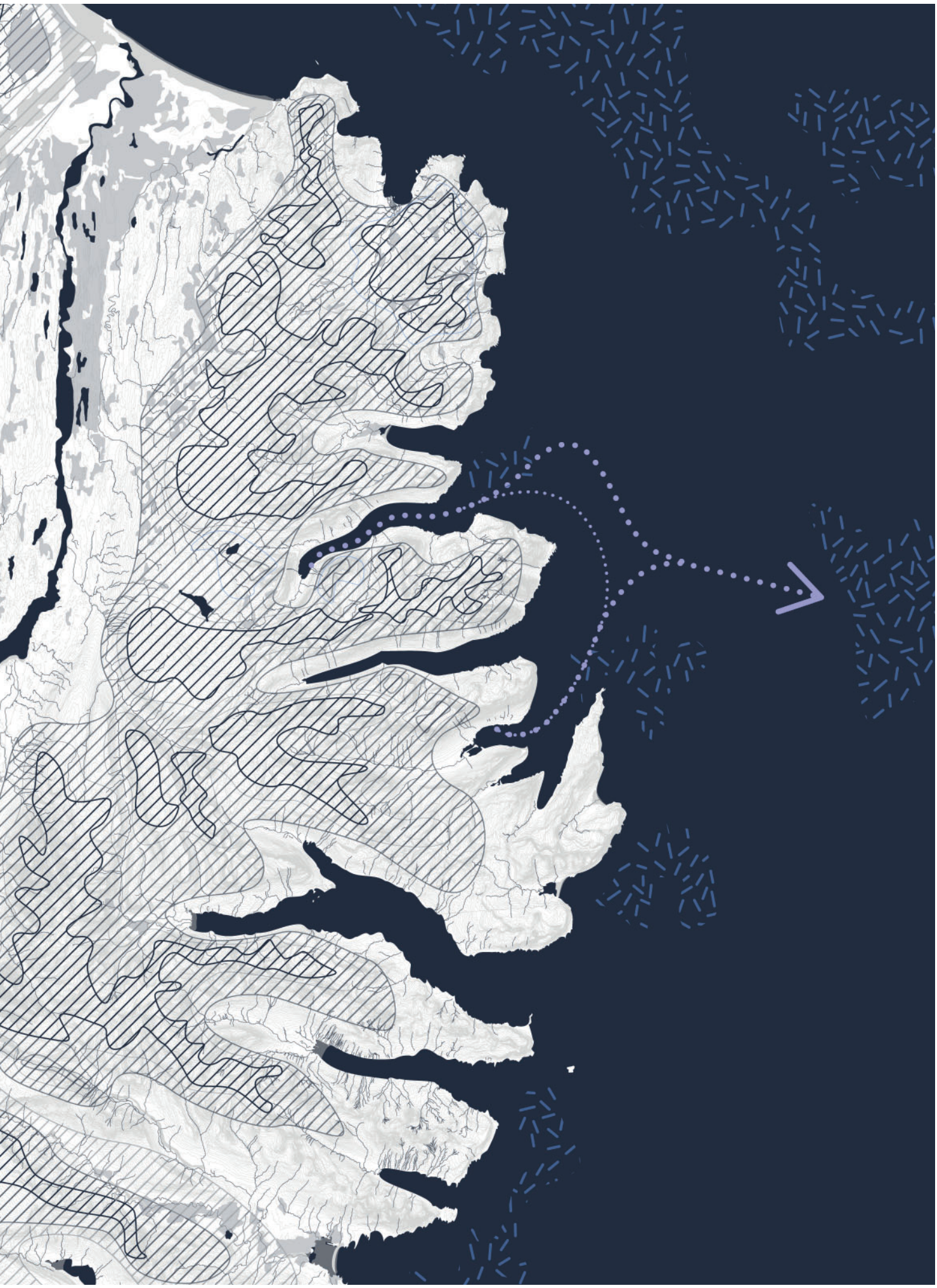


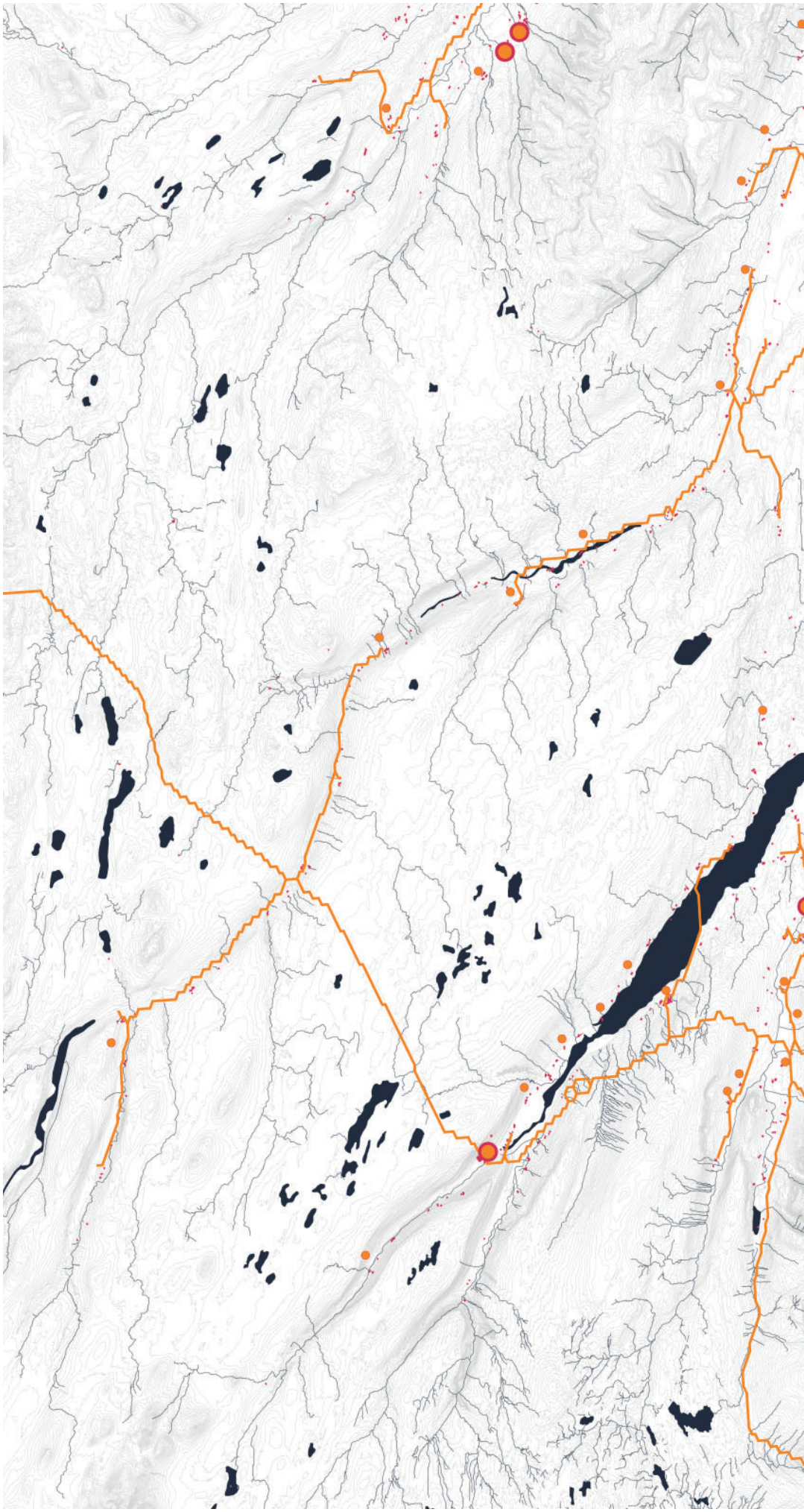
NEXUS / water

Water plays a big role in the Icelandic landscape. All possbible forms of water are present on the island. Boiling hot springs, thick packs of ice, acidic wetlands, oceans full of arctic wildlife, runoff water causing dangerous amounts of sediment to come down with it. These forms of water are what the identity of Iceland is based upon.

- topography lines
- ocean
- snow
- peat bogs / wetlands
- rivers / runoff water
- ferry routes

km



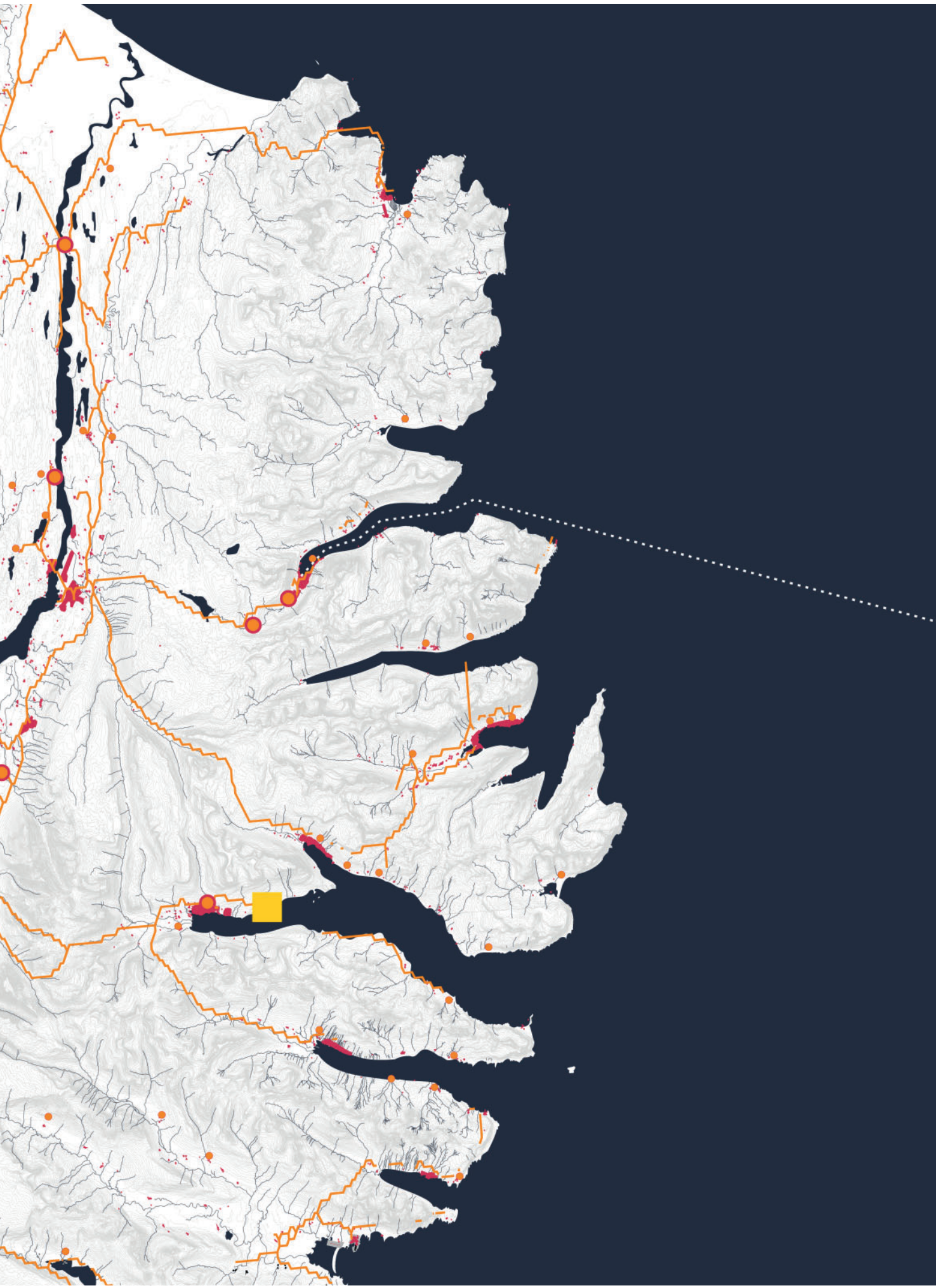


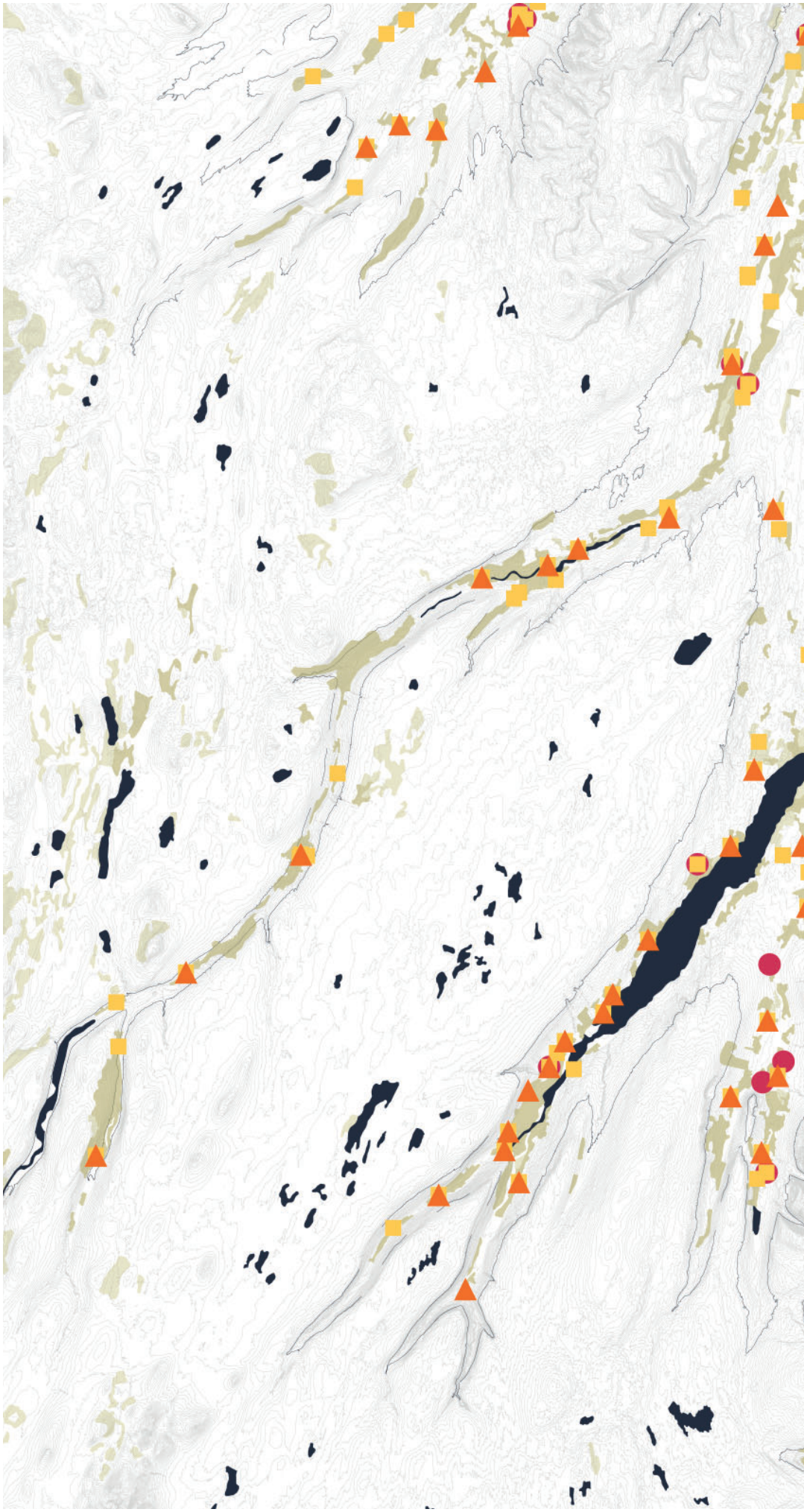
NEXUS / energy

Energy has been pushing itself to the foreground if it comes to problems of a global scale. In Iceland, all energy is produced through renewable sources, either geothermal heat or hydropower. In this area, a large-scale hydropower plant produces all energy to support the important aluminium industry. Energy for domestic use is produced in smaller hydropower stations along smaller streams.

- topography lines
- water
- alcoa smelter
- central hydropower plant
- local hydropower plant
- internet cable
- electricity network

km



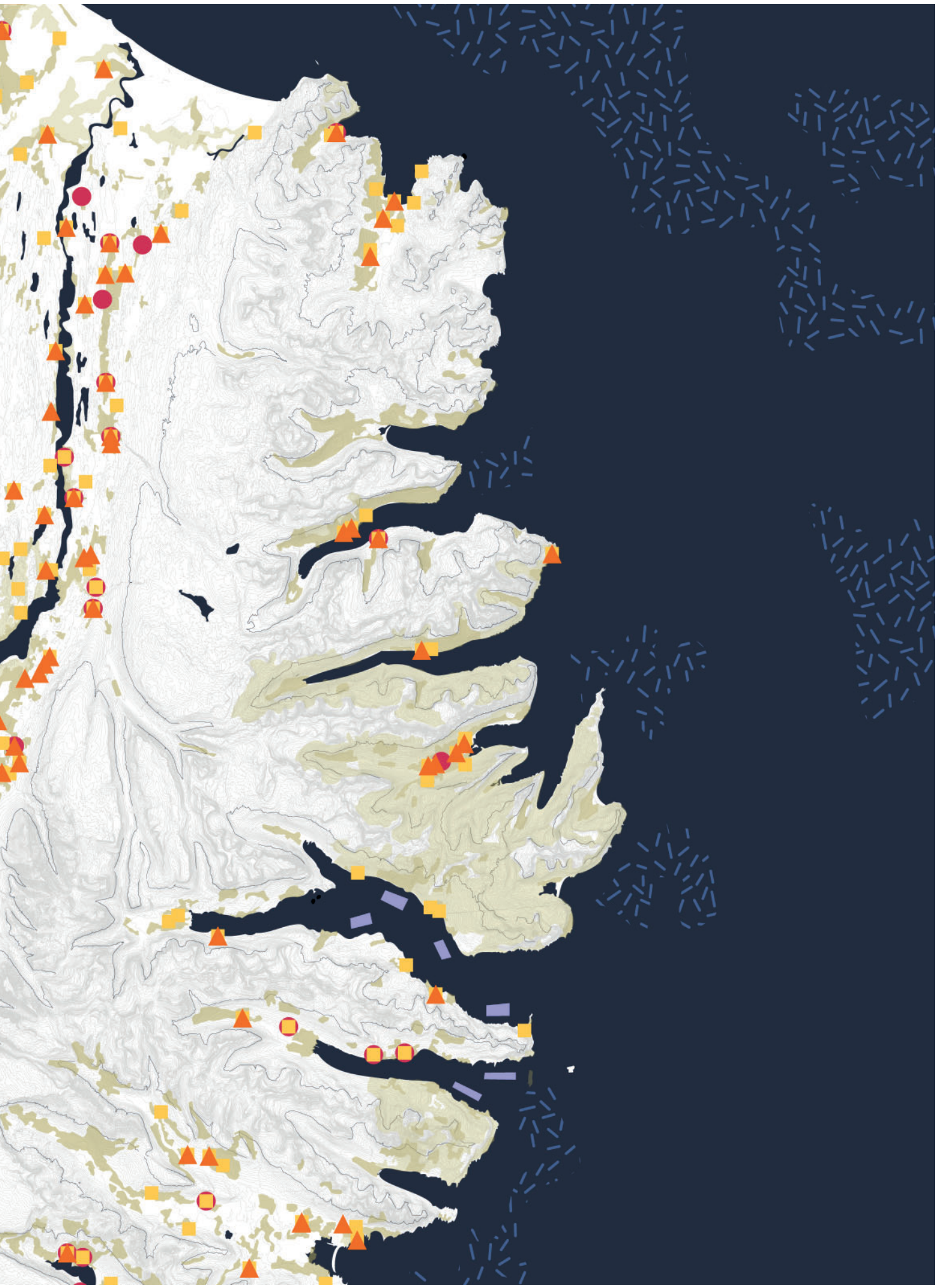


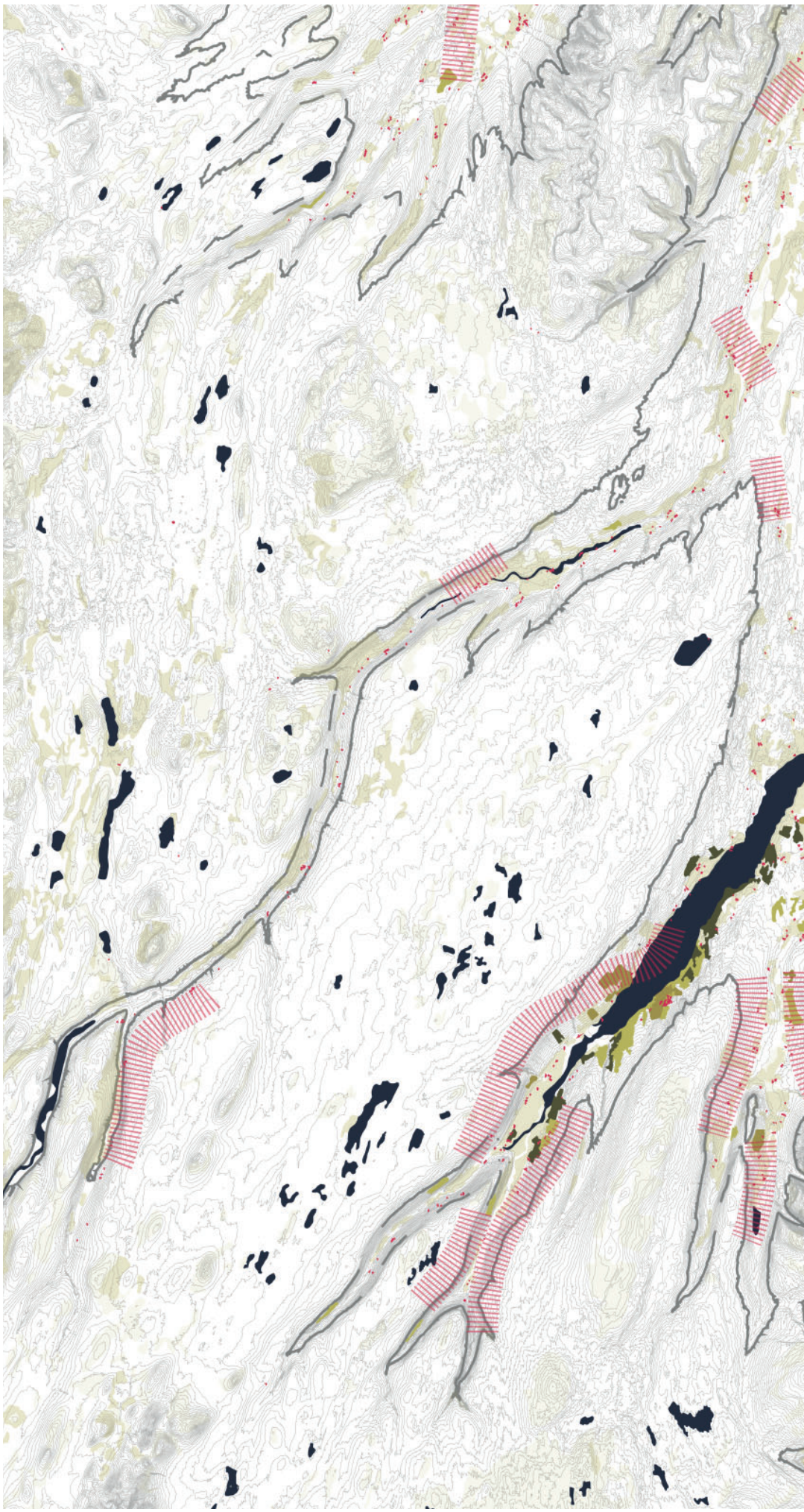
NEXUS / food

The production of food is less efficient in the poor soils of the cold country, cultivating plants directly on the grond is almost impossible. In the low-laying valley large numbers of sheep and horses graze. The ocean is used for fishing, but the highlands are predominantly empty. The vast majority of food has to be imported from other parts of the world.

- topography lines
- water
- grazing
- pastures / grasslands
- sheep farm
- horse farm
- cattle farm
- fish farm

km





NEXUS / minerals

Minerals have been a more predominant problem in the area over the last few decades. Mainly landslides caused by soil erosion form a danger to the current population. This risk increases through the lack of vegetation on the sides of the hills. Roots from bushes and trees interrupt the gliding surface and stop sediments from sliding down.

- topography lines
- water
- sparsely vegetated
- forest
- built environment
- landslide risk

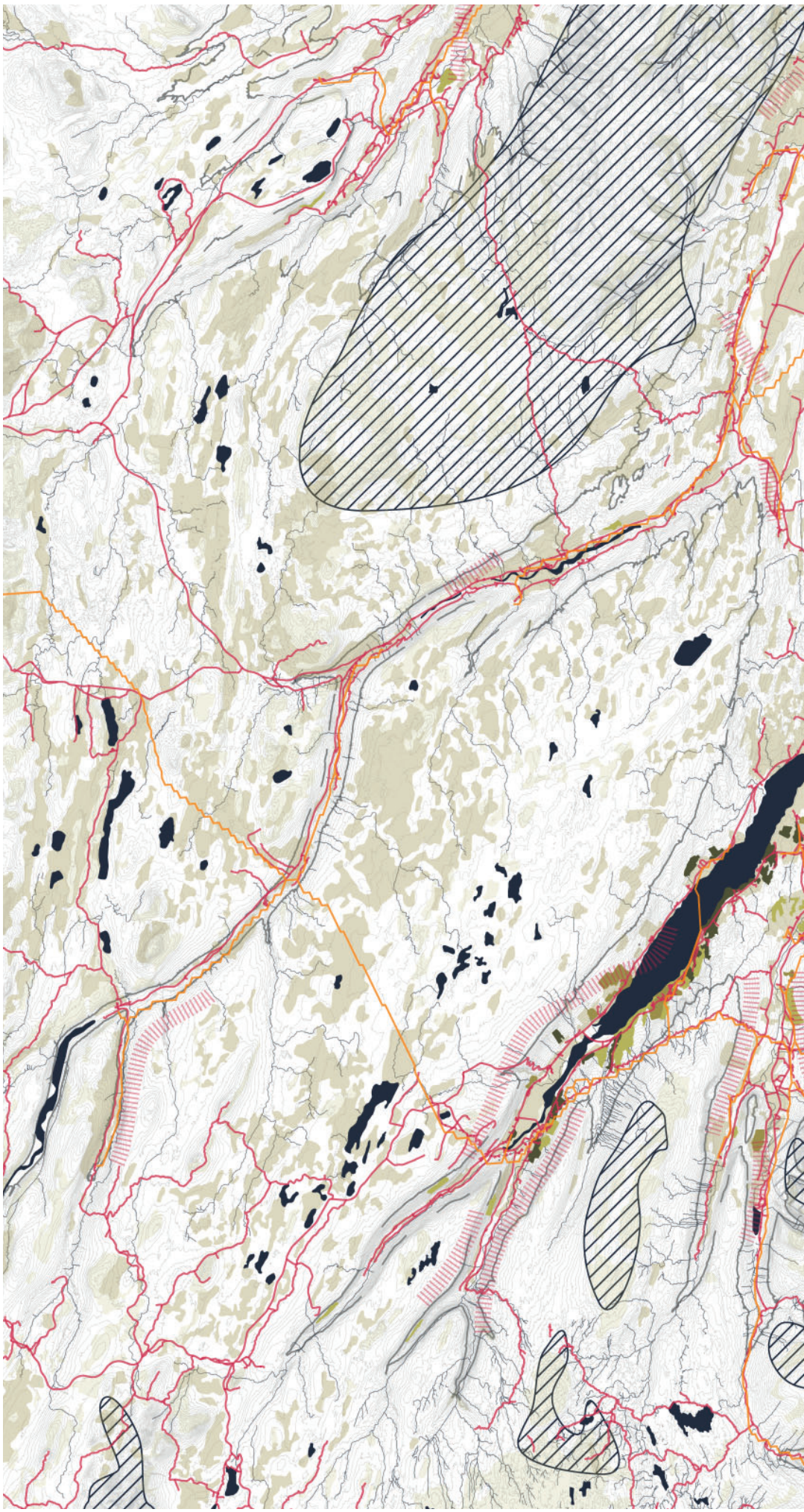


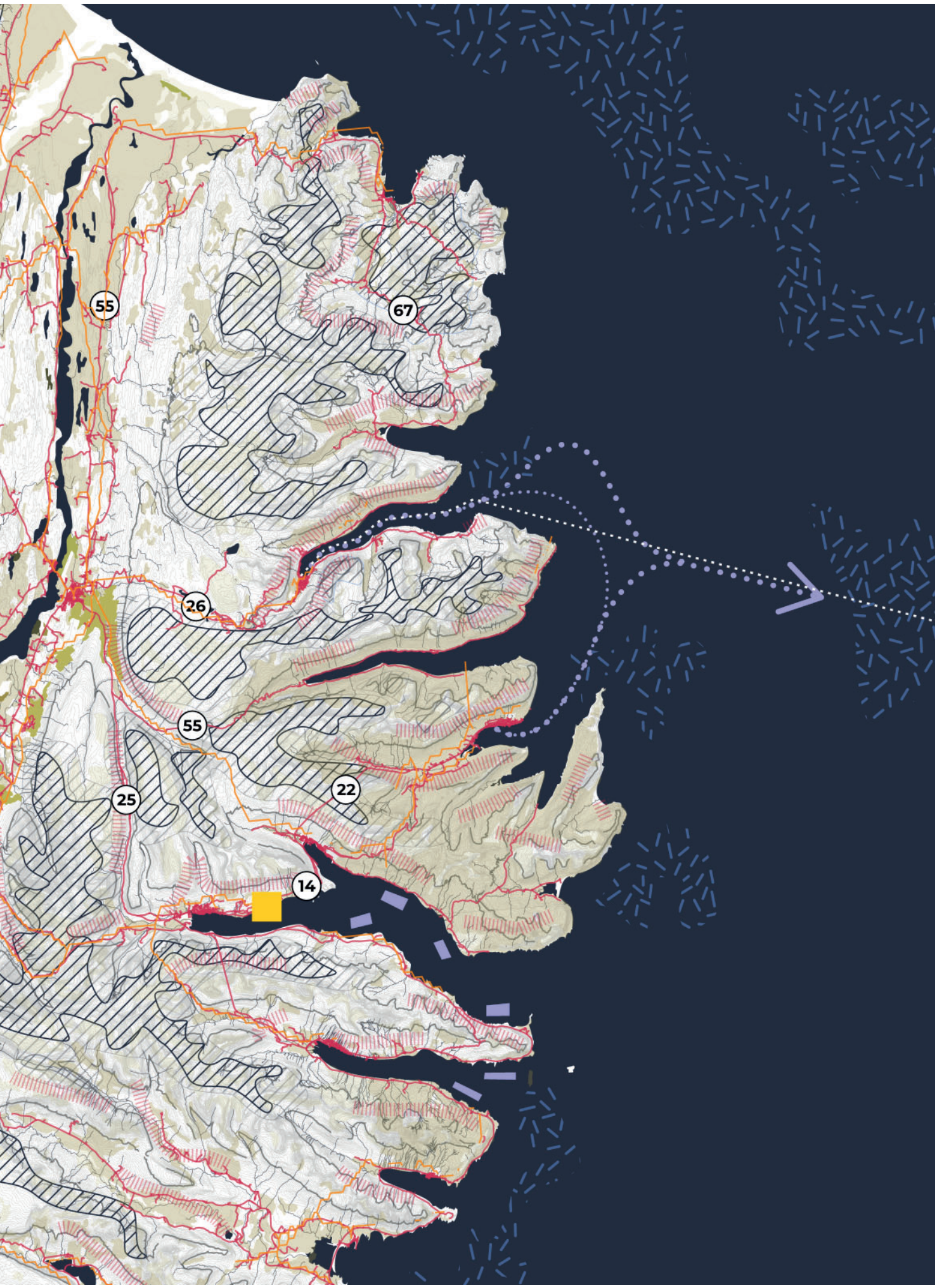




Synthesis

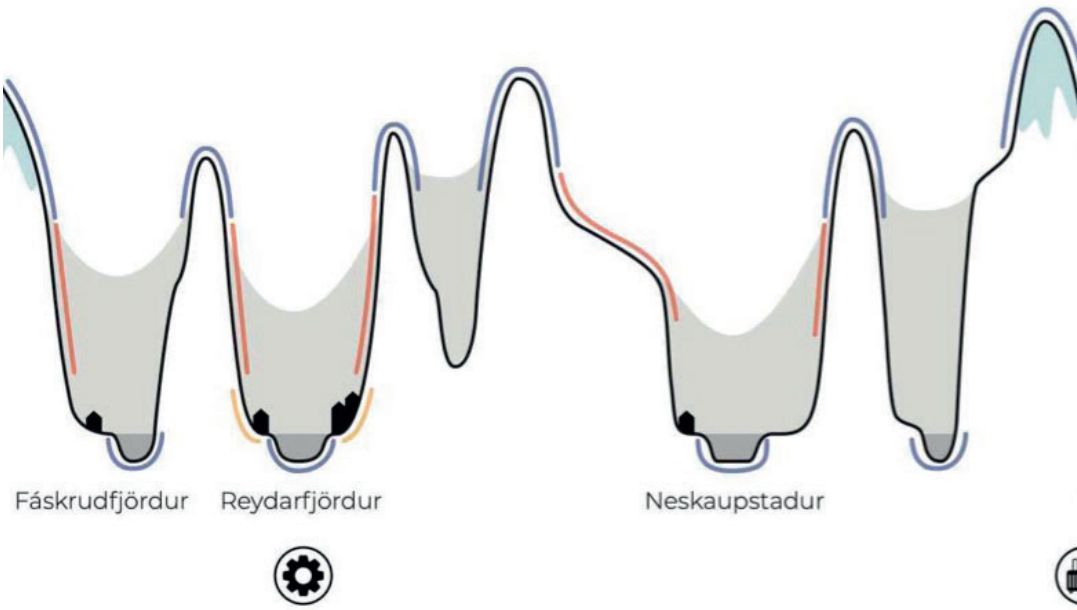
This map shows a summary of all research done on the regional scale. The most influential problems in the region are landslides (caused by erosion), overgrazing, unreliable connectivity through roads of bad quality and lack of vegetation. The population in the area has shifted completely due to the arrival of the ALCOA smelter in 2003. This caused a lot of villages to shrink or grow drastically. The connection between each fjord town is very unreliable, as there is only one road leading to the towns, mostly starting in the capital of the region, Egilstaddir. This way of transportation is very inconvenient, especially if the roads snow over in winter.




55
67
26
55
22
25
14

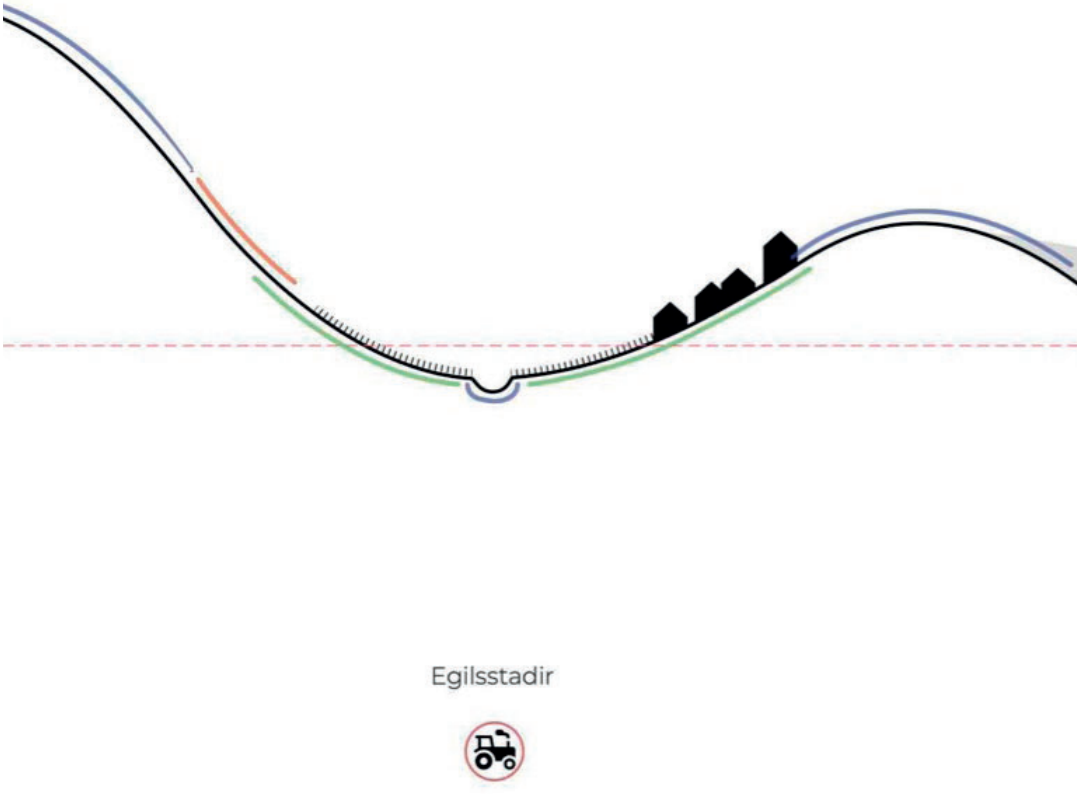
Systemic fjord section across

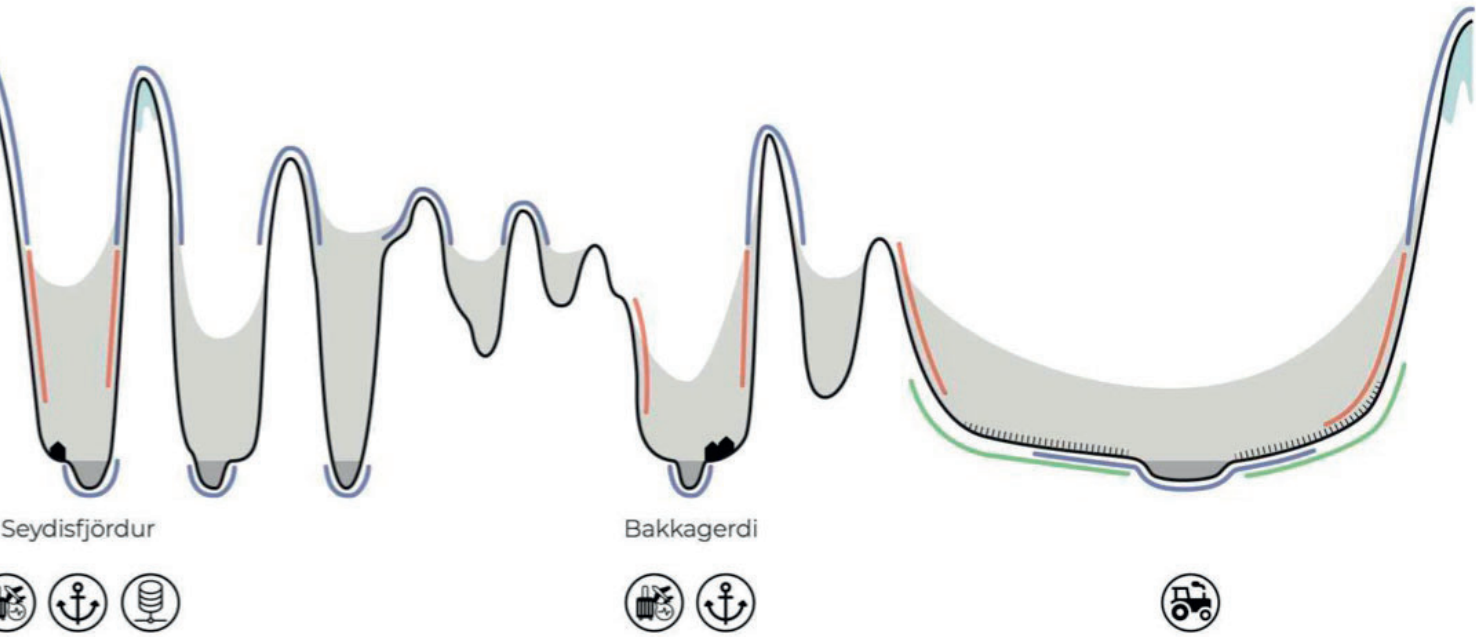
This section shows an overview of all the fjords in the region. It becomes very clear that every little village has its own specialty and character. Another thing that stands out is the small amount of buildable land. The power of nature is really present in the steep fjords, making it difficult for towns to expand.



Systemic fjord section perpendicular

This section shows the obstacle that needs to be crossed to get to the towns that lay in the fjords. The valley (lowlands) in which a lot of animals graze has a very argicultural character, whilst that is not possible in any of the steep slopes of the fjord villages. A pattern in infrastructure is that the road from the fjord village always goes back to Egilsstadir, in the valley, before heading to another fjord.

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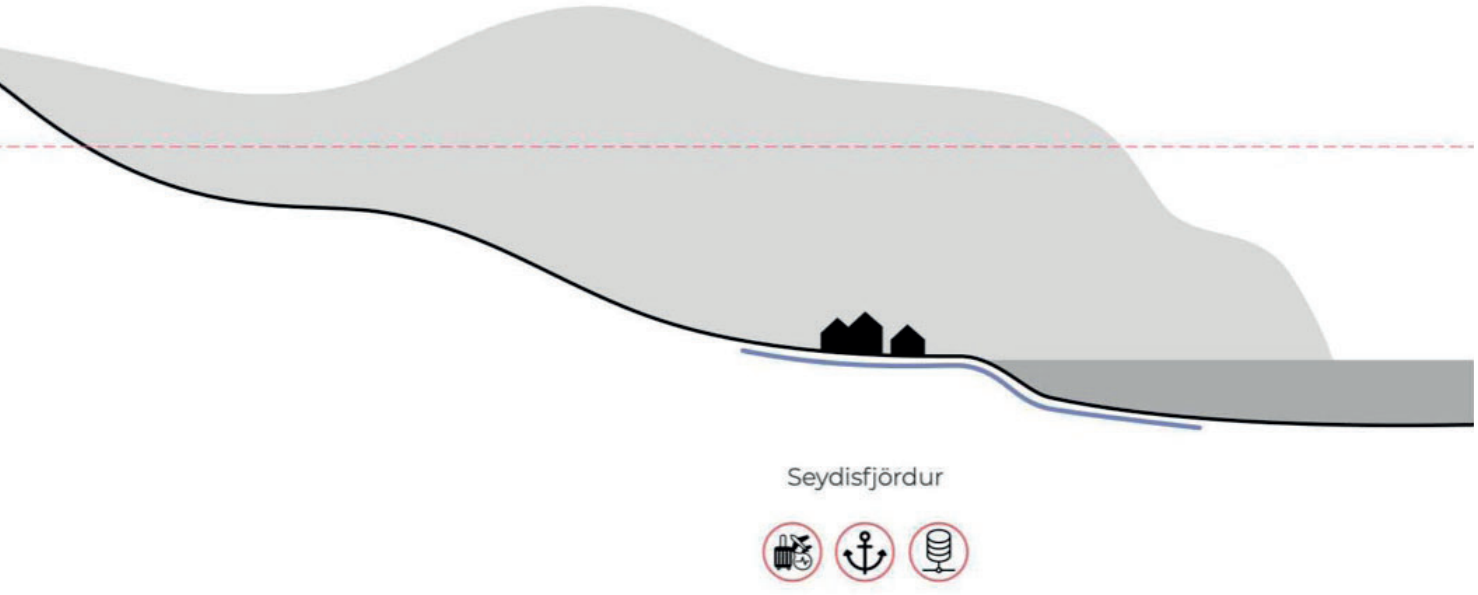

Seydisfjördur

Analysis conclusions

The analysis has been done through the lens of the WEFM-nexus (Water, Energy, Food and Minerals), which has led to some interesting conclusions.

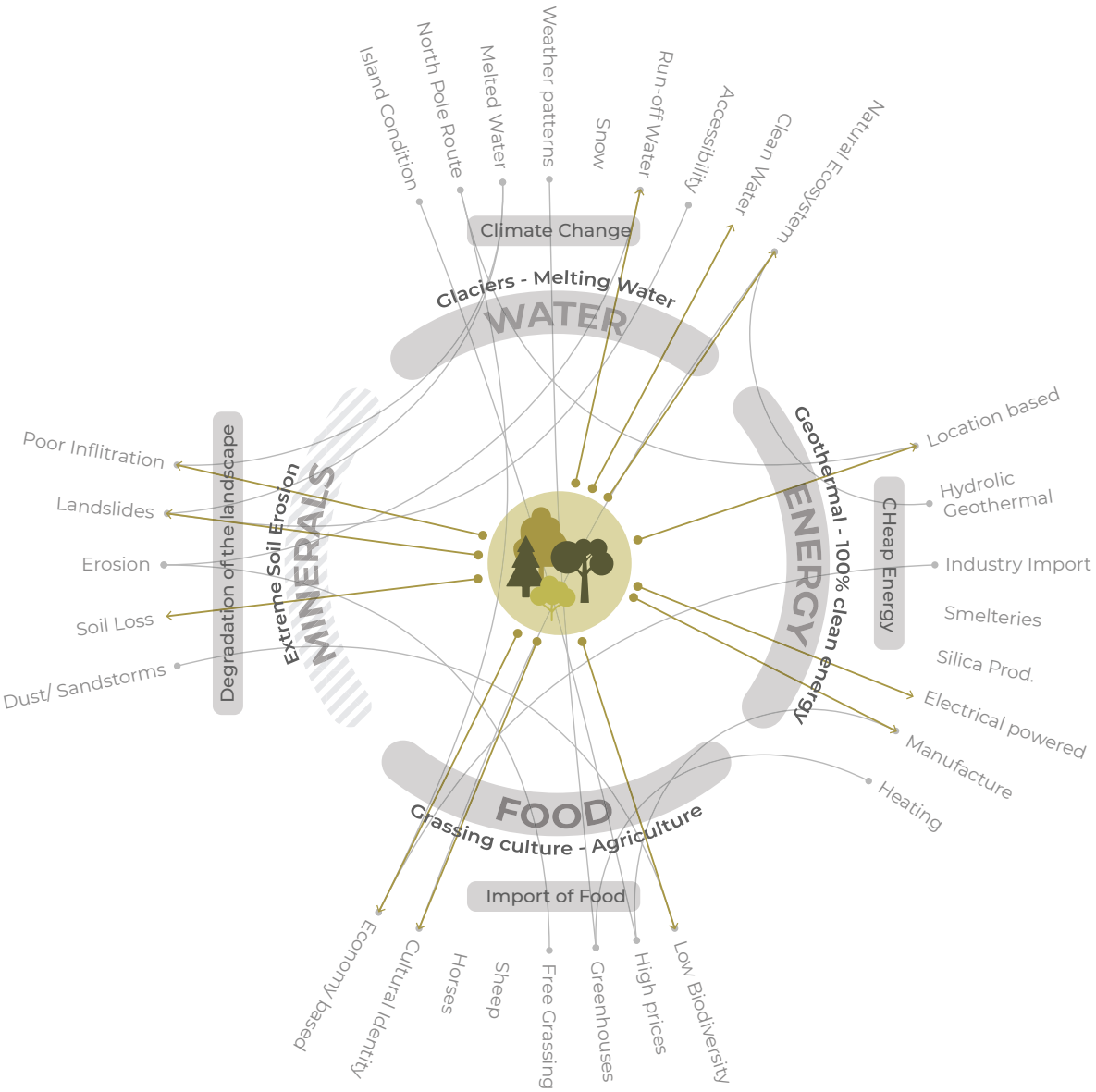
Water is present in all possible forms in this region of Iceland. It mainly plays a big role in the generation of energy, both for industrial use and domestic use. The icy mountaintops hinder traffic in winter, causing the accessibility of the villages to be very fragile. Even in may (during the field trip), these roads were still snowed over, which makes this a large problem for the local community. It is essential that these villages are accessible via at least two roads, in case one closes up. The presence of water causes even more problems, because the landslides that occur in this region in increased frequency, are caused by heavy rainfall or big amounts of melting water. These landslides are very dangerous and have seriously harmed the property of current residents in the past.

Energy is very abundant in the area. A big dam provides all the power to facilitate the ALCOA smelter, where raw aluminium is being processed into usable pieces. Suprisingly, there is no geothermal activity in this region, so all power is generated with water. Energy for domestic use is generated through smaller streams of water. These generators are generally hidden in small cottage-like buildings. Camouflaging their existence.

Food is a controversial topic, as there is not much that can grow in the poor and cold soils of Iceland. The absolute majority of food needs to be imported from other parts of the world. The valley landscapes in the lowlands do have a lot of sheep and horses that graze on the land. This grazing is one of the other major problems, because over the years the sheep have eaten all of Iceland's original birch forests, causing the landscape to be very empty and open. The open landscape causes an immense amount of erosion and movement of sediment. Climate change might allow a new way of cultivating, which needs to take shape in the coming years. As the valley and the sea are used to obtain food, the mountainous fjord landscape is not used for any agricultural practices.

Minerals are mainly a problem in terms of erosion and landslides. The lack of vegetation plays a big role in the speed and acceleration of this process. The lower parts of the mountain slopes need to be vegetated in order to stop disastrous landslides from happening in the future.

3. Territorial Vision



WEFM Nexus concept

WEFM Nexus Approach

On the WEF-M Nexus, each of the perspectives (Water, Energy, Food, and Minerals) have different aspects that translate into the landscape as problems or potentials. The aspects correlate to one another, influencing the way in which each gets expressed in the region, gWenerating a dynamic system that is really difficult to manage by just tackling one of the aspects independently. Because of this, it is necessary to propose a converging nexus between the perspectives, that acts more or less equally on all of the perspectives and enables tackling most of the problems and possibilities through an integral action that connects various aspects of the WEF-M approach.

In the case of Iceland, reforestation seems to be a possible linking action that allows controlling the erosion and landslides in the region, manages the water by controlling the run-off effect, and purifies the water sources that the melting ice generates. On the other hand, it may be possible to generate an economy out of them by making use of the available energy produced by the hydro plants of the region and putting agroforestry practices in place that would combine the existing agricultural spaces with new ecological services that forests lend to the territory.

Vision and strategy

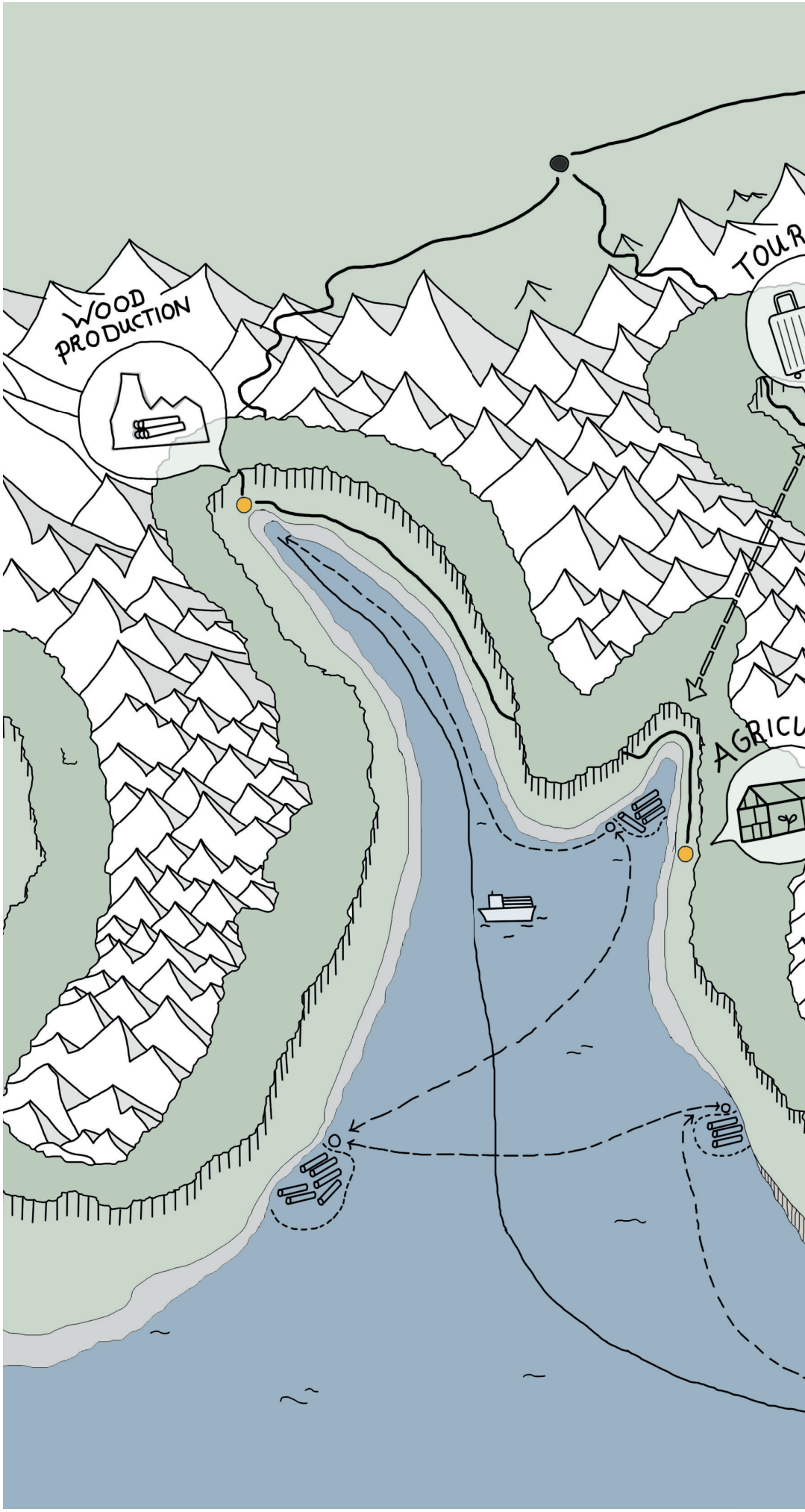
Based on the previous explained WEFM Nexus concept, the vision includes some core principles that the analysis and problem statement have identified. Iceland's identity is based mostly on its unique landscapes and natural phenomena. Nowadays the landscape has degraded so much that it has shifted from a striking and majestic ecosystem to a vulnerable, degraded landscape, stripped from its once-blooming cover. The reforestation program (already undergoing in Iceland) are essential to restore both the well-being of the island and the unknown natural identity that originally represented Iceland.

To complement this program and add more value to the program, a circular economy based on timber production is introduced, that aims to manage the new forests in a more sustainable manner, in that way, the reforestation can benefit the local communities on a more direct way, with economic and social impacts. The planned reforestation opens also the possibility to develop a green corridor integrating different sites with historical and natural values, generating a new possibility for tourism to expand while respecting the healing process of the landscape.

Connectivity and accessibility become key elements in the proposal, making necessary the expansion of the existing network and upgrading of the current roads and trails. The construction of these key micro-infrastructure elements generates a waste material out of which other elements can be constructed, such as landslide control walls and hiking trails. The material economy that results from these circular practices aims to generate sensible interventions that do not disturb the natural qualities of the place.

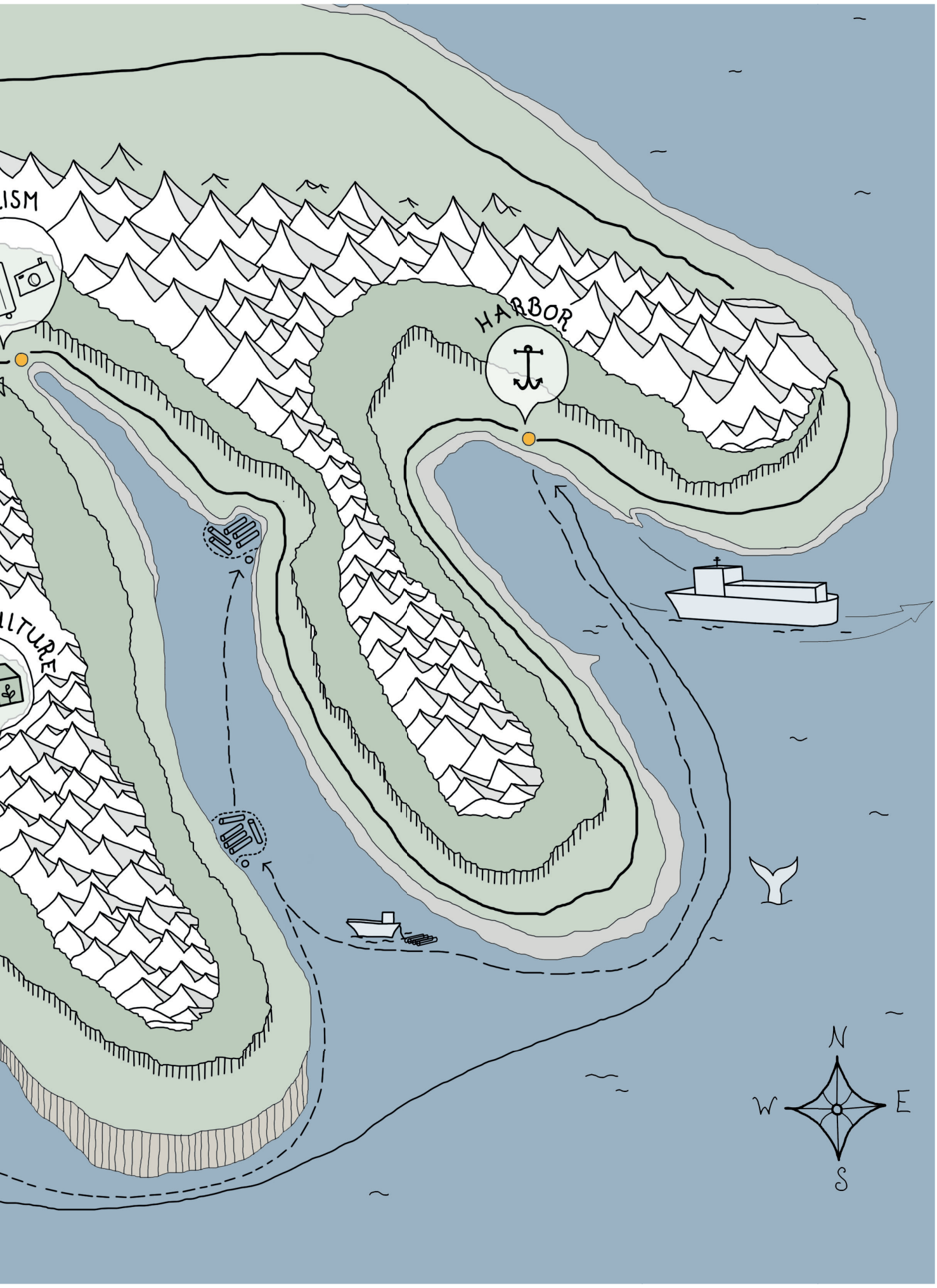
The reinforcement of certain characters in each of the towns makes the interactions between them way more stronger and generates a direct collaboration on the economic processes in the region. Production, Processing, Tourism, and shipping are distributed along strategic points to enhance the value of the towns while being connected by the light infrastructure put in place.

To achieve the desired future, four strategies have been developed. The first one defines 3 typologies of forests: natural reserves, reforestation areas, and productive sites. It focuses on generating a mosaic of different functional green structures, that make the most out of the ecological, social, and economic services that trees and forests present. In the second strategy, the wood produced by the first strategy is transported by cables that transport the logs down to the coastline from where then electrical boats will carry them by water to the processing facilities and the shipping port. The hiking trails proposed by the third strategy aim to enhance the historical value of the landscape, by connecting saga locations and viewpoints through the forests, to the new production and processing facilities. All this is connected by the fourth strategy that proposes micro-infrastructure lines and light systems to access the new areas. Most of this will be done out of the materials extracted from the same region, in a circular material economy that just contributes to the sustainability of the whole project.



Vision

This drawing presents the common vision of the project. It illustrates the reforestation program as a green corridor along the valleys and mountain landscapes, the additional tmber-based circular economy supported by the water landscape, the increased connectivity through different types of infrastructure, and the embraced strenghtened identities of the fjord towns.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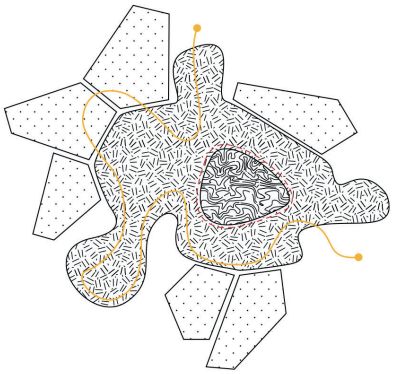
Strategy Map

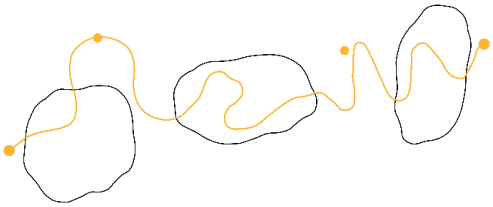
This map shows the concrete interventions in the context of the designed vision for this project. The four strategies are, the mosaic of forest typologies supporting the reforestation program, the water-based log towing system collection points providing for the timber-based circular economy, the hiking trails and micro-connectivity infrastructure connecting the region on different scales, and experiencing the true Icelandic identity through a network of hiking trails that show all different types of landscapes and introduce people to the sites where the ancient sagas played out.



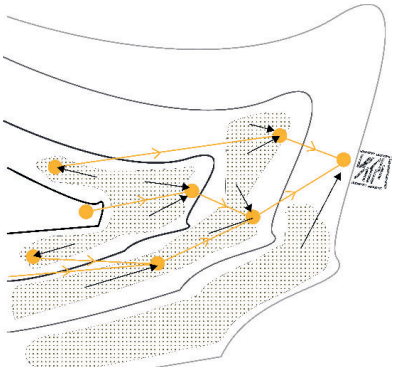
Diagram



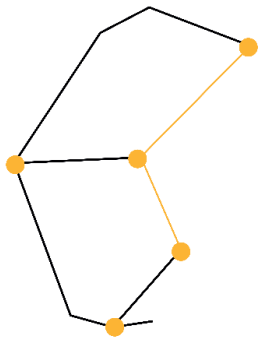
Reforestation Efforts



Identity Experience

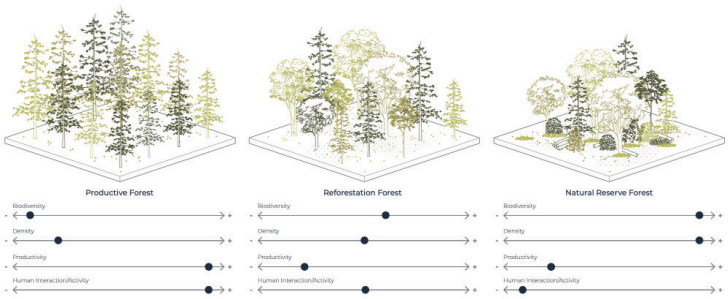


Sustainable Landscape Management

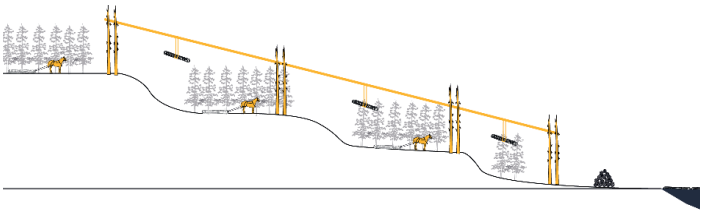


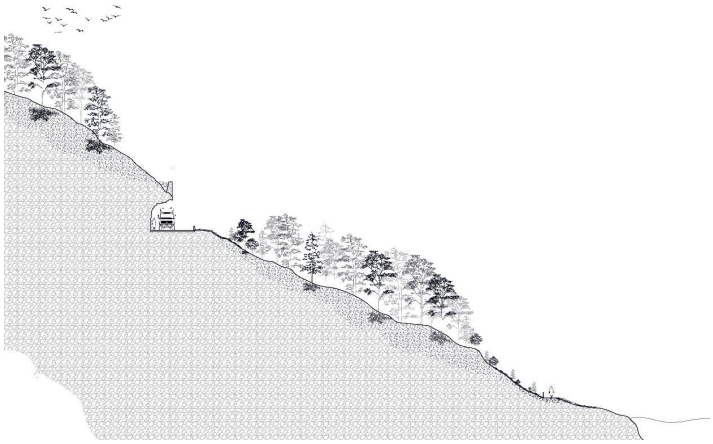
Enhance Accessibility

Principle









Guidelines

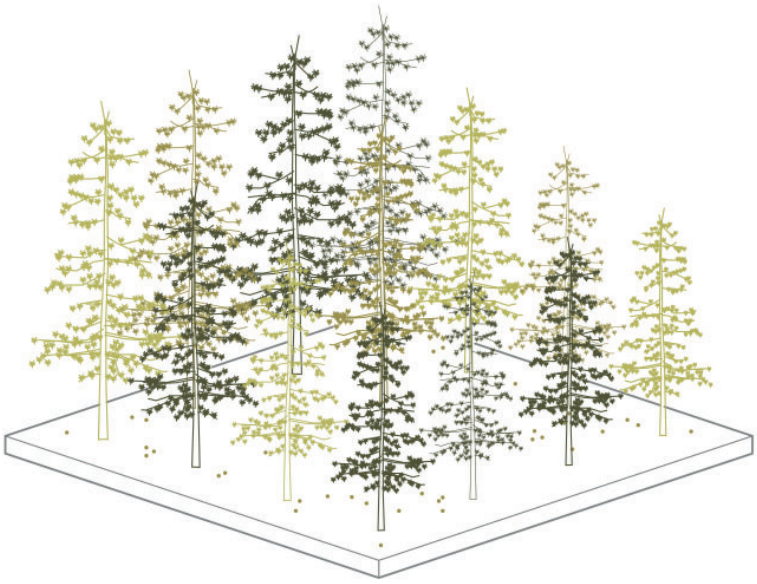
To be able to design a coherent story for the Eastern fjord Region the guideline toolbox (left page) presents the red line of the overall strategy. Based on the four vision guidelines, the diagrams show the four different strategies that are placed all along the region and the principle how these strategies are delivered. At the core of these principles it is crucial to minimize their impacts on the natural landscape.

For the **reforestation efforts** strategy, three different typologies of forest are developed as a way to maximize the benefits and services that each of the types of forest lends to the landscape. The natural reserves aim to enhance the biodiversity values of the region and improve the ecological services that the green structures lend to the region. The productive forests are more focused on adding economic values to the whole strategy and reinforcing the productivity of the area by growing timber trees. And the last one the leisure forests connect the region by creating a green corridor that binds everything together and where the community and tourists can enjoy the regenerated landscape.

Identity Experience. Since its discovery 1000 years ago, Iceland's historical landscape has changed drastically. When the first foundations of the small villages in the fjords were laid, at least a quarter of the island's surface was covered in birch forest. Nowadays, this is only 1,5%. The immense overgrazing by horses and sheep has caused the forest to repulse. Ultimately, reintroducing the forests today will take the region back to its pre-human state, whilst also mitigating the effects of climate change and lowering the risk of dangerous landslides that have been occurring in the region in increased frequency. To experience this new differentiation of landscapes in the Fjords, a vast network of hiking trails is laid out over the region. The trails show the newly growing forest, allowing people to step back in time and experience this part of Iceland as the Vikings once did. Going back to the core identity. The landscape opening, closing, opening, closing. Forest, coastline, endless open fields, and ever snowy mountain tops. Reviving the ultimate historical experience by pointing out the sites where ancient sagas took place. All to be explored at eye-level.

Sustainable landscape management. Supplying a wood-based economy in a sustainable way asks for harvesting techniques that have a low impact on nature. The wood will be selectively cut, and instead of using heaving machinery for transportation, techniques like Cable Logging and Horse Logging will be used. Cable logging is a method were cables are spun between points to transfer logs through the air, therefore not harming the soil. With horse logging horses are used to transport the logs to the pick-up point. Horses are highly manoeuvrable and cause less soil disturbance. Once the logs are at the pick-up point they will be pushed into the water, waiting for a pull boat that pulls the floating logs to the timber factory.

Lastly, **enhancing the accessibility** of the region. A range of impacts has been designed for the infrastructural interventions. The most impactful is the half-tunnel. Through critical analysis, the half tunnel along the coastline instead of a tunnel through the mountains has been selected as this provides a way to intervene as less as possible. The half-tunnel is carved out of the rock interior to provide a broader experience of the natural elements of the landscape and to provide a window view from the tunnel, instead of a traditional closed-off, isolated portal. To complement this principle, hiking trails have been designed to provide for both vehicles and pedestrians. By adding this intervention, micro-connectivity is provided on different scales, for different experiences, and with different intensities.

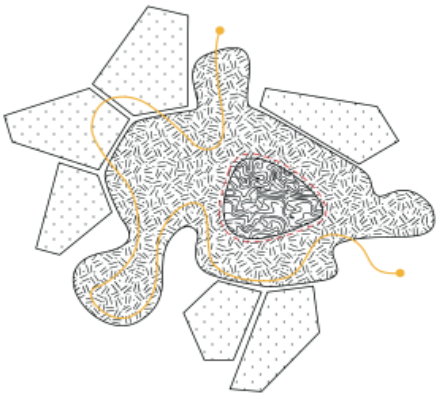


Productive Forest



Reforestation Efforts | Diagram

The diagram illustrates the relationship between the different forest typologies. The Reforestation Forest functions as the glue between the productive sites and natural patches. The natural patches are isolated areas while productive and reforestation patches are accessible for human interaction.

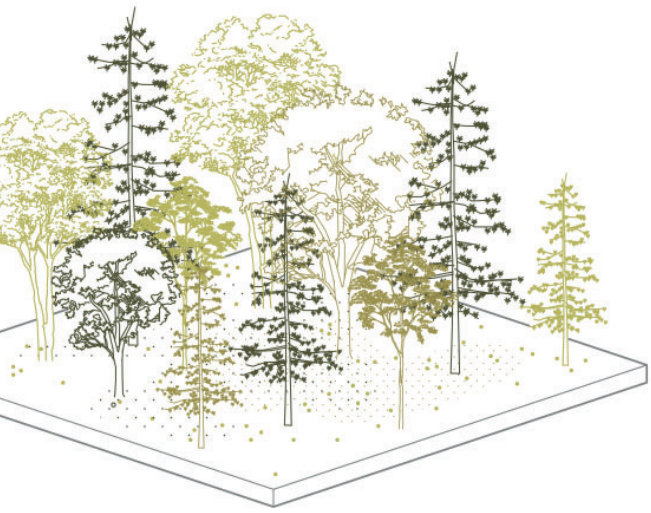


Reforestation Efforts | Typologies

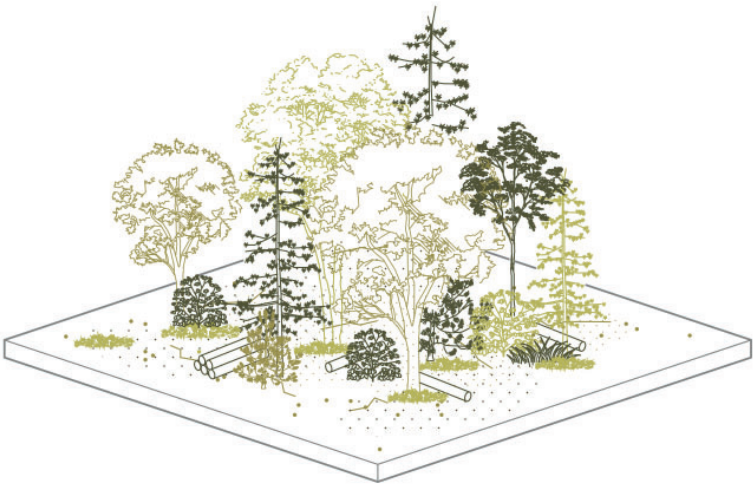
This catalogue provides an overview of the three forest typologies: productive, reforestation, and natural. The various forest types differ in biodiversity, density, productivity, and human interaction intensity.

Reforestation Efforts | Forest Matrix

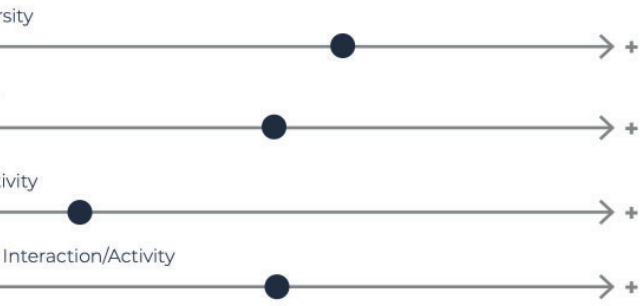
This matrix provides an overview of the critically selected tree types, analyzed and researched during the forest Field Trip in Iceland. It illustrates each characteristic and functions as a guide for suitable tree implementation.



Reforestation Forest

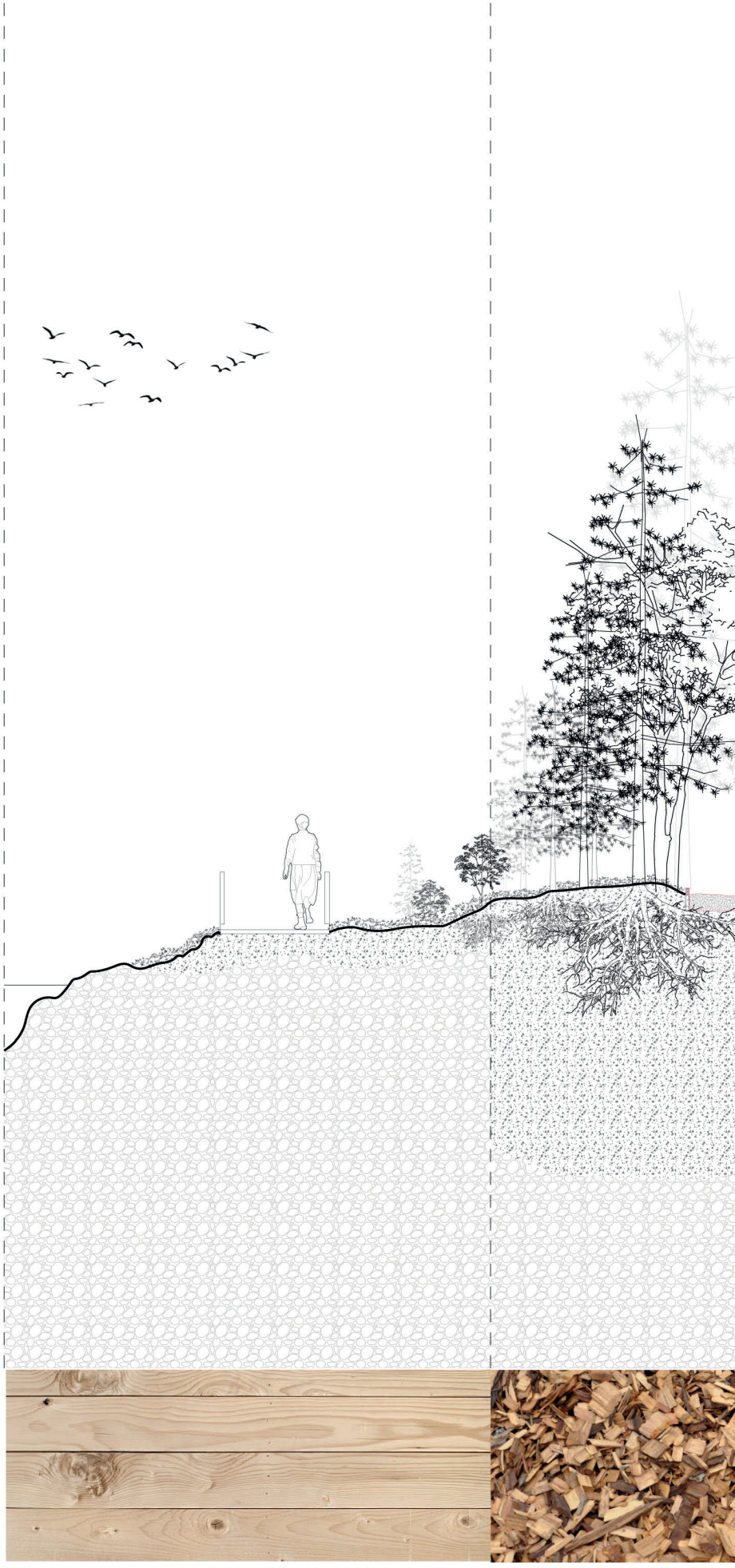


Natural Reserve Forest



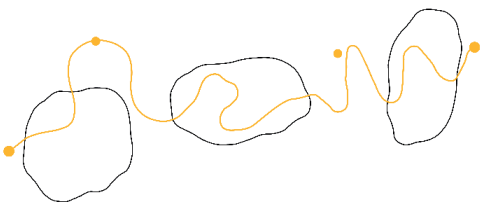


name	native area	evergreen?	pioneer/climax species	cold tolerant	shade tolerant	soil type	use	wood quality	forest type
black spruce	north-america	●	c	●	●	peat + wetlands	lumber + clt	●	p + r + n
curly birch	europe		p	●		poor	furniture	●	n + r
silver birch	europe		p	○		wet	furniture + plywood	●	n + r
black cottonwood	north-america		p	○		well drained	lumber + paper	●	n + r
downy birch	europe + asia		p	●		heathland + moors	furniture + plywood	●	n + r
western redcedar	north-america	●	c	●	●	wet + tolerant	tree of life	●	p + r + n
white bark pine	north-america	●	c + p	●	○	tolerant of soils			n + r
eastern larch	north-america		p	●		wet + swamps	plywood	●	n + r
western hemlock	north-america	●	c	●	●	bedrock	lumber + paper	●	p + r
subalpine fir	north-america	●	c	●	●	wet			n + r
siberian pine	siberia		c	●	●	well drained	lumber + furniture	●	p + r + n
nootka cypress	north-america	●	c	●	●	well drained + poor	lumber	●	p + r + n
rowan	iceland		p	●		peat + clay	erosion control	○	n + r
mountain hemlock	north-america	●	c	●	●	wet	lumber	●	p + r
blue spruce	north-america	●	c + p	●	○	well drained + clay	lumber	●	p + r + n
european larch	europe		p	●		tolerant	lumber	●	n + r
aspen	iceland		p	●		well drained + clay	lumber + paper	●	n + r
douglas fir	north-america	●	p	●	●	well drained + poor	lumber + erosion control	●	p + r + n



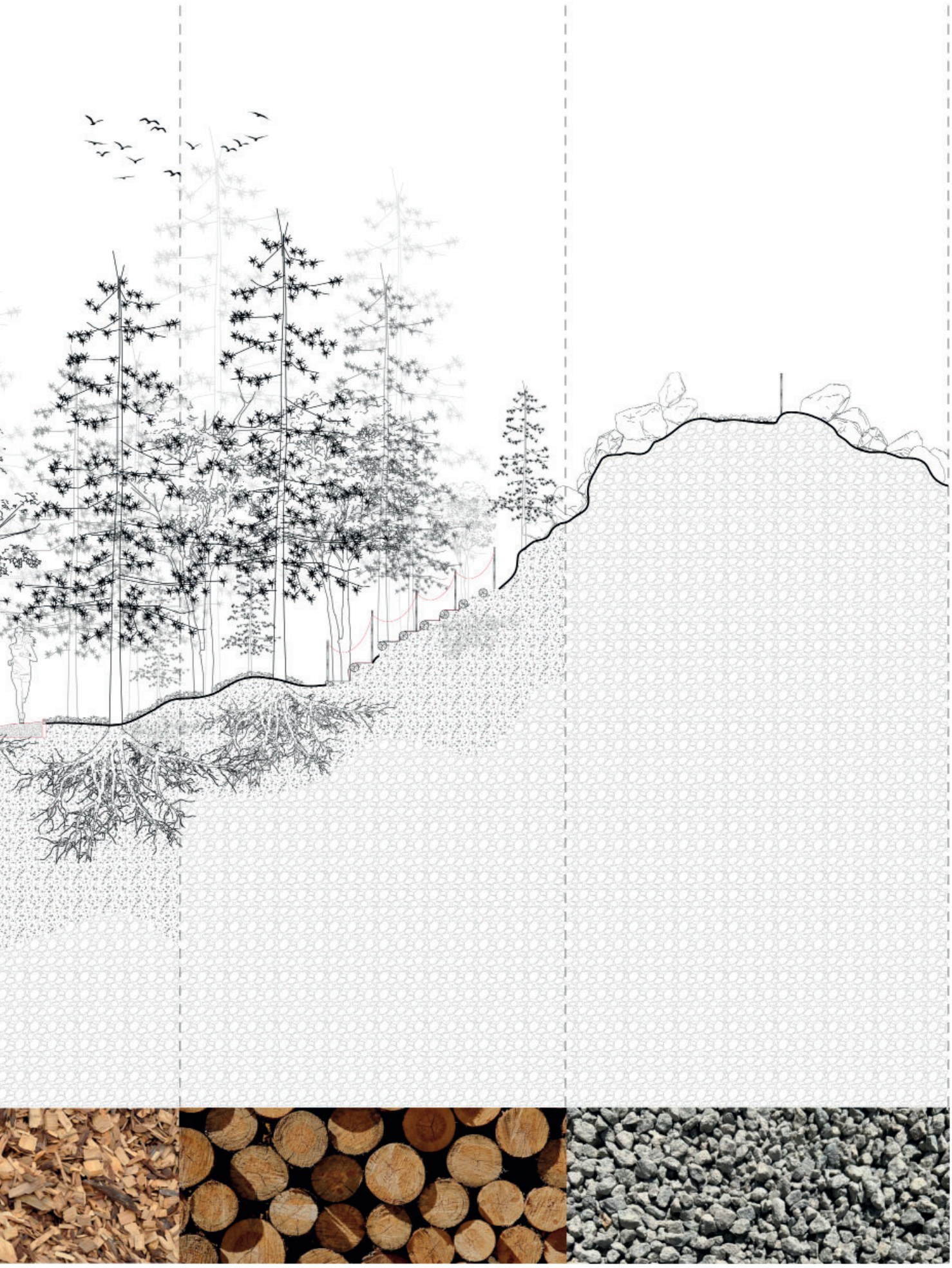
Identity Experience | Diagram

This diagram illlustrates an overview of the experience principles, as the hiking trail (the core element) interacts with differet forest typologies, interacts with nodes and acapunctures, and depends on the underlying topography.



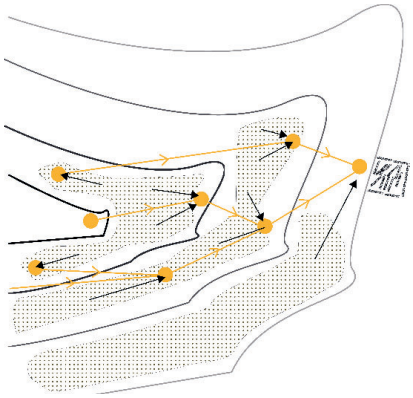
Identity Experience | Section 1:200

The section illustrates the different hiking interventions with their various impact intensities. Waste products from timber production sites and tunnel construction, and processed wood materials are material inputs for the hiking interventions to contribute timber-based circular economy.



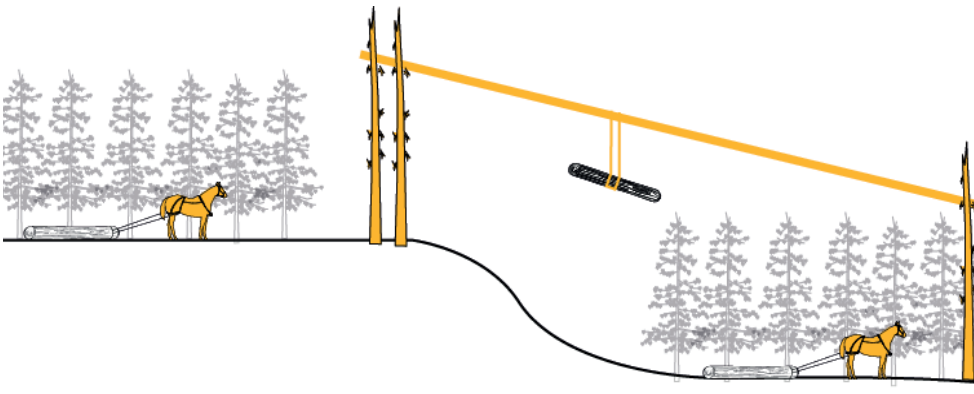
Sustainable Landscape Management | Diagram

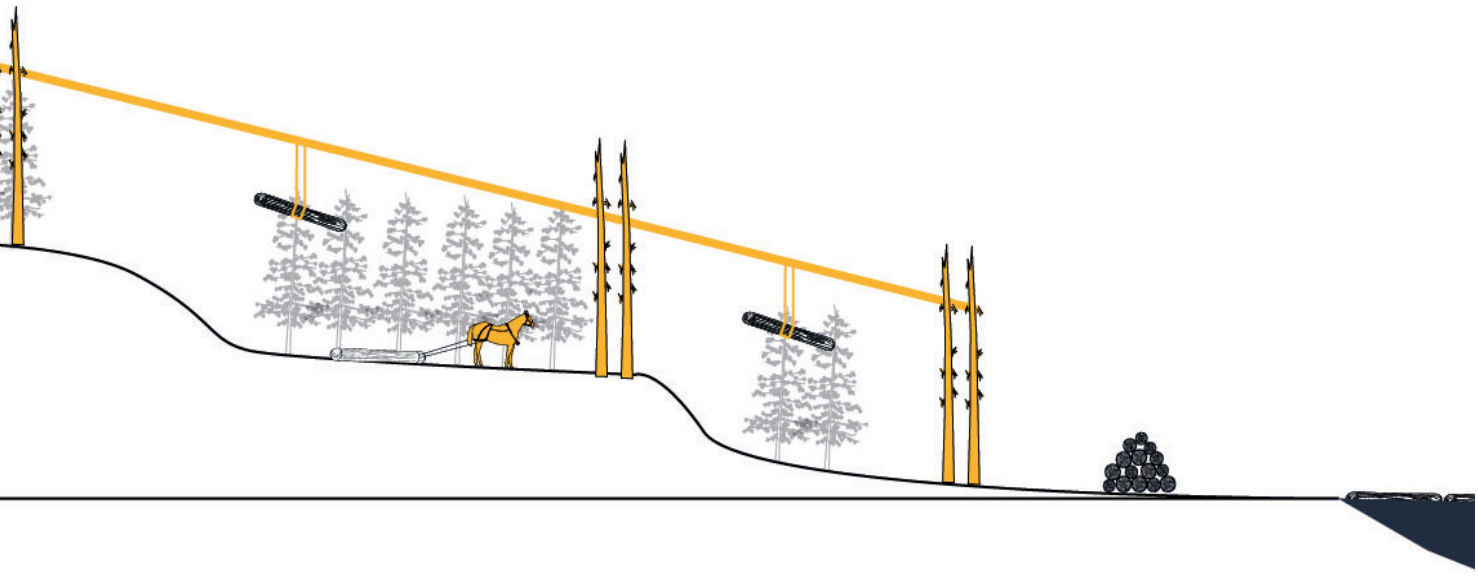
The diagram illustrates an overview of the logging system, which is depending on the topography of its underlying landscape.



Sustainable Landscape Management | Section 1:400

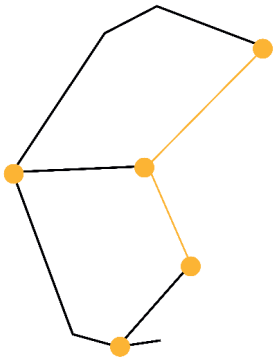
The section illustrates a clear overview of the wood logging process from uphill towards downhill where the wood will be collected in the water. With low impact measurement this system will function in a sustainable way, without utilizing machineries.





Enhance Accessibility | Diagram

The diagram illustrates a simplified situation of the existing infrastructure (black) towards each town (yellow nodes) and the newly designed infrastructure through micro-connectivity to enhance the accessibility of the currently isolated towns.



Enhance Accessibility | Long Section
1:400

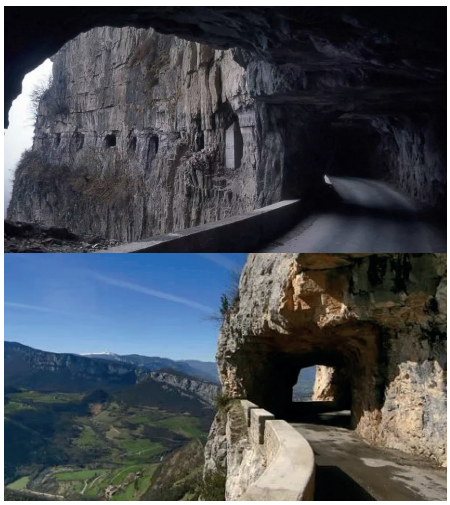
The long section illustrates the different intensities of micro-connectivity interventions. The most impactful intervention is the carved half-tunnel along the coastlines and the least impactful intervention are the hiking trail interventions.

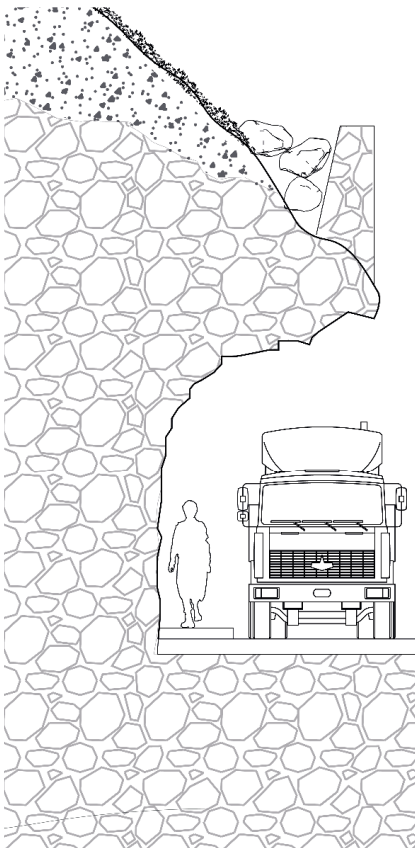
Enhance Accessibility | Detail Section
1:100 (scaled to fit)

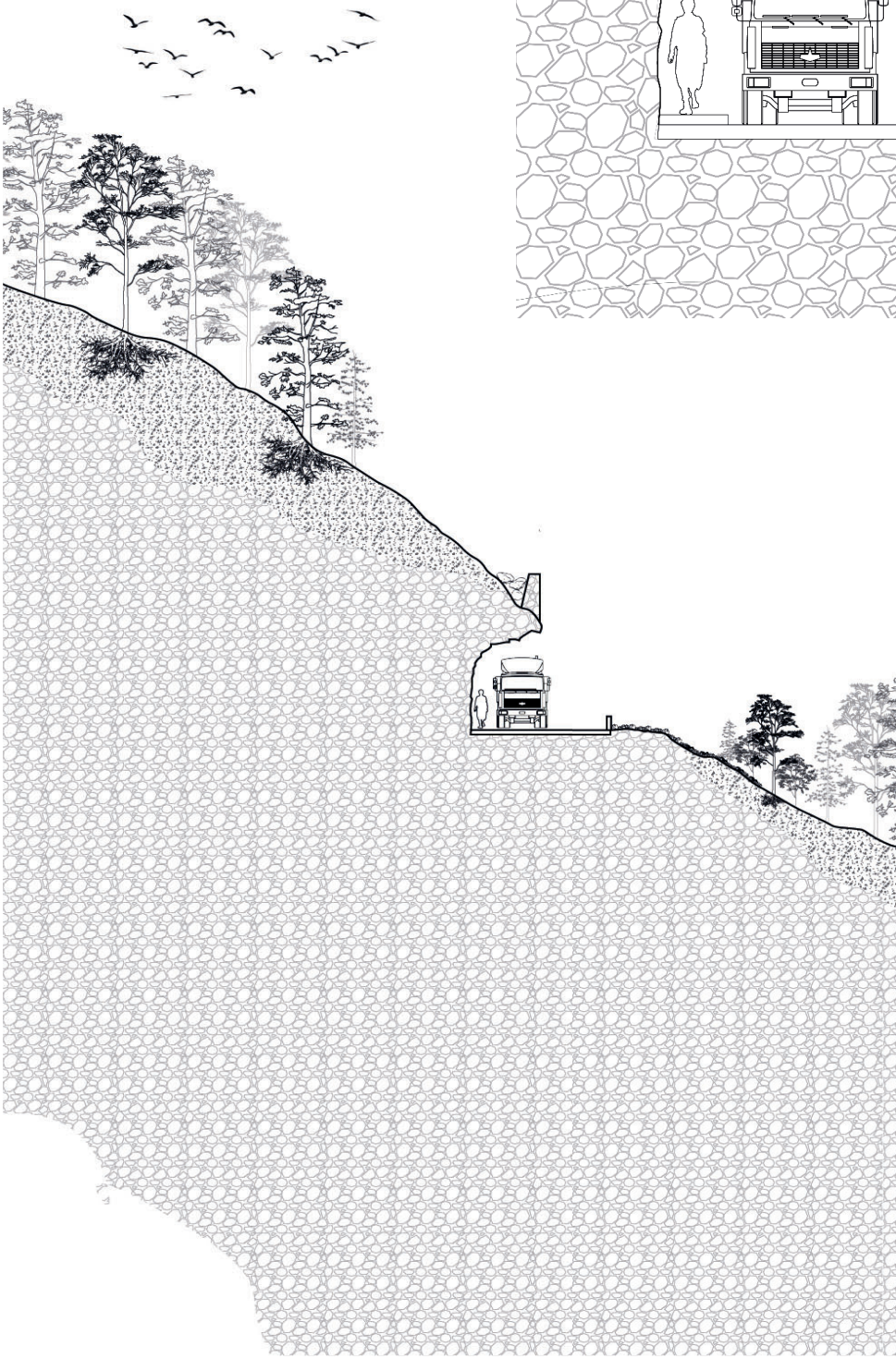
The detailed section of the half-tunnel illustrates the interaction with its surrounding landscape, functioning as a windowscape for vehicles while providing an open intervention instead of an isolated inner-mountain tunnel. To contribute to the circular economy, the rocky waste materials will be utilized for both infrastructure and land slide barriers.

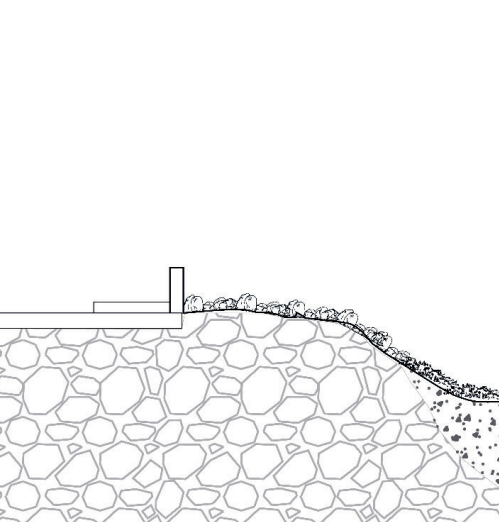
The detailed section of the hiking paths illuestrates the alternative low-impact intervention for micro-connectivity. In this way, micro-connectivity will provide for both vehicles and pedestrians, in different scales, forms and intensities.

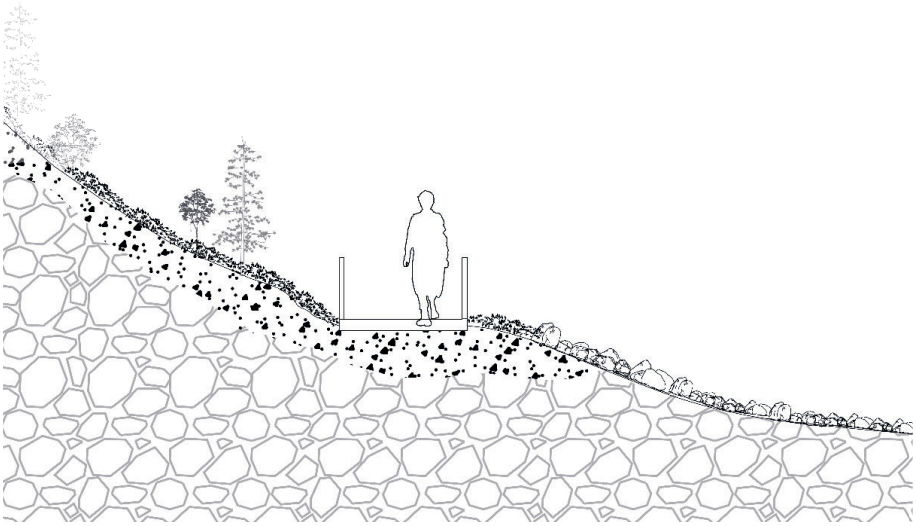
Reference Guoliang Tunnel

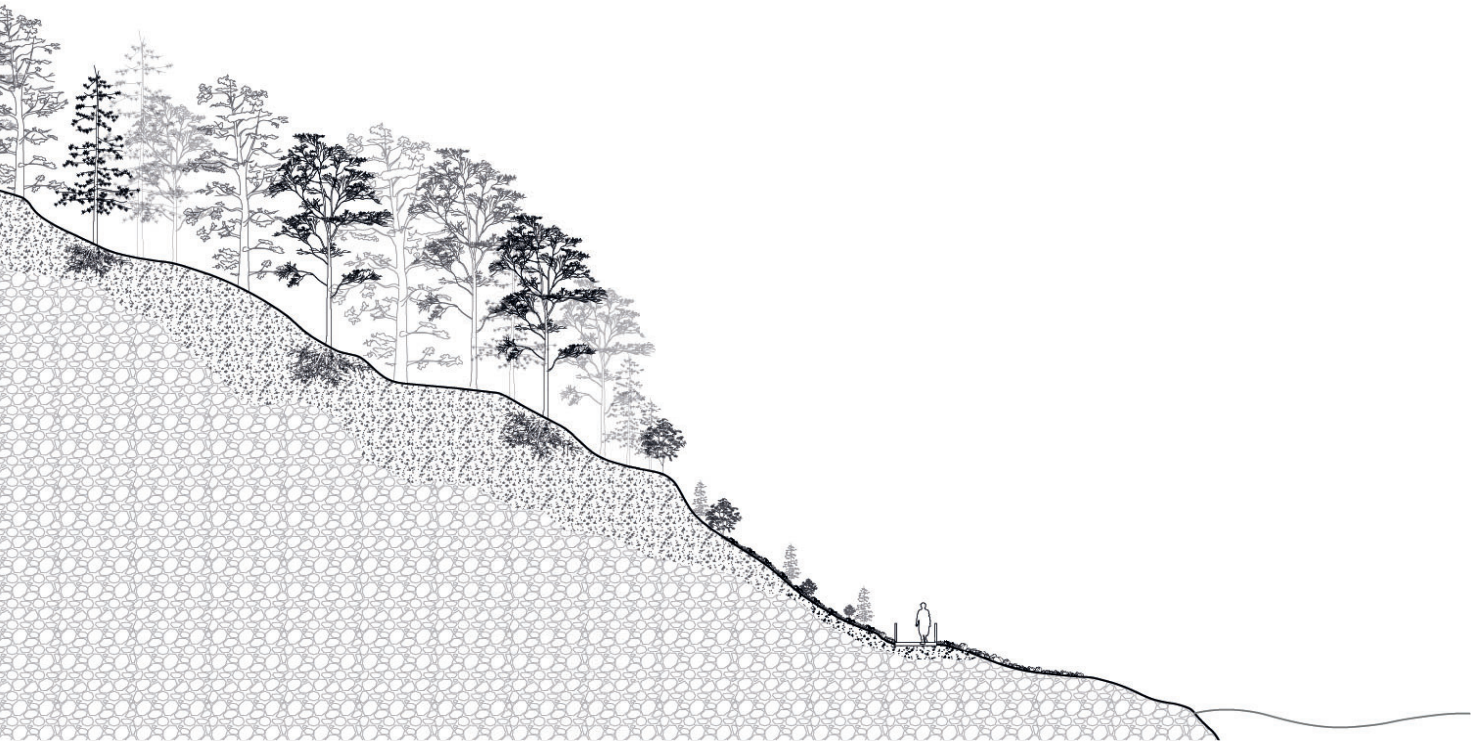














4. Towards a Floating Future

Kim Schneider | 4784863

Scenario making

introduction

For each of the individual strategies, a specific location has been critically selected to provide different scenarios through different identities. In this way, different approaches toward the common goals and enhancing the sense of belonging by emphasizing the various identities and historical landscapes are analyzed and reviewed.





Manifesto

This manifesto centers around Bakkagerði, a fisherman's village, focusing on its water-related identity. Situated in the northern part of the Eastern region, Bakkagerði presents opportunities for future maritime connections with China, through newly accessible Arctic shipping routes due to global warming. Additionally, the new port in Bakkagerði aligns with an existing transnational port development plan, indicating the potential for global connectivity. The manifesto also emphasizes Bakkagerði's individual contribution on a smaller scale, in line with the regional guidelines. The port plays a crucial role in the timber-based economy as it functions as the final station for the processed wood from which it will be shipped internationally.

The port's identity revolves around its relationship with water and its dynamic nature. Despite being overlooked and underappreciated, the village's and island's undeniable connection to water should be celebrated. Rather than perceiving the rising sea level as a threat, it should be transformed into an opportunity to profit from the port's dynamic characteristics.

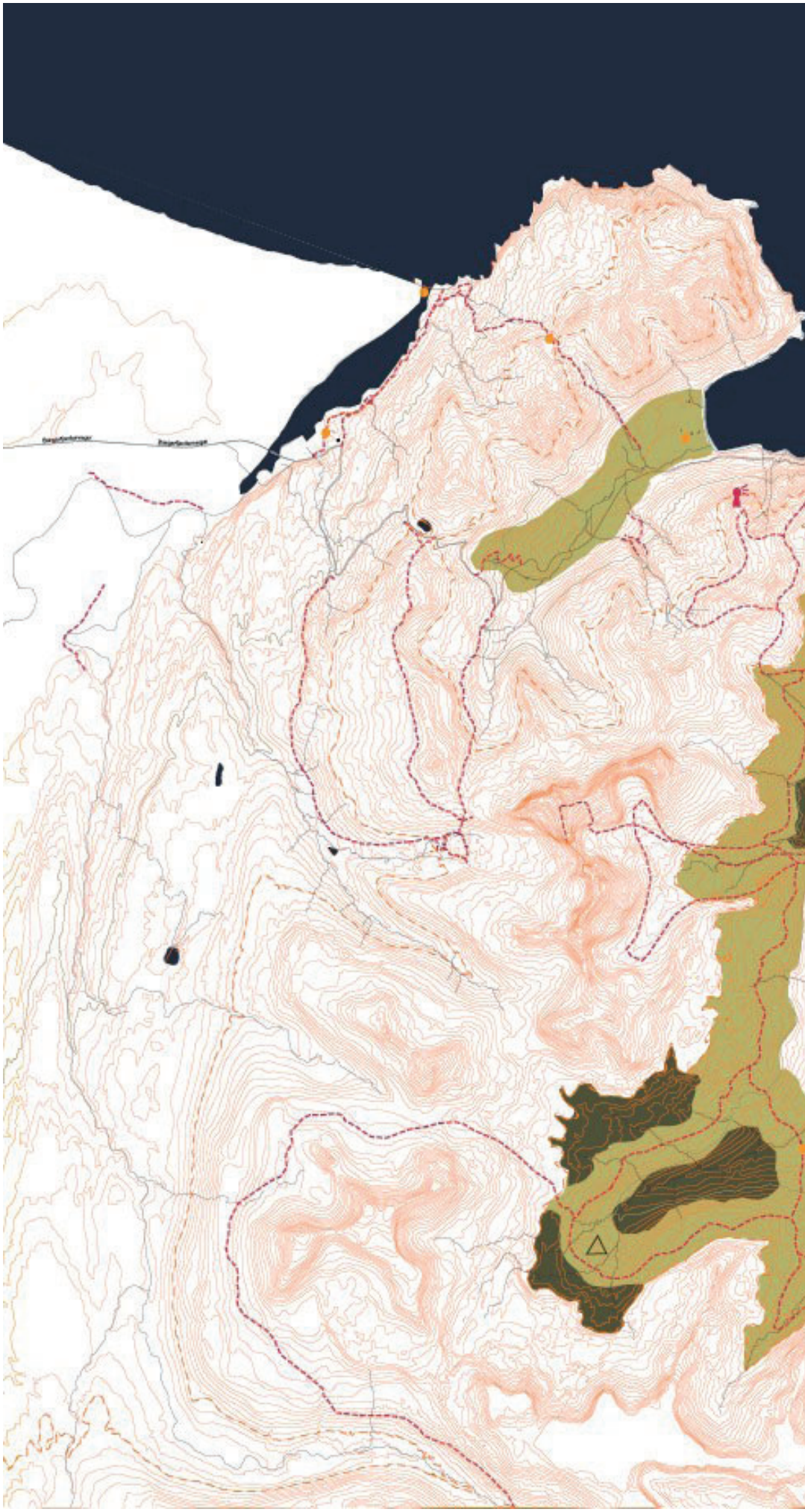
At the core, the strategy revolves around the porosity of the land-water interface, as well as the perspective of and from water. Currently, the interface between these elements is static, forming a divisive border rather than a harmonious reality. The project proposes revaluing the cultural significance of water and its interrelation with land and human interaction. In this case this will be tested through a floating port multi-scalar intervention. Similarly, attention is given to the natural landscape, by introducing the reforestation program the question arises of how to act upon the wildlife-urban interface. Therefore, boundaries, flows, and territories are again crucial aspects of how to intervene in both of natural and human habitats.

Based on the key elements and guidelines, a strategy is developed. The foundation of the plan involves a reforestation program that aims to restore the eroded landscape of the valley up to 400 meters. This program includes recreational and natural patches, offering opportunities for experiencing the village's identity through hiking trails across the fjord (region). Integrating the existing saga locations within these restored landscapes allows interactive experiences of the area's identity. However, productive patches are not located within this area, as the site is too far from the production factory in the southern area.

Zooming in, the integration of the reforestation program and the port identity is shown. A green corridor beneath the urban fabric acts as a barrier, separating the remote hinterland from the port village and protecting it from noise pollution from the (air) port. Additionally, a separation is designed between the western and Eastern parts of the valley. The right side, with protected natural sites, is minimally intervened, while the left side, where the current port is located, receives focus for interventions.

The key principles involve the interaction of land and water. Green fingers originating from higher mountains, along with hiking trails, provide connections to the port and integrate the port identity experience into the design. The port is a floating platform, built through a floating foundation system (FFS), with adaptability to shifting water levels. It is a low-impact intervention as it could be easily removed and only interrupts the landscape through the two access points. The forest experience extends towards this floating port and into a floating wetland park, blurring the static border between land and water in a playful manner. The forests act as the cohesive element of the strategy while stepping on the water prompts visitors to acknowledge the interrelationship and opportunities provided by water dynamics. In this way, water is utilized as a tool to connect different elements while transforming borders into flexible components.

Kim Schneider



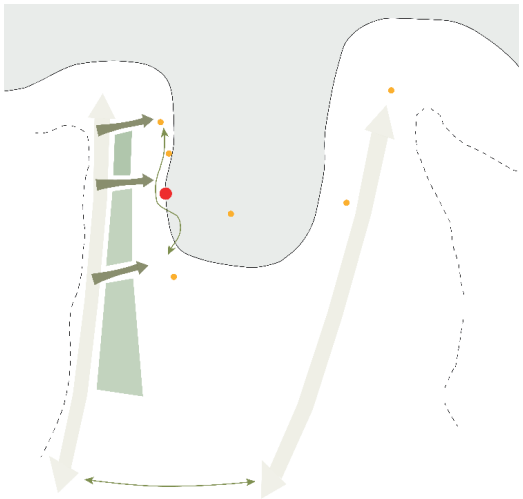
Individual Strategy Map
1:75.000

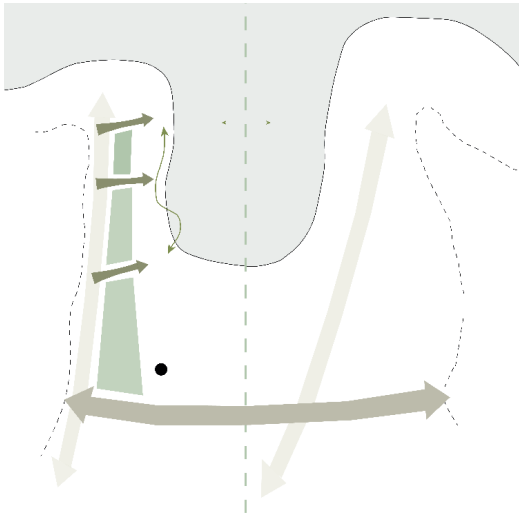
This strategy map illustrates an overview of Bakkagerði in which the reforestation program including hiking trails creates an integrated design by connecting the port valley on different scales, while restoring the damaged landscape.

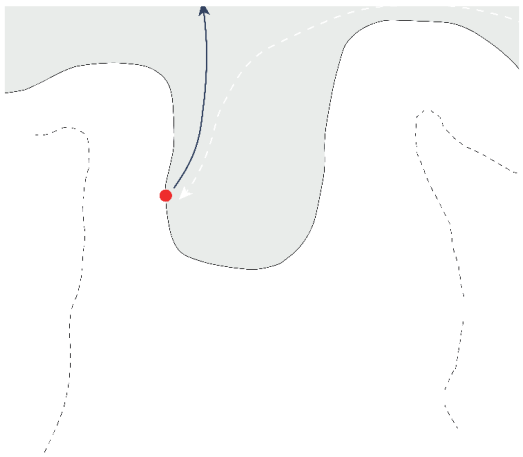
Legend

- topography lines
- 400 meter mark
- ocean / rivers
- runoff water
- roads
- hiking trails
- built environment
- recreational forest
- natural forest
- landslide control barrier
- ferry routes
- viewpoints
- campsites
- saga sites
- port







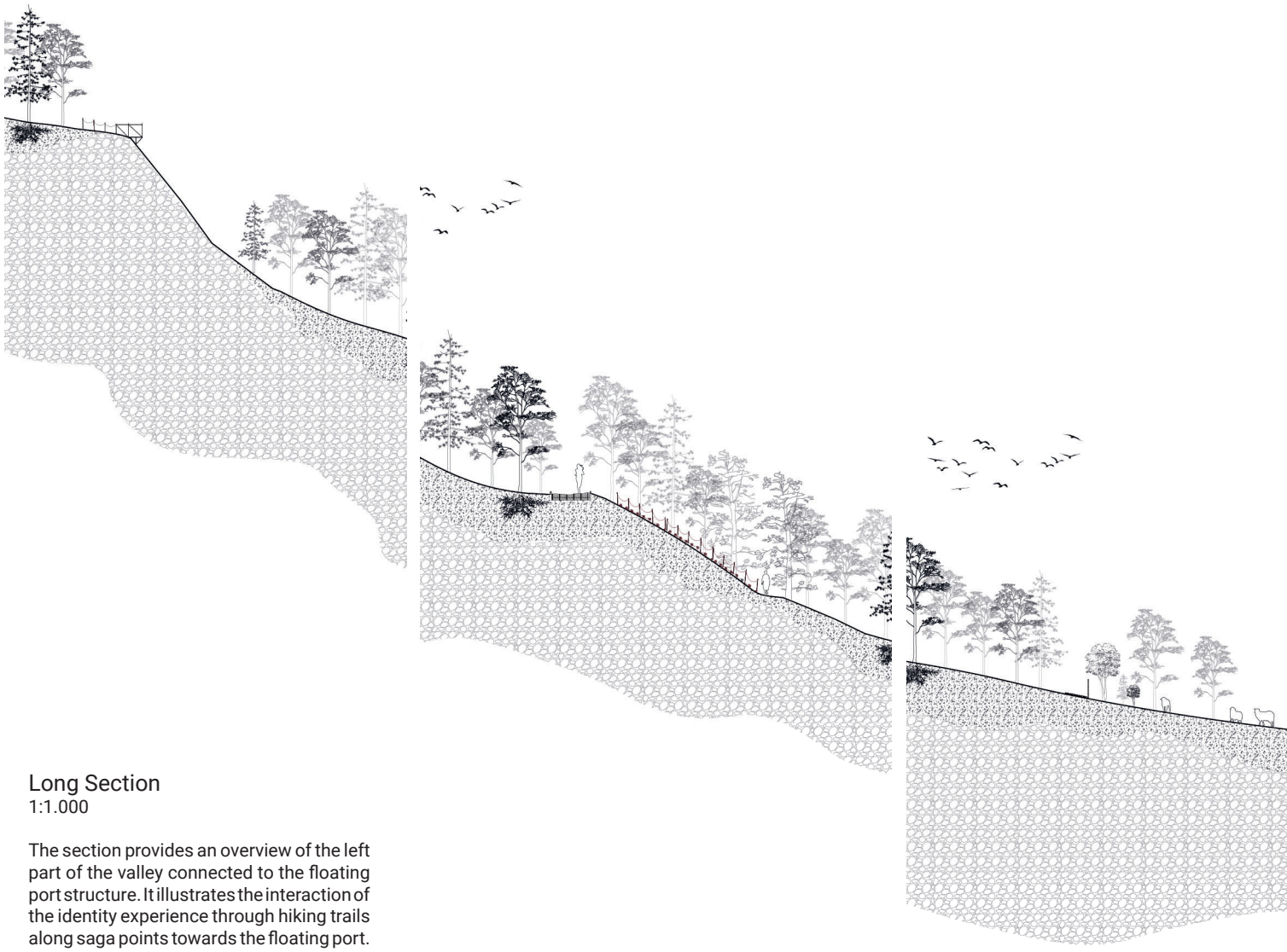


Principle Diagrams (left)
1) integrated identity experience.
2) green structure
3) maritime connections

Zoom-in Strategy map (right)
1:50.000

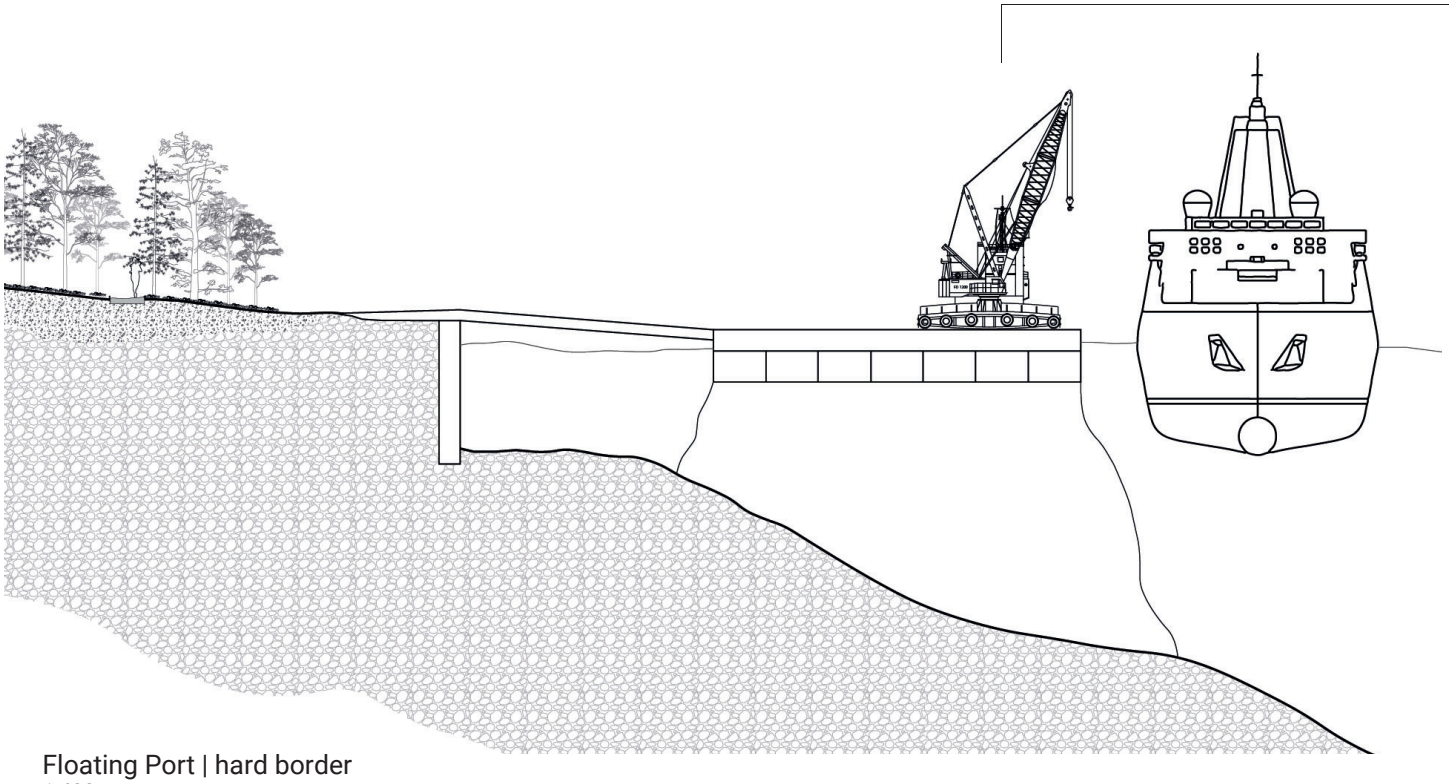
In this zoom-in, the integration of the reforestation program and the floating port (orange triangle) is clearly visualized. The hiking trail identity experience is not limited to the reforestation program but extends into the port and village identity.





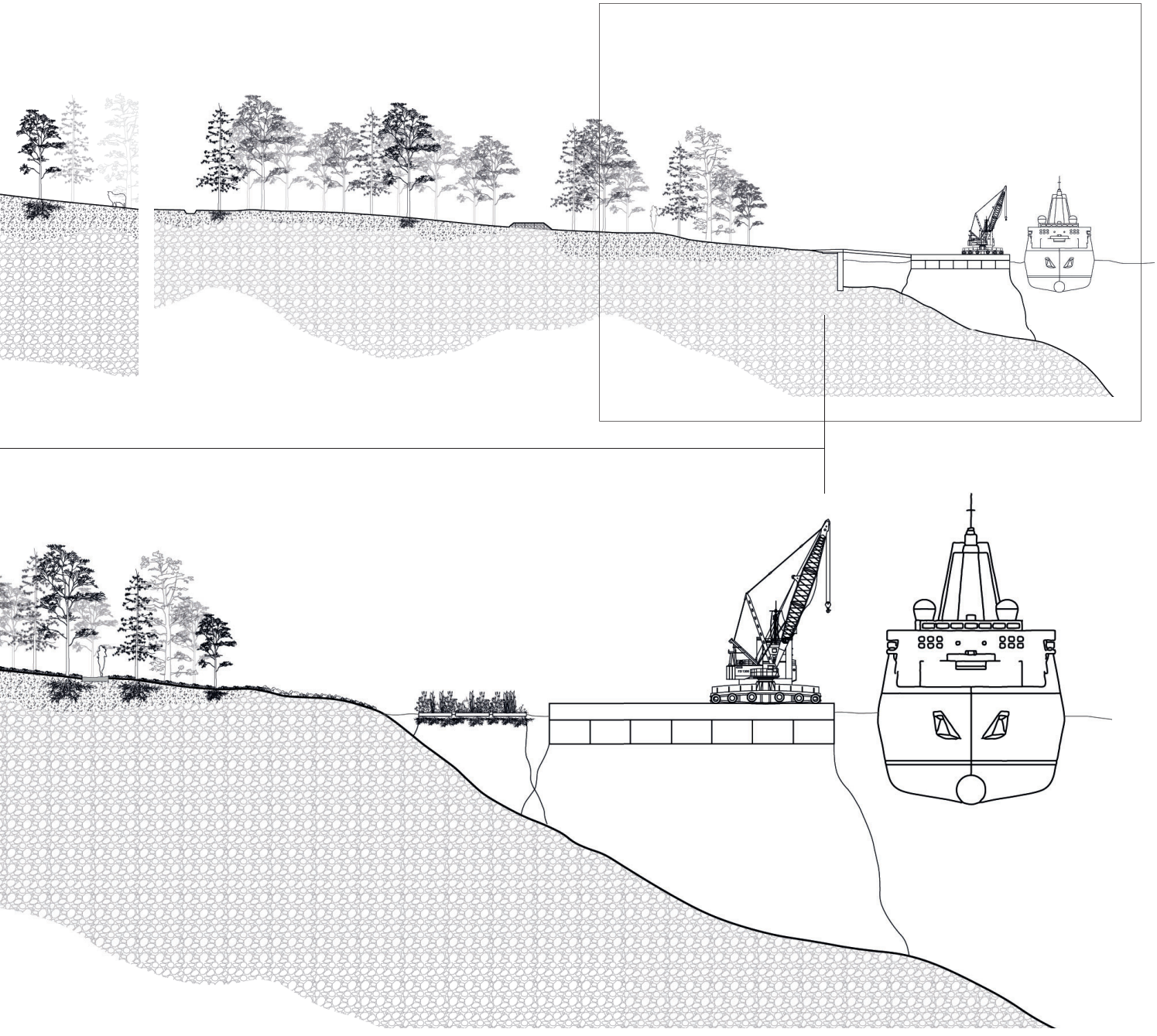
Long Section
1:1.000

The section provides an overview of the left part of the valley connected to the floating port structure. It illustrates the interaction of the identity experience through hiking trails along saga points towards the floating port.



Floating Port | hard border
1:400

This section provides an overview of the brief, hard interruptions of the natural coastline by the constructed quay walls with their access bridges towards the floating structure.



Floating Port | soft border
1:400

This section provides an overview of the soft border consisting of floating wetlands, connecting the floating structure to the green structure. using water as a medium.

Floating Port Map and Section (right)
1:1.000

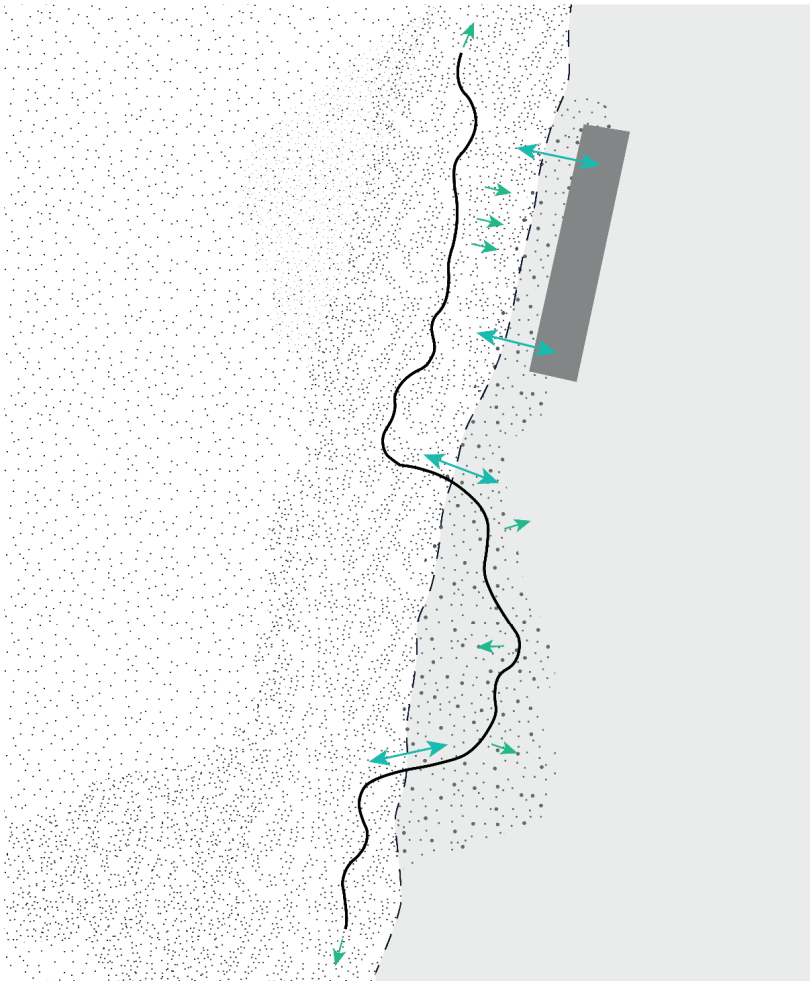
The map illustrates an aesthetic overview of the integration of the land and floating green structure and the floating port platform, supported by its section. The reforestation program creates a fluent border between the existing agriculture (left of the road) and the newly constructed floating port. At the same time, the floating wetland park creates an integrated, fluent transition between land and water interventions.

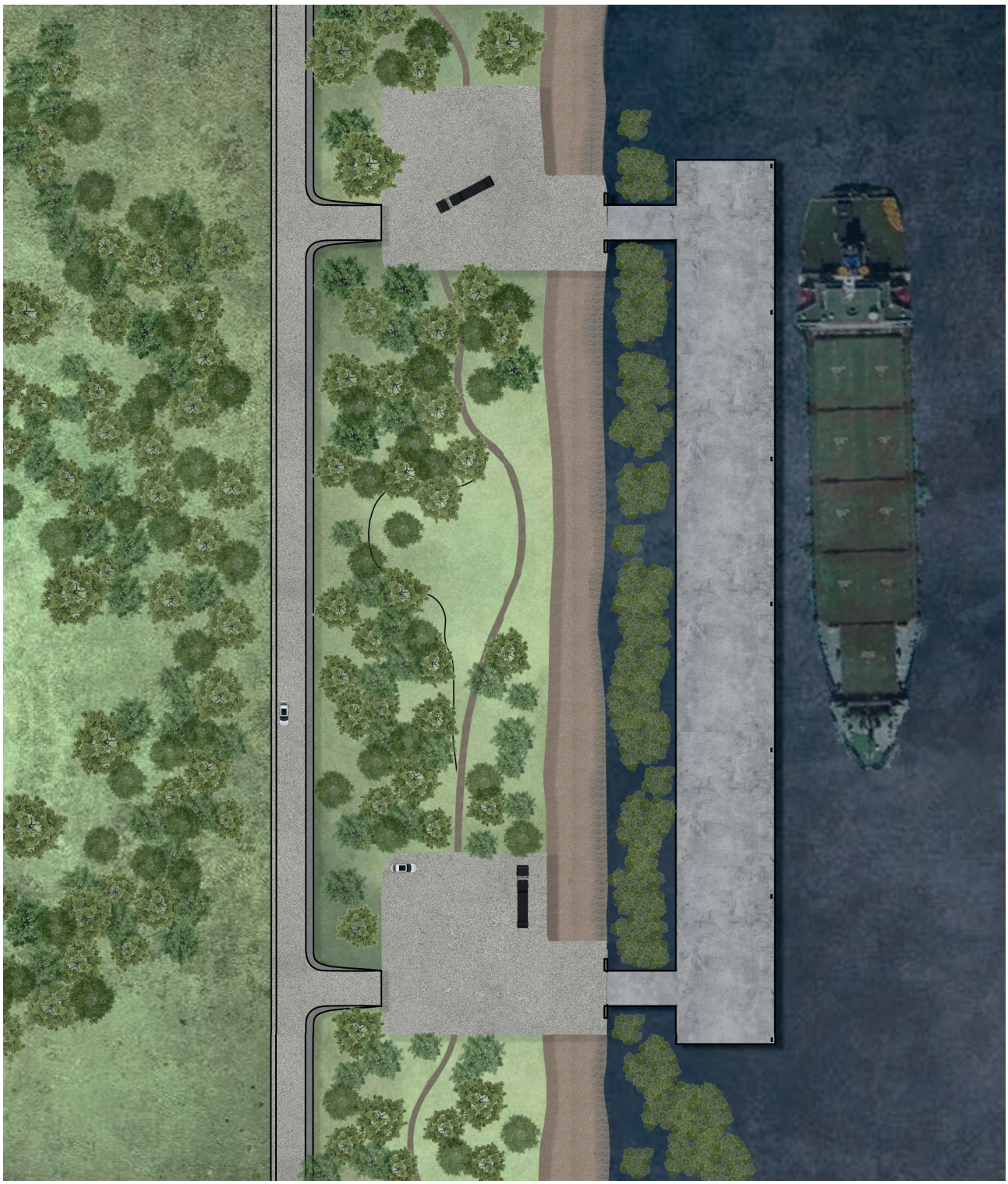
Diagram principle (floating) wetland park (left)

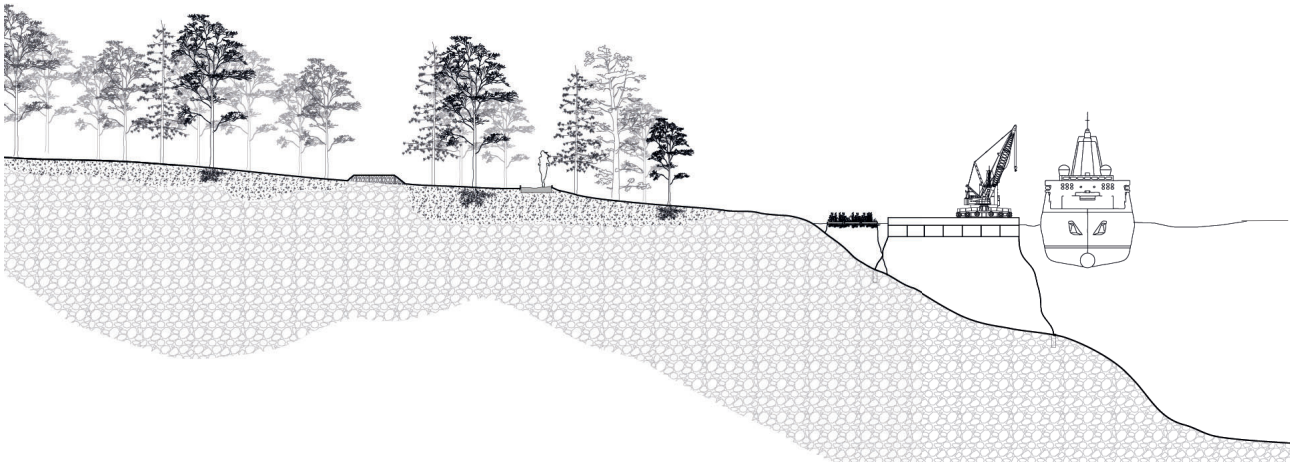
This diagram explains the integration of the identity experience with the floating port through the green structure while interacting with the water landscape.

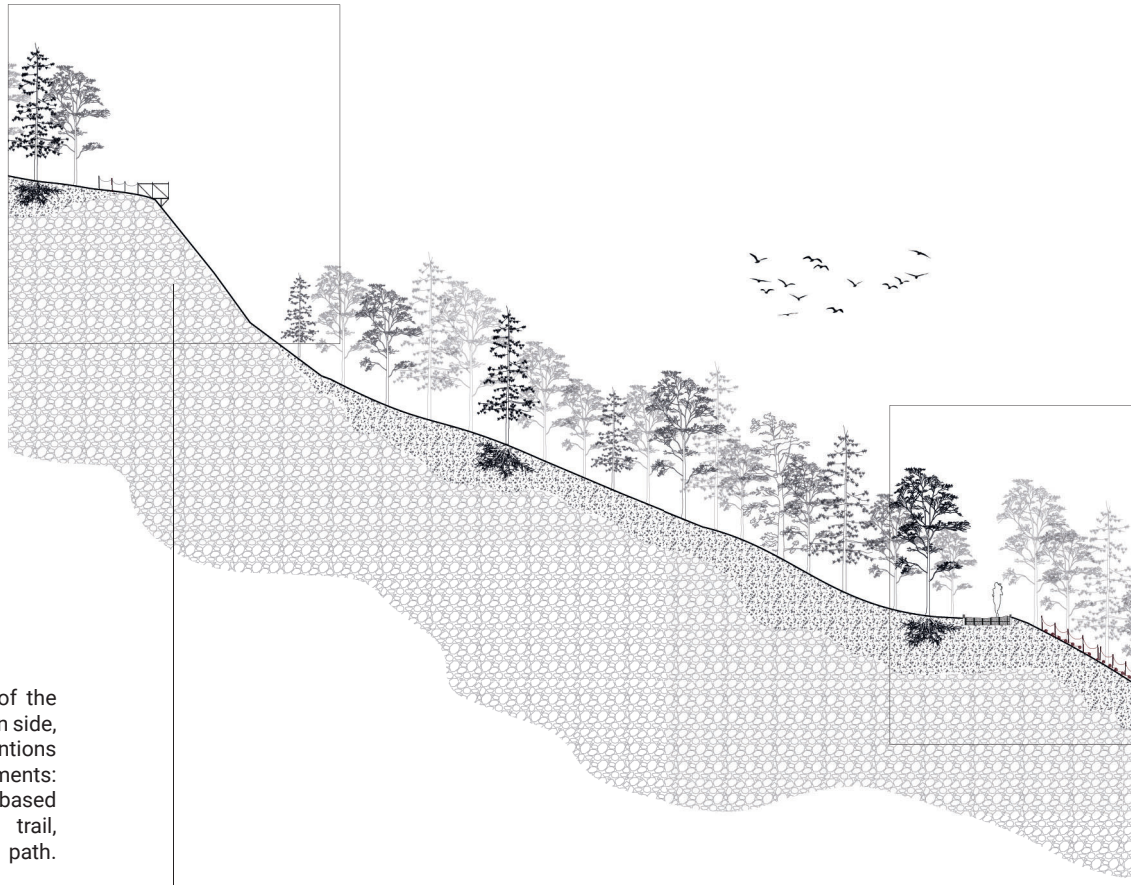
Legend

- viewpoints
- interactive border
- floating port
- water
- agriculture
- reforestationprogram
- floating wetland park



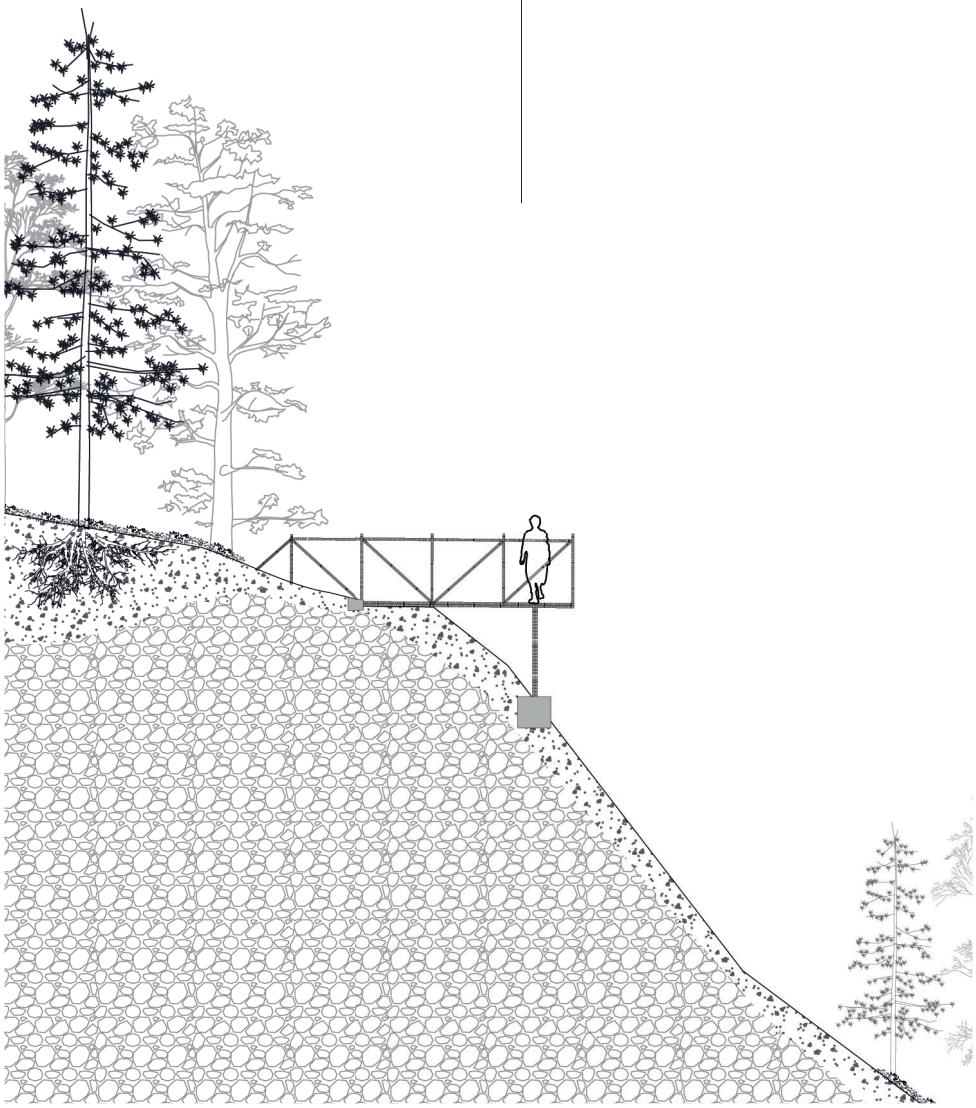


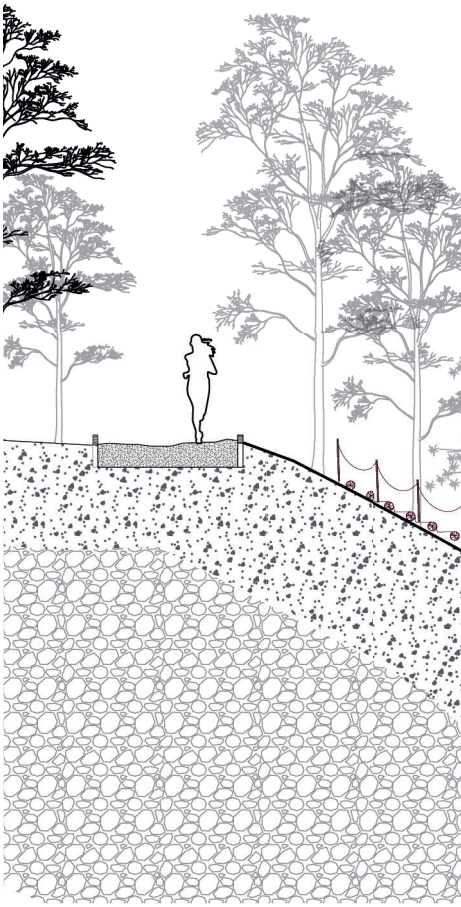


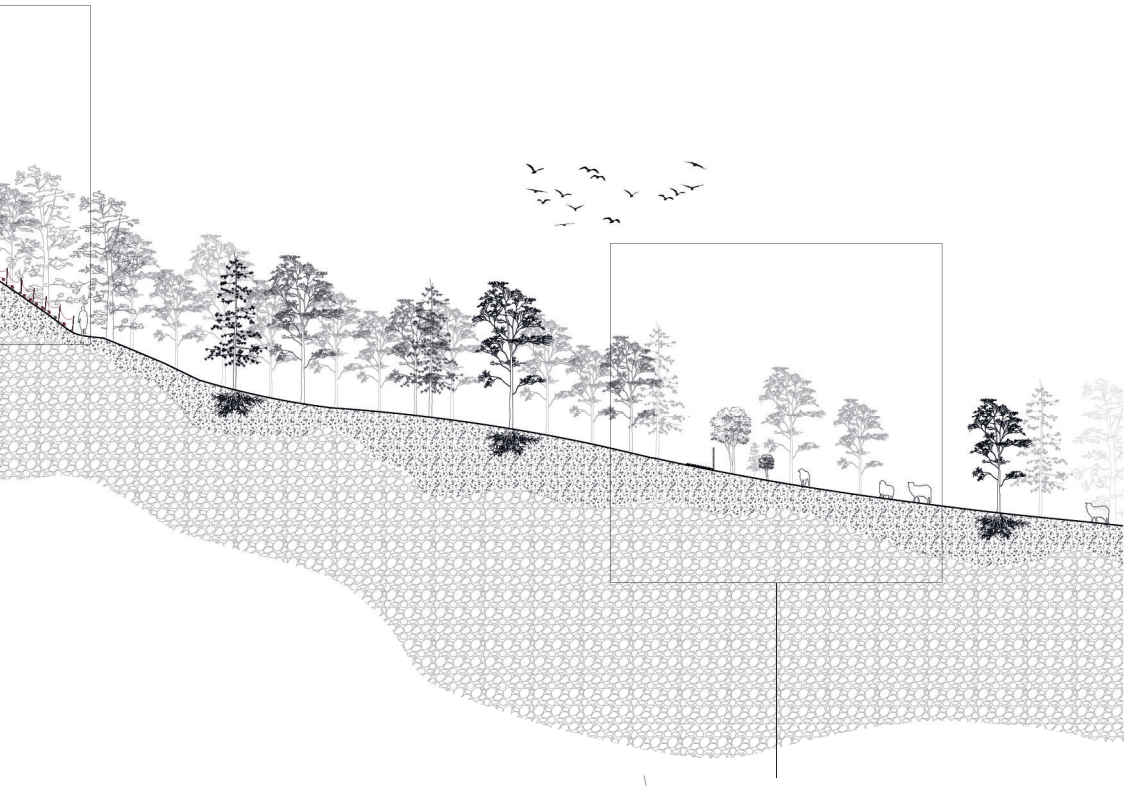


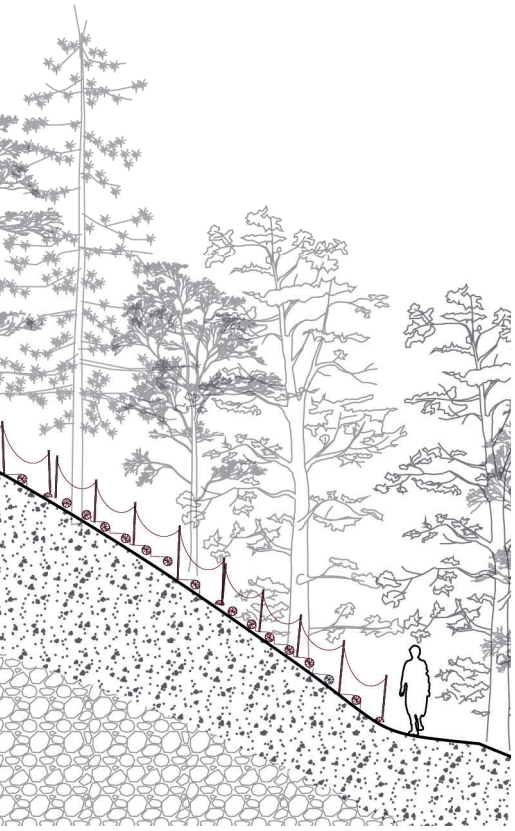
Long Section Mountain
1:1.000 (above) | 1:200 (under)

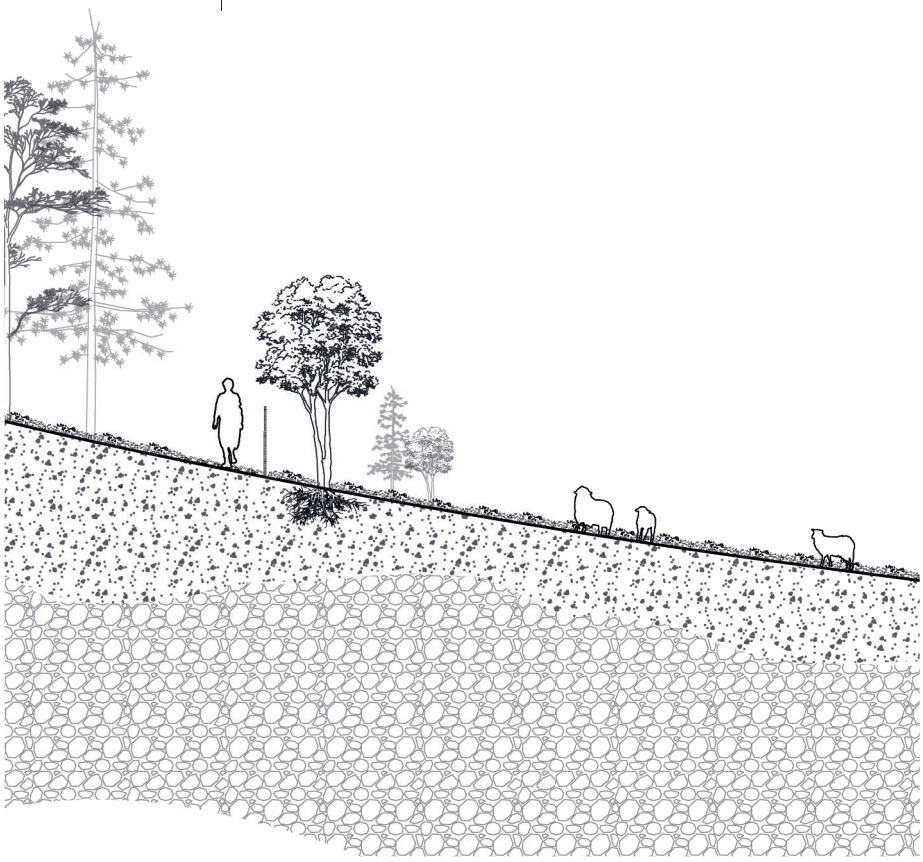
The section provides an overview of the left part of the valley, on the mountain side, illustrating the various hiking interventions with different impact measurements: a viewpoint, wooden trunk-based stairs towards a soft hiking trail, and a gravel hiking path.

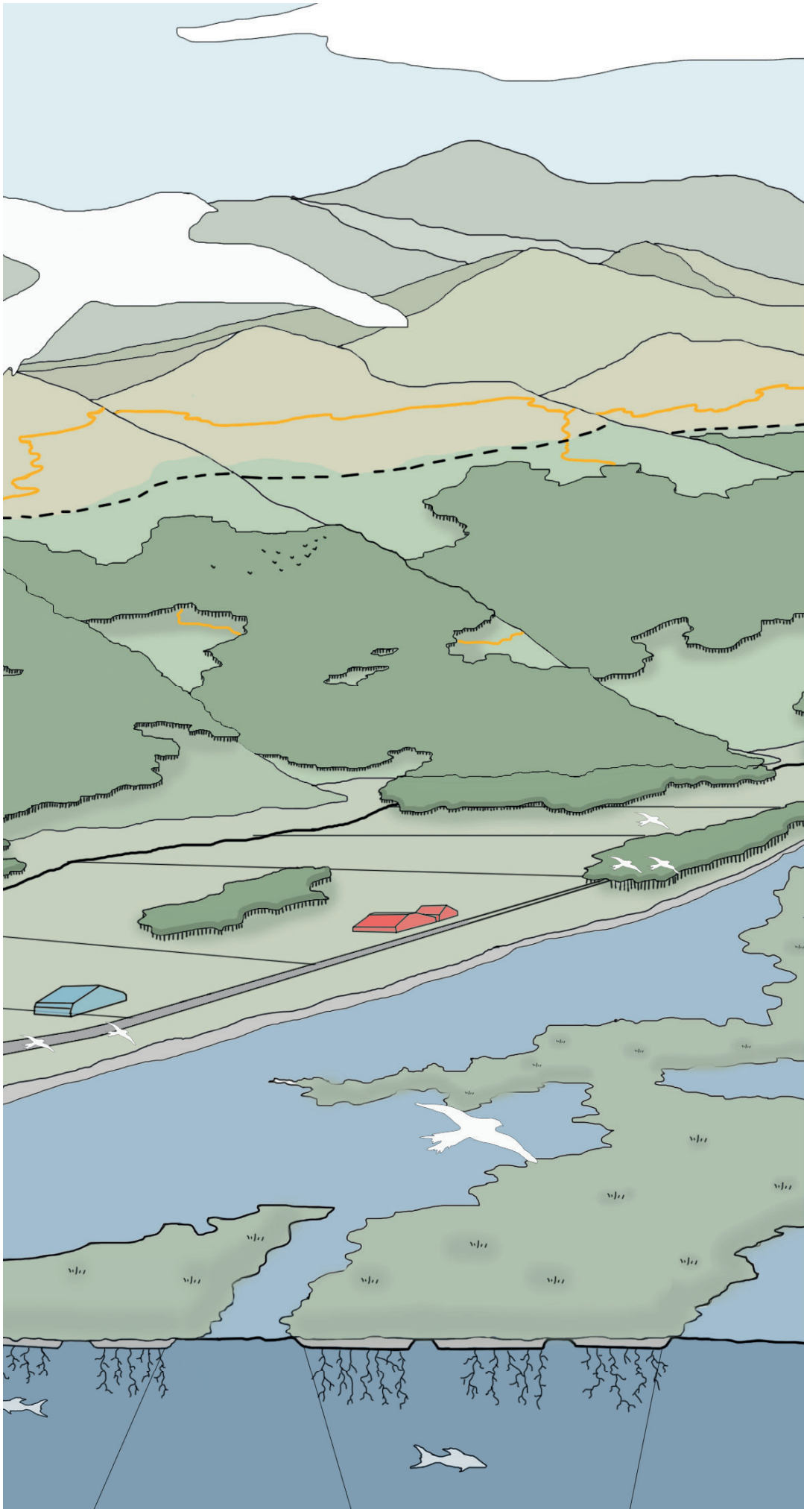








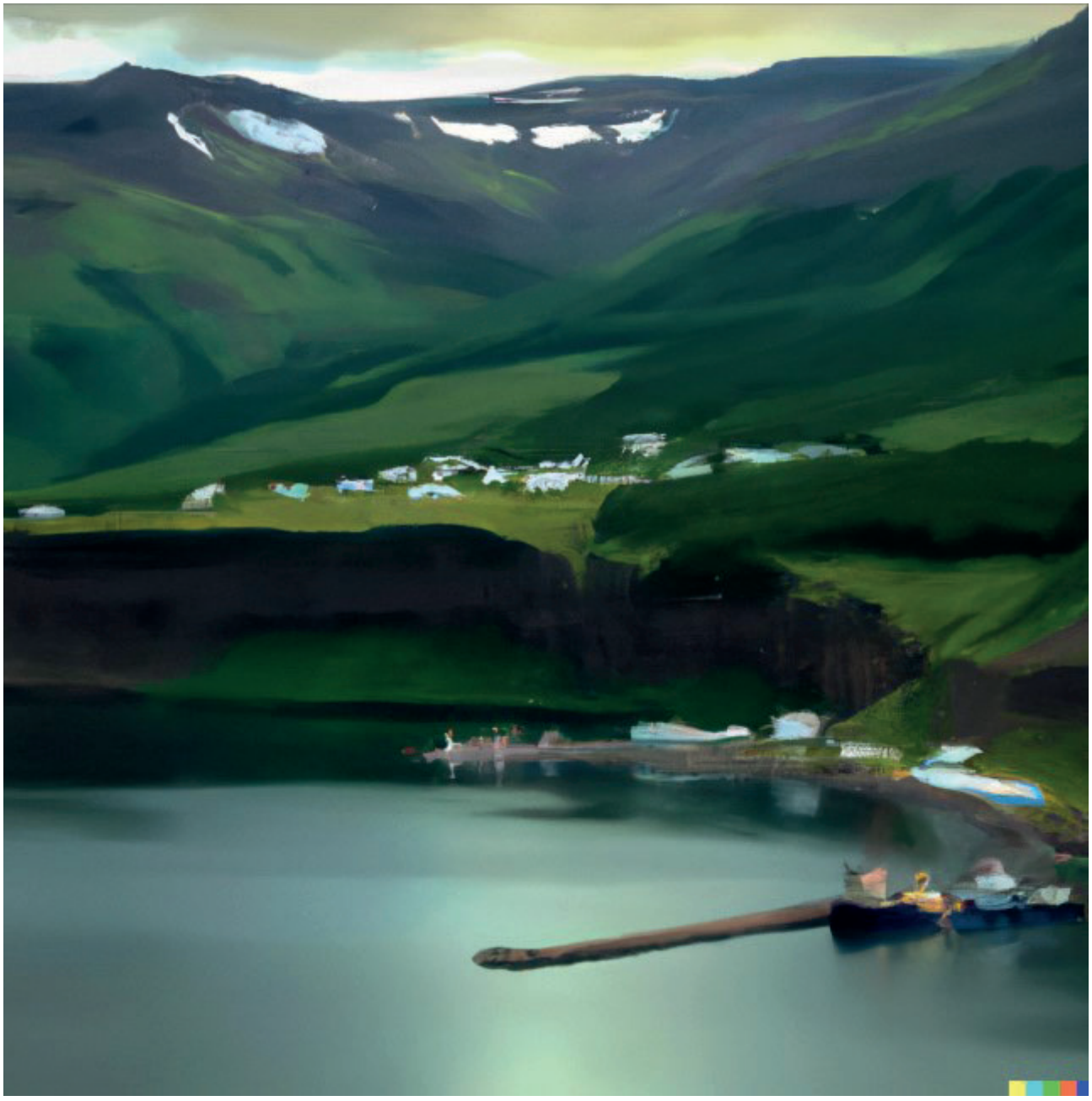




Impression drawing

This drawing provides an overview of the integration of the green structures and floating port, through the interaction with water. The interactive identity experience along the saga points melts into the port and floating wetland park experiences, resulting in a coherent entity.





AI generated impression of floating port

An AI generated impression of the calm environment surrounding the floating port in the Bakkagerði valley.



AI generated impression of a saga experience

An AI generated impression of the mystical sagas of the Icelandic restored landscape along the hiking trails.

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Jóhannesson, T., Hansson, G., Ingólfsson, Ö., Brynjólfsson, S., Hreinn, M., Jónsson, Ó. H., & Grímsdóttir, H. Snow avalanches hitting deflecting and catching dams in Iceland.

Pictures:

Guoliang Tunnel was dug through the side of a mountain by hand. (z.d.). https://www.dangerousroads.org/asia/china/46-guoliang-tunnel-china.html

Reflection Kim Schneider

While reflecting on this project, brings forward the interesting relationship between human interventions and natural landscapes. More interestingly, this relationship and the difference between landscapes and waterscapes. Waterscapes often play an important role in urban identities and function as foundations of their pasts, even though nowadays this value is blurred from our perspectives. This project aimed mainly to design a multi-scalar intervention that would provide a fluent, integrated land-water interface while emphasizing and celebrating the water-related identity of Bakkagerði, focussing on the port. Reflecting critically, it would have complemented the project by diving further into the water landscape and its soil and characteristics. Even though the focus was put on the interface of water and land, the separate landscape interventions were brought more light than waterscape interventions. More emphasis on the perspective of water could be an interesting and complementary approach.

At the same time, even though the focus was put on the water-land interface, this mainly concerned how to design low-impactful human interventions in a subtle and respectful manner. Further research on how to restore this water-land interface, that plays in the coastline area through for example wetland restoration or other interventions could be a great addition.

Nevertheless, this project taught me new perspectives and ways of how to design subtly and respectfully while still designing a regional strategy, for example through the micro-connectivity and floating port construction. Even these 'hard interventions' can be designed in a soft, low-impact manner while reaching the same goals. In the end, it is inspiring to see how each of the individual strategies are complementary and commonly supports a clear, regional vision while providing different perspectives on what if-scenarios.


Image Landsat / Copernicus



4. Among Nature’s Narrative

Merel Garritsen | 5055253



Manifesto

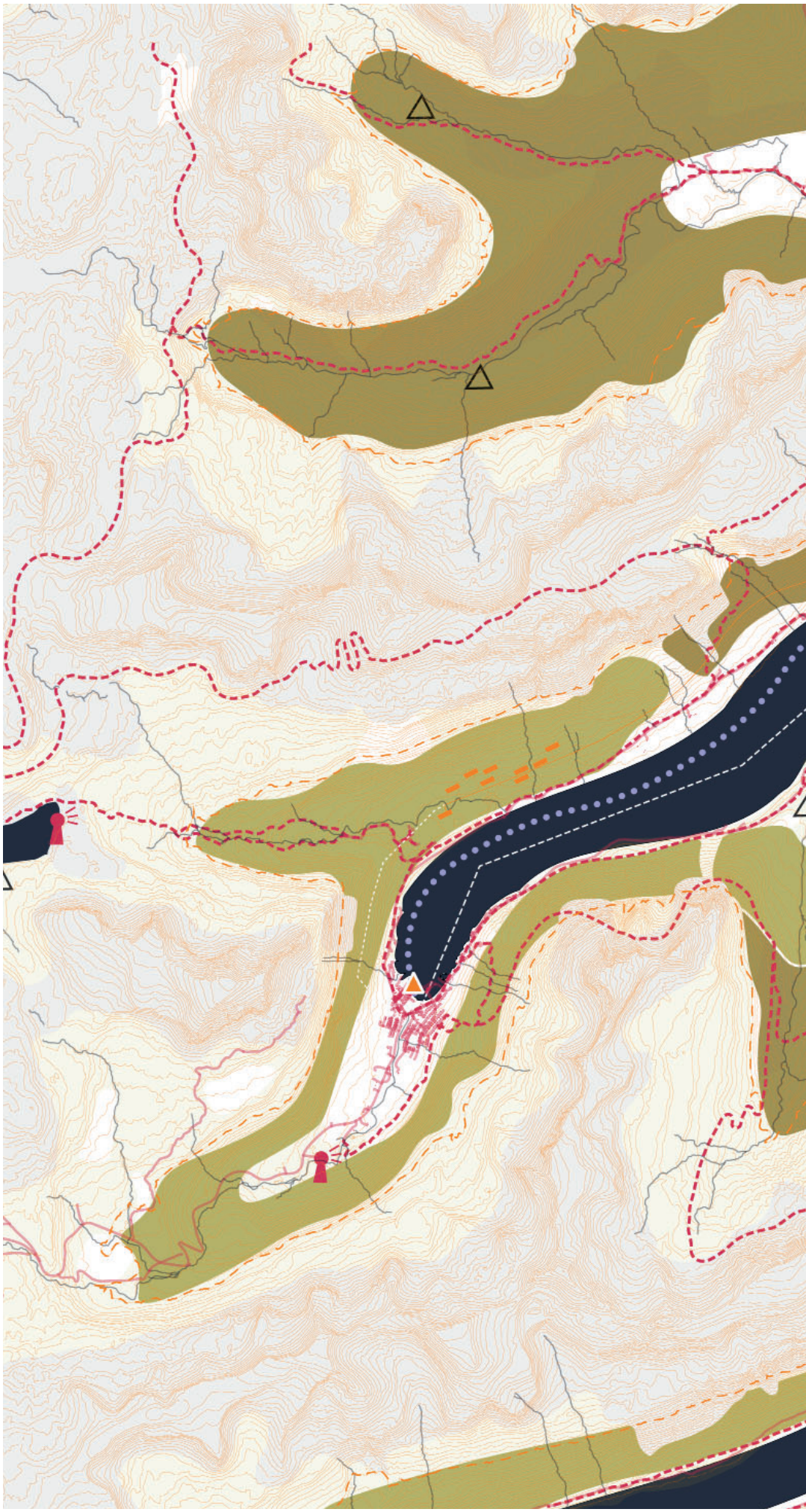
The tale of tourism in this region is told around the small town of Seydisfjördur. For years now, the international ferries have docked in the small port. Large cruise ships are continuously creating an immense contrast against the small nordic-style cottages. Towering above all other buildings and reminding everyone of their presence. When entering the village through the only available road, from the mountains, you have a beautiful view over the fjord and the valley. This route emphasises the amazing power that nature holds in this region. Large highland plains that are covered in snow for the majority of the year, cliffs that house and sustain the local puffin population, mighty waterfalls attracting many annual tourists, astonishing views that ýou can really not capture on camera'.

The power of nature also applies to this town specifically, as it was struck by a substantial landslide in late 2020, which destroyed a couple houses and damaged many more. This landslide was triggered by a couple days of heavy rain, causing the soil to become so saturated and heavy, that it all came down. The lack of vegetation on the slopes of the hill is what allowed the soil to become so saturated. Future landslides will be prevented from occurring by introducing a reforestation program. Vegetation will absorb the excess water and interrupt the smooth gliding surface of the slope. This will halt the sediment from the top of the hill to slide down to the valley. A landslide barrier based on a natural process, respecting nature in all aspects.

The power of nature is best experienced at eye-level. The larger-than-life sublime views that make you instantly realise what romanticism is based upon. These views and landscapes can be experienced through a vast network of hiking trails. These trails are based on the topography and the slope. They bring you to stunning viewpoints, over snowy mountaintops, along the campsites and coastlines. The intensity of this path-intervention is being kept as low as possible. Wooden constructions, wooden chips and logs that can be used to construct the paths can all be harvested from the local productive forests.

The power of nature is also contradicted in the small town of Seydisfjördur. Despite being very small, as one of the first complete settlements in the age of the vikings, the town gained quite some importance on the regional scale. The Icelandic internet cable comes to land in the little town, all the way from Scotland. The technical character is honoured by the placement of the technical museum. The internet cable, however, allows data centres to be installed in this fjord. The residual heat of those data-centres can be used to boost the tourist sector again, by introducing a spa centre on the coast of the fjord, overlooking the ocean.

The power of nature is the red line that this town is identified by. The relationship with nature is used as a tool to boost both natural and urban areas of the region, by focusing on low-impact interventions.



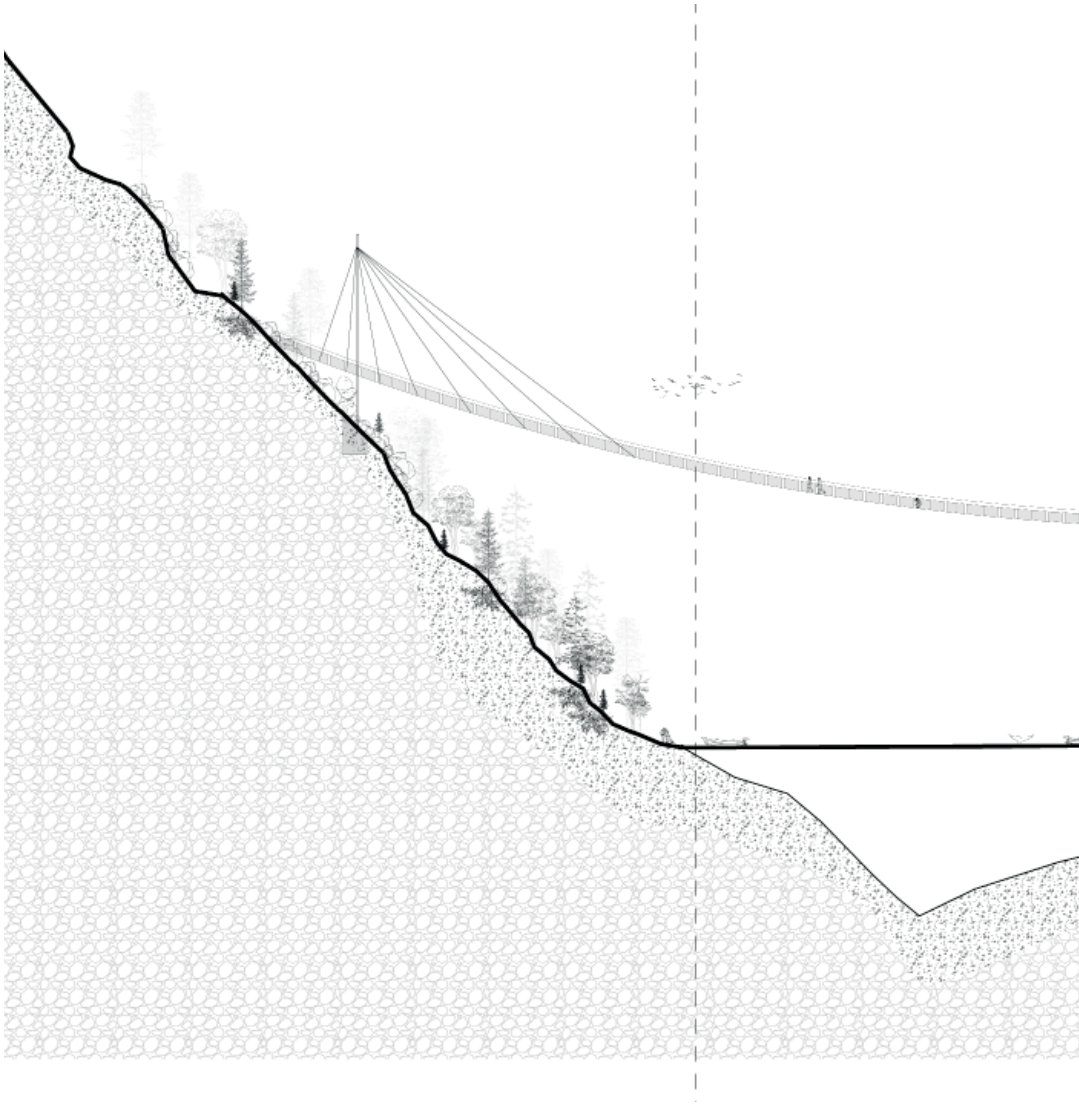
Individual Strategy Map
1:75.000

As Seydisfjördur has an identity that is interwoven with the presence of tourism, this will be enhanced with the regional interventions. The strategy map shows the hiking routes that will pass the touristic town of Seydisfjördur. The international ferries dock here. The lower sides of the mountains are forestated, to control erosion and prevent dangerous landslides from affecting the area. Another unique case is the Icelandic internet cable coming up in Seydisfjördur, from the atlantic ocean. Despite the presence of a technical museum, the technical character is underexposed. To enhance this side of the town, while also adding to the economical prosperity of the down, data centres will be installed on the lower slopes of the hills. With the residual heat they generate, a spa resort on the other side of the fjord can be heated.

Legend

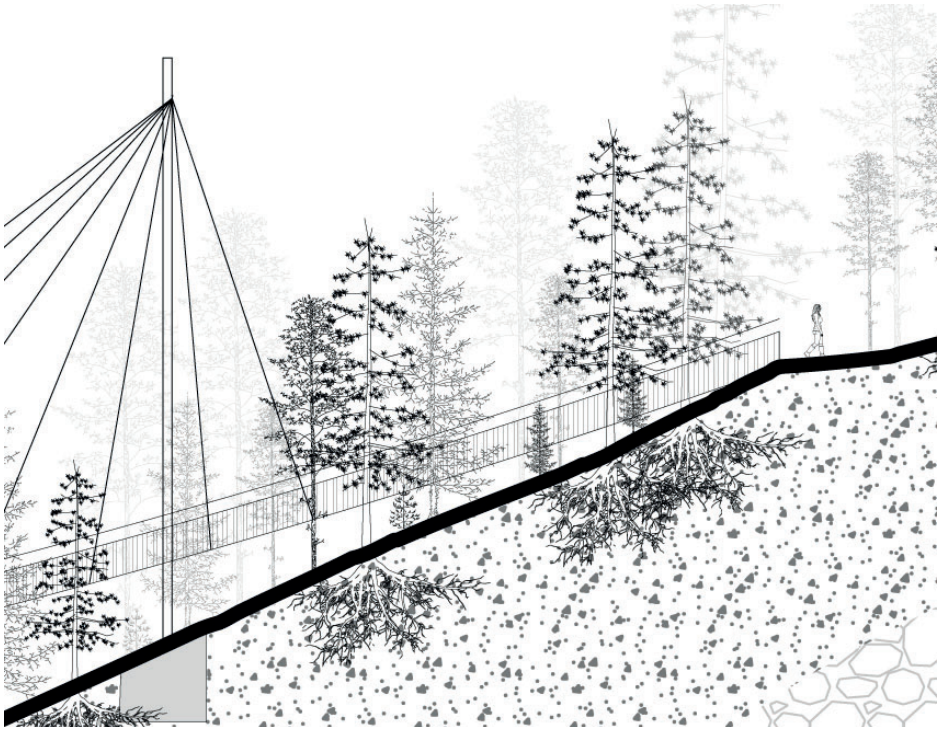
- topography lines
- 400 meter mark
- ocean / rivers
- runoff water
- bare rocks
- sparsely vegetated
- roads
- hiking trails
- built environment
- productive forest
- recreational forest
- natural forest
- wood collection points
- ferry routes
- internet cable
- viewpoints
- campsites
- data centres
- heat transportation
- port





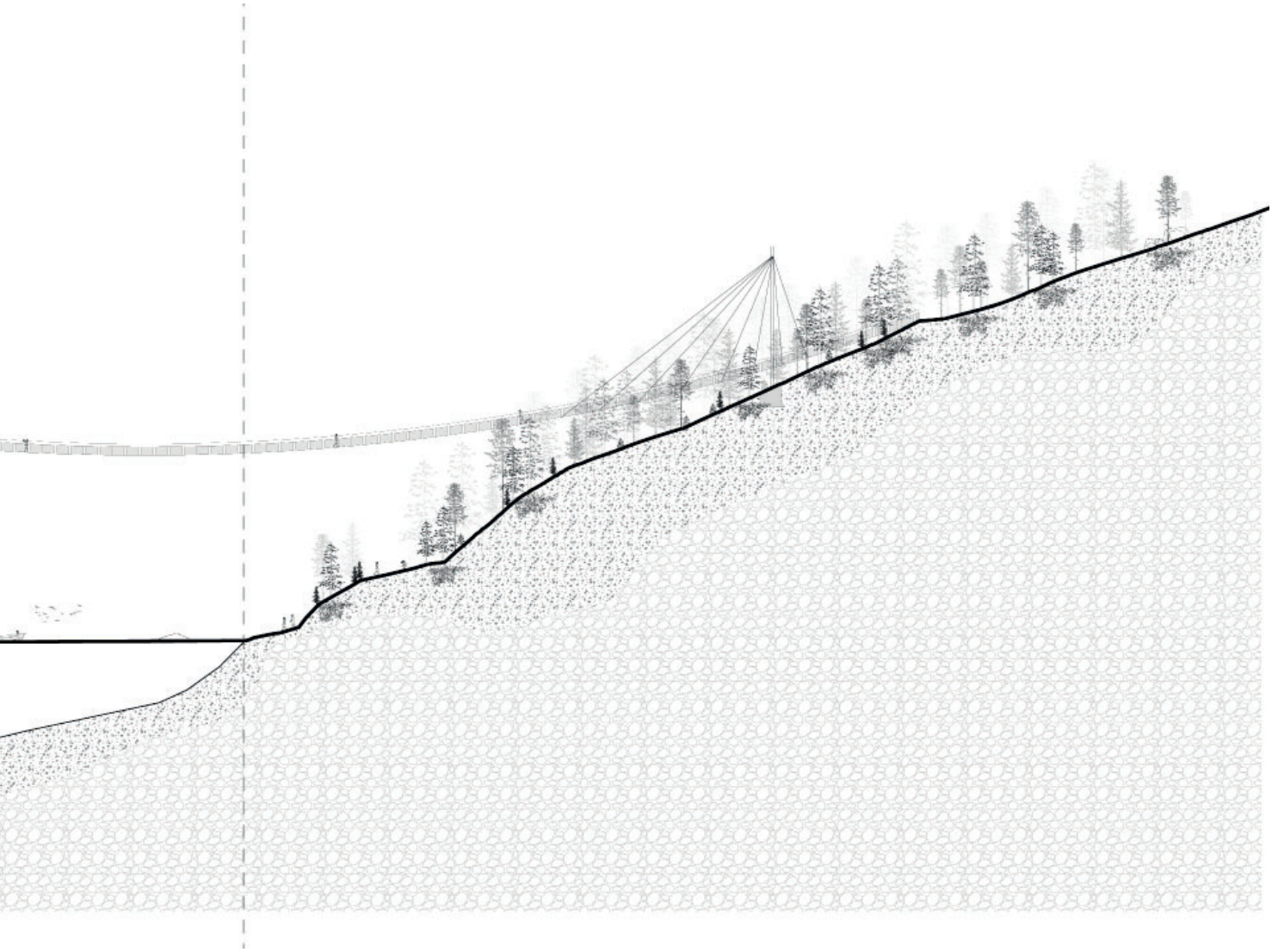
Long Section
1:1.000

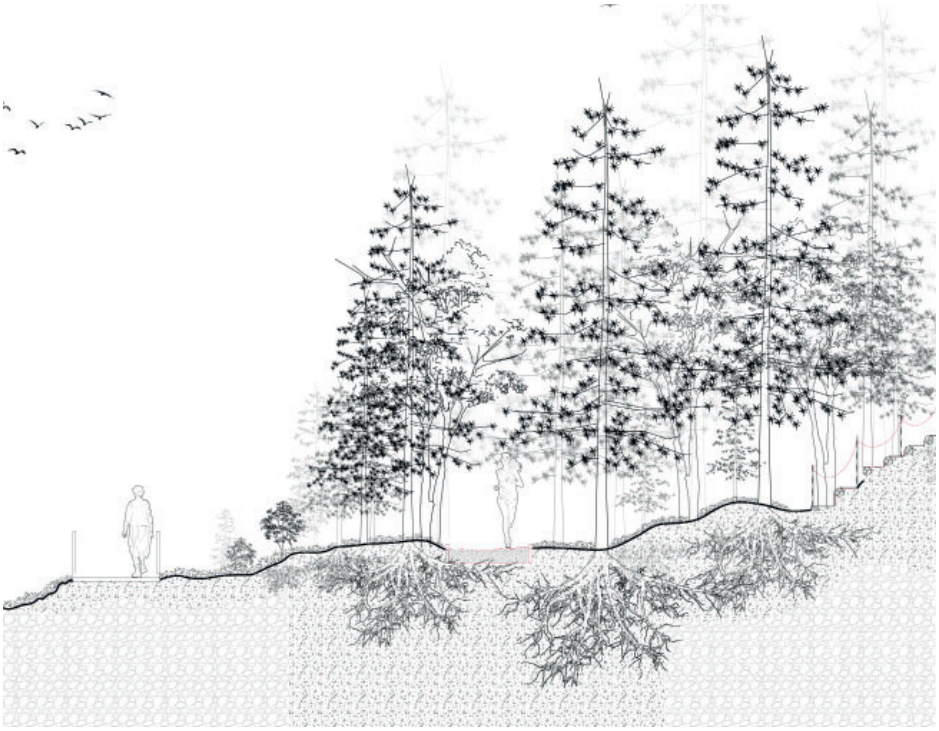
The long section gives a sight in the landscape between the different fjords. The landscape can be explored through the many hiking trails, but also across this incredible pedestrian hanging bridge., connecting both sides of the remote fjord Mjóifjoïdur.



Hiking trail typologies
1:400

This section provides an overview of the hiking trails across the fjord region. The pedestrian bridge offers an exclusive and unique experience, allowing the whole fjord to be appreciated in one glance.





Hiking trail typologies
1:400

This section provides another look into the different hiking trails that can be explored in the region. The materials are all from local sources.

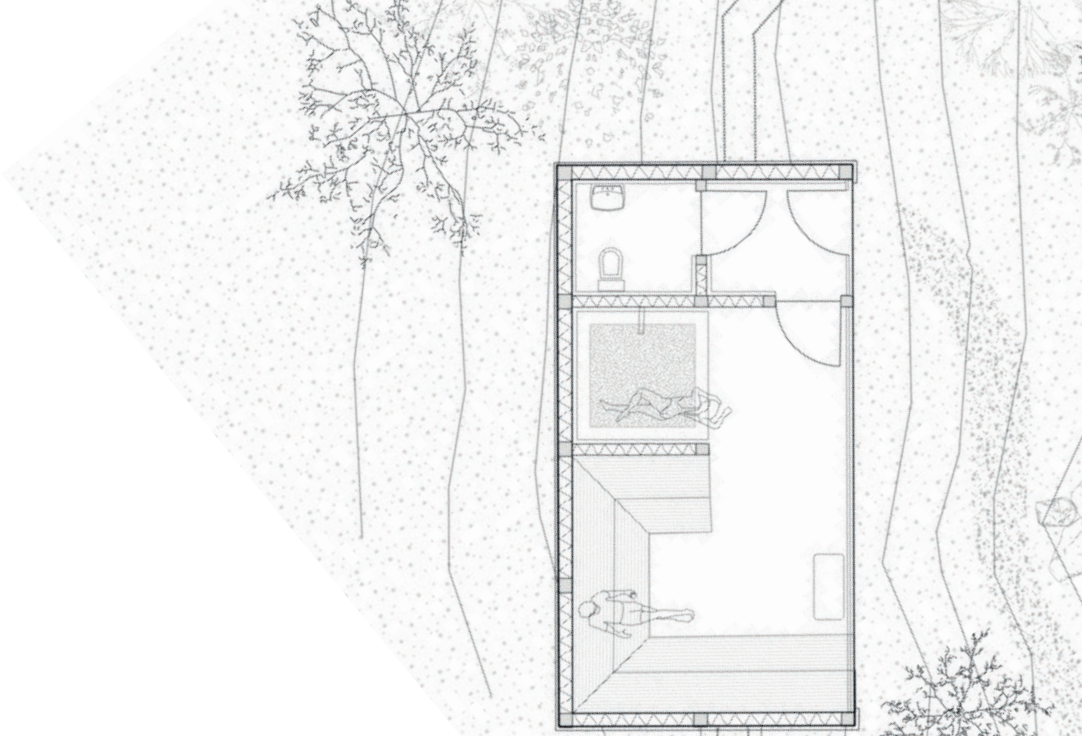


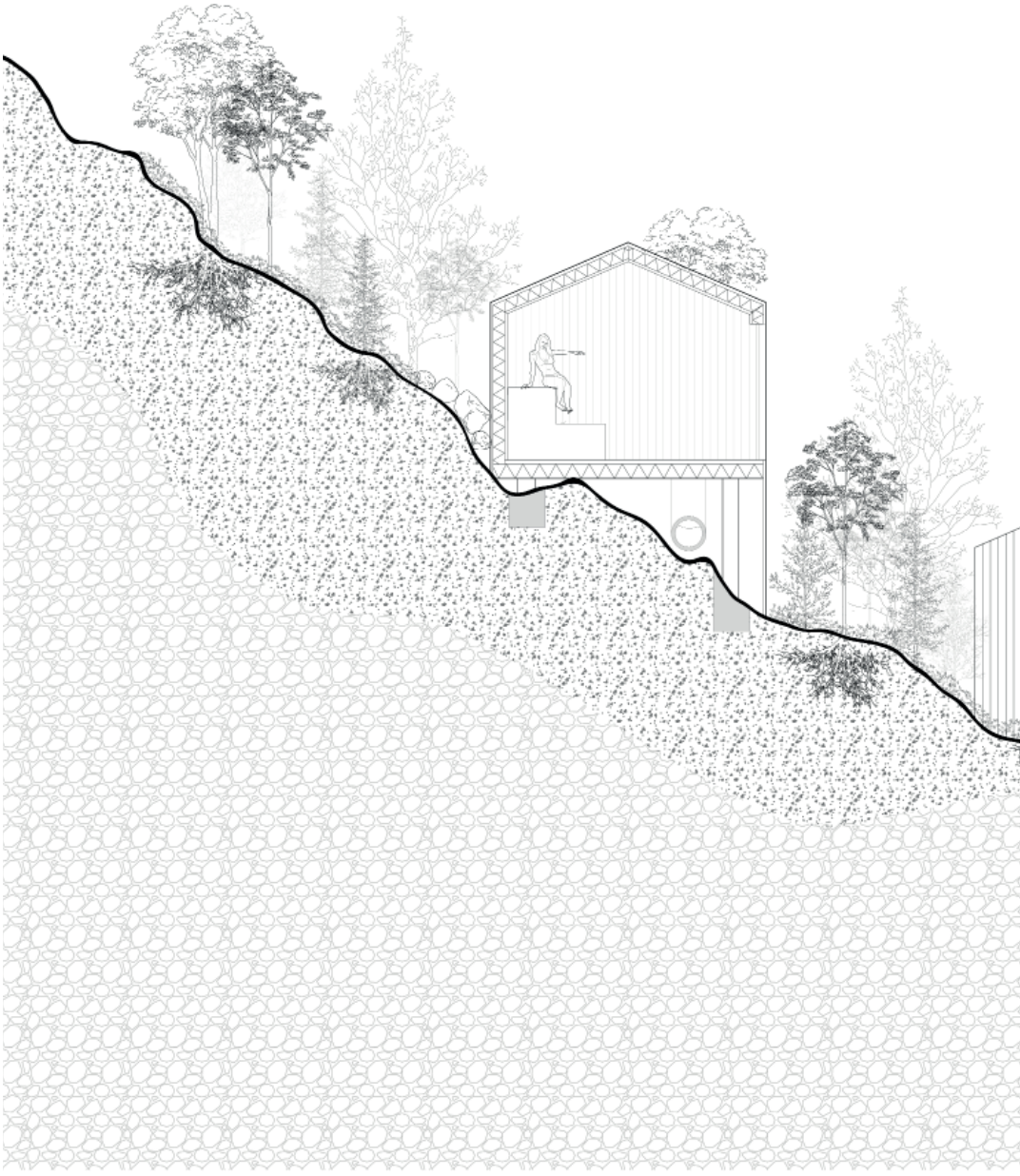
Spa retreat and Coastline plan
1:200

The plan shows the configuration of the planned spa retreat on the North-East side of Seydisfjördur. The Spa is located on the tip of the fjords, away from egenral population. Total peace. This is a place in which the tourists can relax and take a well deserved break from walking the many hiking trails in the region. The Spa overlooks the ocean, where the occasional whale might appear at the surface of the water. The cabins are located on the lower parts of the hill, so that the connection with the water is most appearant. Different types of vegetation guarantee privacy and a feeling of enclosure.

The wood logging industry also docks on this location. The trunks that are harvested will be collected on the coastline, where the logs can float. A small boat will come to collect the logs by pulling the floating logs to the processing factory a few fjords down.





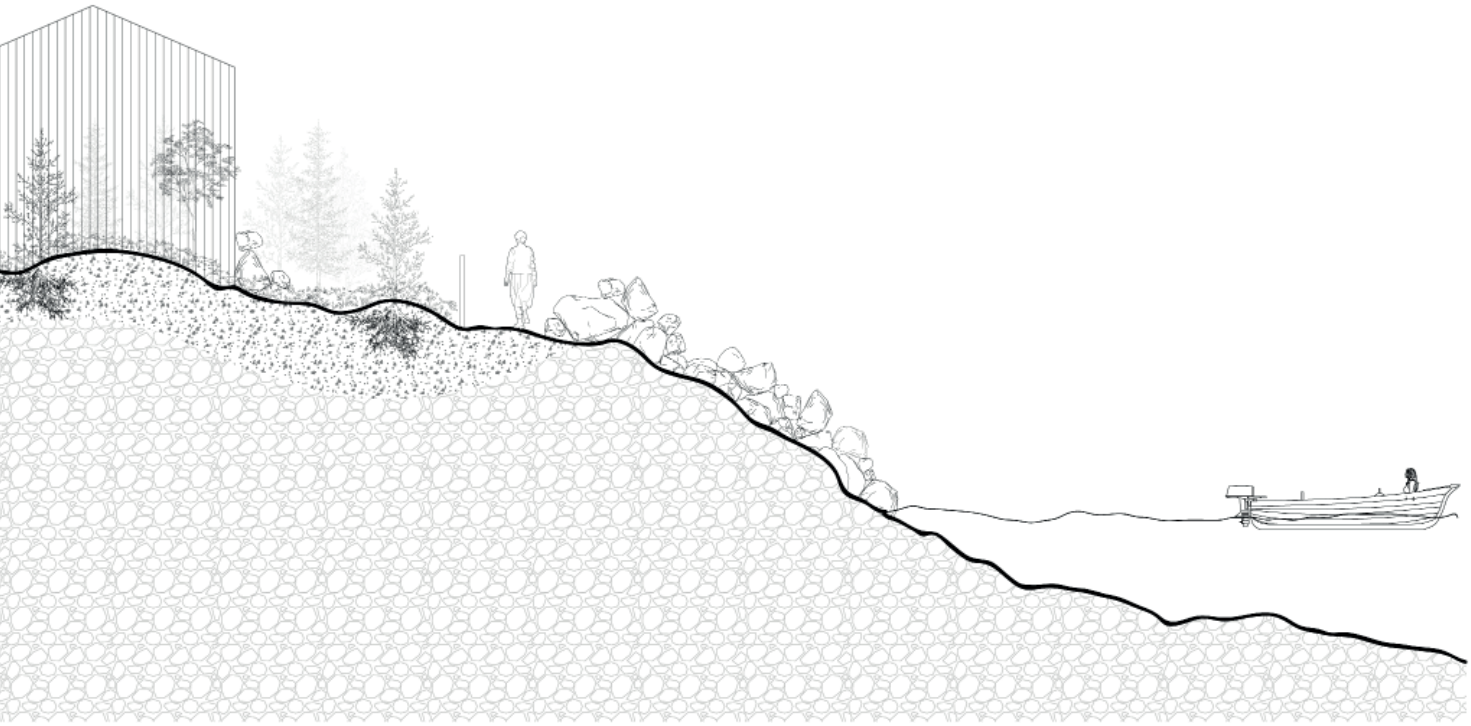


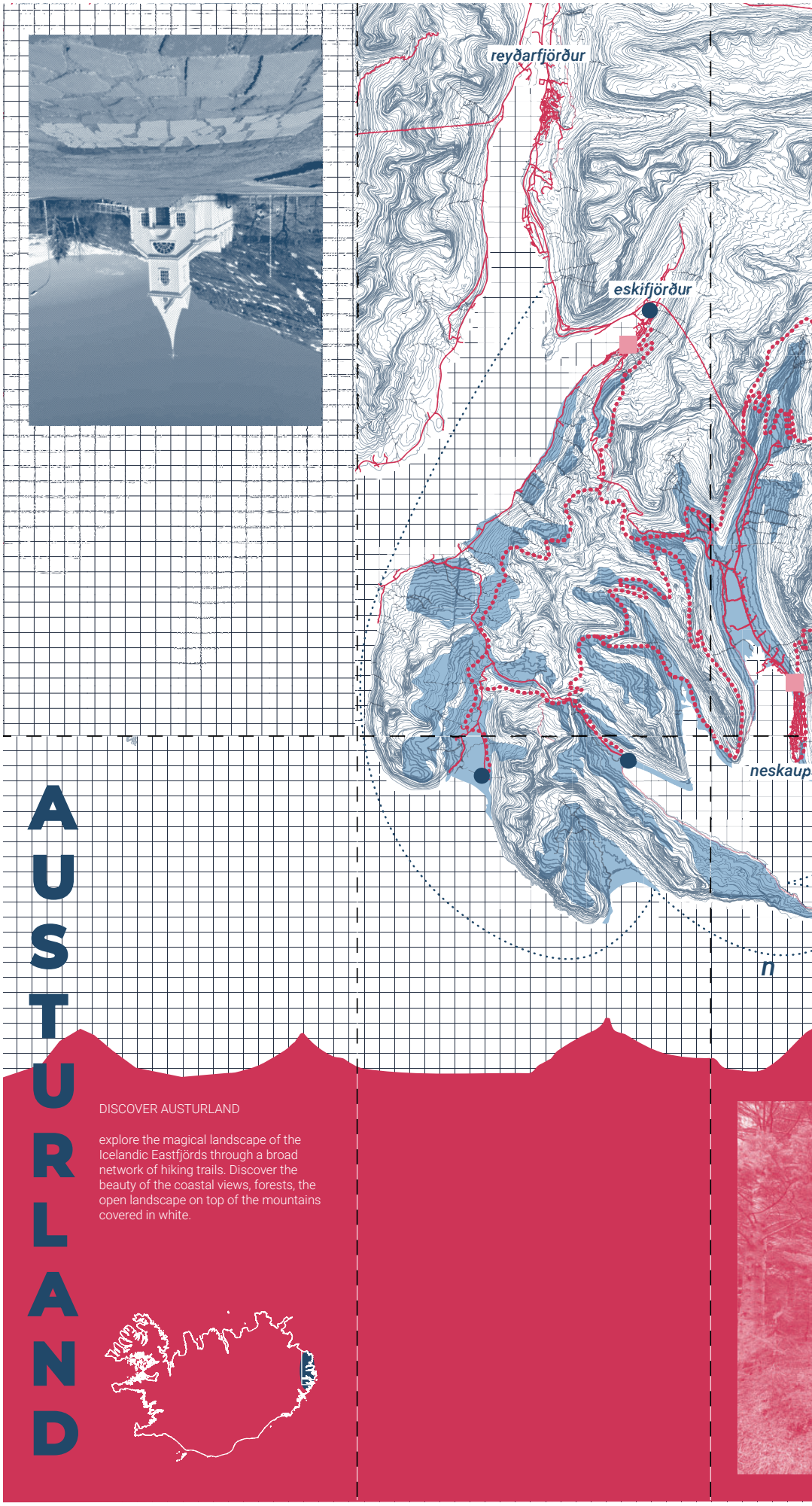
Spa Retreat and Coastline section
1:100

This section shows how the configuration of the spa cabins is in relation to the hill and the coastline. The view from the Spa will be incredible, overlooking the ocean. This retreat is located at the tip of the fjord to guarantee phenomenal views and appreciate nature in an optimal way, as the heat for the Spa is generated by the nearby datacentres.

The lower hills of the mountains are covered in forests of different kinds. The wood logging industry is something that goes on at the coastline. The logs that are cut down are collected in groups along the shore and are being picked up by small boats that pull the floating logs to the processing factory.

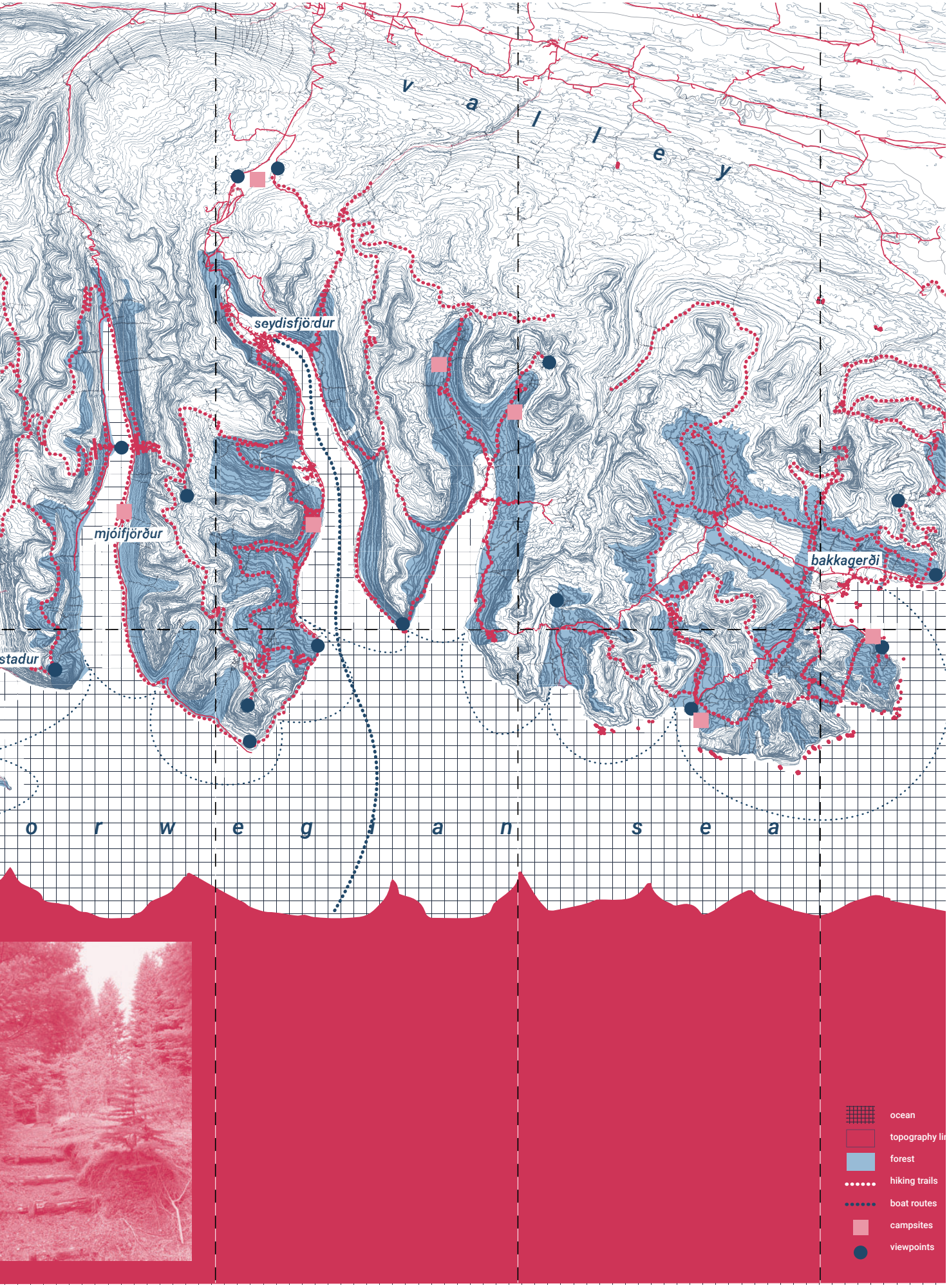






Region Tourism map
1:250.000

This is a map that could appear at the tourist information offices in the region after ple plan is realised. It tells the visitor about the different hiking trails, the origin of the forest and its functions. It is a map as much as it is an educational flyer. All hiking trails are laid out, as well as all viewpoints, campsites and forests, but at the bottiom, information on local species, forests and sights can be found. A must have for a holiday in the Austurland region!


valley
seydisfjörður
mjóifjörður
bakkagerði
stadur
orwegian sea
ocean
topography li
forest
hiking trails
boat routes
campsites
viewpoints



AI generated impression of hiking in the birch forests

An AI generated impression of the Icelandic birch forests that can be explored at eye-level. Along with it are incredible views over the fjords and the cliffs.



AI generated impression of a data centre hidden in the forests

An AI generated impression of the modern micro-datacentres that are hidden in the forests in the lower hills of the mountains. Where two worlds collide.

References

Reflection Merel Garritsen

This project has been one of the most fascinating ones I have been lucky enough to work on so far. The incredible location has indicated the possible size of differences between landscapes around the world., which is something you are not confronted with enough on a daily basis. The way we are used to practicing urbanism (for me, usually on the mainland of Europe) always deals with a developed existing context. In this case, we had to deal with nothingness. At first glance, there are no signs of any humans ever being present. Taking the projects away from dense civilisation is something that was very refreshing. It reminded you that certain methods do not work in other contexts. It needed another way of thinking, way of designing, way of intervening.

The relationship between the overpowering grip of nature and the very deferential urban population is something that is normally not really associated with urbanism, yet it is very much part of it. To respect this relationship as much as possible, interventions were carefully chosen and kept at a low intensity. Hiking trails that can be constructed with locally grown wood, or residual stone from the heavier interventions. Appreciating the touristic character of Seydisfjördur, whilst also celebrating the fact that overgrazed grasslands are slowly turning back into the forests they once were.

This course has inspired me to look at different ways of designing. The way you have been taught is not the only possible route. To broaden your horizon, not only literally, but mostly mentally. To make interventions that uplift both the current natural context and the urban. Subtle interventions can have as much impact as large-scale ones. Personally, I think the vision for the Austurland fjord-region has become a very clear one.





4. Living in between the Forest

Stephan Hosie | 5864666

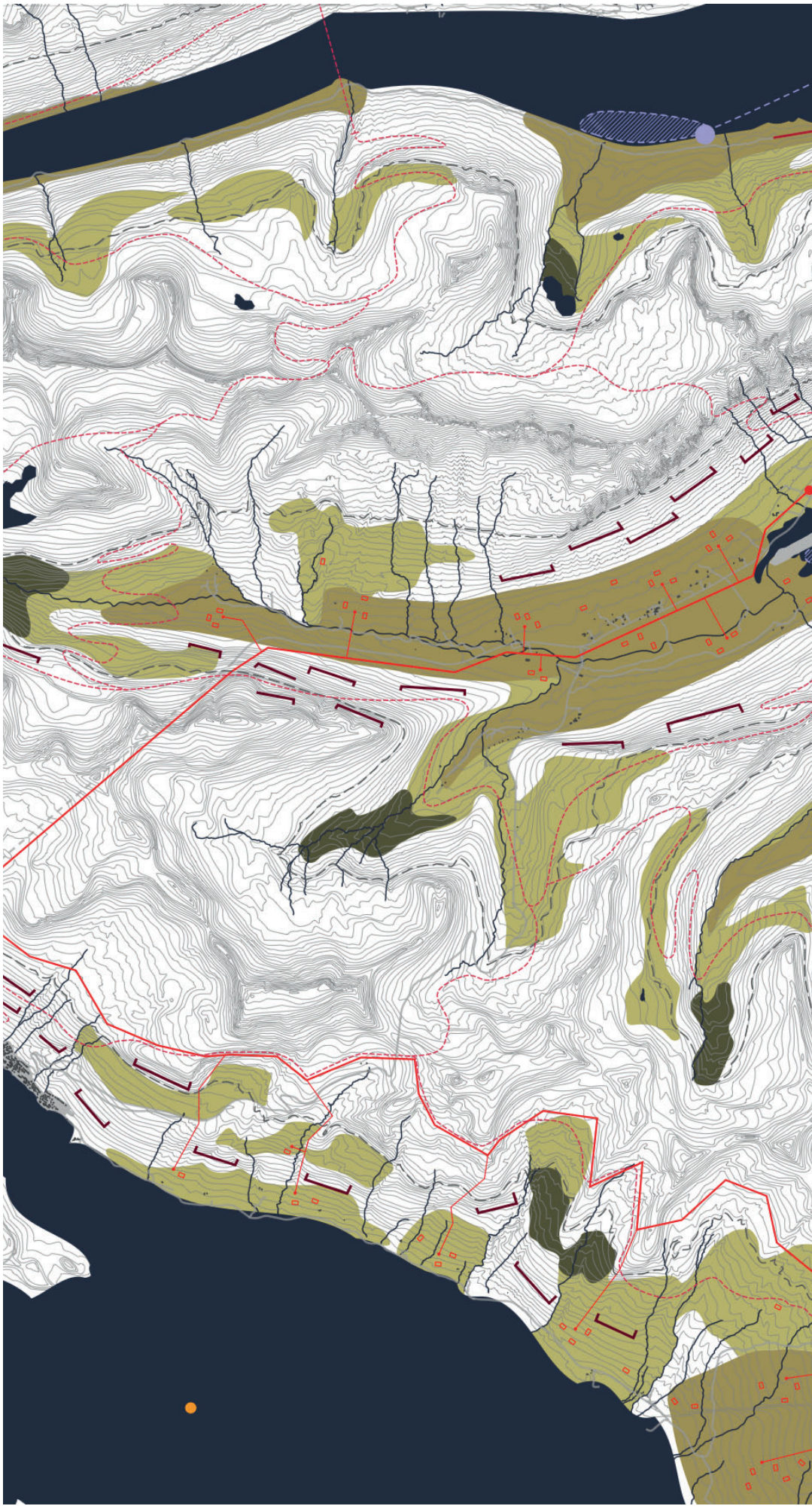


Manifesto

Urspung - In German, the word refers to the place of origin of someone or something, but added to that, it has a connotation of before leaving, before taking the leap. The nostalgic Tates that this word has when naming it, reminds us of before the devastation happened in Iceland. Is there a need to go bac to what the place once was? What are the benefits of re-introducing forests in the open perspectives of Iceland?

Souvenir - Looking back, the Landscape before it started degrading must have been a beautiful scenario where life happened in between the native forest that were devastated by the first settlers. Returning Iceland to its original shape and state not only intervenes on the identity of the place and the cultural evolution the community has had, but its also a call for landscape regeneration which the Region is in dire need.

Solitude - Not only is the call for Landscape regeneration completely necessary for the week being of Iceland, but considering it lonesome situation of an island in the middle of nowhere, makes us realize that the solutions for the problems its currently going through have to come from within. Its Isolation and uniqueness does not allow for any foreign logics to be applied there and no model previously constructed in Europe or even Scandinavia would serve here, due to its harsh conditions and special settings..



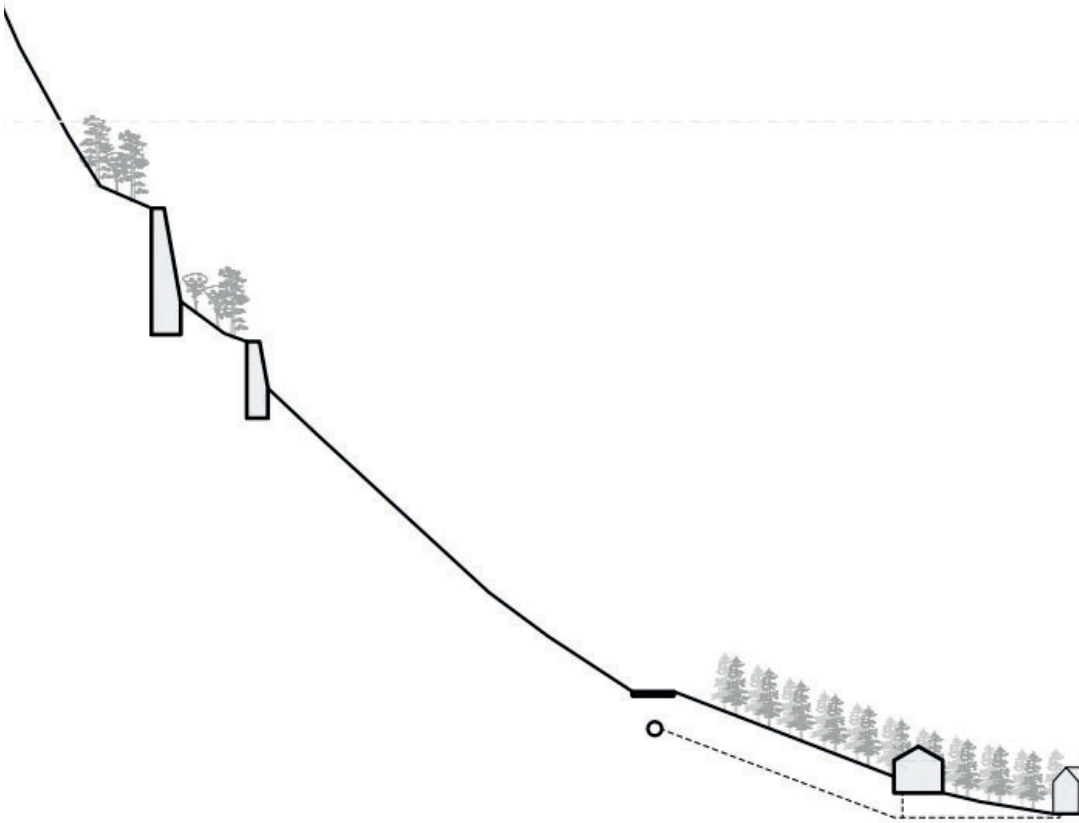
Individual Strategy Map
1:75.000

Neskaupstadur, because of the multiple valleys and available flat lands. It was a good place to become a production oriented area, that could easily be used for agroforestry practices to be put in place. This fjord has also the characteristic of being relatively close to the ALCOA smelter, meaning it was possible make use of the residual heat of the processes of the factory for some sort of greenhouses. A pipeline was planned, between the ALCOA smelter and the town of Neskaupstadur, that then branches out to the greenhouses. To minimize the impact that this pipeline would have visually in the landscape it runs along the road, or under hiking paths covered by a layer of earth and extensive vegetation.

Legend

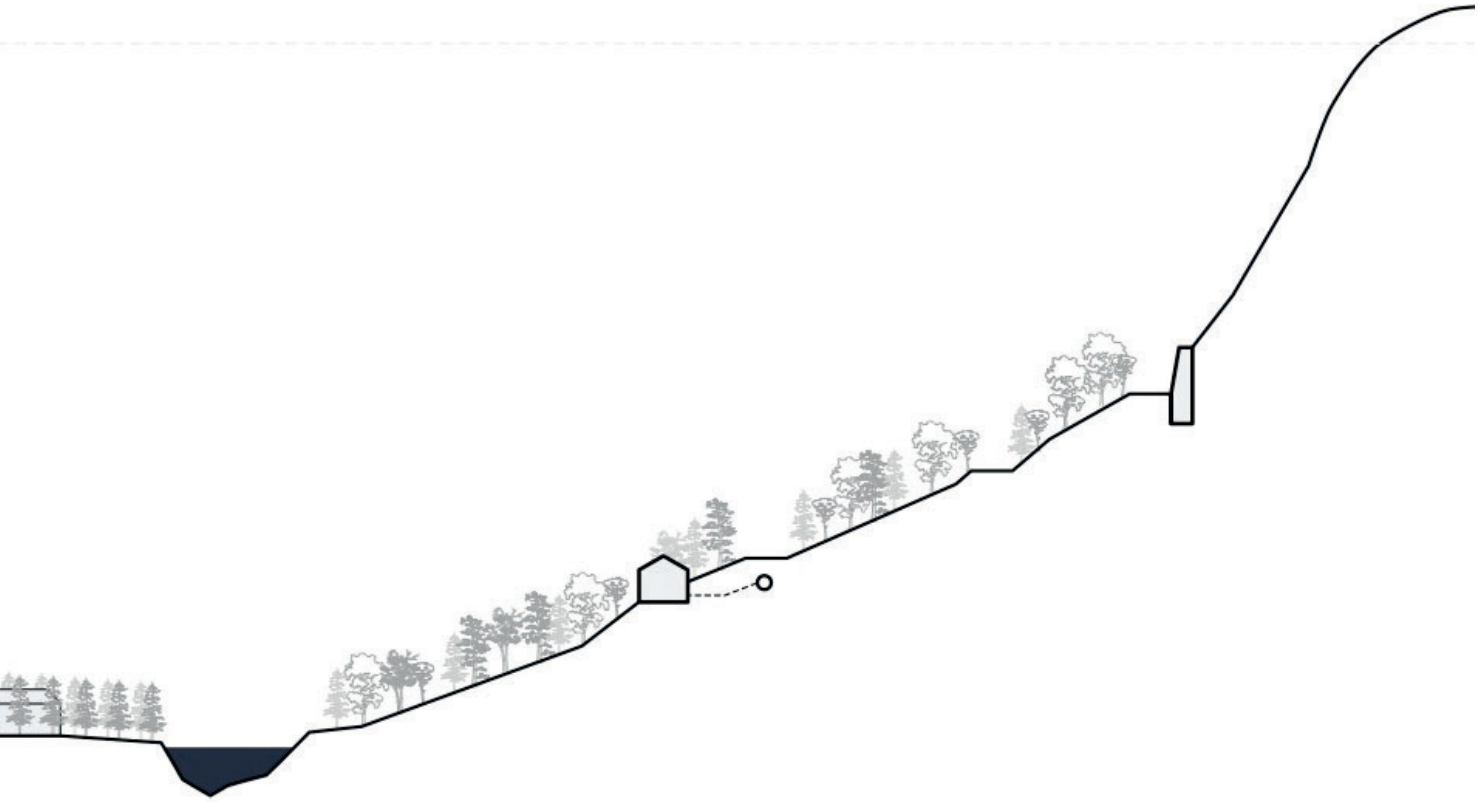
- topography lines
- 400 meter mark
- ocean / rivers
- runoff water
- roads
- hiking trails
- built environment
- productive forest
- recreational forest
- natural forest
- landslide control barrier
- ferry routes
- wood collection points
- saga sites
- heat transportation
- greenhouses
- protected bird areas

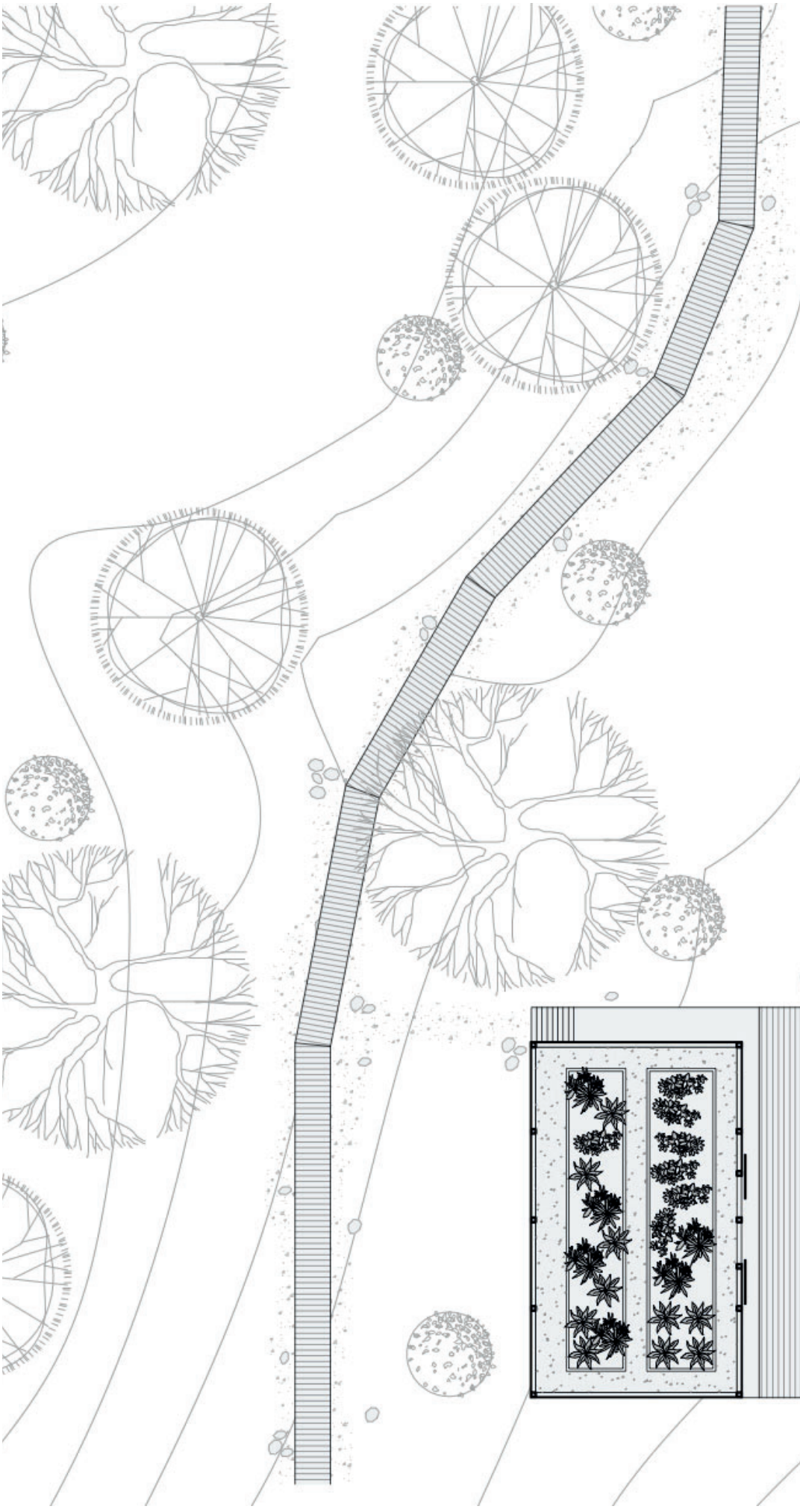




Long Section
1:2.500

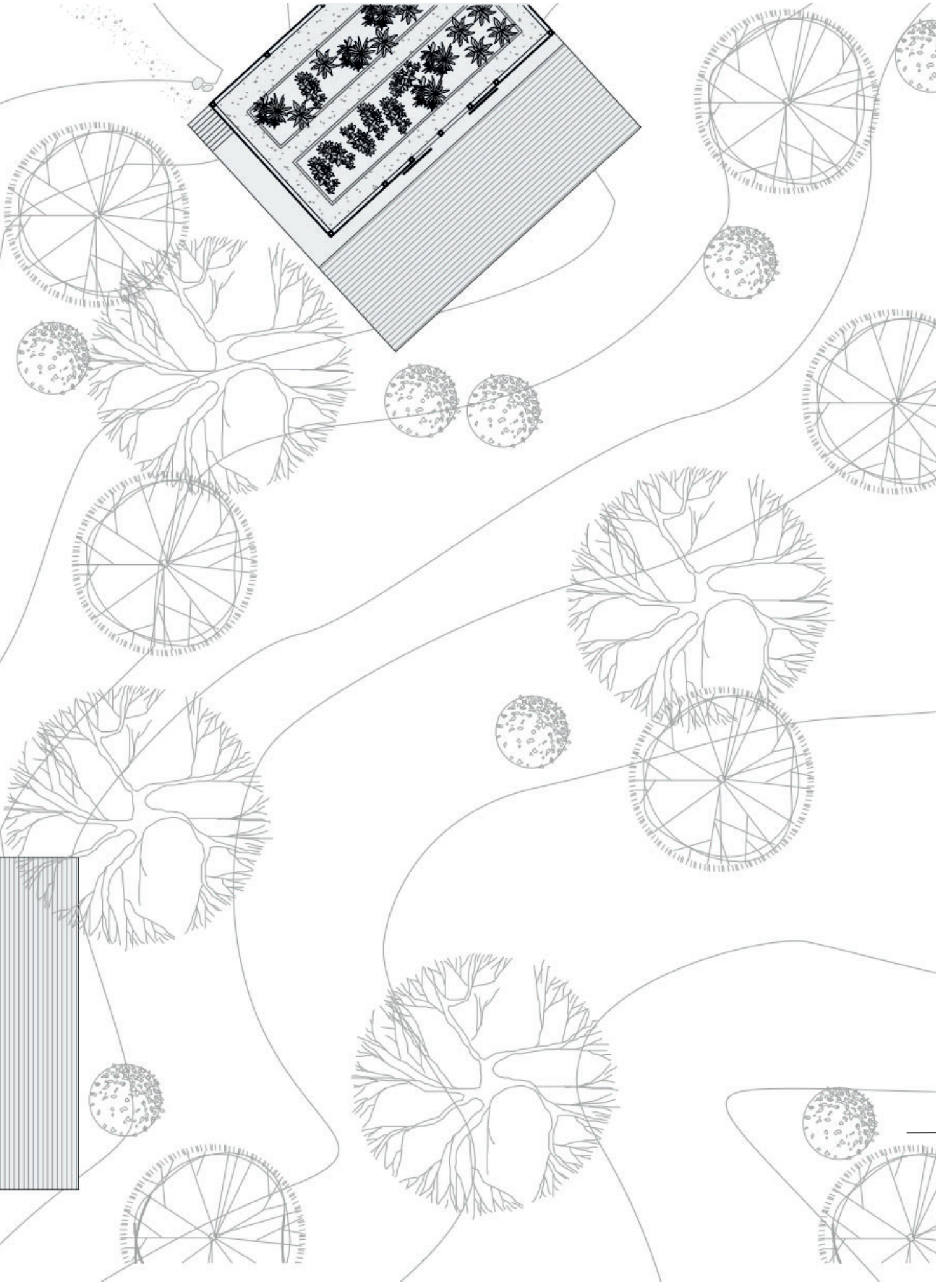
The section illustrates how the different typologies of forests are distributed on the height levels and in the topography. the more functional and productive type of landscape concentrates on the lower parts and the leisure environments with hiking paths go along the middle part of it.

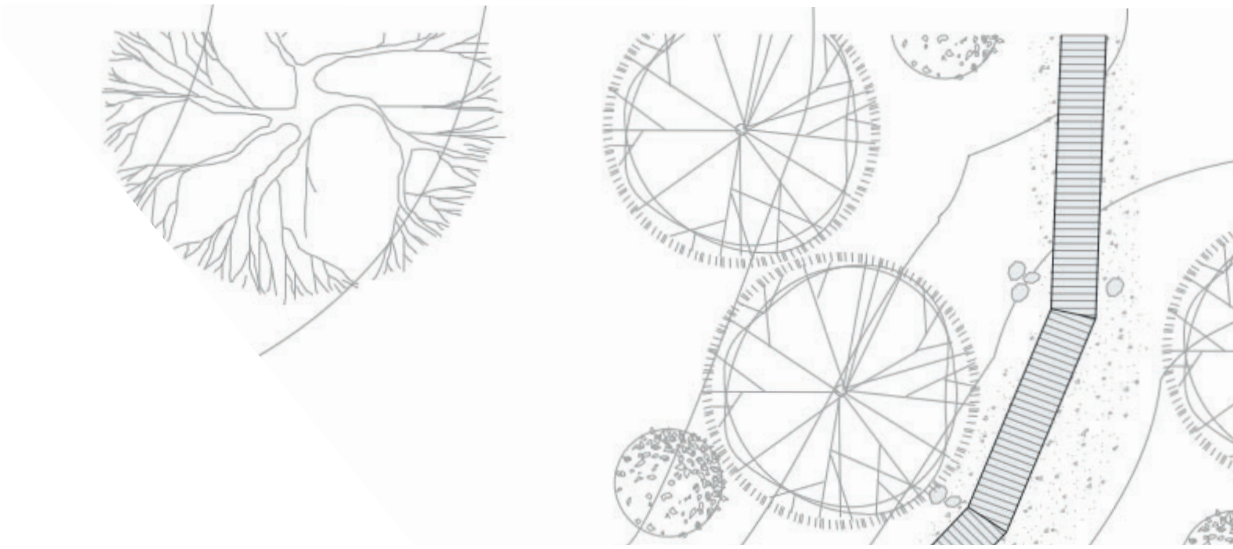


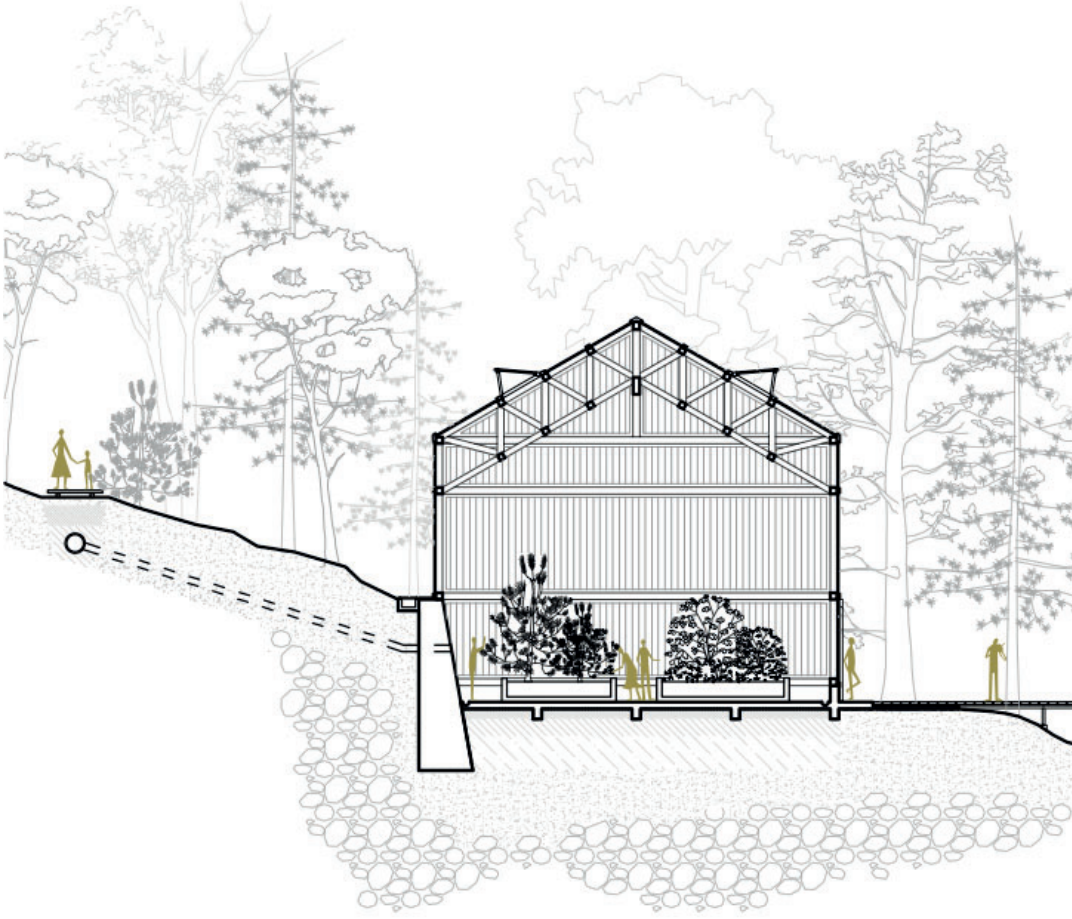


Detail Floorplan of Scattered Greenhouses within the Forest
1:500

I tried to detail more how the greenhouses would be configured inbetween the trees, making up a hybrid situation, mixup different functions. The leisure side is generally provided by the forest, but also providing some ecological values, and the more productive side of it with the greenhouses making them accessible by a very light type of infrastructure.

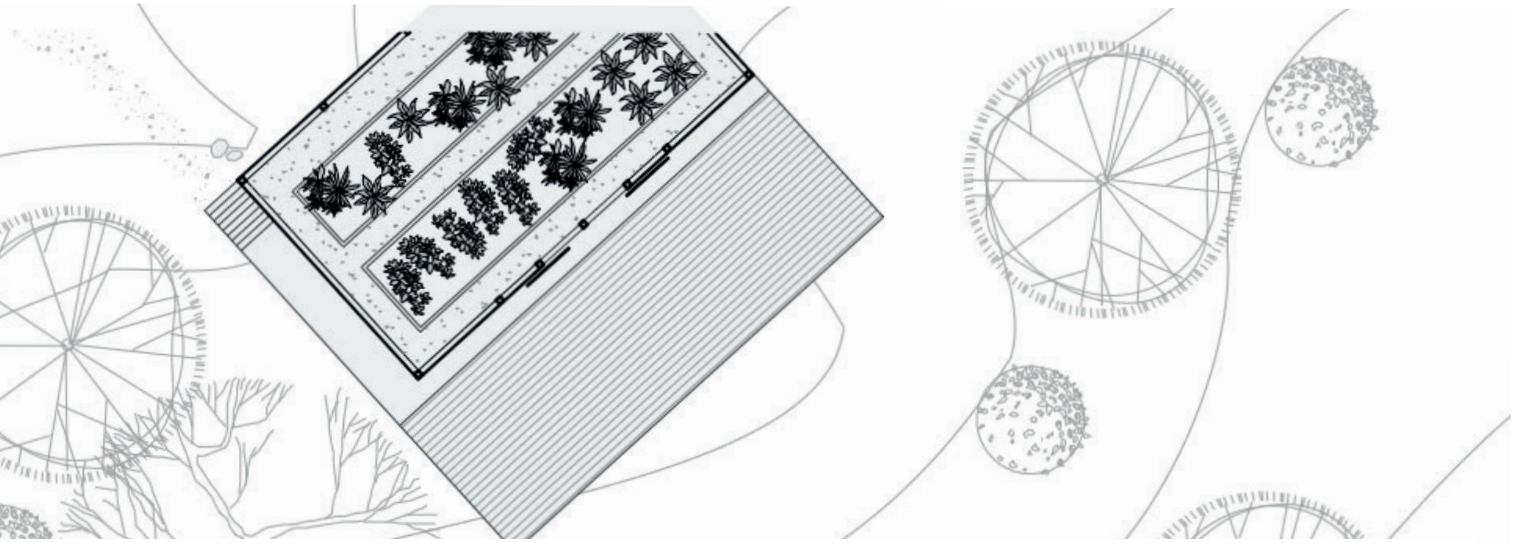






Detail Section of Scattered Greenhouses within the Forest
1:250

So that they get kind of lost in between the trees trying to to keep the feeling of living in the forest as much as possible.

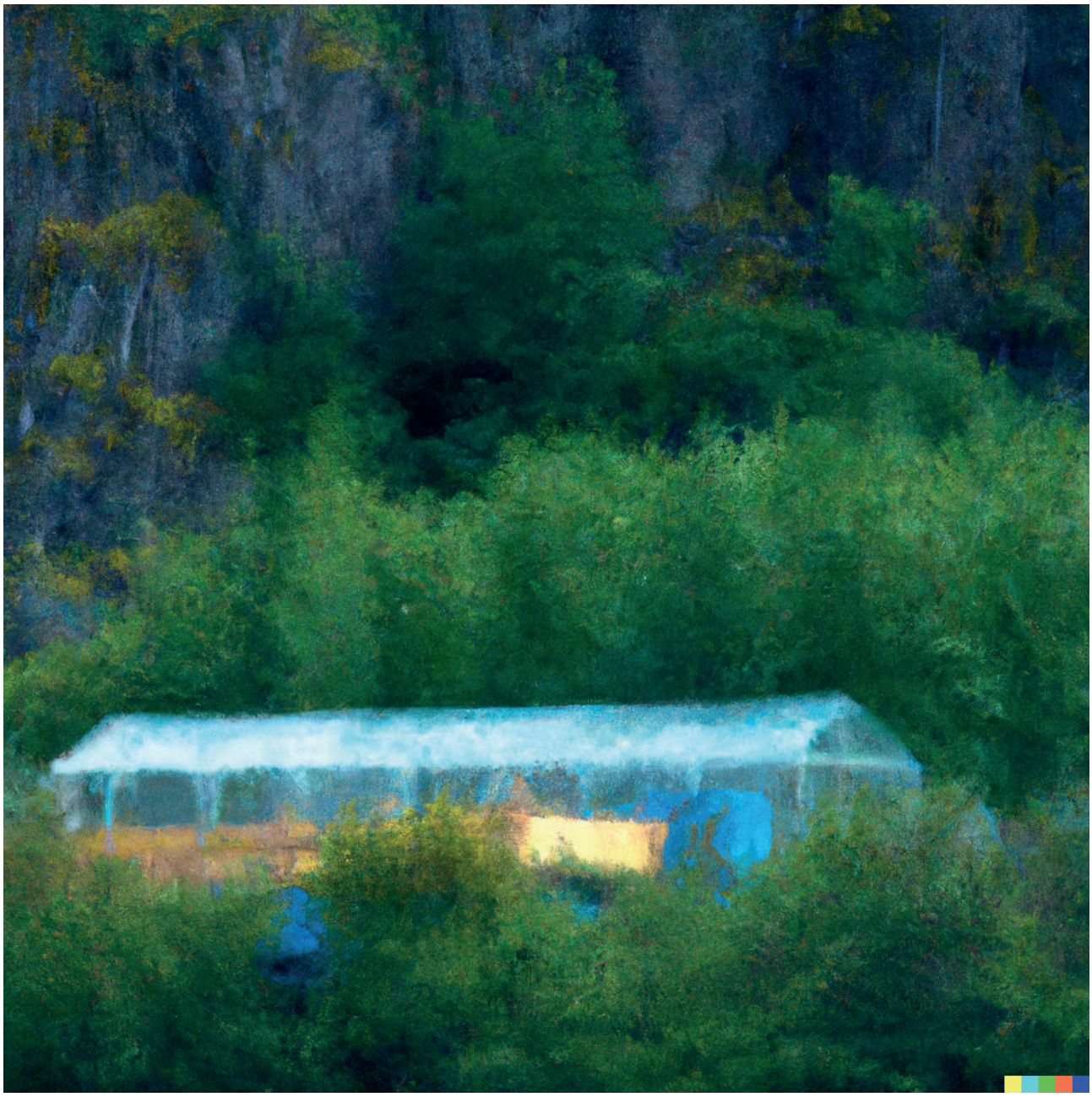






Living within the Forest

AI generated impressions of agroforestry practices
including greenhouses within the reforestated areas.



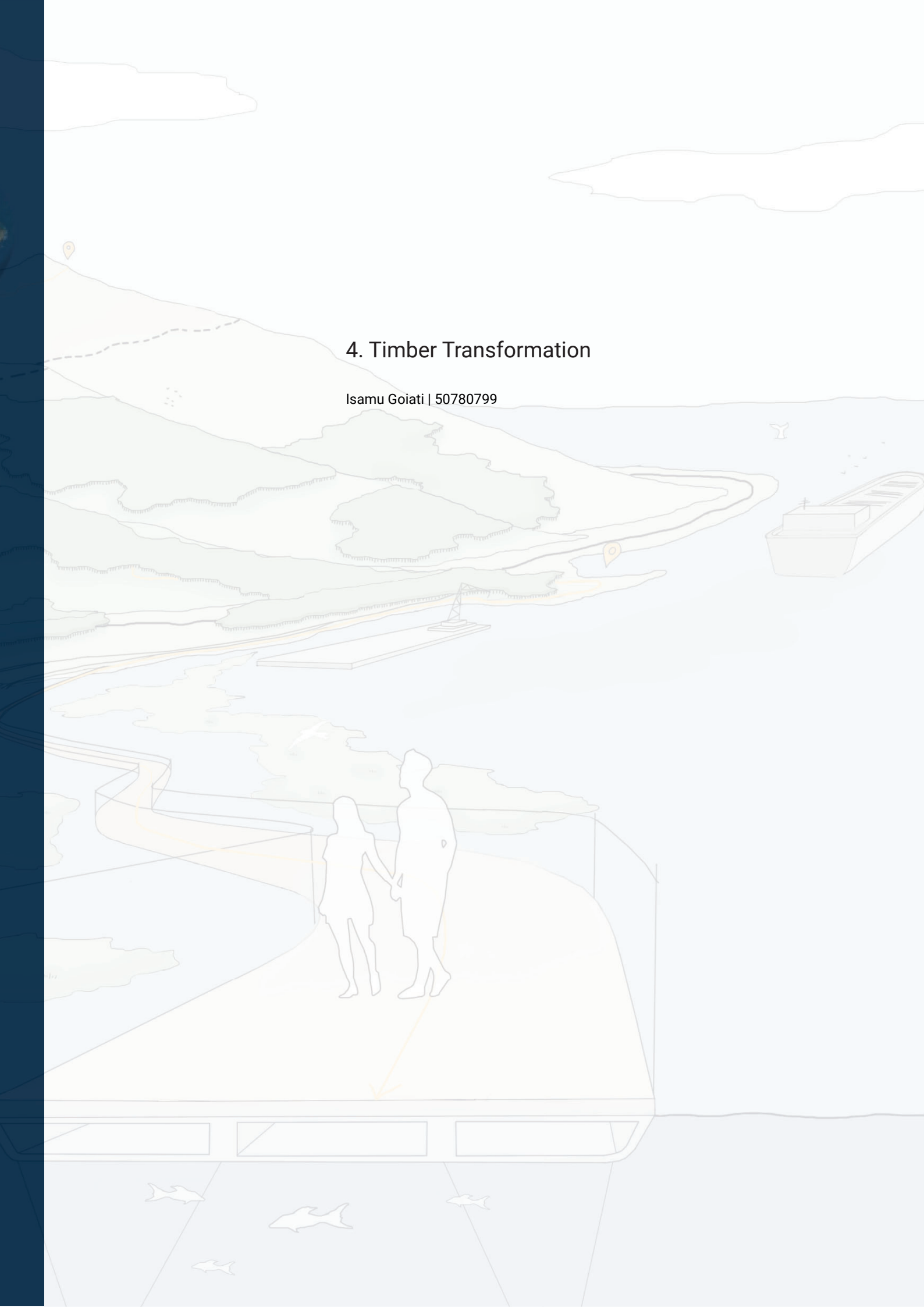
Reflection Stephan Hosie.

I think throughout the process of the course, many interesting questions rose of how to intervene and further develop a landscape. Specially a landscape which is suffering an extreme erosion and living under extreme conditions that further isolates it from the rest of the world. Iceland's geographical location and condition of an island makes it interesting as a case study for a project that tries to mix up urban strategies with environmental needs. The need of a network of infrastructure to exploit to the max the natural resources and the energy potential sites, calls for a series of sensible interventions and an integral network of minimal projects that try to mitigate the effects of the intervention as a whole. Somehow also the intervention has to include a strategy to manage and regenerate the landscape, coming up with strategies to properly handle the erosion of the soil, which right now is the biggest problem that Iceland as a landscape is facing. Reforestation efforts and the replanting of the island is already a main strategy that the local government is currently putting in place, to control the soil loss and run off waters. The mixture of this two sides of a same coin results on a project that mixes urban planning lógica with landscape and sustainability needs. All in all I think the project was very interesting as a base question and formulation of a problem, but generally the mixing of the different methodologies and approaches to the one solution, made it difficult to reach a clear and well formulated conclusion. The multiple perspectives and formulas sometimes contradicted the process that the project was already undergoing, so there was a need to constantly review what the project was about and the way to proceed.



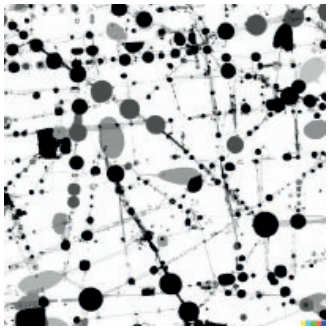
4. Timber Transformation

Isamu Goiati | 50780799





Manifesto



Complexity

Iceland, an emblem of nature's intricate complexity, weaves a tale that reverberates through the echoing gorges, and glacial plains. It stands as testament to the delicate balance of forces - from volatile geysers to stoic mountains. Yet, human intervention, like an unwelcome note in an orchestral symphony, risks unsettling this harmony. We shape the land, and in turn, it shapes us - a lesson in humility taught by the ceaseless tides and winds. Thus, Iceland teaches us that complexity isn't chaos, but rather a symphony of interdependence, a melody to respect, a natural balance to be preserved.

Urban



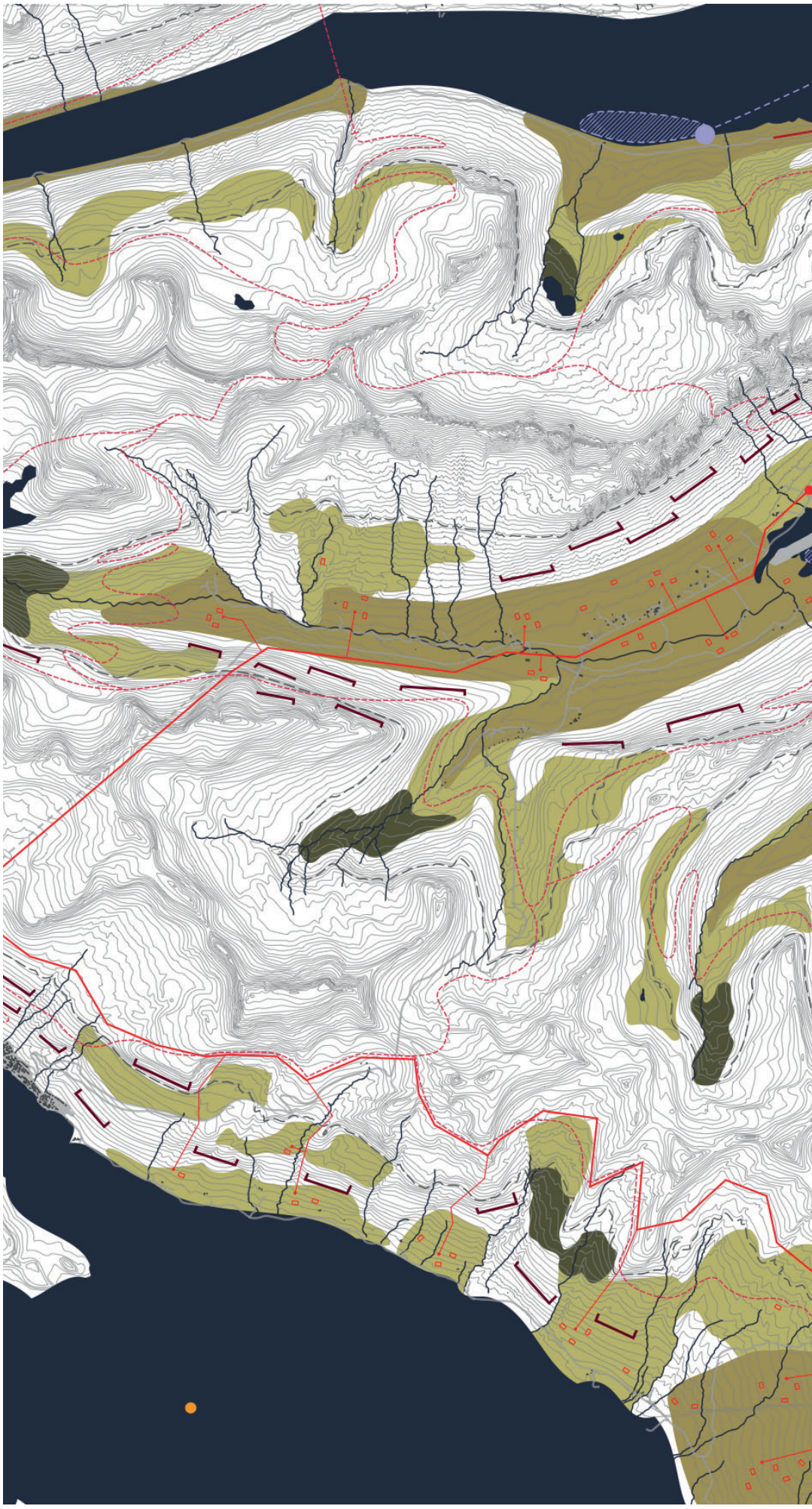
The evolution of human spaces, whispers tales of progress, intertwining webs of steel, glass, and ambition. Yet, in this march toward advancement, we collide with the primal, unadulterated beauty of nature. Icelandic landscapes, standing in stark contrast, embody pure existence untouched by human hand. They propose a challenge: How do we advance, yet maintain harmony with nature's rhythm? As our cities reach for the sky, Iceland's silent, majestic landscapes urge us to seek balance - a marriage between the constructs of human intellect and the raw, earthy poetry of the natural world. A reminder, that we are stewards, not masters of this planet.

Growth



Growth, an innate dance of existence, is both a journey of accumulation and refinement. It paints stories on the canvas of time, tracing lines of wisdom and resilience. Our cities expand, symbolizing the physical manifestation of human ambition, yet our hearts and minds must match this outward expanse. As towering skyscrapers mirror our achievements, the breadth of our compassion should echo in their shadows. Icelandic wilderness, ever-evolving yet enduring, prompts us to see growth not merely as an increase in size, but a flourishing in depth and quality. For, true growth, is learning to thrive in harmony with the world we inhabit.

Isamu Goiati



Individual Strategy Map
1:75.000

The surroundings of Reyðarfjörður contain multiple elements that form unique fjord landscape. The ALCOA smelter is an existing element that provides work in the area.

In the smelting process a lot of residual heat is produced, this heat will be used to provide the greenhouses and the wood processing factory with warmth.
The factory processes all the wood that is harvested in the area, providing job opportunities for nearby inhabitants. The factory is situated nearby the smelter for minimal heat loss and away from the town for minimal nuisance. The large waterbody offers enough space for the large amount of log and ships to move freely.

The reforestation in the area consists of a diverse type of forests that create an unique forest fjord landscape.

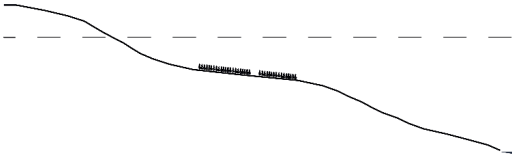
Legend

- topography lines
- 400 meter mark
- ocean / rivers
- runoff water
- roads
- hiking trails
- built environment
- productive forest
- recreational forest
- natural forest
- landslide control barrier
- ferry routes
- wood processing factory
- saga sites
- heat transportation
- greenhouses
- protected bird areas



Long section A
1:12.500

The section shows the geography of the fjord and how decisive it is in shaping the environment. The southside of the fjord has a steep slope that does not provide the opportunity to build or to plant. The northside has a gentle slope that provides more opportunities. This is also the side where the town, smelter and factory are situated.



Section A - South of fjord

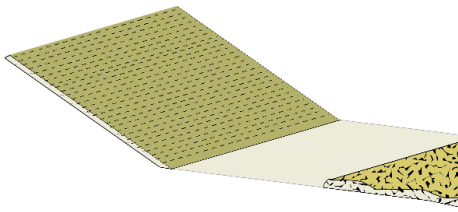
Although the steep part of the southside does not allow trees, it is still possible to take measurements that tackle soil erosion in a sustainable way.

1. Erosion control blankets - Erosion control blankets use wood waste in biodegradable mats laid over soil, particularly on slopes, to stabilize the soil, promote vegetation growth, and add organic material as they decompose.

2. Mulching - Mulching involves applying a layer of wood chips or shredded bark to the soil surface to protect against rain impact, conserve moisture, and provide organic matter as it decomposes.

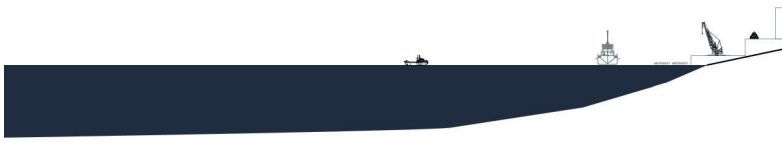
3. Filter berms - Filter berms or socks are barriers made from mesh tubes filled with wood waste, placed on slopes or around construction sites, to prevent soil erosion and capture sediment.

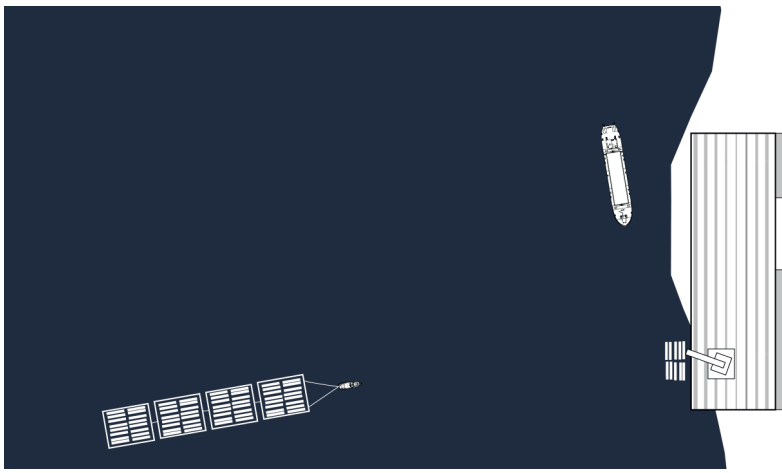
4. Streambank stabilisation - Streambank stabilization utilizes wood chips and logs to reinforce stream banks or shorelines, provide structure, create vegetated buffers, and help reduce erosion and filter runoff.

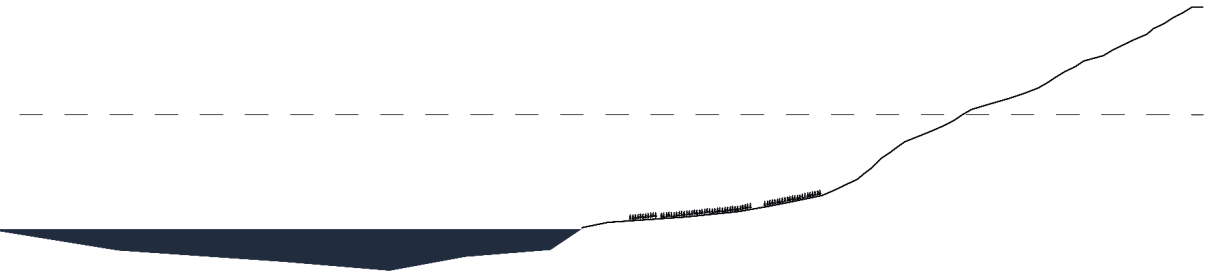


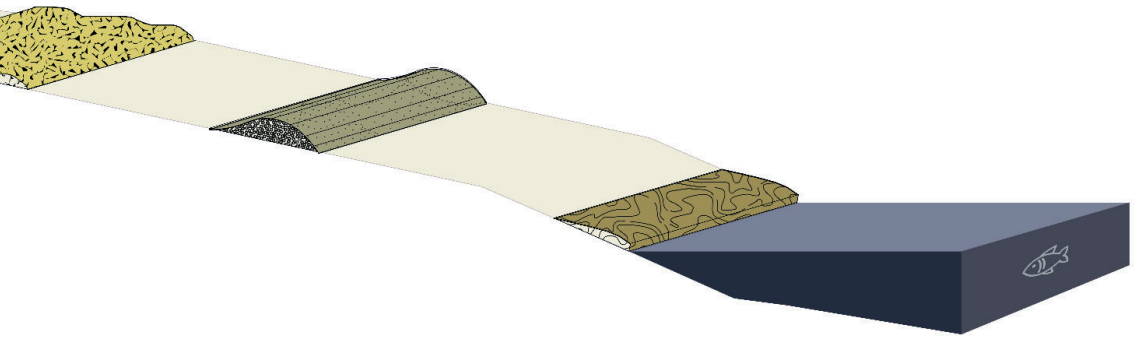
Section A - North of fjord
1:5.000

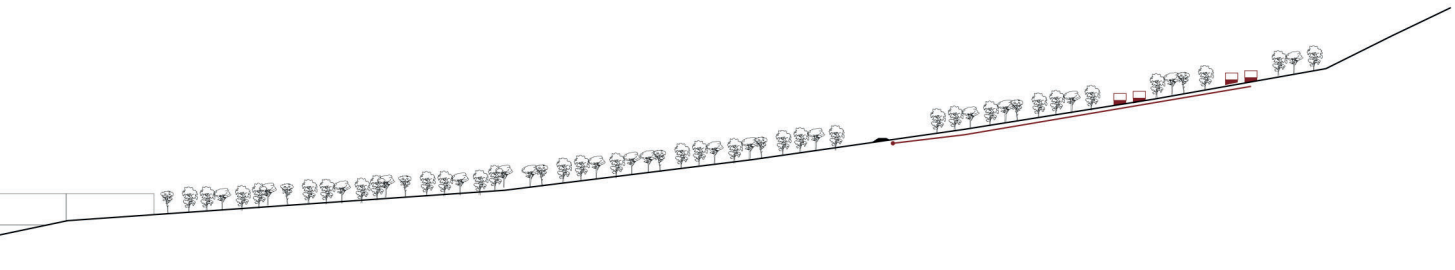
The northside of the fjord will be the place where the new wood processing factory is placed. The section and map show the factory and the processes around it, surrounded by new forest just as the greenhouses more uphill. Although the building is quite big, it pales in comparison to the fjord.

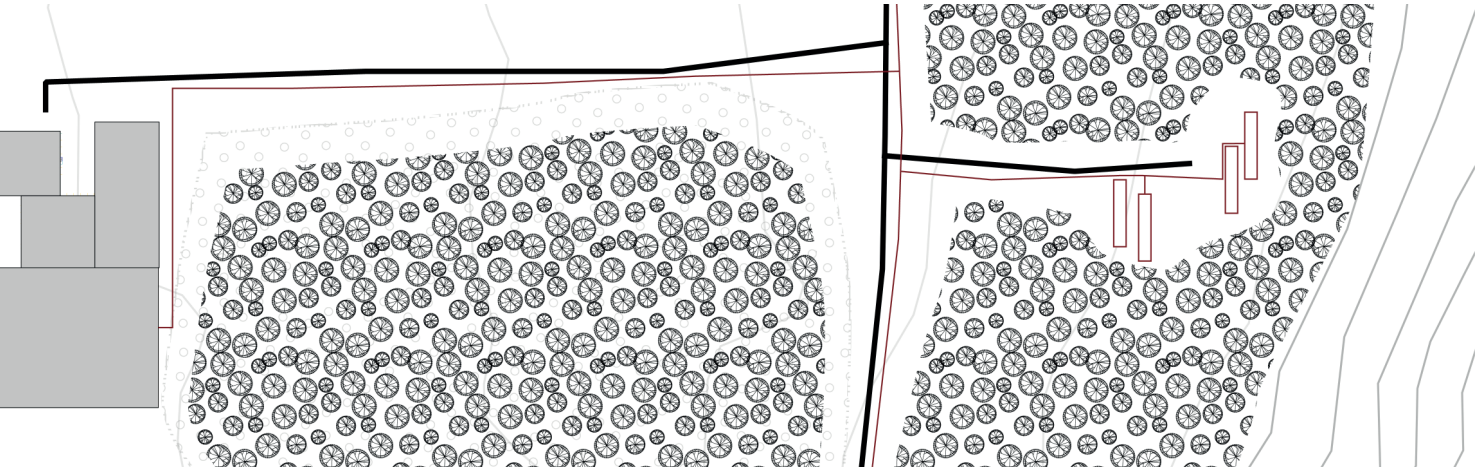






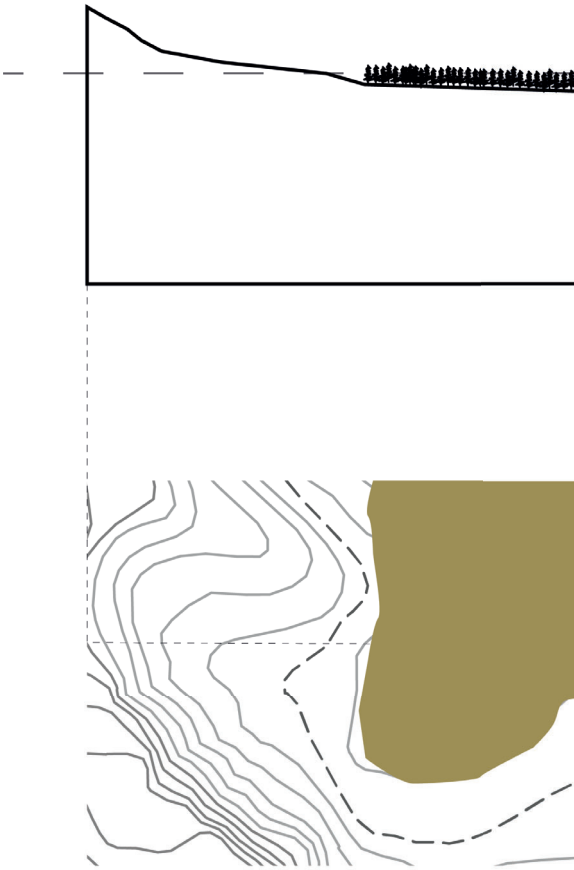






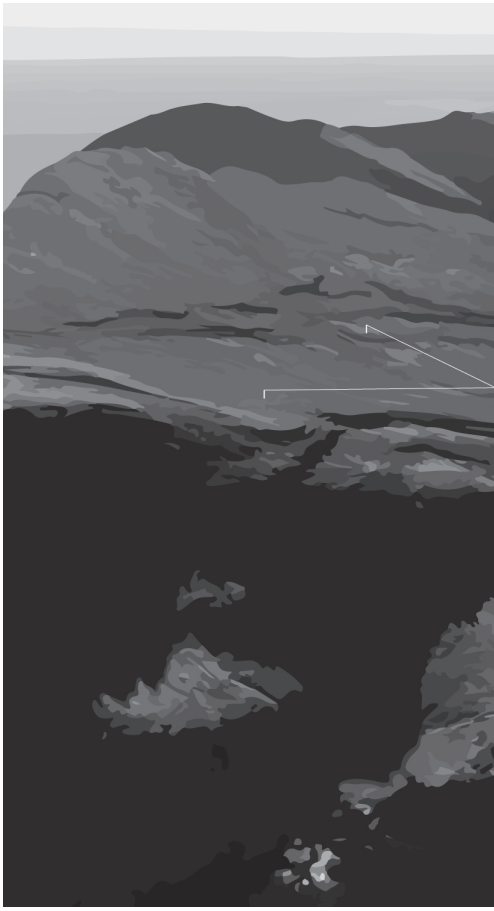
Section B
1:12.500

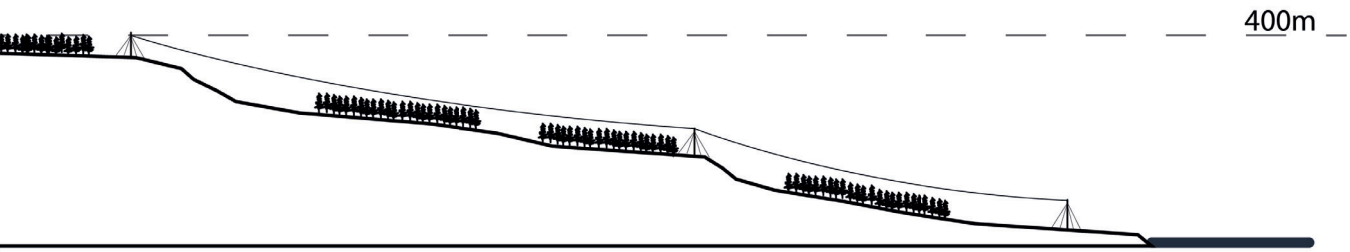
The section shows a fjord with a lot of forestry. With the use of the cable system, the height of the fjord is used in its advantage. The harvested wood can be transported without harming the soil.



Cable logging visualisation

The cable logging system can be seen as a spiderweb that can expand across a fjord. It is a flexible system that can be set up and removed easily.

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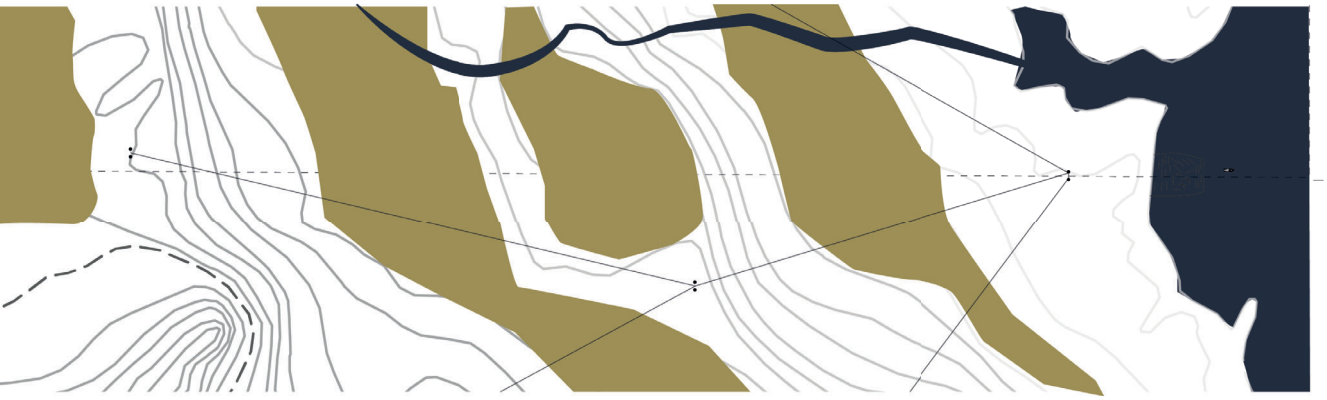
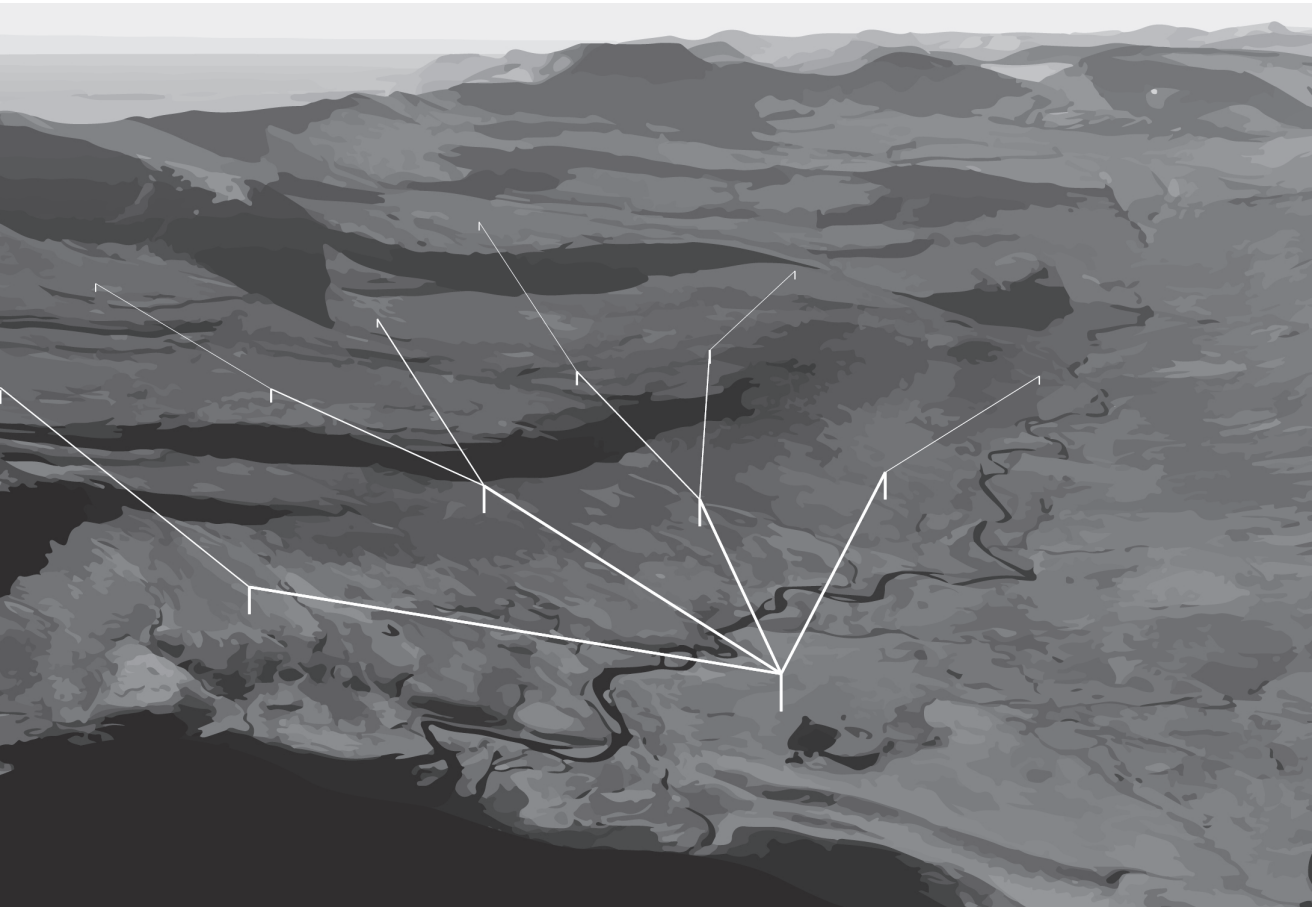
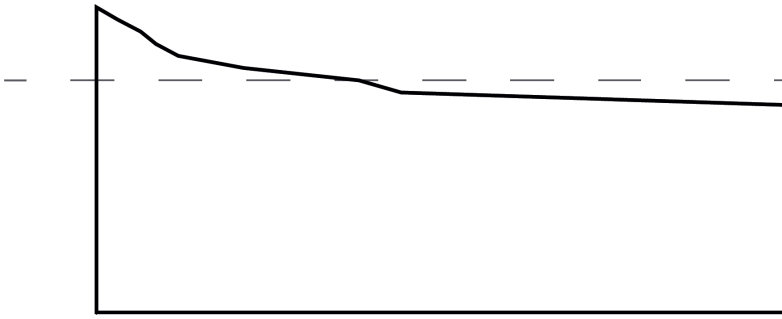


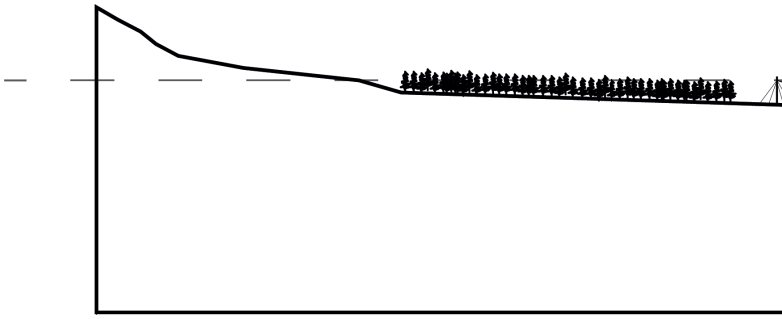


Fjord section
1:12.500

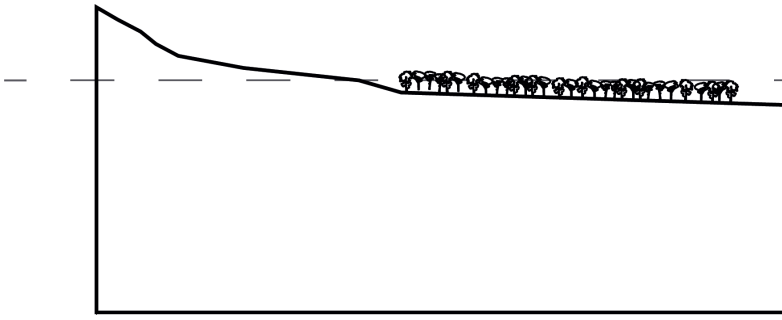
The fjord is currently not containing any trees, like many other fjord in the area. The variants shown on this page show how different forestation scenarios can be used by the logging system.



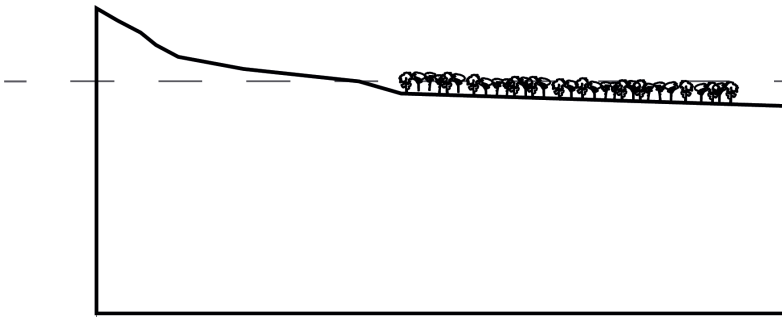
Variant 1
On a slope with only productive forest the logging system can be expanded till the top where the trees grow

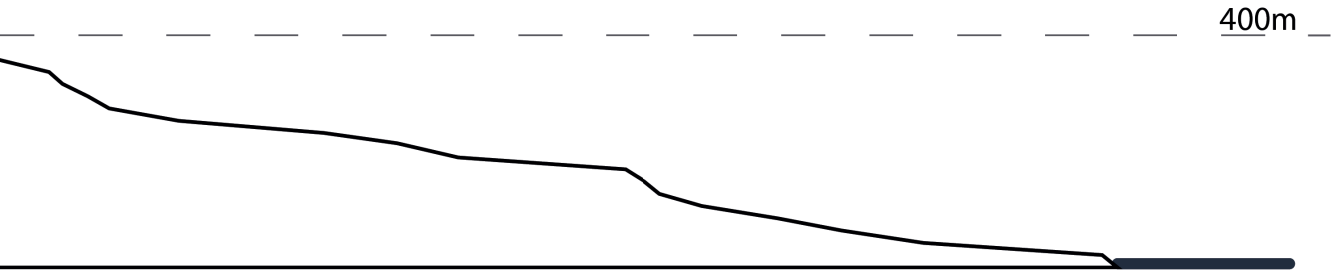


Variant 2
On a slope where there is only productive forest on he lowest part it is not needed to apply cable logging. The forest more up the hill is recreational and natural.



Variant 3
On a slope where only a part of the upper hill is used for productive forest the cable system can be applied for just this area.

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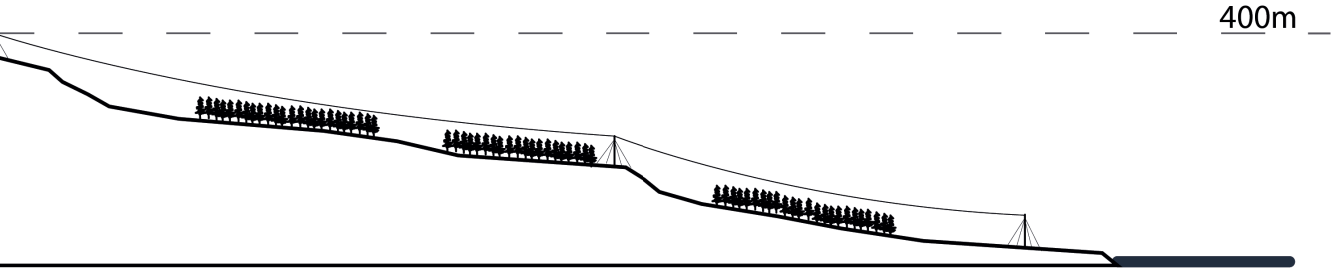
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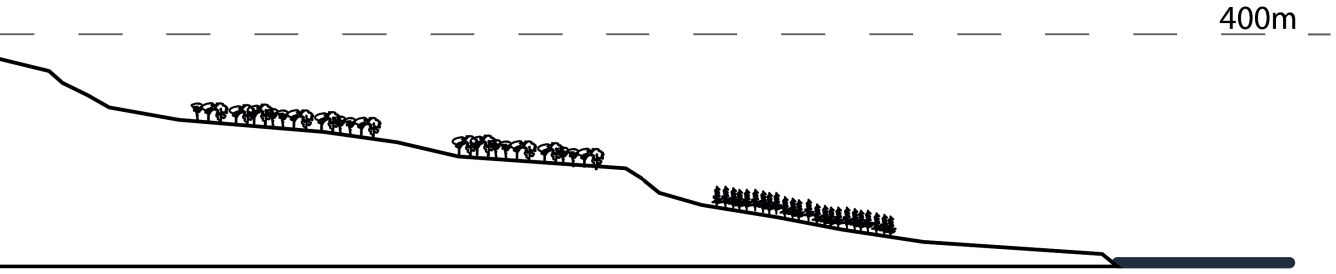
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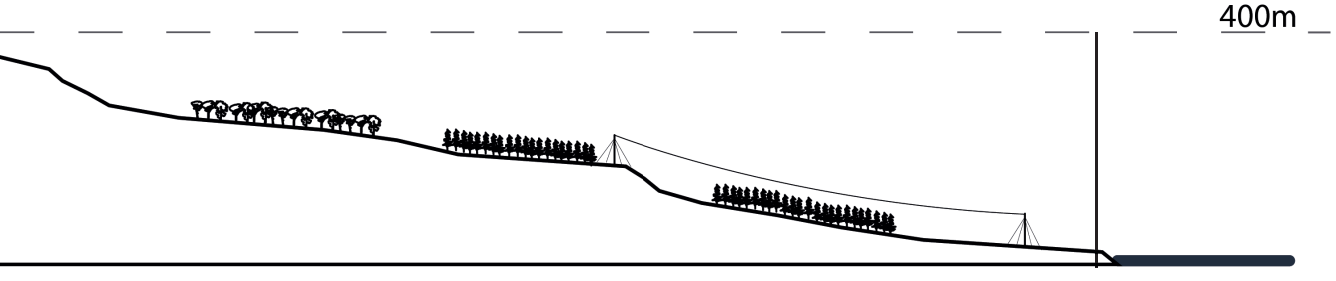
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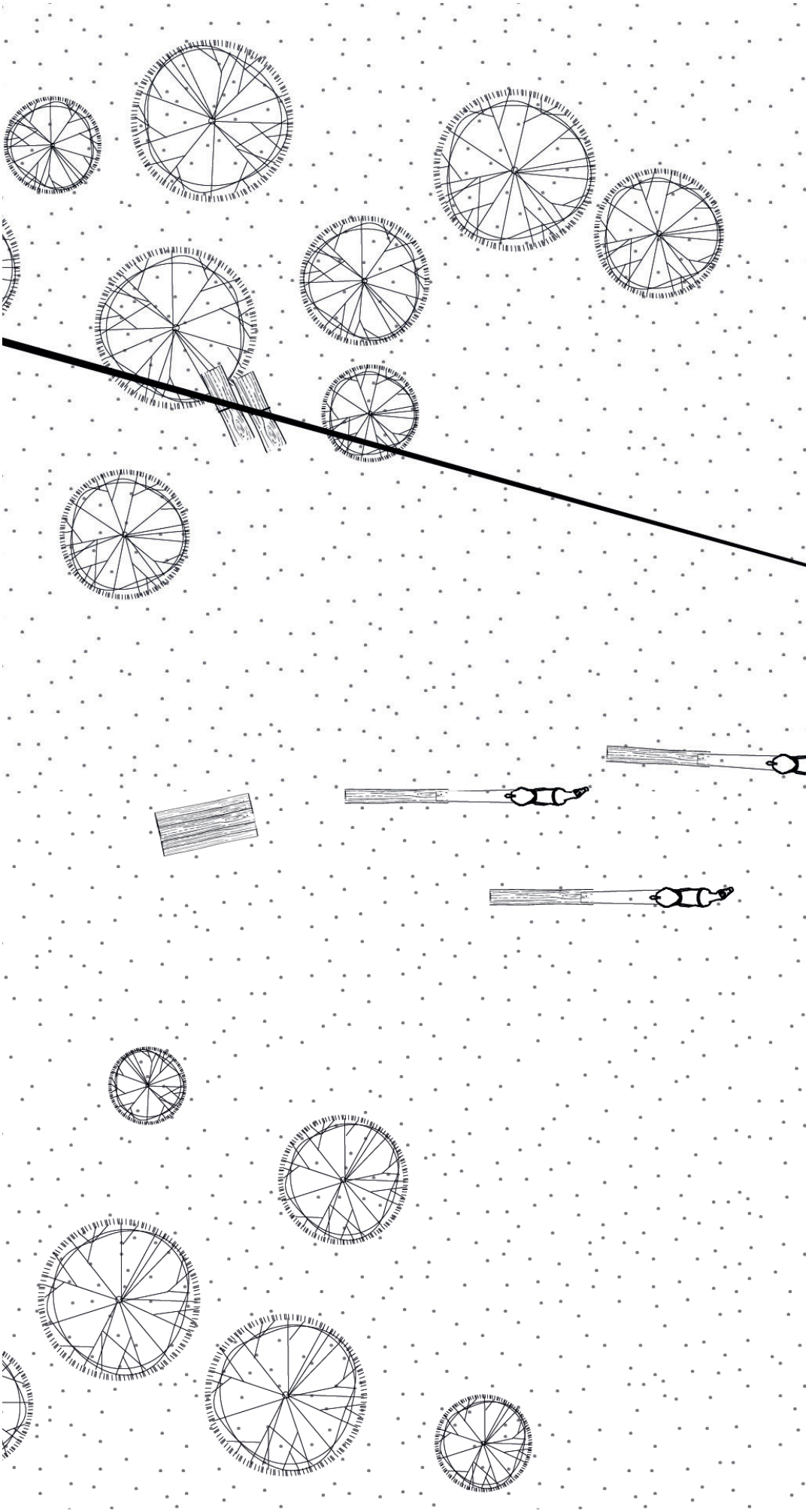
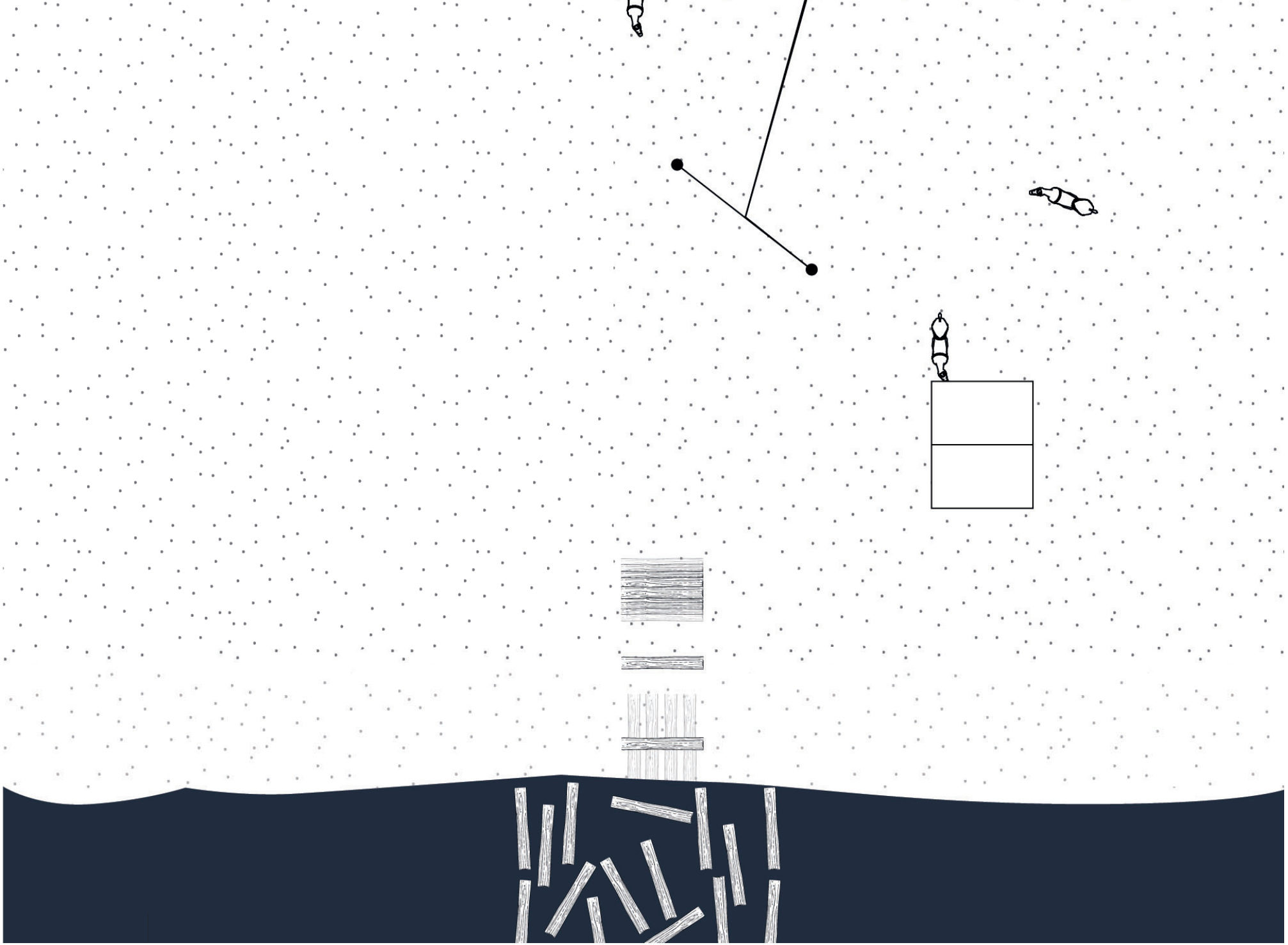
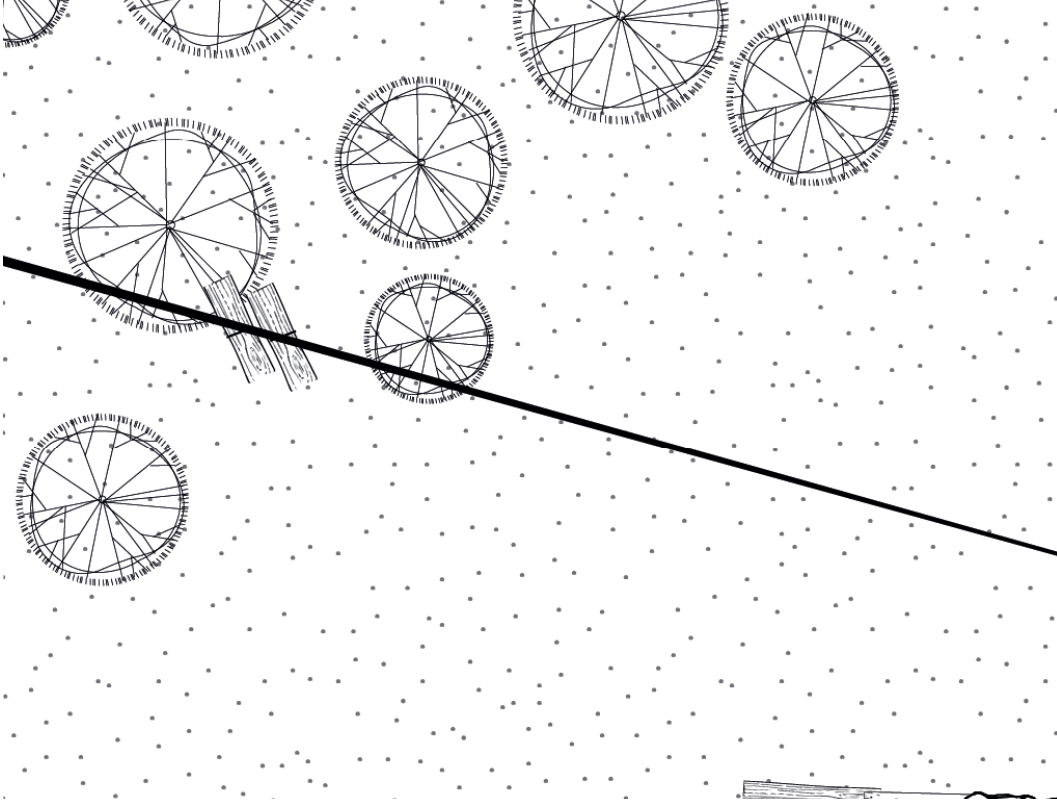
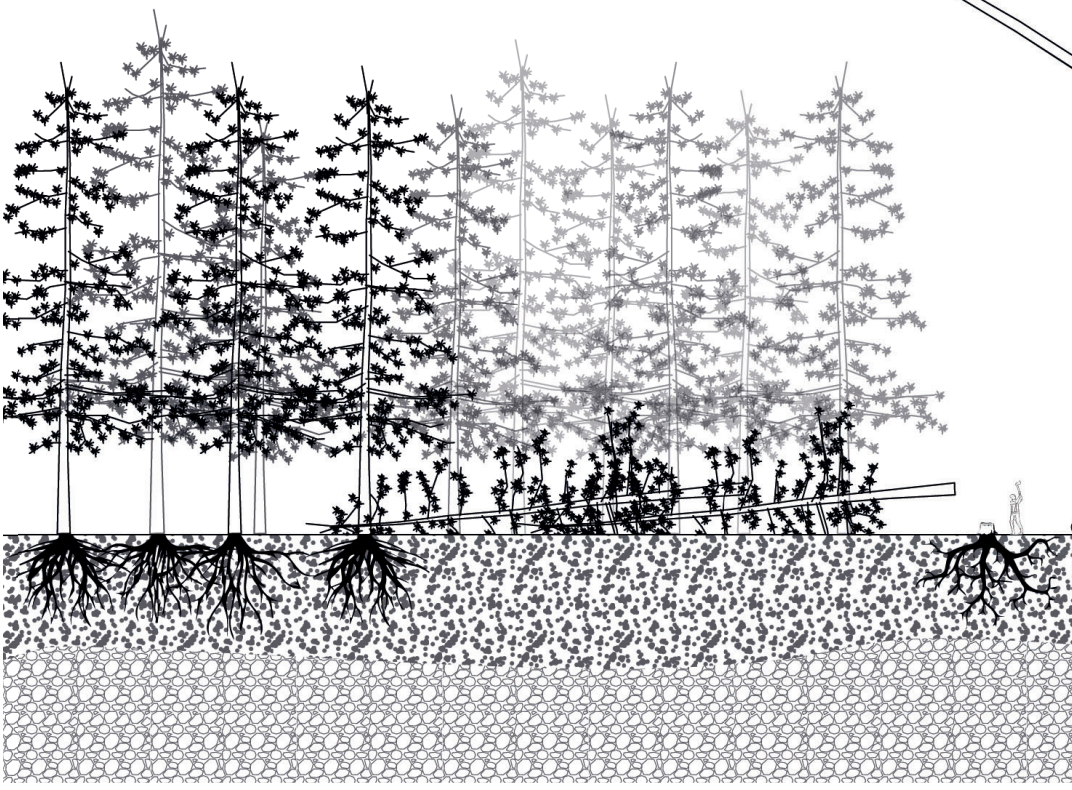


Floorplan of wood harvesting on the bottom of the hill
1:200

The plan shows how wood harvesting takes place. The trees that are chopped down by humans are chopped into logs.

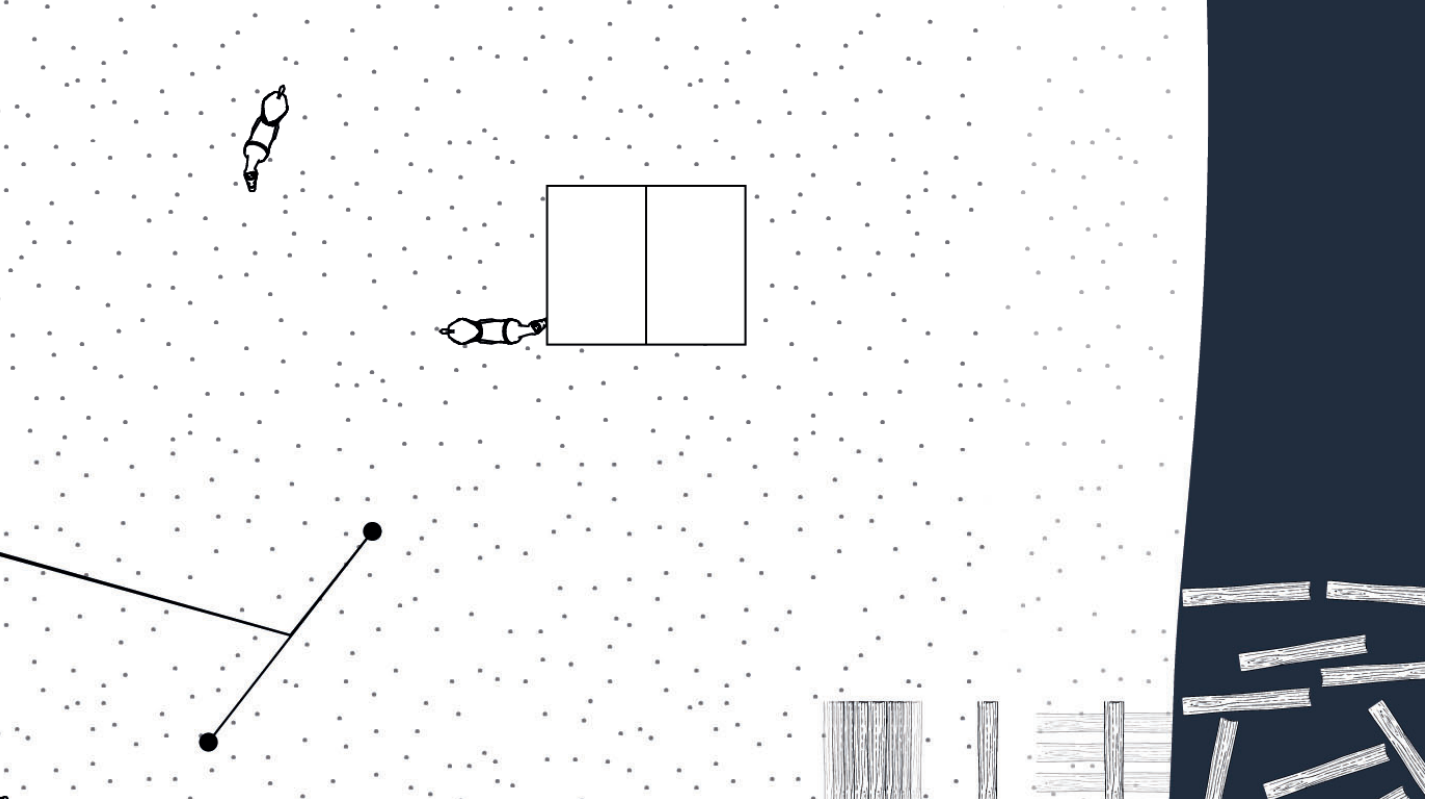




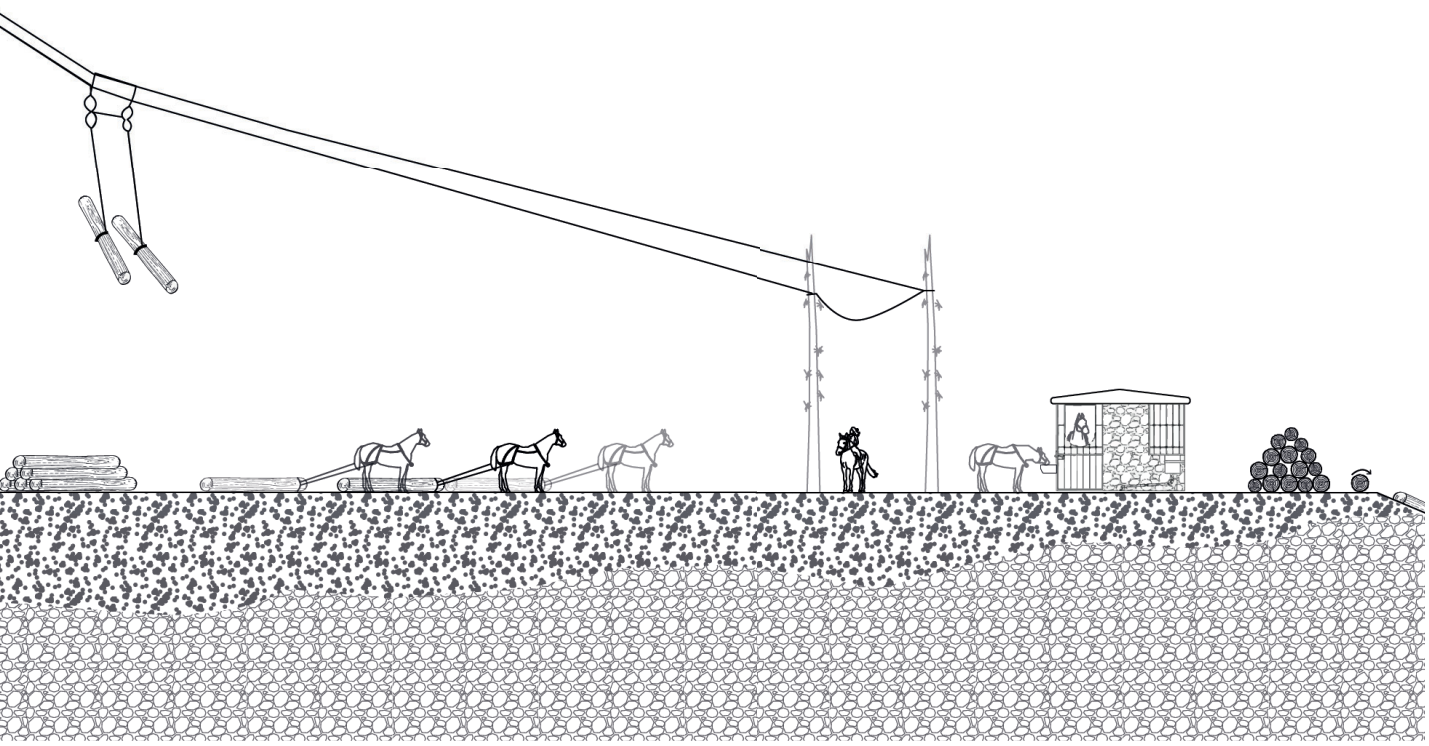


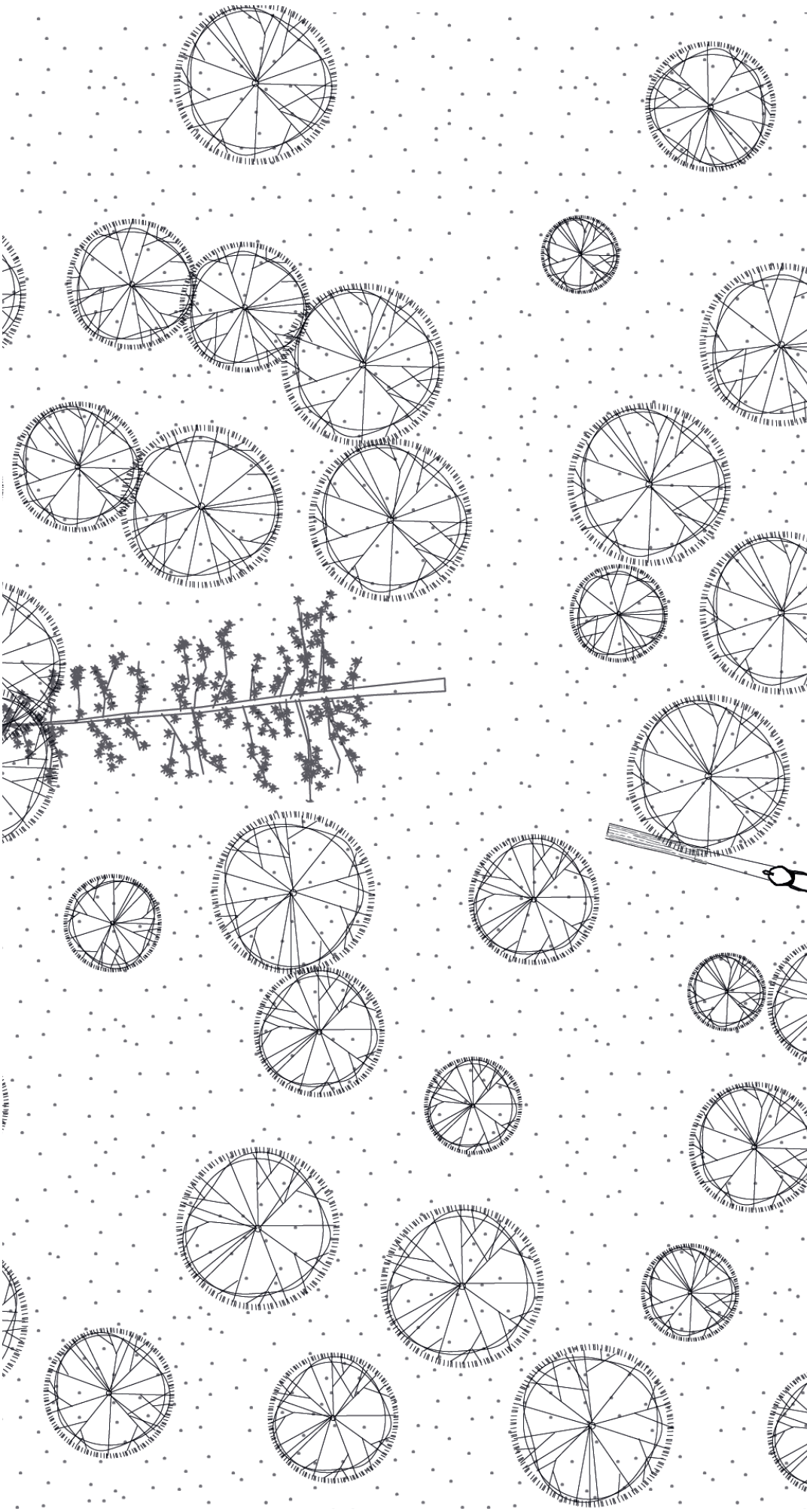
Section of wood harvesting on the top of the hill

The harvesting process is quite similiar to that on the bottom of the hill. The logs are transported with the cables to the bottom of the hill.



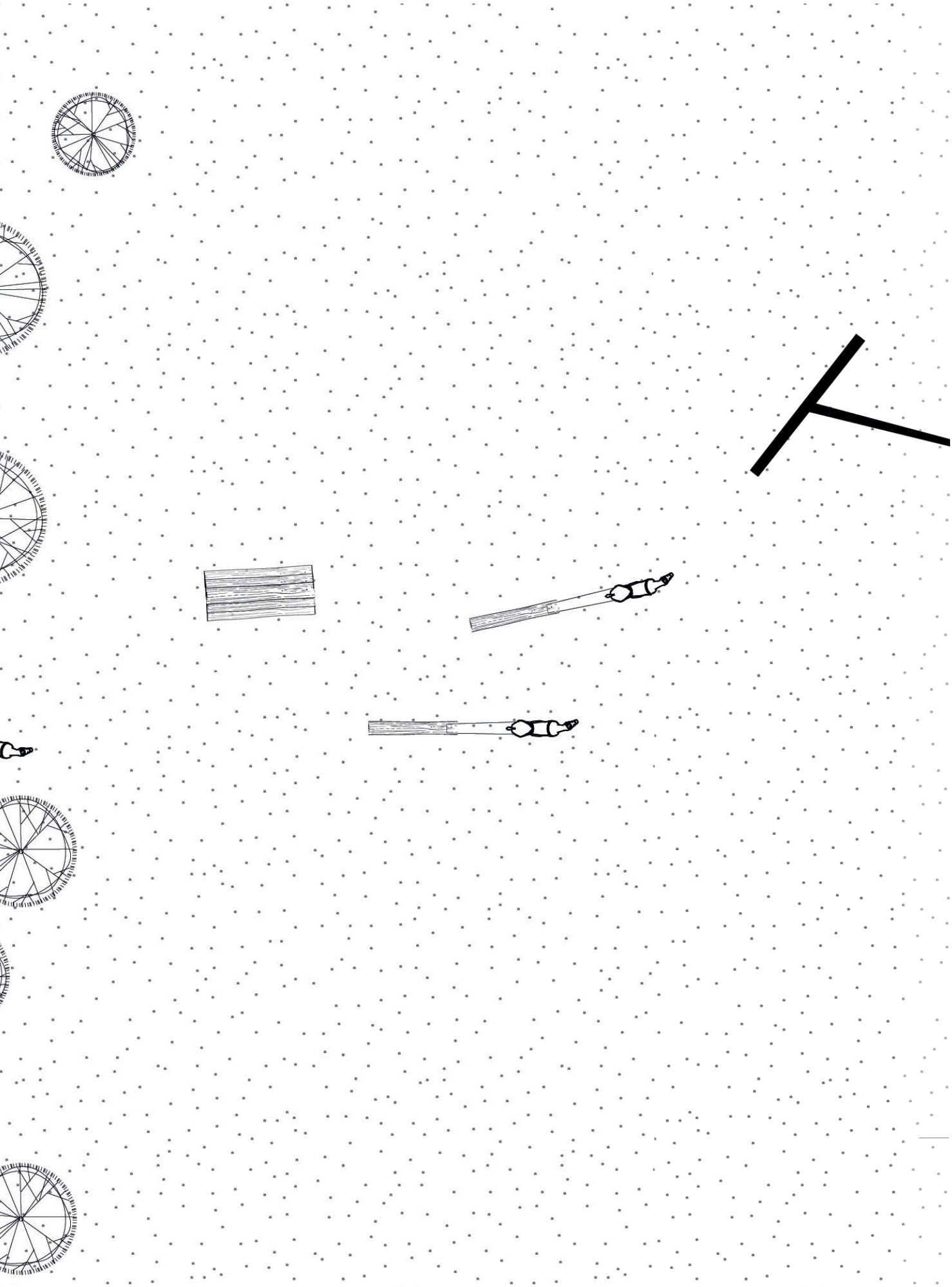


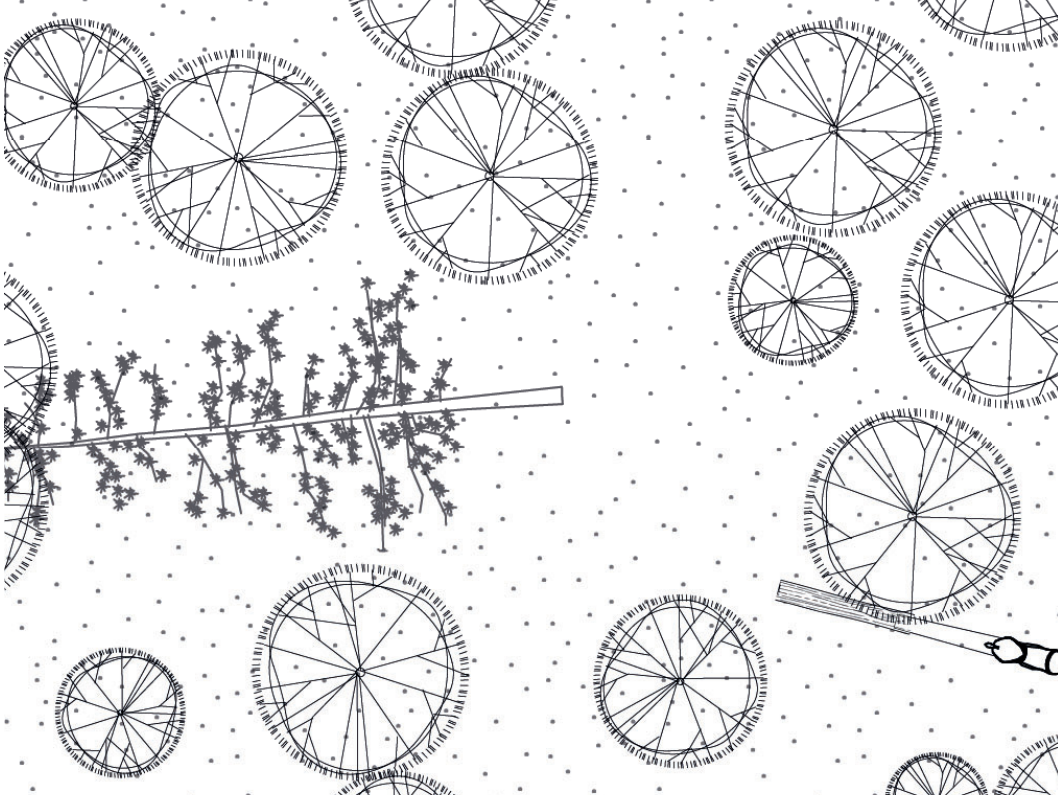


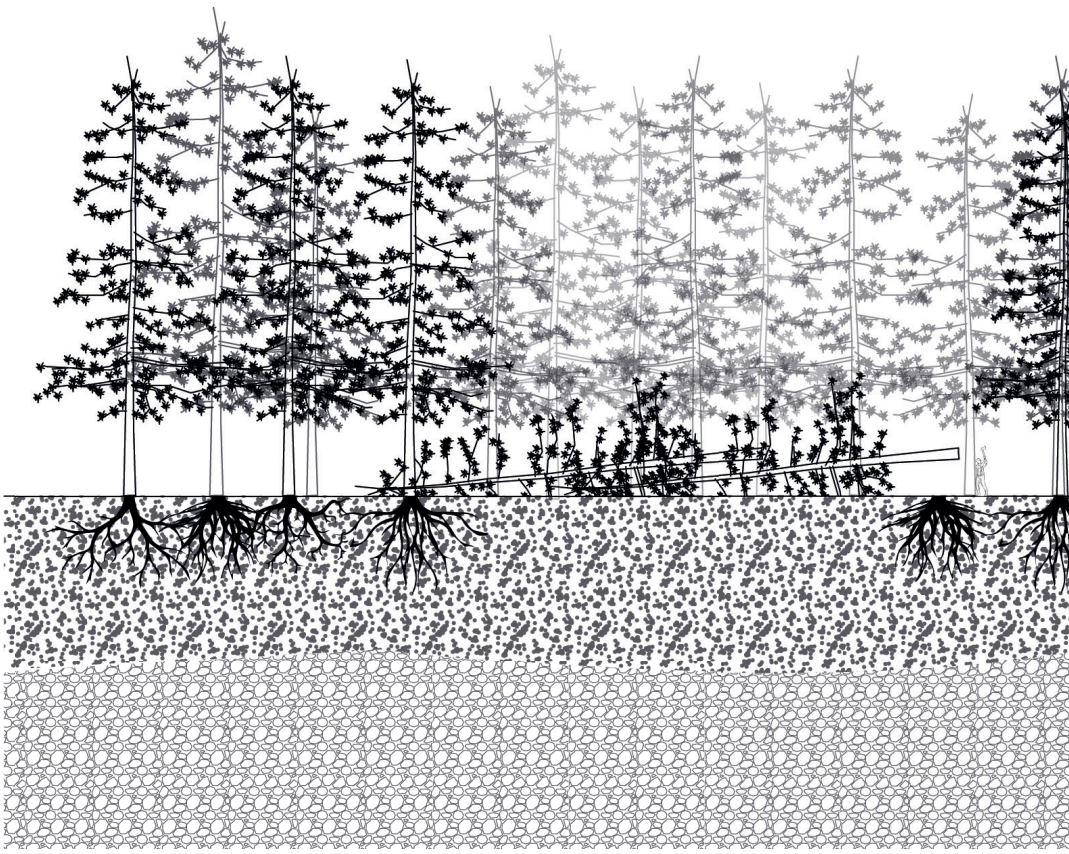


Floorplan of wood harvesting on the top of the hill
1:200

The plan shows how wood harvesting takes places more up the hill.

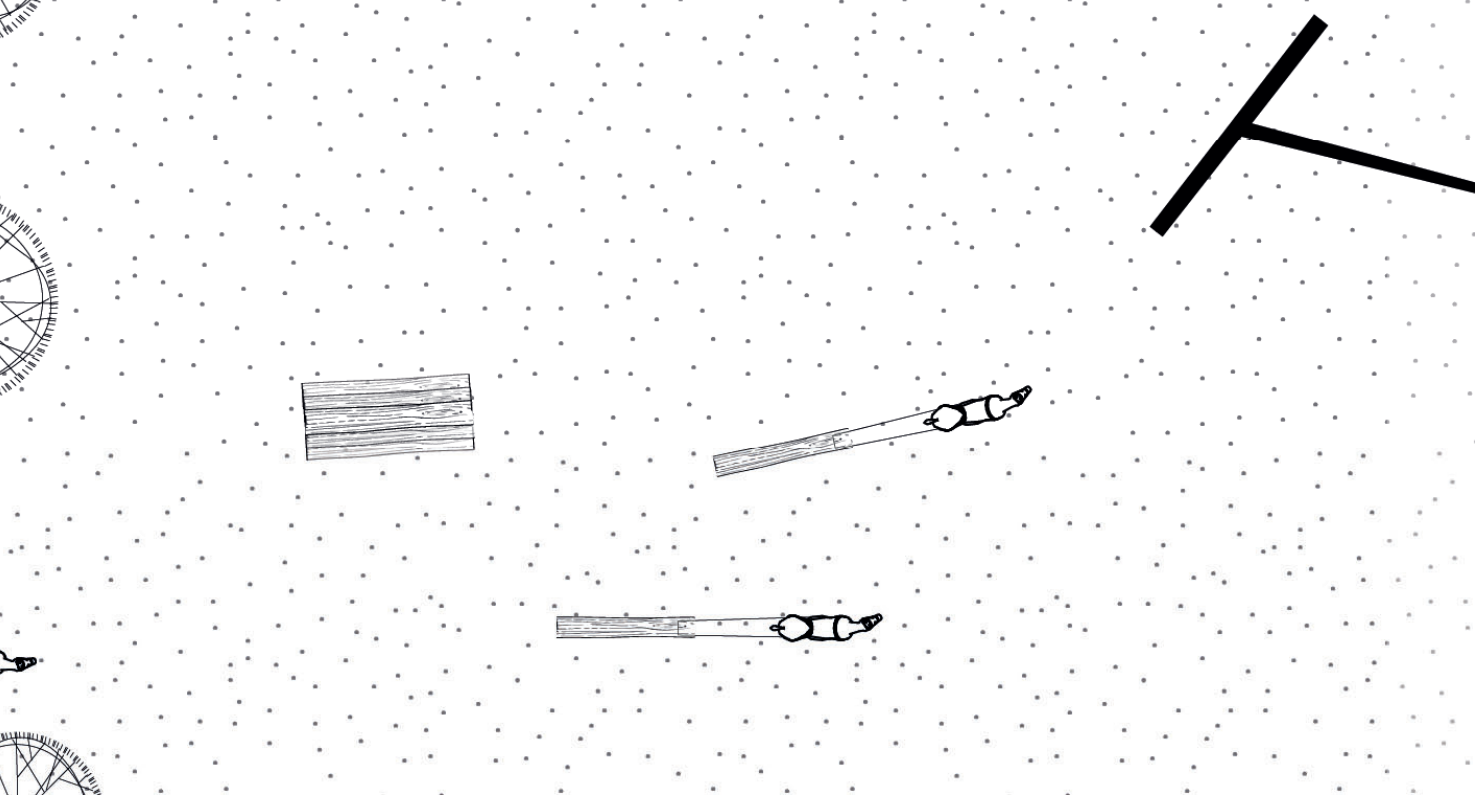


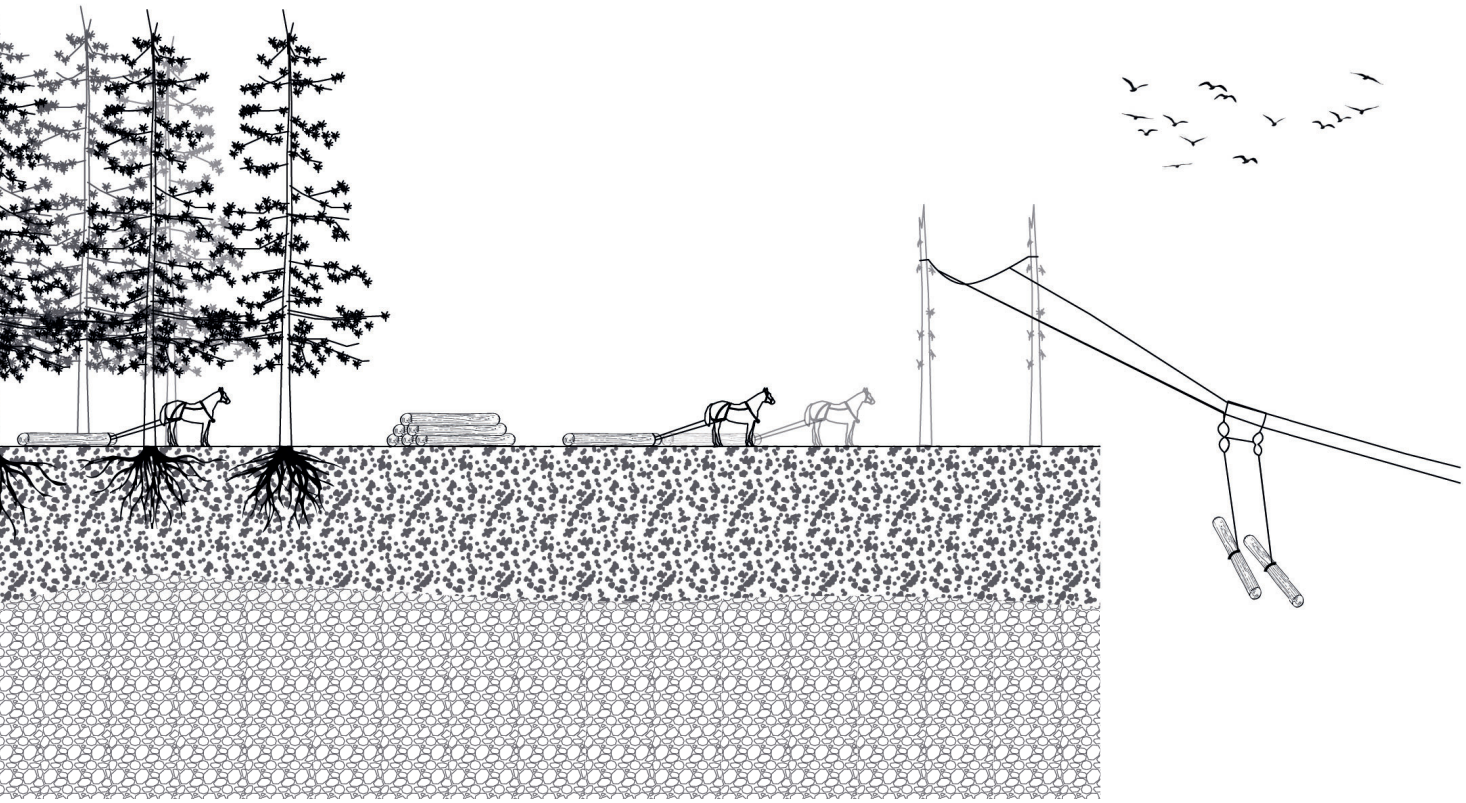




Section of wood harvesting on the top of the hill

The harvesting process is quite similiar to that on the bottom of the hill. The logs are transported with the cables to the bottom of the hill.







Wood harvesting

AI generated impressions of the wood harvesting process in the icelandic fjords.



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Complexity, 2023, AI-Generated

Valley section by Geddes, T. G. B. I. (2019, 10 november). Valley Section by Patrick Geddes.

Reflection Isamu Goiati

The conflict between preservation of nature and the need for human intervention is a long lasting struggle, a dance that has been playing out for centuries. At the heart of this struggle is a delicate balance between development and sustainability. Our project in the Eastern part of Iceland provided a unique opportunity to contribute to this dialogue.

The realization that we need to design with nature, not against it, was a guiding principle. Yet, we found ourselves questioning our own perceptions of what ‘nature’ truly is. While standing in the landscape, wild beauty of Iceland, it was easy to believe we were surrounded by untouched wilderness. Yet, we later realised, this was not the case. The landscape, though beautiful, was showing signs of human influence.

Our intervention approach sought to meld the need for connectivity with a deep respect for the environment. We rejected the conventional methodology of simply building new roads and tunnels. Instead, we went for minimally invasive interventions that retain the natural integrity of the land.

The introduction of a reforestation plan not only sought to restore the area’s natural ecosystem, but also laid the groundwork for a sustainable timber economy. This way, we weren’t just designing with nature, we were designing for a sustainable future. The beautiful landscapes of Iceland taught us an invaluable lesson: not everything is as it seems, and harmony can be achieved when we learn to work with, not against, the forces of nature.

5. Conclusion and Reflection

Conclusion

Conclusion. Iceland has one the most magnificent and unique landscapes on the planet, changing with every turn you make on its gravel roads. Travelling through moss overgrown volcanic rock, to magical black sand beaches, to moon-like landscapes. Surprisingly, during the field trip we learned how this ‘untouched wild nature’ actually was thoroughly damaged and eroded, as mankind has altered it. These lowlands were once part of a large and dense birch forest. The importance of sustainable landscape management and respectful design towards nature was therefore one of the key motives while doing this project. However, we acknowledge the fact that humans also need interventions. The challenge was in finding a way to add valuable interventions that would both serve the human and natural habitats, restoring damaged landscapes while providing improved conditions for urban areas. Restoring damaged landscapes through minimal interventions was a red line that pulled all four individual projects together.

From the beginning, the vision and strategy were quite straightforward and impactful, having a core consisting of reconnecting the remote areas on different levels while bringing back the historical forest landscape in eroded valleys. During the research, a way to design subtly was investigated, resulting in micro-connectivity. It is interesting to see how this process was tested in different scenarios through different identities, evaluating the outcomes that interpret these principles in different ways, but all keep respecting nature in their core.

From conflict to coexistence

The Casco Approach to Sustainable Tourism in Hveragerði

Kiki Dekker
Yoshi So

2022-2023 IED
Infrastructure and Environment Design
July 2023

Giving Back to the Land
&
Strenghtening (natural)
identity

How to get there ?

[extraction]
Tourist attractions

[extraction]
use of land

Pride of the Unique

[ADAPTATION]
DANCE with the Dangerous

openness

Natural disasters

wild, untamable land

Confrontation with the
POWER OF NATURE

[IDENTITY]

arrival : Human experience

[NATURAL STATE]

The untouched Land

R1

geothermal

PRIDE OF THE UNIQUE

[extraction]

HOT RIVER

TOURISM

[IDENTITY]

[extraction]

DATE

P

[Extraction]

INFRASTRUCTURE

Tourist attractions

HIKE

CITY

HYDROGEAL

ALL YEAR WATER FLOW

use of unique River

City

earthquake zone!

FARMING

[Adaptations]
Dance with the Dangerous

R1

[EXTRACTION]

[natural state]

UNTOUCHED LAND

FOREST

use of LAND

SWAMP

[Human experience]

CONFRONTED with POWER OF NATURE

1st CENTURY

Amber Coppens

Introduction

Iceland, with its raw beauty and untamed landscapes, used to embody the essence of nature in its natural state. From its majestic glaciers to its fiery volcanoes and cascading waterfalls, the country showcases the Earth's powerful forces at work. When humans first arrived on this remote island, they were confronted with the overwhelming might of nature. They witnessed the unpredictable eruptions, fierce storms, and vast icy expanses that tested their survival skills. Over time, they learned to navigate the treacherous terrain, adapt to the harsh climate, and coexist with the land's untamed spirit. Through this dance with danger, the icelanders became proud of their ability to coexist with the land and therefore proud of the uniqueness of their land. They started appropriating the land even more, to show off it's natural beauty, trying to attract people from other countries to see their land

Therefore, the touristic sector in Iceland grew excessively over the course of a few years. While it provides for a large amount of their annual income, it also came hand in hand with a fear of over-tourism, intruding the natural areas of the beautiful island. For centuries, Iceland has been attractive to international scientists and artists wanting to experience this impressive nature as well as the Icelandic society and culture. Nowadays this has changed into tourists hiring a car and driving along Route 1 to stop at all the natural hotspots. These hotspots are often situated within sensitive natural areas, with frequent volcanic eruptions, volcanic soils and short growing seasons tend to be very sensitive to external physical impacts (Sæþórsdóttir et al., 2020). Due to these sensitive areas being the main tourist attractor it becomes hard to preserve and protect these areas.

The idea of the honorable harvest serves as a source of inspiration when examining tourism as an activity that extracts resources from the earth and its people without offering anything in return. Embracing the Honorable Harvest means recognizing our responsibility when taking from the earth, ensuring the preservation of its richness for future generations.

Similar to the principles of the honorable harvest, this project aims to establish a tourism industry that gives back to the landscapes visited, the nature explored, and the communities traversed. It endeavors to create an environment where tourism actively contributes to the well-being of these places and the people who inhabit them.

1.

Conceptual Framework

Context and Problem Field

The research area of the project lies within the borders of the Ölfus valley municipality, renowned for its captivating landscapes shaped by geological and geothermal forces. Notably, a warm river named Reykjadalur flows through from the mountaintop to the sea. This remarkable river serves as the main attraction of the region.

The two main towns within the project's research area are Hveragerði and Þorlákshöfn. Hveragerði is located close to the valley walls. Þorlákshöfn is located along the sea and holds the main port of South Iceland. This project will shortly develop on the scale of the Ölfus valley after which it zooms into the village scale, designing for Hveragerði.

Hveragerði is a small town located in southern Iceland, it has a rich history rooted in its unique geothermal surroundings. The area has been inhabited since the early settlement period, with evidence of Viking presence dating back over a thousand years. Hveragerði's name translates to "hot springs garden," highlighting the significance of its geothermal activity. Throughout the centuries, locals have utilized the abundant geothermal energy for various purposes, mainly for the heating of greenhouses to cultivate flowers. The town has also experienced devastating earthquakes and volcanic eruptions, shaping its history. As of today the locals have learned to deal with the natural conditions of their local environment. The town is slowly shifting its economic focus from flower cultivation to tourism, using its geothermal activity in the most lucrative way.

Hveragerði with its very sensitive, highly valued natural wonders and landscapes and its historically rich culture is turning into a hotspot for tourists. This project deals with societal and cultural issues caused by this exploding tourist industry.

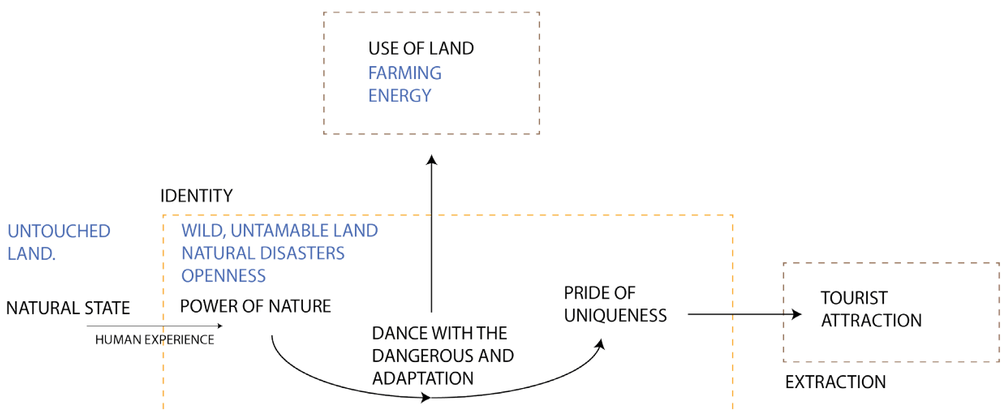
Problem Statement

Welcoming a great number of tourists has proven to be a big challenge for Iceland (Sæþórsdóttir et al., 2020). Tourism becomes a risk when the industry starts to overshadow local cultures and intrudes preserved nature.

The rapid growth of tourism in Hveragerði, a small town in southern Iceland, presents pressing societal and cultural challenges. The town's geothermal activity and natural wonders attract an increasing number of visitors, necessitating the urgent management of the negative impacts associated with this burgeoning tourist industry. Hveragerði's fragile natural landscapes, including hot springs, geothermal areas, and delicate ecosystems, are at risk of degradation without proper preservation measures. The physical impacts of intensive tourism threaten the long-term preservation of these unique natural wonders.

Simultaneously, the rise in tourism poses social and cultural challenges for the local community. The transition from a historically flower-focused economy to a tourism-driven one alters the town's social fabric and cultural dynamics. The influx of visitors brings opportunities and potential conflicts, such as increased demand for services, changes in local traditions, and the risk of cultural commodification. Without careful management, these changes may undermine the community's well-being, cohesion, and connection to their local environment.

Thus, urgent action is needed to address the societal and cultural challenges arising from the rapid growth of tourism in Hveragerði. Sustainable strategies must be identified and implemented to balance economic development with the preservation of the town's sensitive natural landscapes and rich cultural heritage.

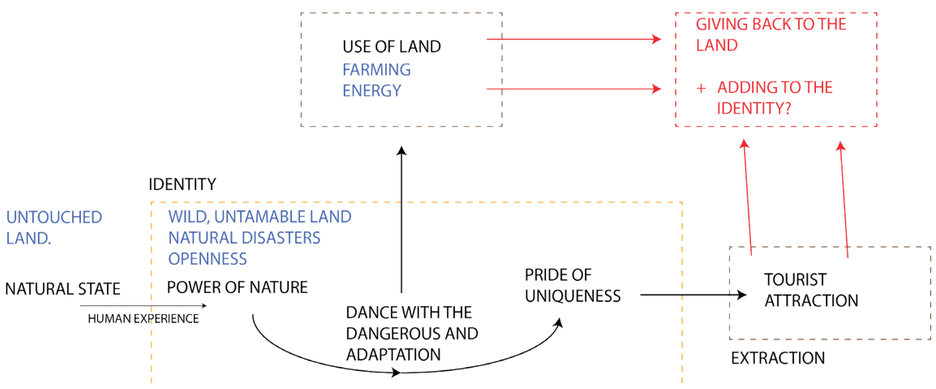


Aims of the Project

The aim of this project is to address the challenges posed by the rapid growth of tourism in Hveragerði, southern Iceland, while preserving its natural areas and promoting cultural heritage. By implementing sustainable tourism practices and engaging with the local community, the project seeks to achieve several outcomes that benefit both the town and its residents.

The project's main goal is to achieve a balance in identity and tourism, having a growing touristic sector while protecting the identity of the place. We expect to achieve several outcomes. These include the preservation of natural areas for future generations, the celebration and promotion of cultural heritage, and the establishment of a responsible and sustainable tourism industry in Hveragerði. By promoting sustainable tourism practices and preserving the town's unique qualities, we can create a positive and mutually beneficial relationship between tourism and the community. Additionally, the strategy will contribute to the long-term economic stability of Hveragerði by attracting conscientious visitors and supporting local businesses that align with sustainable principles. Ultimately, our goal is to create a thriving and resilient town that retains its natural beauty, cultural richness, and quality of life for residents, while providing memorable and sustainable experiences for visitors.

As many Icelandic villages are facing the same problem as Hveragerði, this project aims to provide an example of a solution on how these villages can plan for this growth. The natural- and cultural casco concept are tested on Hveragerði in this design project. The way in which these concepts are formulated could also be applied in other areas. This project therefore aims to be an example in using the casco concept for urban planning in Iceland in order to protect certain qualities.



Concept of the project

The project encompasses design considerations at three distinct scales: geographical, landscape, and tectonic.

At the geographical scale, we address Iceland's presence on the global tourism agenda and the associated risks of overtourism. We recognize that the preserved natural areas, which are significant tourist attractions, can create conflicts that need to be managed and resolved.

Moving to the landscape scale, we focus on the river as the backbone of Hveragerði's cultural and economic vitality. We recognize its importance as a driving force in shaping the town's identity and seek to leverage its potential for sustainable development.

At the tectonic scale, we embark on a cultural and socio-economic exploration, examining the identity of Hveragerði within the larger context of Icelandic identity. This entails considering the town's urban form, structures, and socio-economic dynamics to ensure that our design interventions are well-aligned with the unique character of Hveragerði.

By addressing these scales, we take a comprehensive and integrated approach, considering the broader global context, the specific landscape of Hveragerði, and the town's socio-economic dynamics. This approach allows us to develop strategies and interventions that tackle over-tourism concerns, harness the potential of the river as a cultural and economic driver, and enhance the overall identity and resilience of Hveragerði.



Referential Theories and Practices

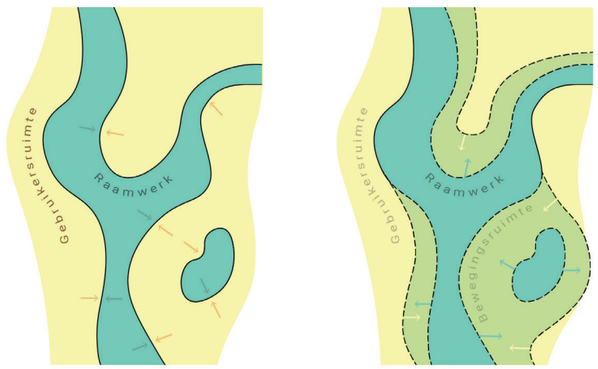
The casco concept is one of the instruments used as an instrument in landscape planning. The concept is defined by H+N+S landscape architects as “a planning tool to secure low-dynamic functions such as nature, water and landscape elements for the long term through spatial bundling.” The first image shows the original model created as an instrumental elaboration of the Dutch Layers Approach (a dutch planning instrument). The second image shows the latest model of the casco concept. This model of the casco concept defines 3 spaces;

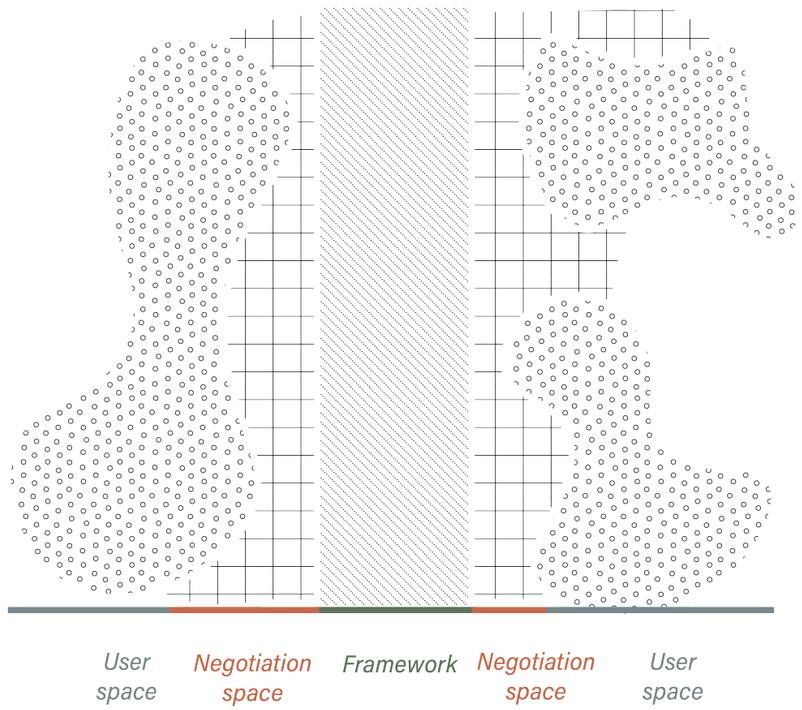
1. The framework: consisting of slow dynamic functions or qualities that need to be bundled in order to be preserved
2. The user space: consisting of highly dynamic elements that should move around the framework.
3. The negotiation space: as a flexible intermediate space between the framework and the user space. This space becomes a transition between the two zones, where the user space serves the framework.

(Redesigning Deltas - Casco Concept and Dutch Layers Approach, 2023)
(H+N+S Landschapsarchitecten, 2023)

In this project we will use the casco concept to preserve certain qualities that we define as important. These qualities will become part of the framework and will therefore be protected in further developments. The concept is currently mainly used in landscape planning and still undiscovered in urban planning. While largely unexplored in urban planning, this project aims to utilize the casco concept to safeguard and enhance certain qualities that contribute to the village’s identity.





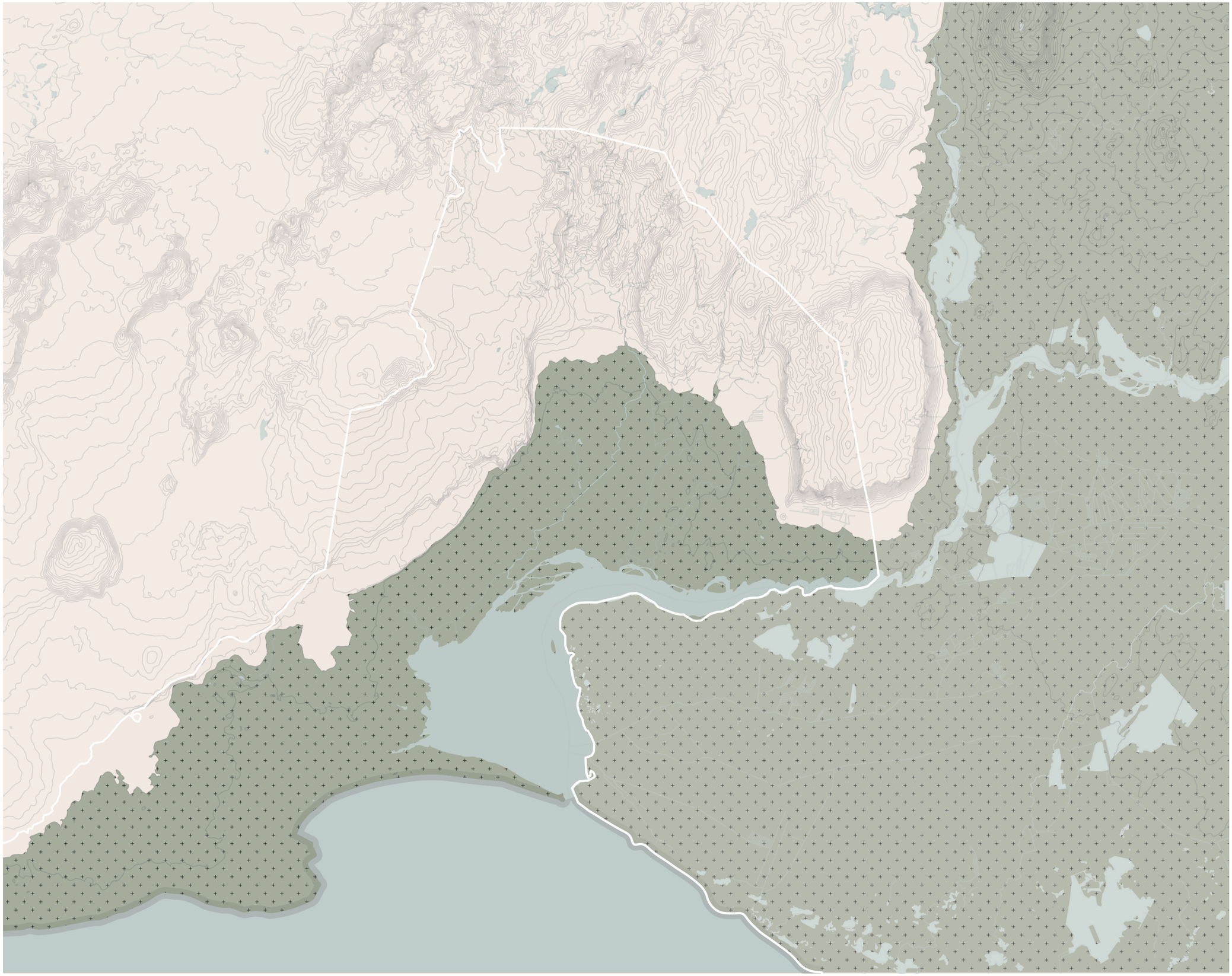


2. Critical Landscapes & Tectonics

Palimpsest 874

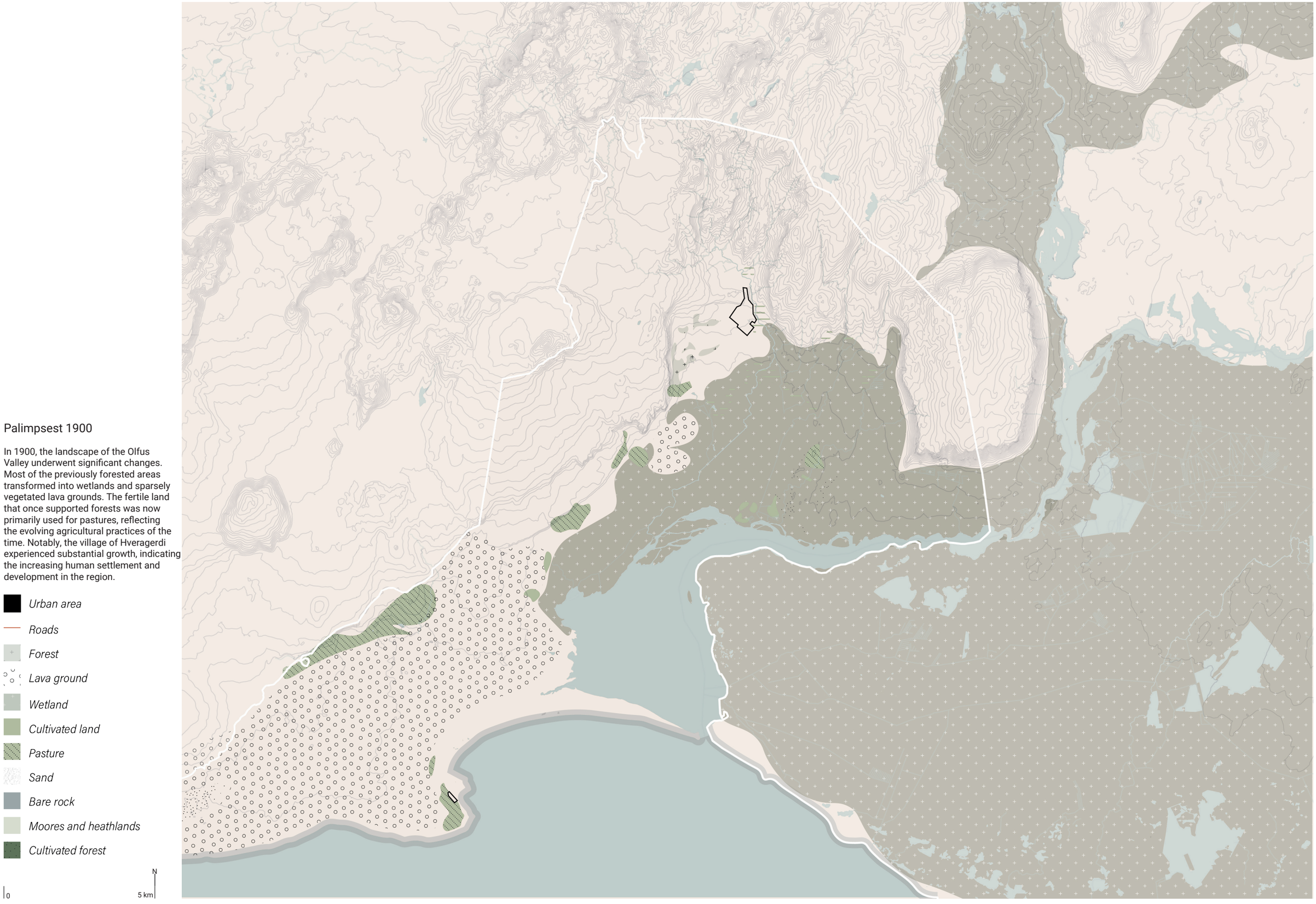
In the early stages of settlement in Iceland, the Olfus Valley was characterized by extensive forests. However, as the first settlers arrived, they began clearing the land for cultivation and utilizing the trees for timber. Over time, the once forested valley rapidly transformed.

- *Urban area*
- *Roads*
- *Forest*
- *Lava ground*
- *Wetland*
- *Cultivated land*
- *Pasture*
- *Sand*
- *Bare rock*
- *Moores and heathlands*
- *Cultivated forest*



Palimpsest 1900

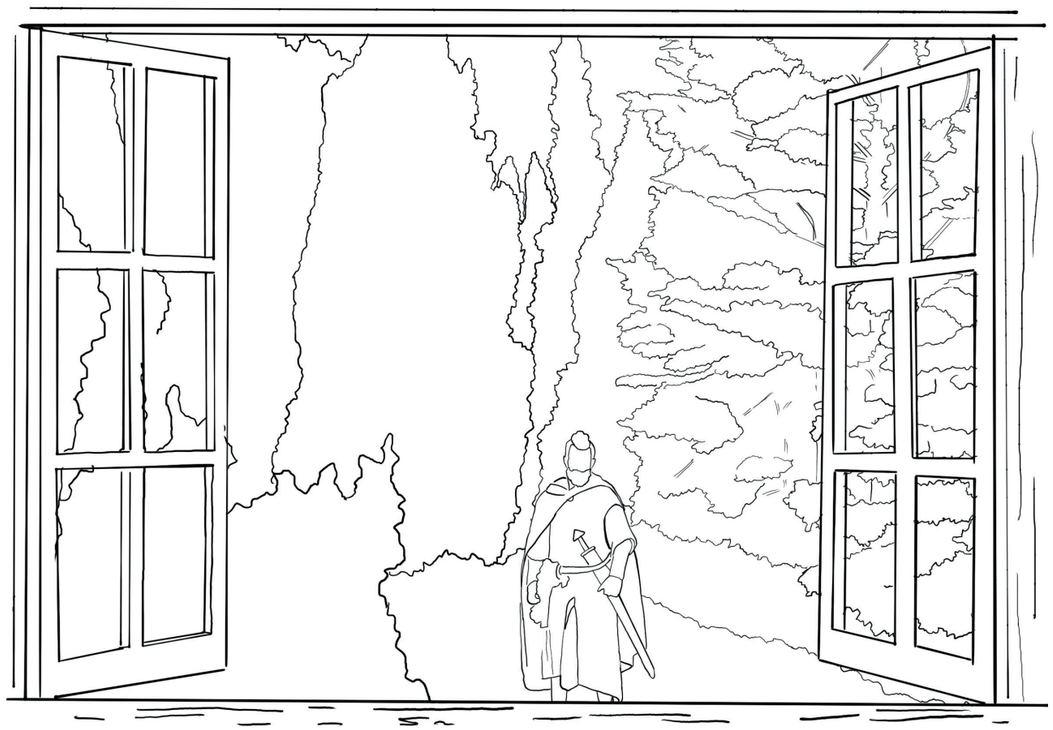
In 1900, the landscape of the Olfus Valley underwent significant changes. Most of the previously forested areas transformed into wetlands and sparsely vegetated lava grounds. The fertile land that once supported forests was now primarily used for pastures, reflecting the evolving agricultural practices of the time. Notably, the village of Hveragerdi experienced substantial growth, indicating the increasing human settlement and development in the region.



Palimpsest 2023

Between 1900 and 2023, further transformations shaped the Olfus Valley landscape. The expansion of pastureland continued, accompanied by the growth of the two towns and the infrastructure connecting them. By 2023, a majority of the land was cultivated, reflecting the intensification of agricultural activities. However, a small portion of the wetland remained. Additionally, there were notable efforts towards reforestation, signifying a recognition of the value of restoring forested areas and promoting ecological balance within the valley. These changes illustrate the ongoing human impact on the landscape and the emerging awareness of the need for sustainable land management practices in the Olfus Valley.





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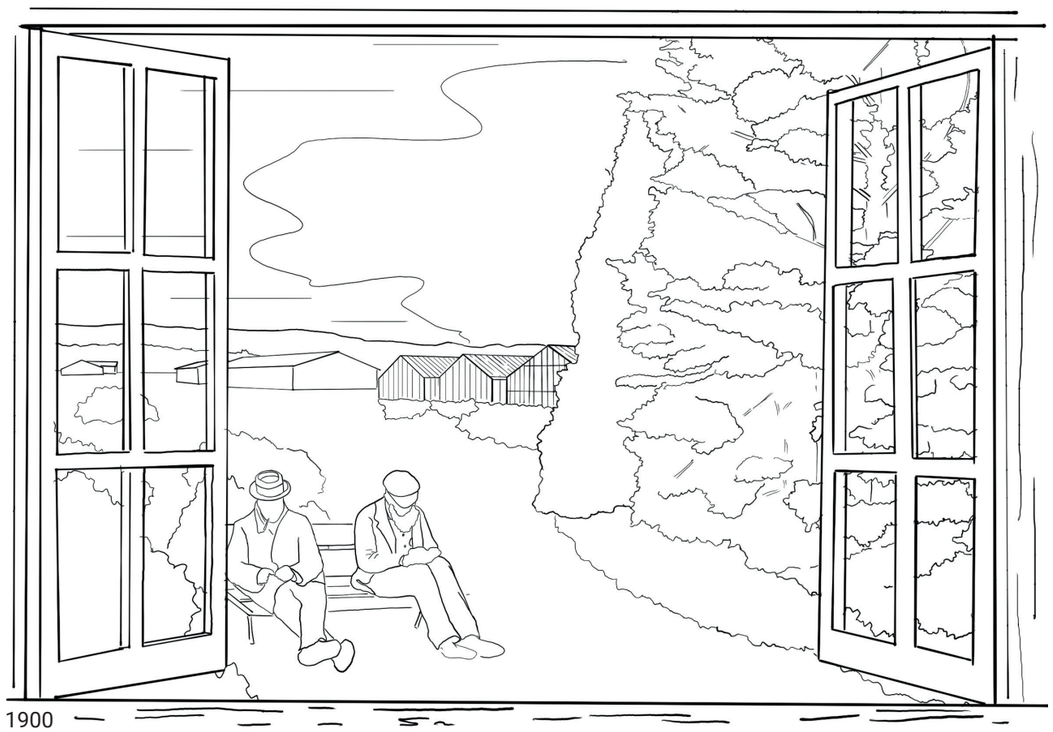
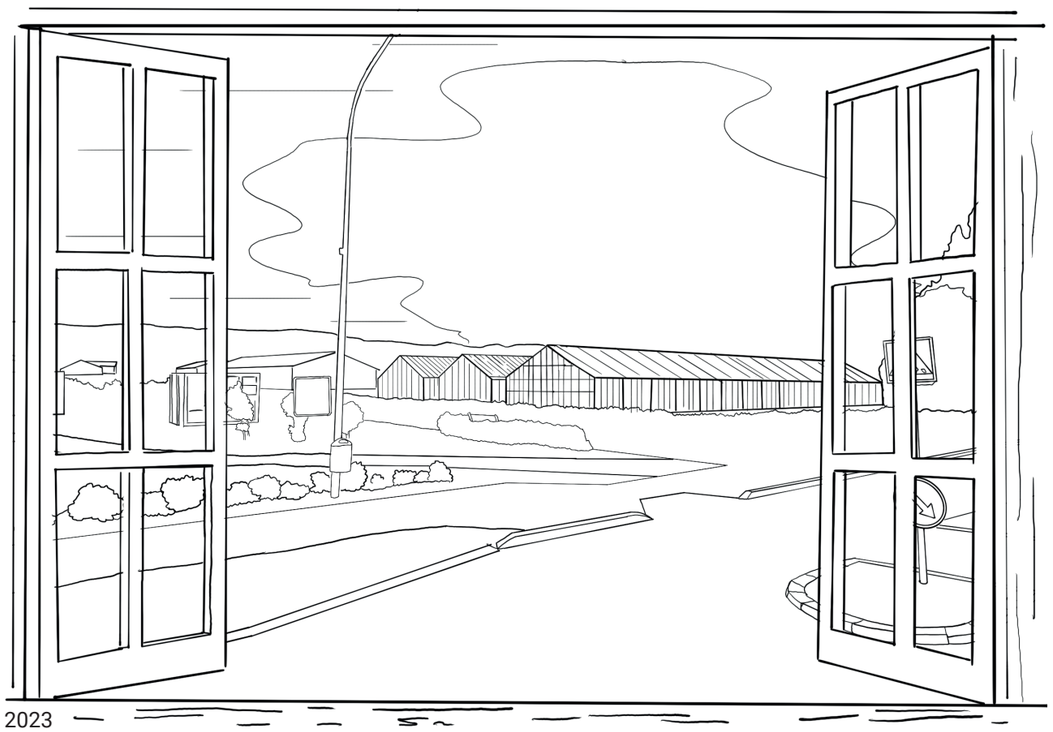


1900



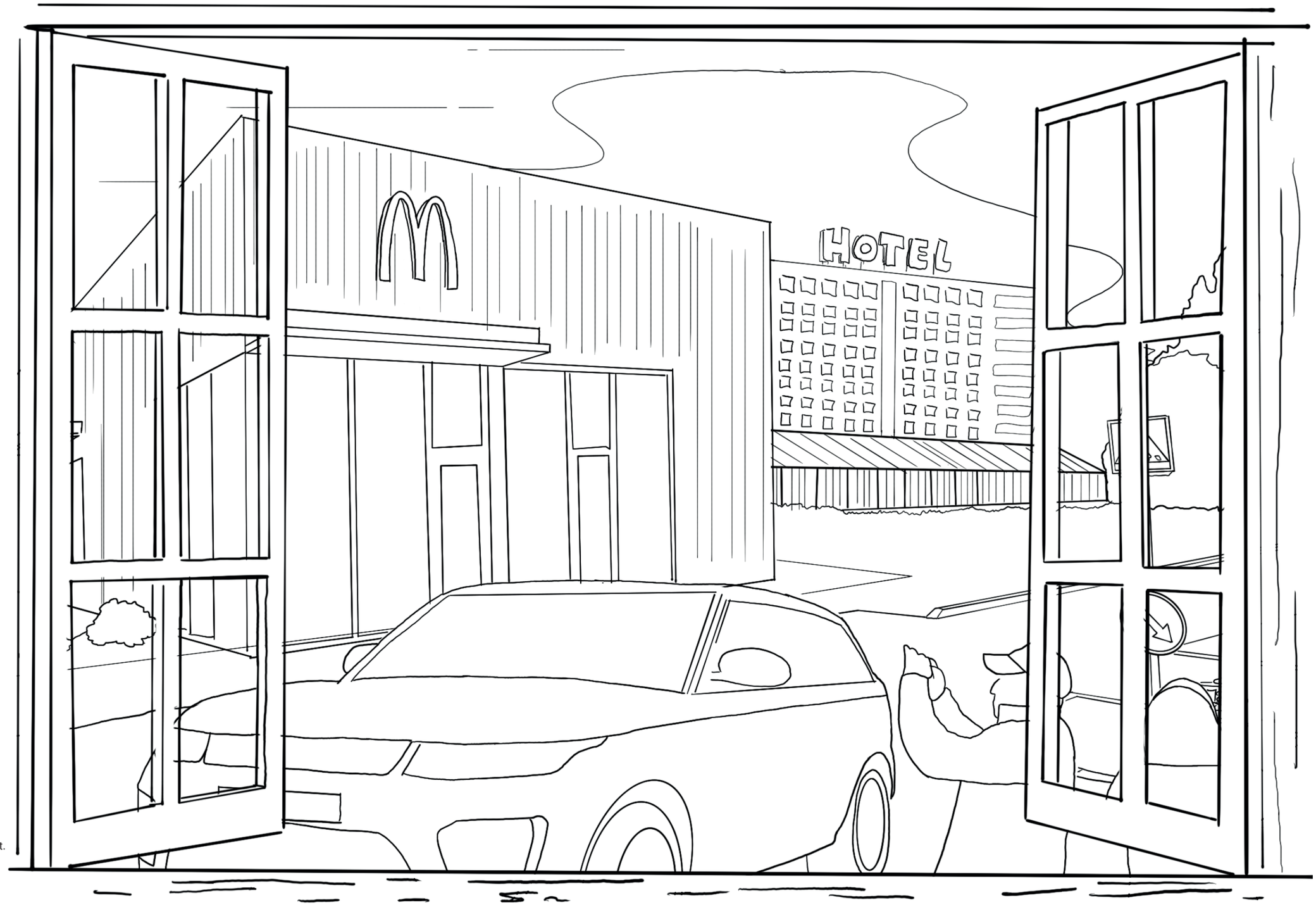
2023

Windowscapes

On a smaller scale, Hveragerdi has undergone notable transitions. In its early days, around 874, the town was nestled within lush forests. However, by 1900, the majority of these forests had been cleared to make way for agricultural activities. Hveragerdi capitalized on its abundant geothermal resources, utilizing them to create a thriving flower industry housed in heated greenhouses. This specialization in flower cultivation brought the town widespread recognition and cemented its status as a prominent tourist destination.

The consequences of Hveragerdi's popularity have left an indelible mark on the town's landscape. The rapid growth of tourism and accompanying infrastructure development have led to the removal of the remaining forests. This transformation highlights the interconnectedness between human activities, tourism, and the physical environment.

As of today, Hveragerdi continues to evolve as a result of its touristic appeal. The town has experienced substantial infrastructure expansion to accommodate the growing number of visitors. However, this growth has come at the expense of the significant alterations to the town's natural surroundings.



2050

Looking towards 2050, with the continuous growth of tourism in Hveragerdi and the influences of globalization, it becomes increasingly crucial to approach development with great care. We must ensure that the existing qualities of the town are not lost but instead preserved and strengthened. Balancing the demands of tourism with the preservation of Hveragerdi's unique identity and natural heritage is paramount.

Parking and tourist hostspots

The map reveals a direct correlation between parking areas and tourist hotspots. These spots largely overlap with the protecrted natural area, highlighting the significant pressure exerted by the tourism industry (in its current form) on the natural landscape.

- Parking
- Hotspring
- Tourist hotspot
- Roads
- Protected area

0 5 km

N

Pastures, infrastrucure and buildings

The map demonstrates a clear correlation between the expansion of cultivated land, including pastures and built areas, and the subsequent development of infrastructure. This interrelation highlights the reciprocal relationship between land use and infrastructure. As the amount of cultivated land increases, infrastructure follows these patterns, accommodating the growing needs of agricultural activities and human settlements.

- Pastures
- Hotspring
- Buildings
- Roads
- Protected area

0 5 km

N



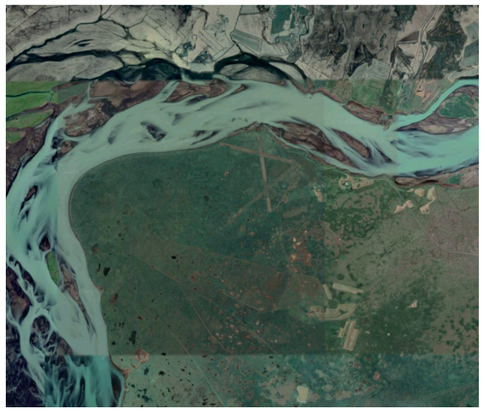
+400



Valley walls



Higher valley plains



Lower valley plains

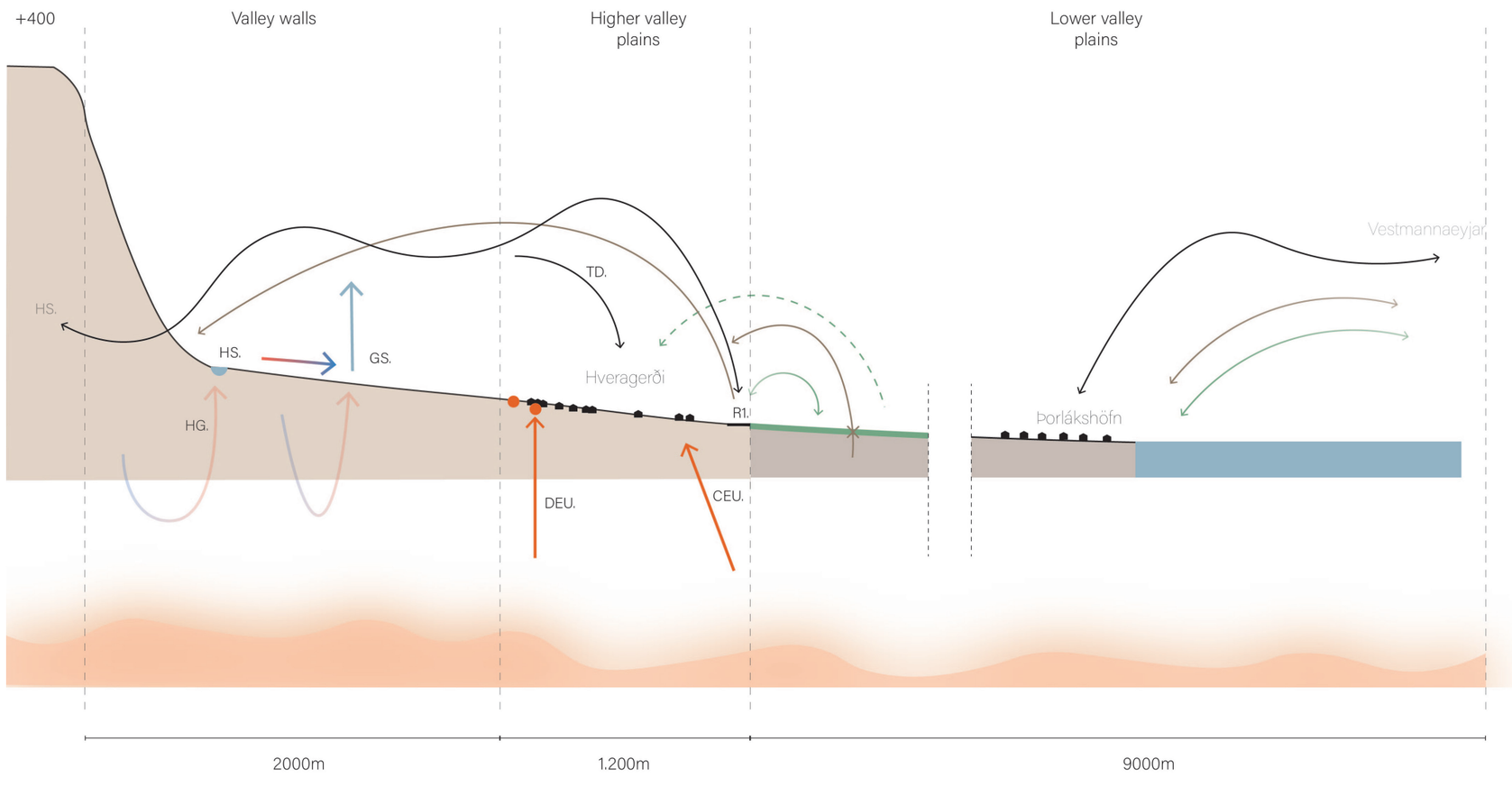
Landscape identity

The range of photos show the 4 different landscape types the Ölfus valley holds. From the highlands where the hot river is used to bathe, to the city that thrives on tourism, to the higher plains of production landscapes and the lower plains where the river meets the sea.
The section shows the WEF-M flows through these landscapes. It mainly ex-plains the water flows getting warmed up by the ground heat and flowing from the valleys walls to the lower plains.

- Brown andosols
- Histic andosols
- Water
- Hot magma

- Water
- Minerals
- Food
- Energy
- Tourists

TD. Touristic dependence
GS. Geysers
R1. Route 1
CEU. Centralized energy use
DEU. Domestic energy use
HG. Heating of groundwater
HS. Hotsprings
HG. Centralized energy use



3. Territorial Vision

Vision and strategy

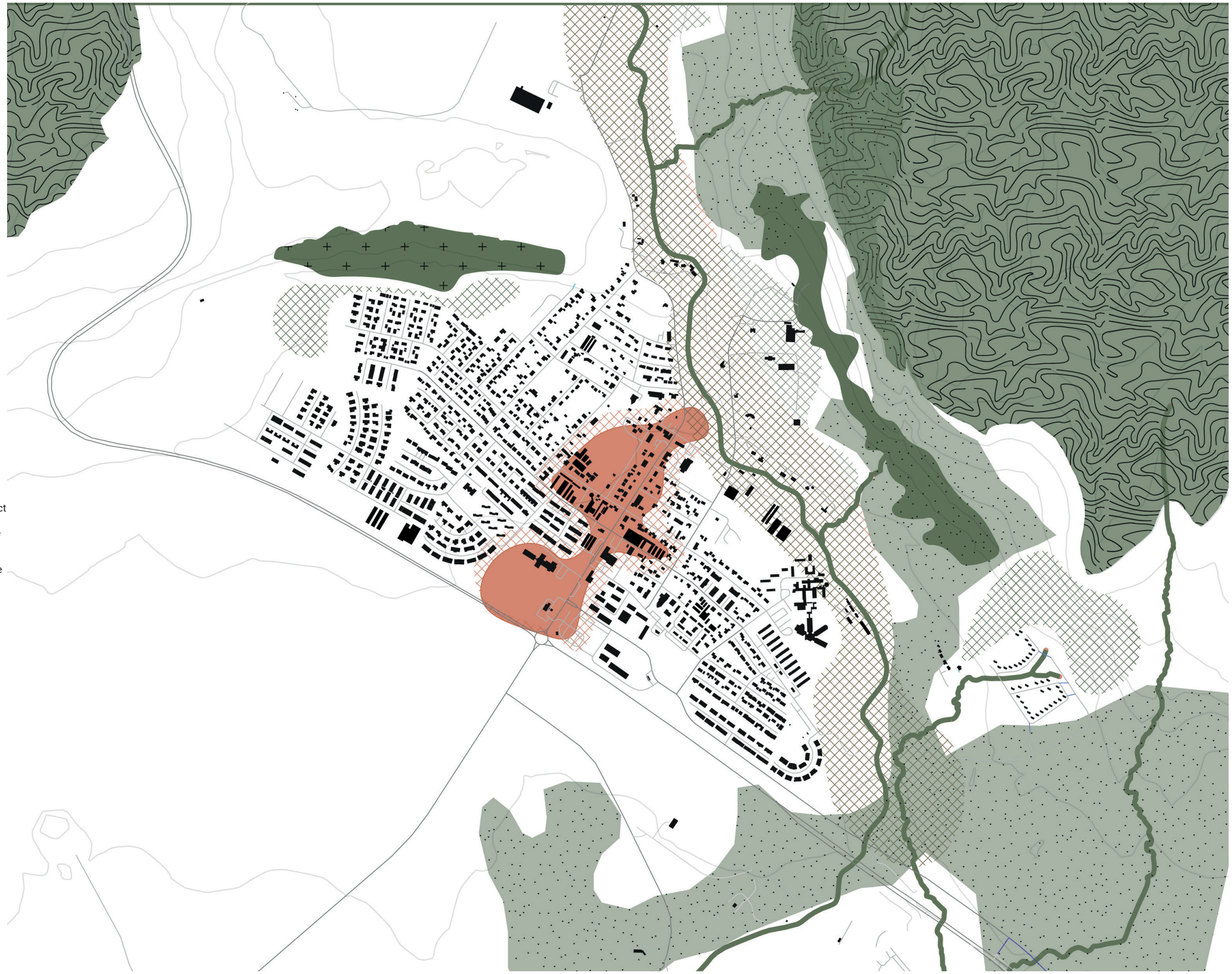
The project envisions a sustainable and resilient future for Hveragerði, where the town's natural and cultural qualities are preserved and celebrated. It aims to foster a tourism industry that not only benefits the local economy but also ensures the long-term well-being of the community and the environment. By adopting a holistic approach we strive to strike a balance between tourism development and the preservation of Hveragerði's unique identity and natural heritage.

In order to achieve this vision we use the casco concept as elaborated on earlier, to preserve the identity. The natural and cultural elements of Hveragerði are safeguarded within the framework.

Preservation of Natural and Cultural Qualities: Recognizing the significance of Hveragerði's natural wonders and cultural heritage, we are committed to their preservation. We will implement measures to protect the fragile ecosystems, geothermal features, and scenic landscapes from degradation caused by intensive tourism. Simultaneously, we will work closely with the local community to celebrate and safeguard the town's cultural traditions, artistic expressions, and historical legacy, ensuring they remain vibrant and integrated into the fabric of daily life. By promoting cultural heritage tourism and supporting initiatives that preserve and showcase local traditions, we aim to create a deeper connection between visitors and the community.

CASCO Map

The map shows the strategy of the project carried by the casco concept. It shows both the cultural and natural layers of the casco approach. The cultural framework consists of the hot river, being the heart of the village, and the village's center. The natural framework consists of the river, valley walls, woodlands and essential natural areas. The user space holds all other urban fabric, including the local component of the village. The negotiation space folds around the river and the village's center.



LEGEND

Framework
- Natural grassland
- Mountains and valley walls
- Forest
- Waterway / -body
- Natural grassland
- Waterway / -body

Negotiation space
- Natural
- Cultural

User space
- Buildings



Passive hotspot watchers



Hikers

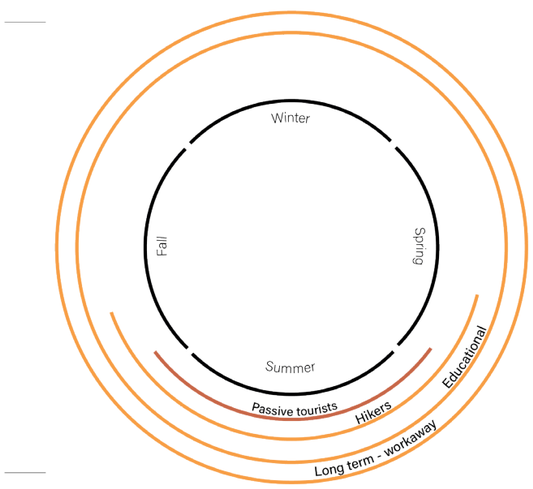


Educational tourists



Long term tourists





Guidelines

With the casco concept as the strategy in order to safeguard the identity of Hveragerði. The additional guidelines are used to change the tourism sector. The project promotes sustainable tourism, by attracting new types of tourists, such as hikers, educational tourists, and ‘workawayers’. By diversifying the visitor base and offering year-round activities, we strive to ensure a steady flow of tourists throughout all seasons. This approach fosters a more balanced and responsible tourism industry that remains vibrant and active throughout the year. The types of tourists promoted (hikers, educational tourists and long-term tourists) could add more value to a place than the currently booming passive tourist. This approach attracts visitors that usually value authentic experiences, leading to this … of the identity. Additionally, it fosters a sense of pride as residents become even more active participants in showcasing their cultural richness.

Hveragerði is well suited to these types of tourism as it is rich in cultural expressions and traditions and already embodies this pride of uniqueness.

4. Design experiment

Yoshi So

Manifesto

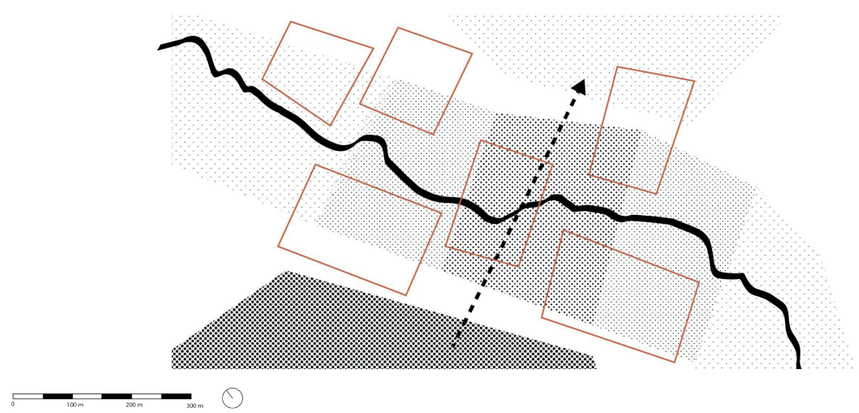
The focus of this individual project is to establish a clearer definition and enhance the negotiation space along the Reykjadalur river in Hveragerði. As one of the main landscape elements and tourist attractions, the river plays a significant role in shaping the transition between the urban and natural areas. An obvious transition is the one from east to west, from the city to the natural area. But a second gradient from north and south to middle is also visible.

Currently, the negotiation space lacks clear definition and feels loosely organized. The goal is to provide a more distinct and cohesive experience by carefully designing the functions and landscapes present in this area. By doing so, the goal is to highlight the cultural and natural diversity of the landscape, creating a stronger sense of place and improving the overall quality of the space.

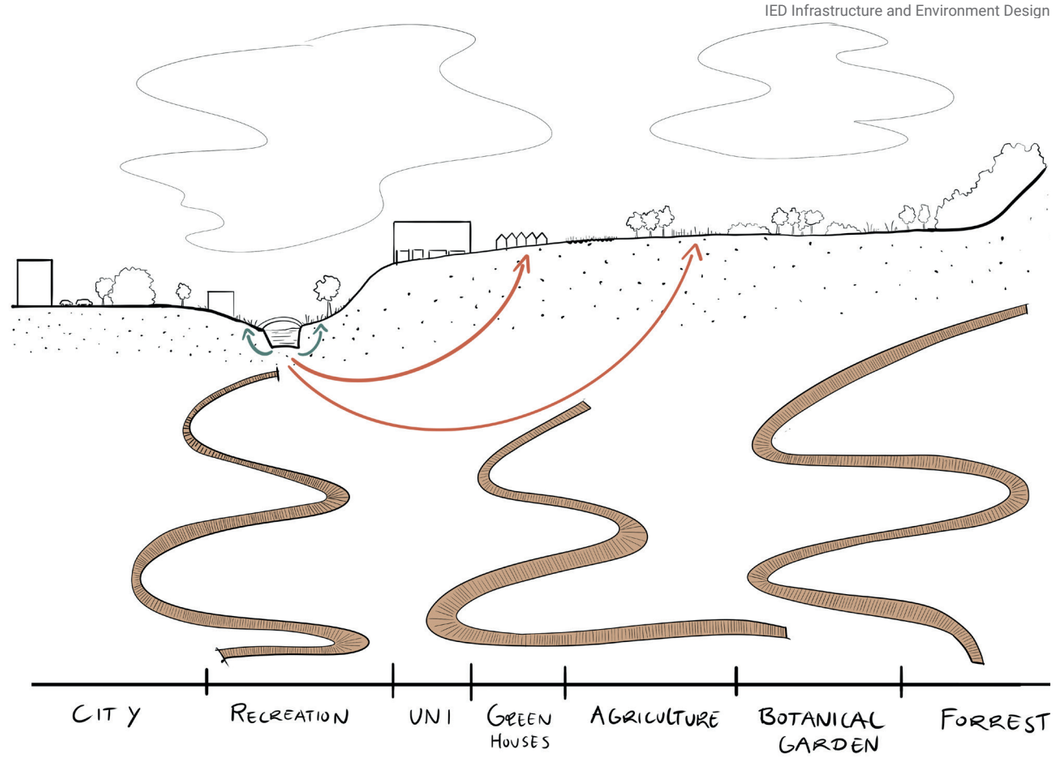




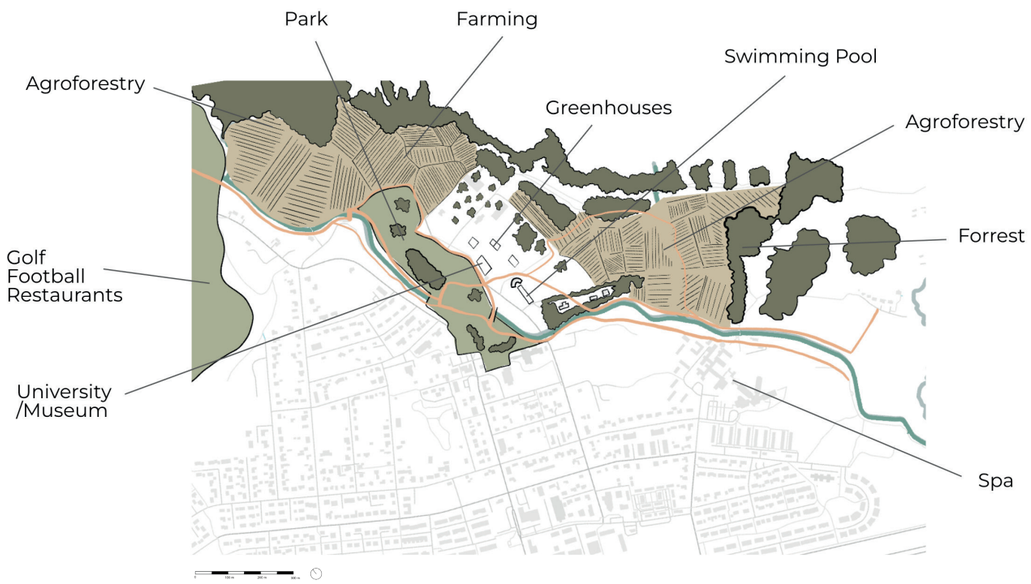


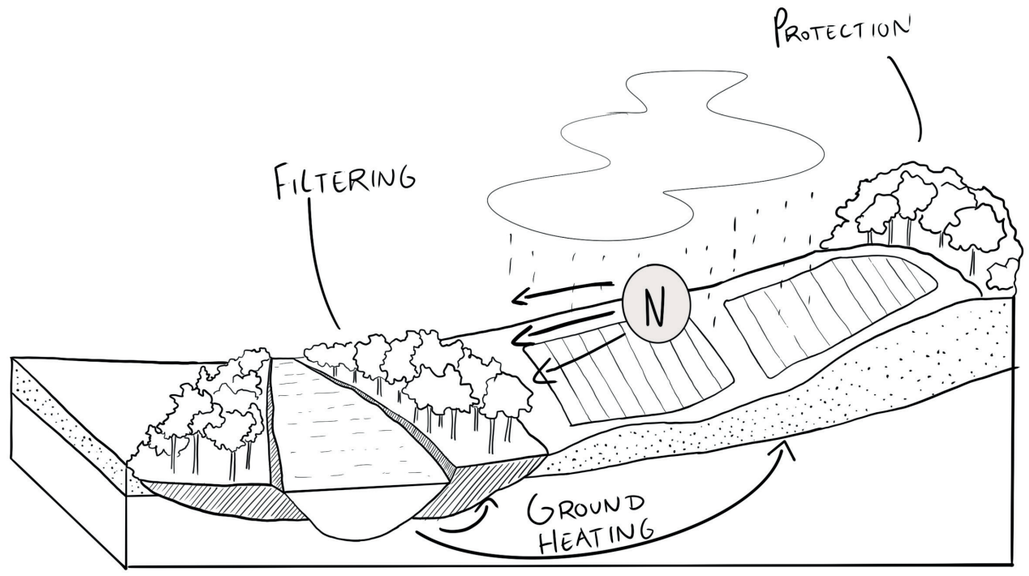


Multiple routes parallel the Reykjadalur river, catering to diverse tourist interests and showcasing the transition from urban to rural environments. The closest route to the city center is designed for recreational use, offering accommodations for tourists and spaces for leisure activities like a spa and a swimming pool. The middle route focuses on education, providing opportunities to learn about Hveragerði's cultural and natural heritage in the university, in the greenhouses and on the farms which make use of ground heat systems and geothermal energy. The route closest to the natural area is ideal for hiking, allowing visitors to immerse themselves in the pristine landscapes. These distinct routes ensure that tourists can engage in activities aligned with their preferences, promoting a more personalized and sustainable tourism experience.



Not only is the transition good for showing the diversity of the landscape, but also for the creation and conservation of riparian zones.







Old



New

In the design area, a park and a university for agriculture and horticulture, including a farm, greenhouses, and a botanical garden, are present. However, currently, these functions are scattered randomly, impeding the perception of a clear transition. In the proposed design, the functions are strategically placed based on the two gradients, enhancing coherence. The design softens the hard edges along the main road, integrating nature into the city, such as in the park, while extending the city into the negotiation space north of the park. This placement fosters a harmonious environment, showcasing the cultural and natural diversity of the landscape.



Vision Map

The vision map distinguishes between passive and active tourism areas. The passive tourism area features tourist accommodations, viewpoints, a spa, and a swimming pool, offering a relaxing and leisurely experience. The active tourism area includes hiking routes, an educational center, farms, and accommodations for long-term stays, providing engaging and immersive experiences for visitors. Through these zones, three routes flow each with their own qualities like mentioned before. This division ensures a diverse range of options for tourists based on their preferences and promotes a diverse, year round, tourism experience and invites passive tourists to continue into the active area.





Park Entrance Map

The park and the walking trails are extended into the city, connecting to the design of the main street and its cultural buildings. Both tourists and locals can emerge into the park, both from this cultural center or from the parking lot adjacent to the park.

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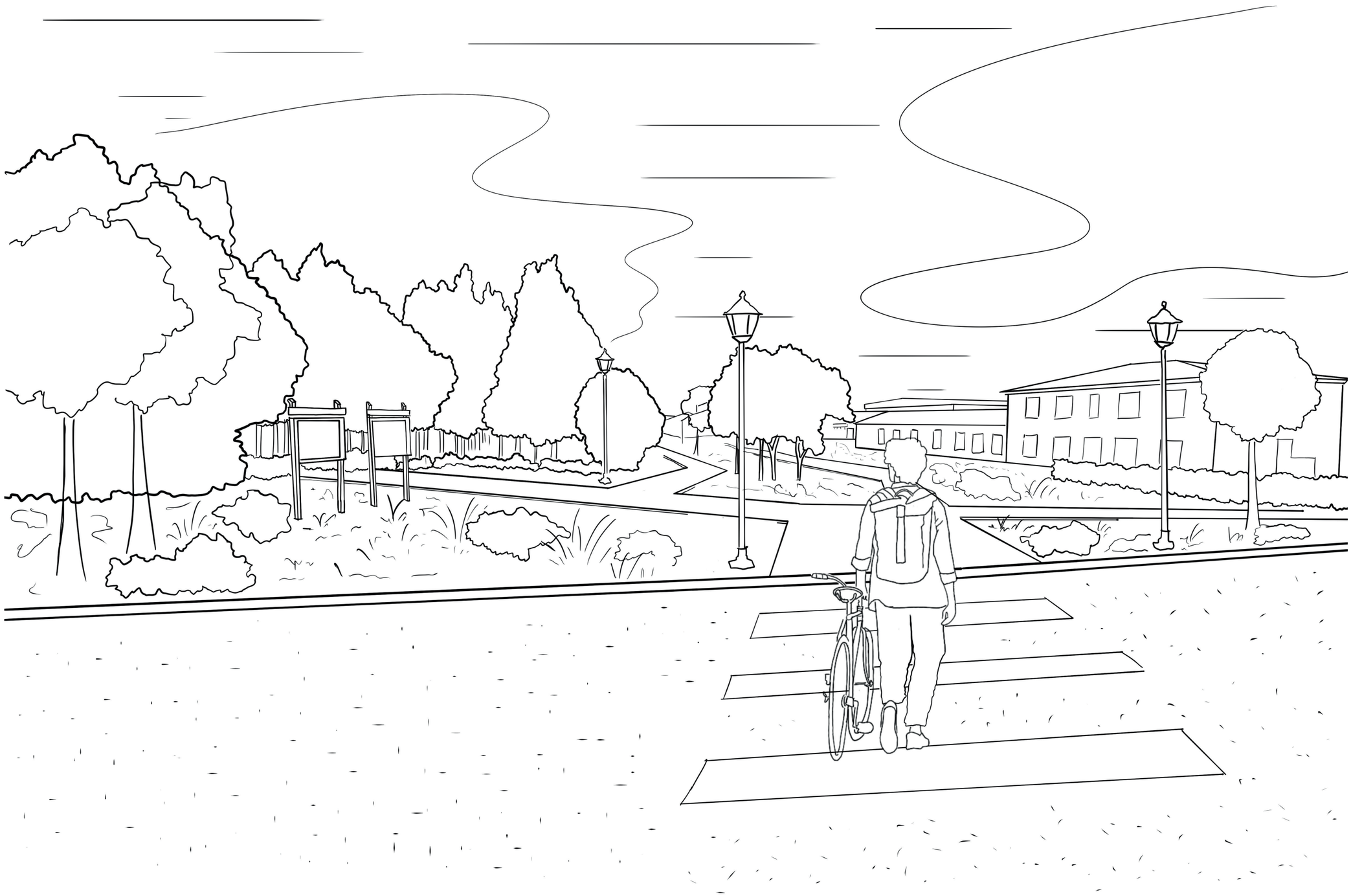
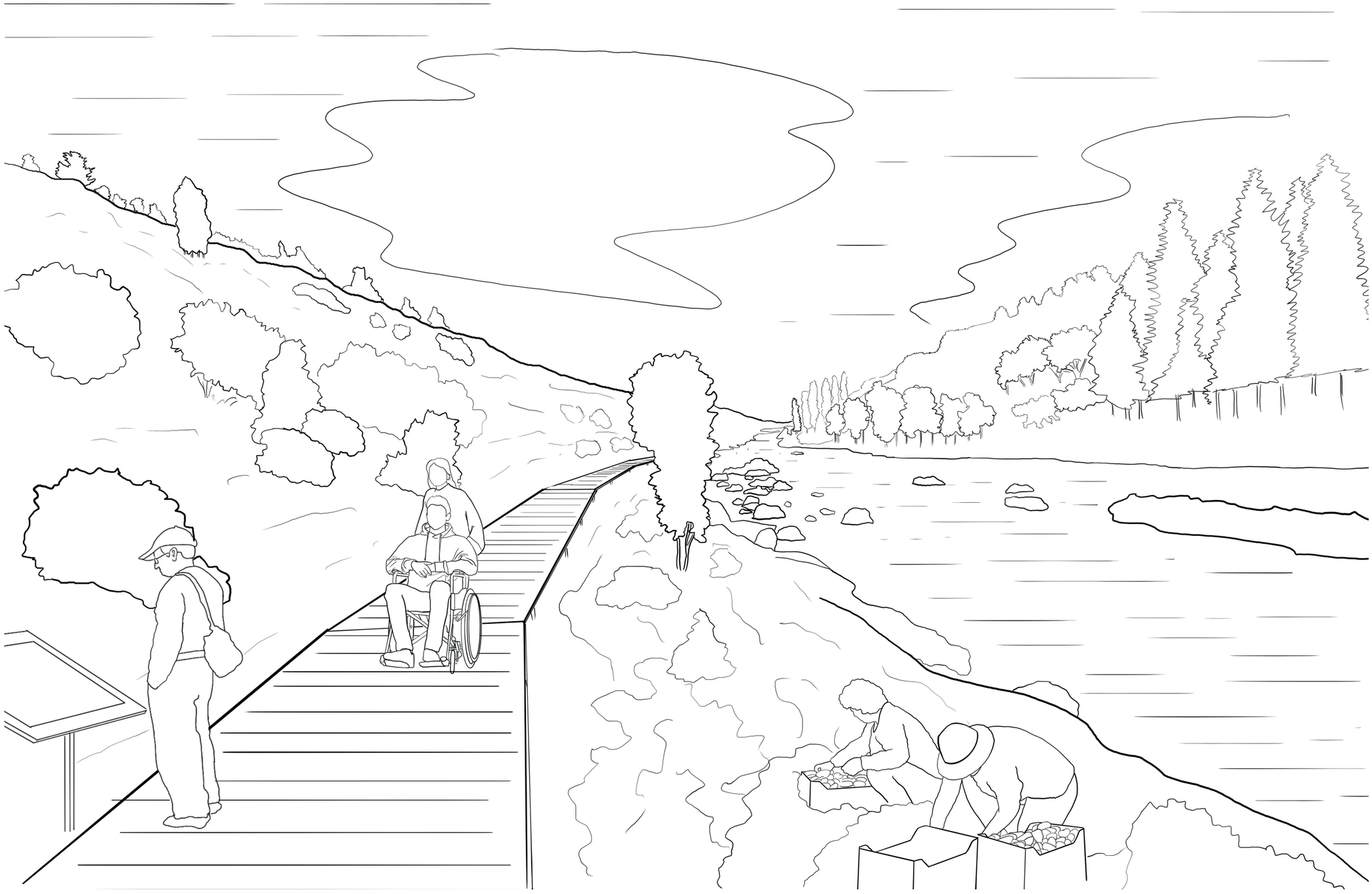


Park entrance sketch

With the extension of the park into the city, a smoother transition is created inviting tourists and locals to go in.



Recreational route sketch

An impression of the recreational route, where you can experience the diversity of the landscape while going by all the big tourist hotspots, providing a bit of information on the way.



Educational area map

From the bridge from the park or from the educational route you enter the educational center. The main building is multifunctional, both serving students and tourists. Behind the main building we find farms, greenhouses and agroforestry transitioning into the natural area.

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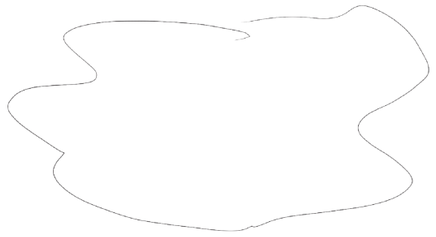
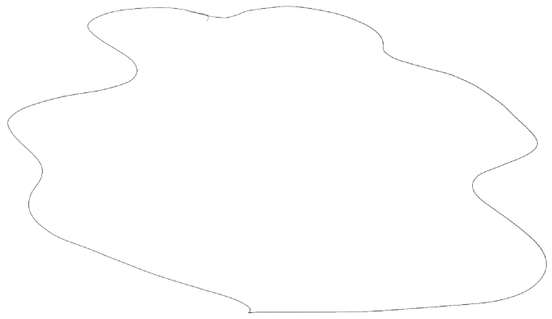
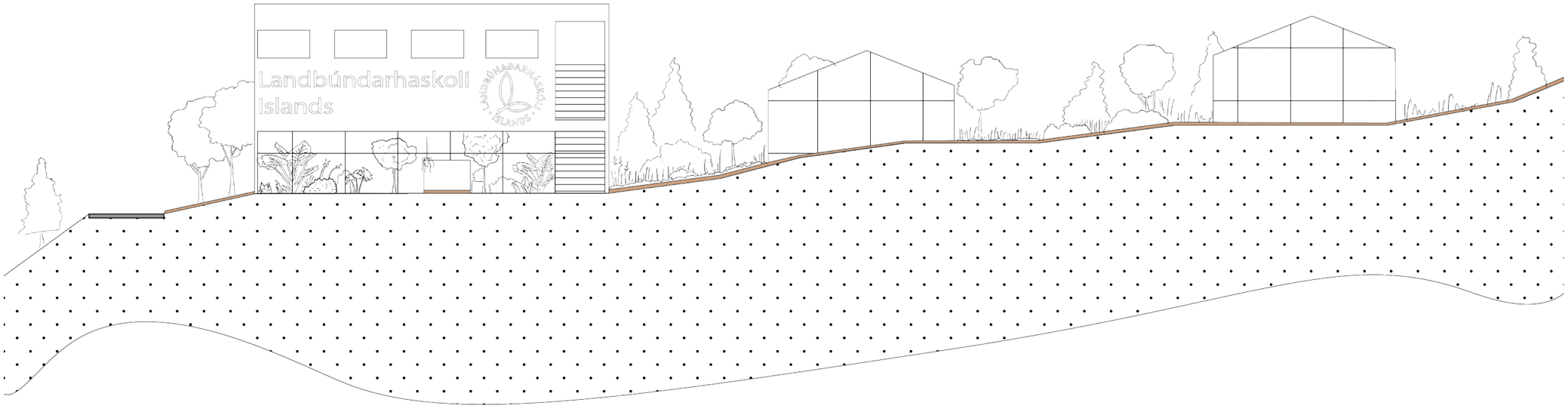


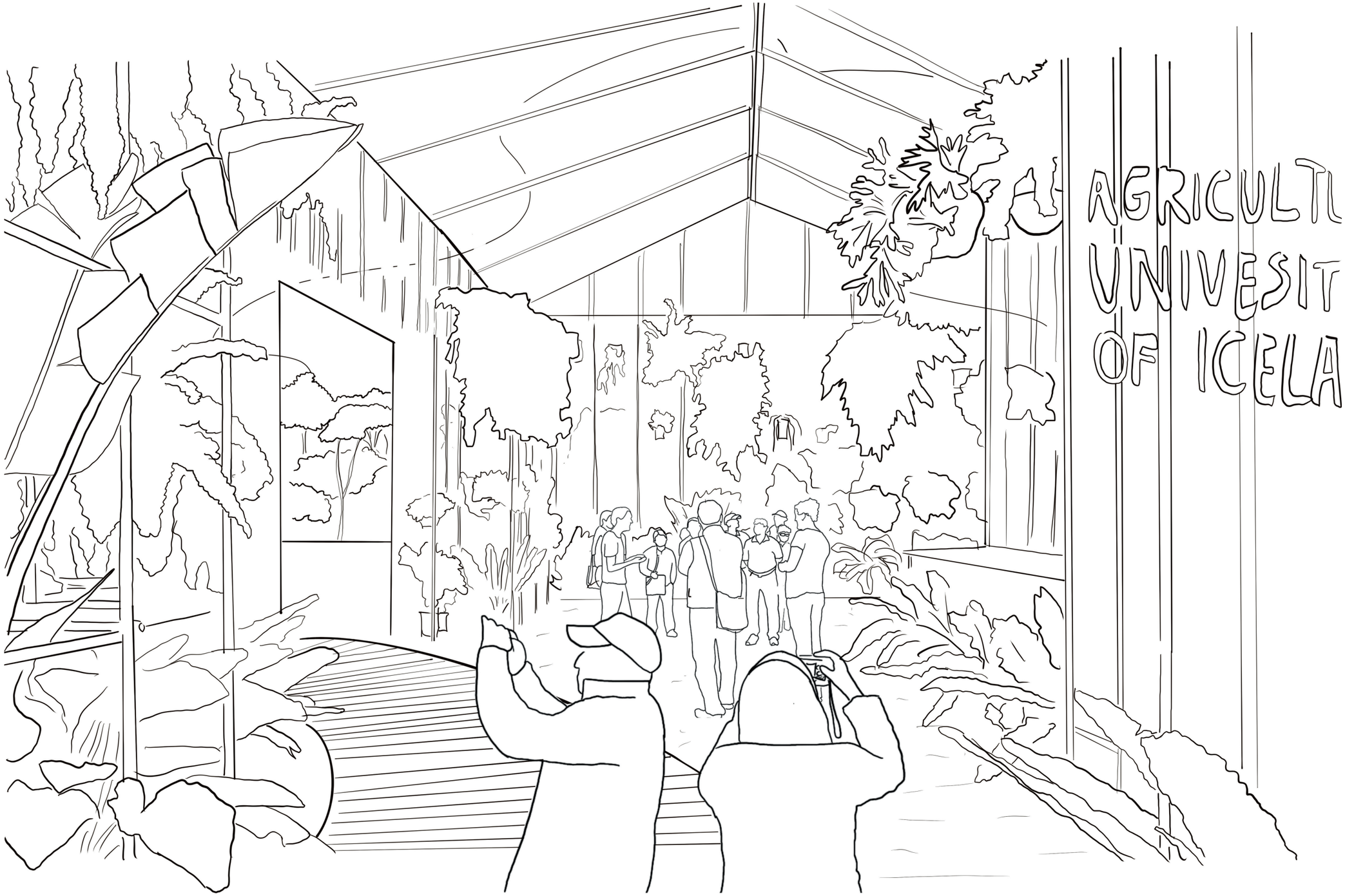




Educational area section

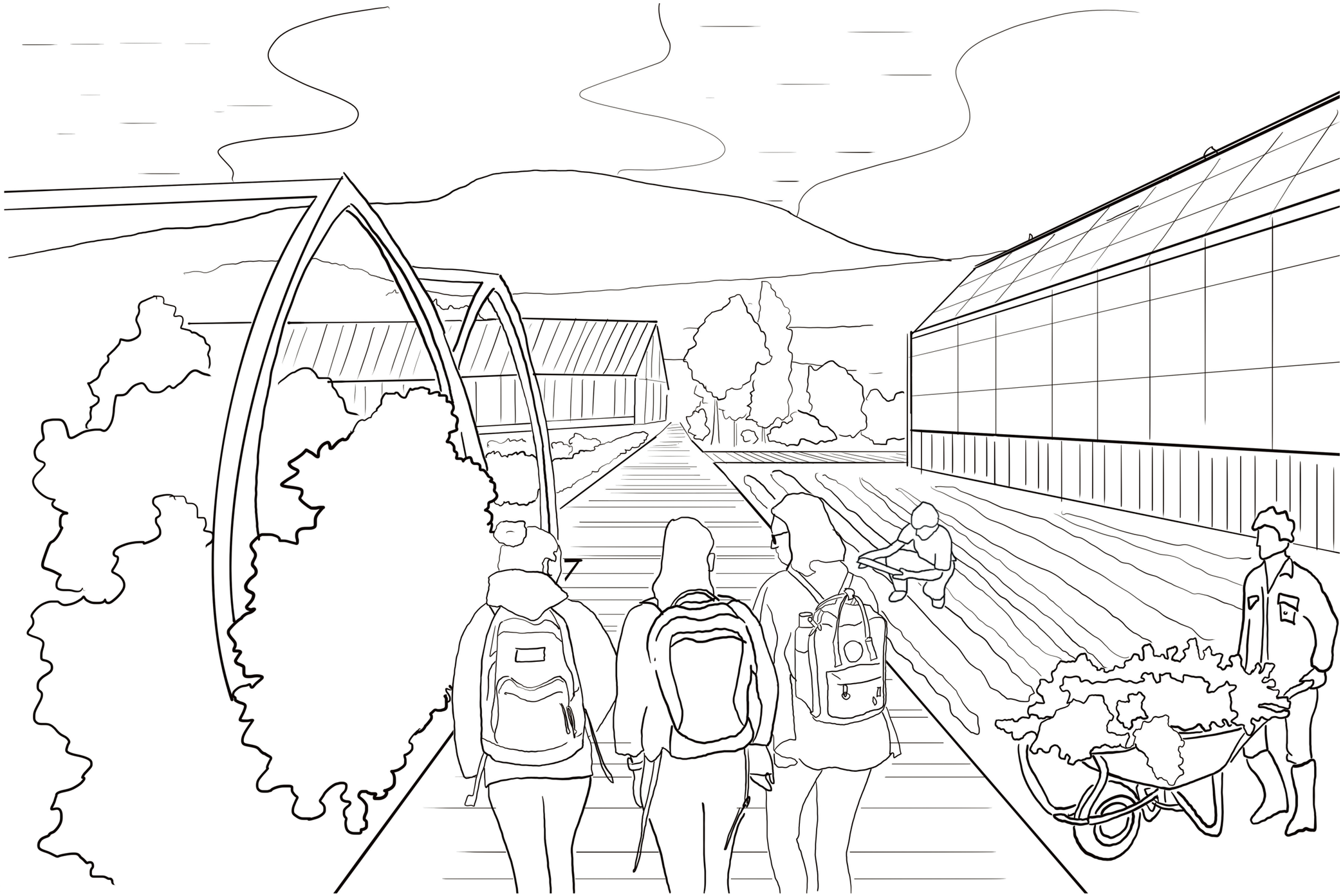
The main building also functions as a greenhouse, both heating up the classrooms on top and creating a low threshold entrance for visitors.

0 20



Main building sketch

The greenhouses can be a place for education both as a point of attraction for all kinds of tourists, another place to experience natural diversity. The one in the main building also has a canteen serving food produced on the farm, manned by workawayers and students.



Campus sketch

The campus is a place where students find themselves in the middle of their work environment, surrounded by farmland, agroforestry and greenhouses. They are able to interact with workawayers and other people working the land, also learning from them. Tourists can learn about the ground heat systems and geothermal energy from people on the farms directly.

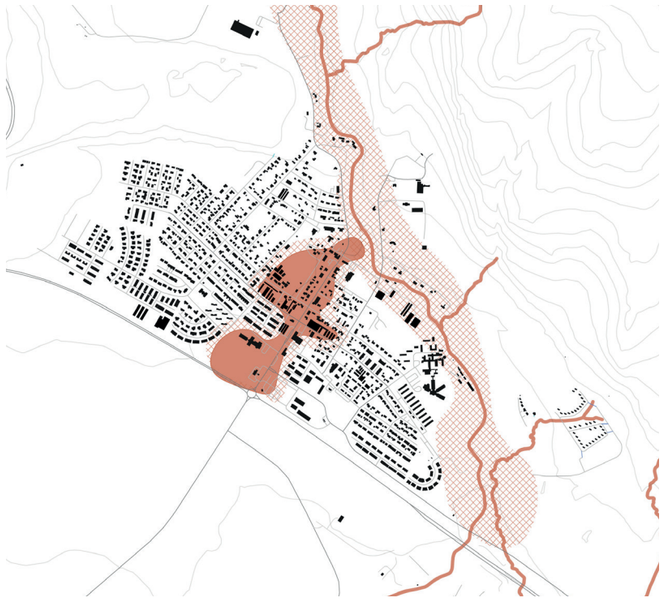
5. Design experiment

Kiki Dekker

Manifesto

Icelandic culture is sometimes hard to understand. On the one hand the country is based on leisure, local lifestyles, sharing and minimal impact but on the other, the country is globally oriented, economically driven and wanting to grow. On the one hand they are protective of their cultures and traditions, but on the other they are welcoming tourists with open arms. To make sure these two identities are able to take place next to each other, it is important to plan and regulate tourism in order for it to not take over the local cultures and traditions. Therefore this design experiment dives into the cultural component of the urban fabric of Hveragerði. It proposes a framework to preserve the cultural elements within the city while promoting active tourism to give back to the local identity. The framework consists of an area full of characteristics that contribute to the village's identity. Through defining culture as the framework it embodies and promotes active tourism instead of a passive form of tourism. Designing a negotiation space as a flexible barrier between the framework and user space provides a transition between the two zones.

Currently, Hveragerði is a poorly planned village which is facing a growth in tourism and inhabitants. Tourist functions pop-up everywhere around the city and houses are built wherever there is room. In order to follow the casco concept and safeguard the cultural characteristics, this design experiment proposes a framework for the village's center according to the casco approach.



Scenario Scale

Kiki Dekker

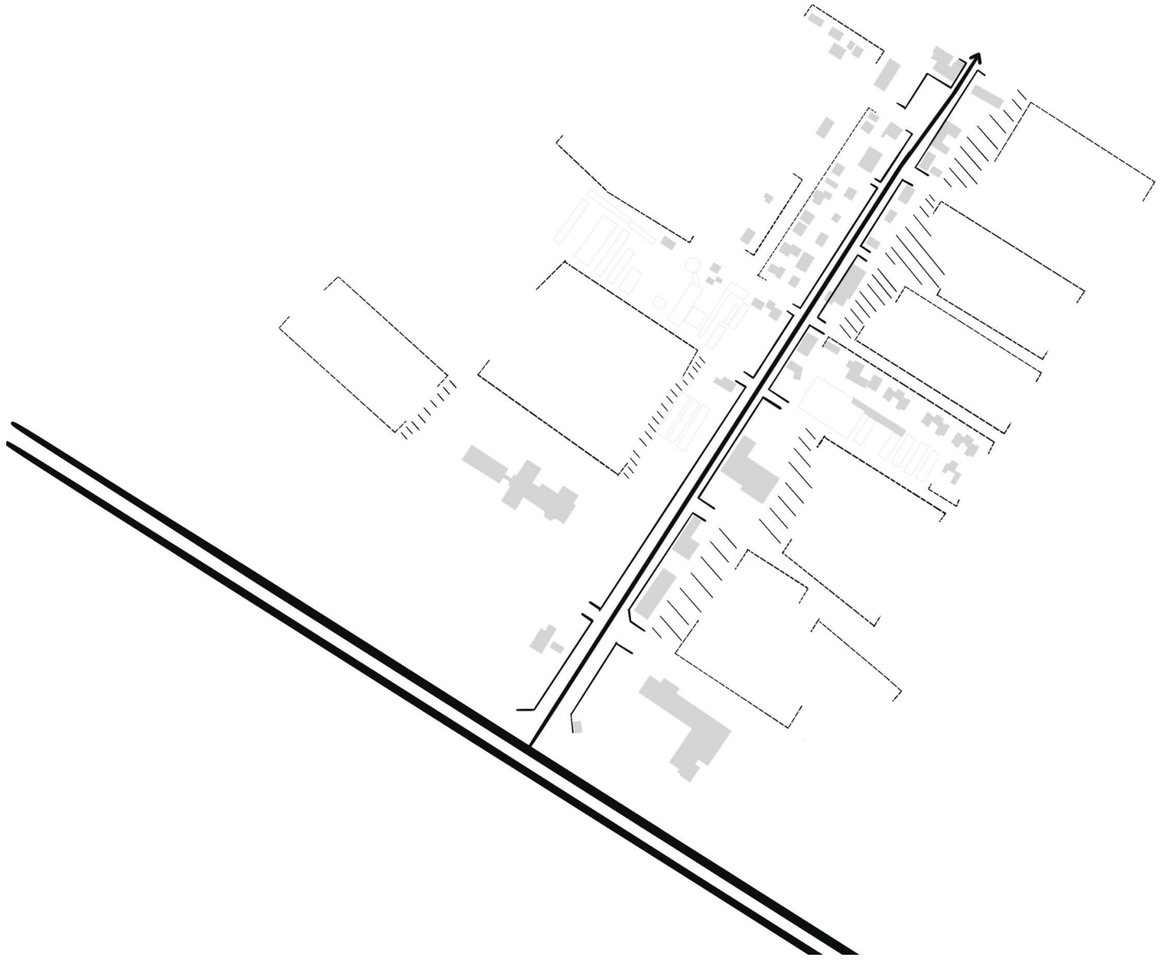
Cultural casco concept

The map shows the cultural casco concept on a smaller scale. Defining where the cultural framework ends and the user space begins, based on current functions and plot edges. Between the framework and the user space lies the negotiation space.

Cultural framework
Negotiation space
User space

N

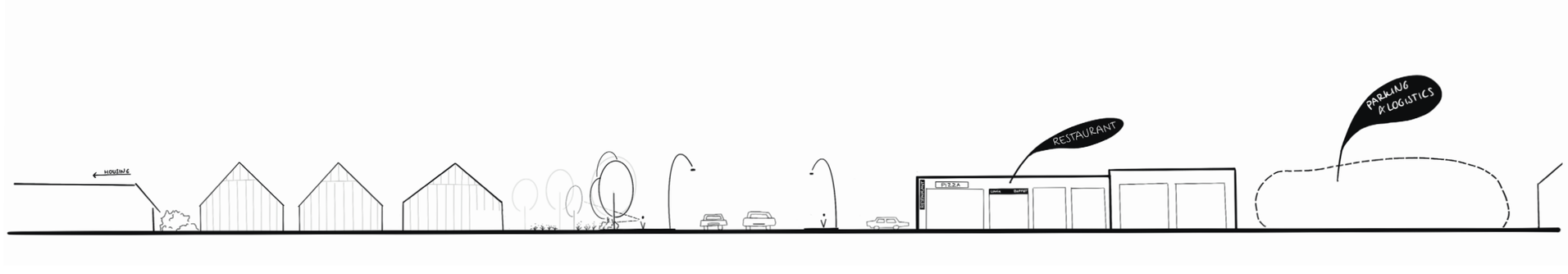
0 5 km



Current urban structure

The map and section show an analysis of the currently poorly planned urban structure of the centre of Hveragerði. It mainly shows the transition from the cultural framework to the user space, often being an undefined space.

- Route 1
- Main street
- Current negotiation space
- Plot edge of cultural framework
- Plot edge of user space
- Building

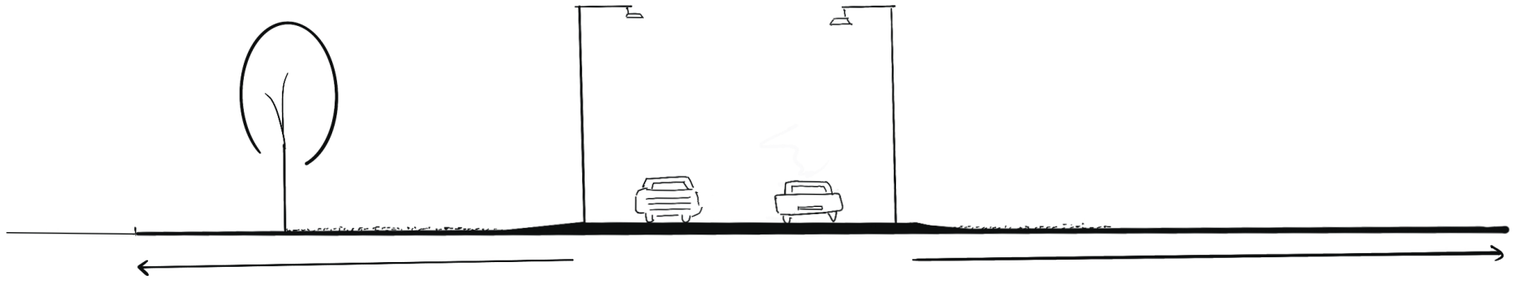


N

0 5 km

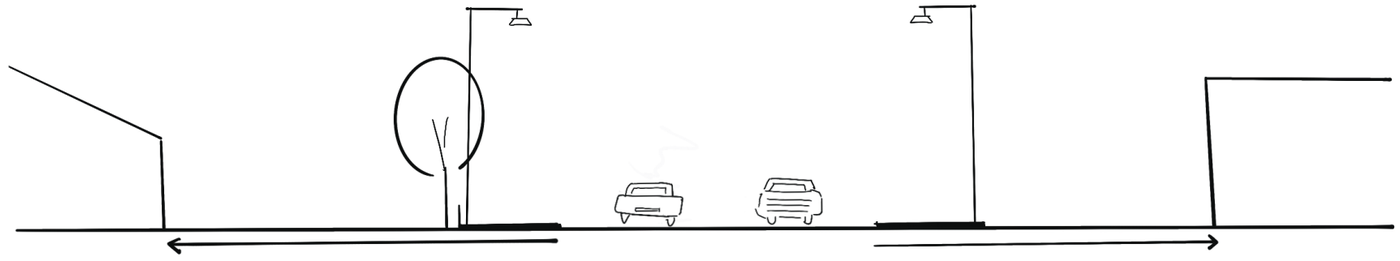
Street profile principle of R1 - current situation

The R1 is the road connecting Hveragerði to Reykjavik on the one side and Selfoss on the other. The road is very distanced from the built environment.



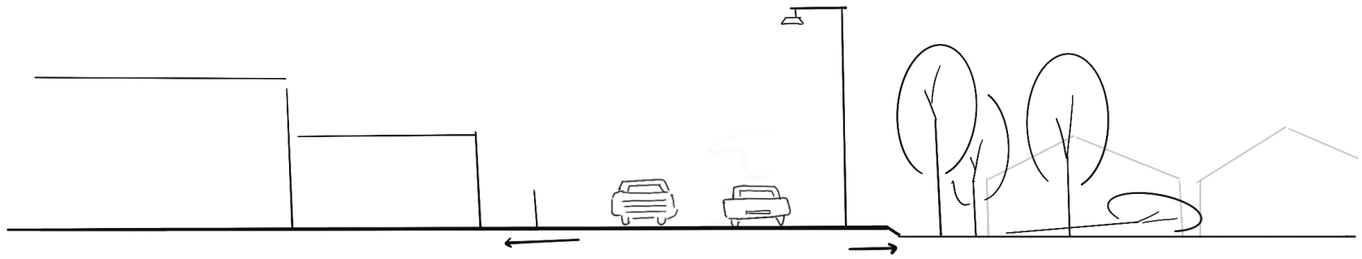
Street profile principle section of main village axis - current situation

Taking the exit to Hveragerði you enter the street of Breiðamörk. This is the main village axis connected to most commercial and cultural function oriented towards Reykjafoss, a big touristic attraction of Hveragerði. The pedestrian lane is still very distanced from surrounding buildings and not communicating with surrounding functions.



Street profile principle of secondary street - current situation

The secondary street brings you from the main axis to the housing area. From here the street is more narrow and the houses are located more closely to the street.

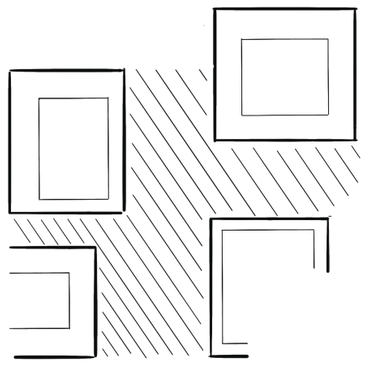


Guidelines

The first diagram shows how the design experiment will be an exercise of designing the public through defining and regulating the private on the scale of the plot.

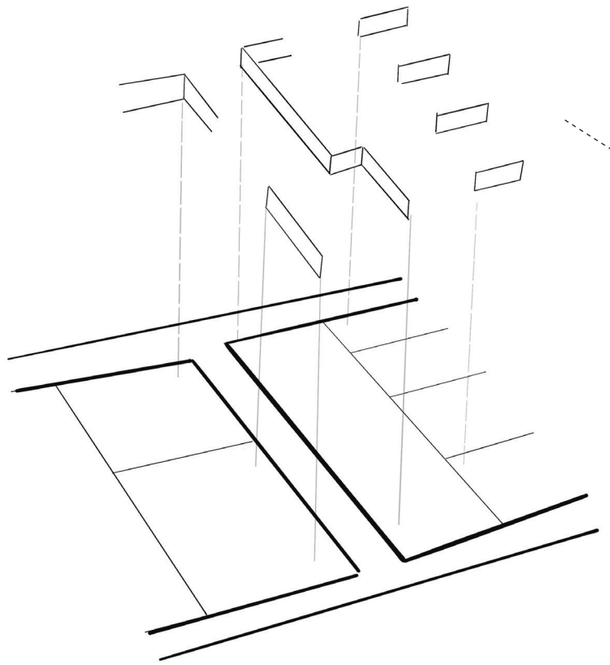
The two diagrams on the right page show two guidelines on the scale of the urban block. The first diagram shows how the current car based axis should also serve as a pedestrian axis by slowing down the speed.This encourages tourists to stay longer in the area, instead of just driving through on their way to the hot river.

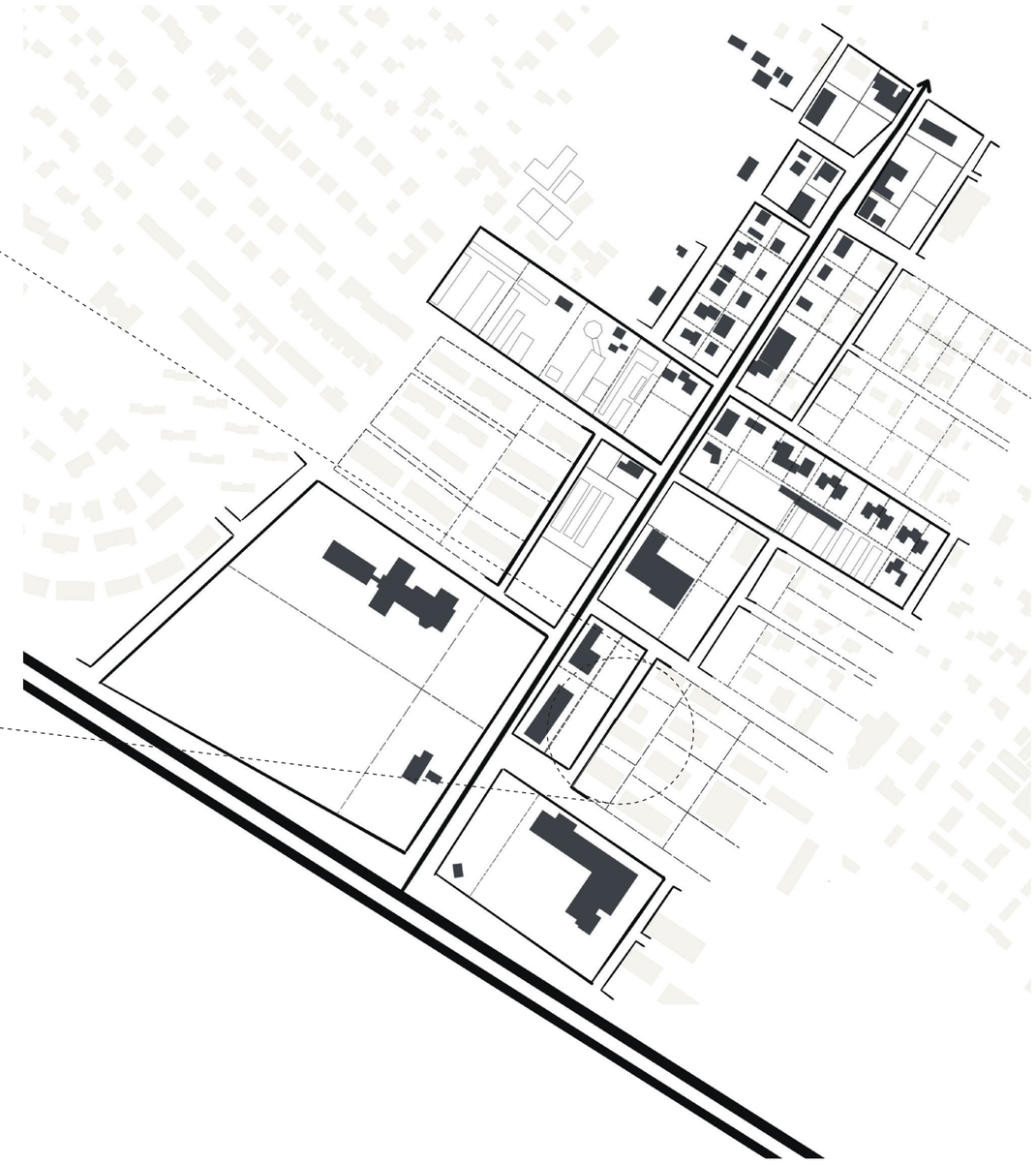
The second diagram shows that the negotiation space between the cultural framework and the user space should be clearly defined.





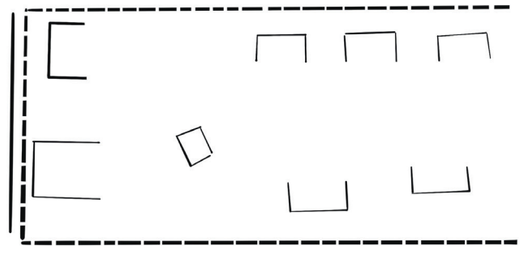


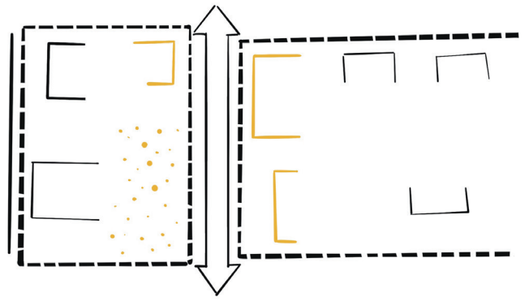




Plot framework for urban growth

The map on the right page shows a new framework for the center of Hveragerði. The proposal defines new groups of plots as one block and introduces new plots within this block. This makes for a structure that clearly defines the cultural framework and introduces additional spaces for new functions. As the diagram in the bottom shows, a street is introduced to separate this cultural framework and the user space, forming the negotiation space between the two. The newly introduced plots adjacent to this street add to the negotiation space, accommodating for functions that could serve both the local and cultural. The zoom in at the top shows the outward-facing orientation of the negotiation facades and inwards orientation of the local buildings.





Building
Building block
Parcellation
Route 1
Main street
Plot edge of user space

N

0 5 km

Plot framework and passport

The map shows the zoning of the functions according to the casco approach. The plots along Breiðamörk are mainly designated as cultural function. The plots within the negotiation space will hold a semi-cultural semi-local function. These functions can serve the touristic sector in summer and promote local activity throughout the less touristic seasons. The plot regulations show how regulating the private space could help in creating more public space, interacting with the street and become part of the framework.

- Cultural plot
- Mixed
- Negotiation plot
- Building
- Building block
- Parcellation

N

0 5 km

Cultural plot

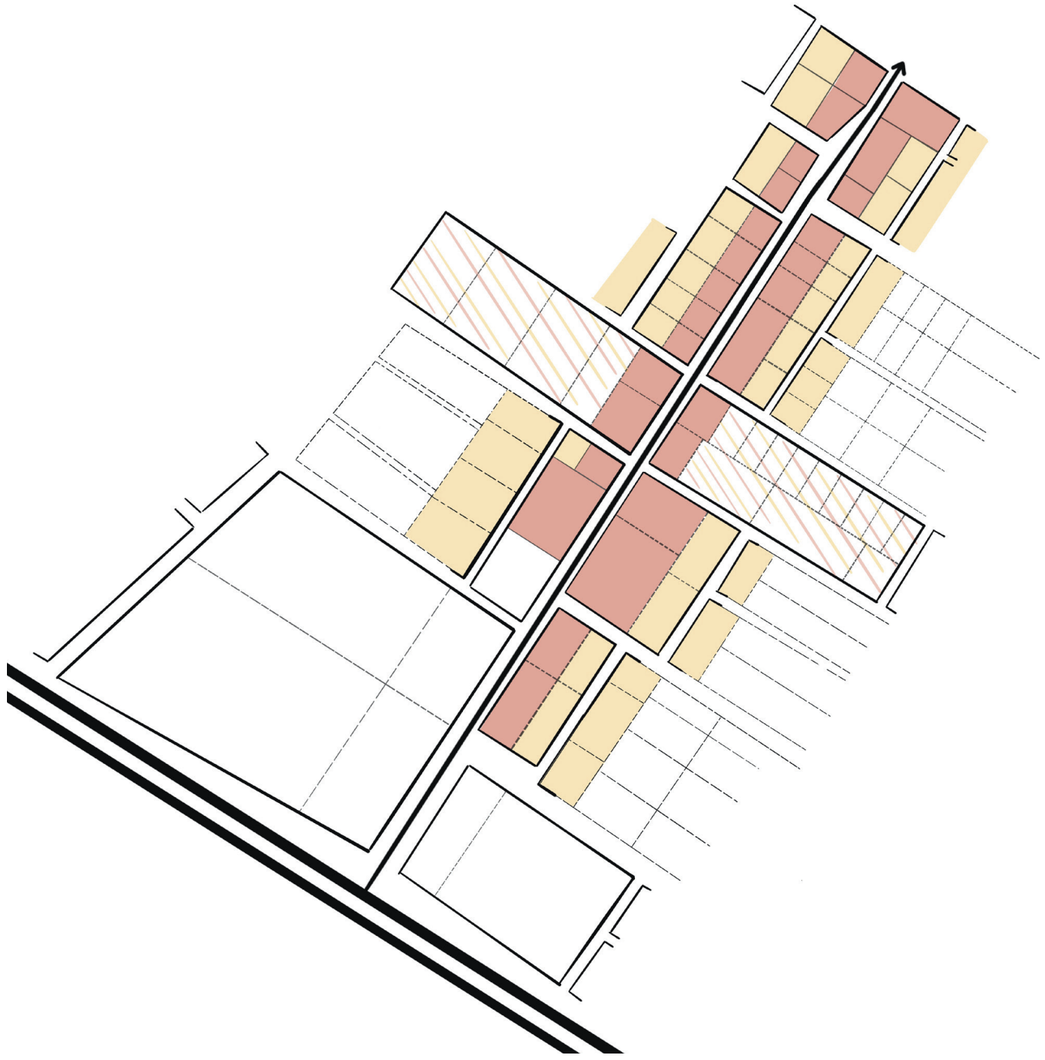
- *Cultural function*
- *min 10% public space*
- *min 10% green space*
- *5% parking space*

Negotiation plot

- *Semi-cultural semi-local functio*
- *building edge close to public space*
- *min 5% public space*
- *min 15% green space*
- *10% parking space*

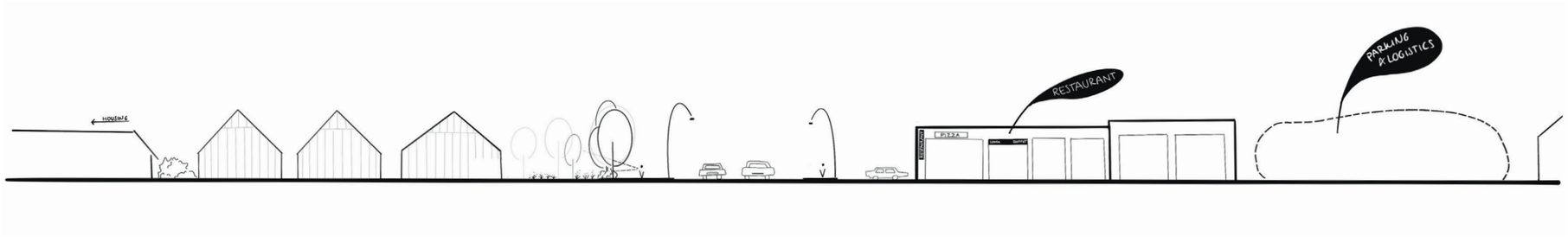
User plot

- *Local function*
- *free building edge*
- *0% public space*
- *min 30% green space*
- *10% parking space*



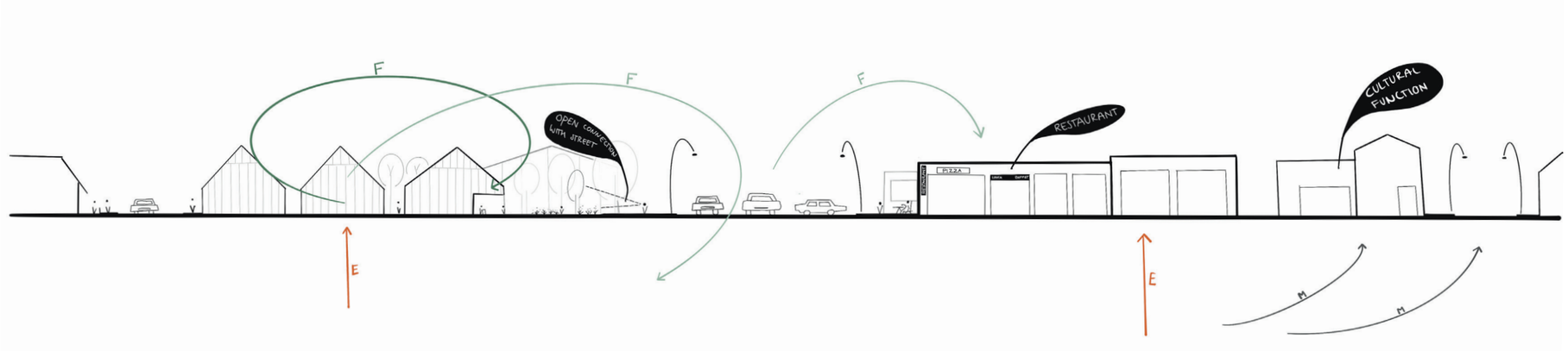
Section of the current situation

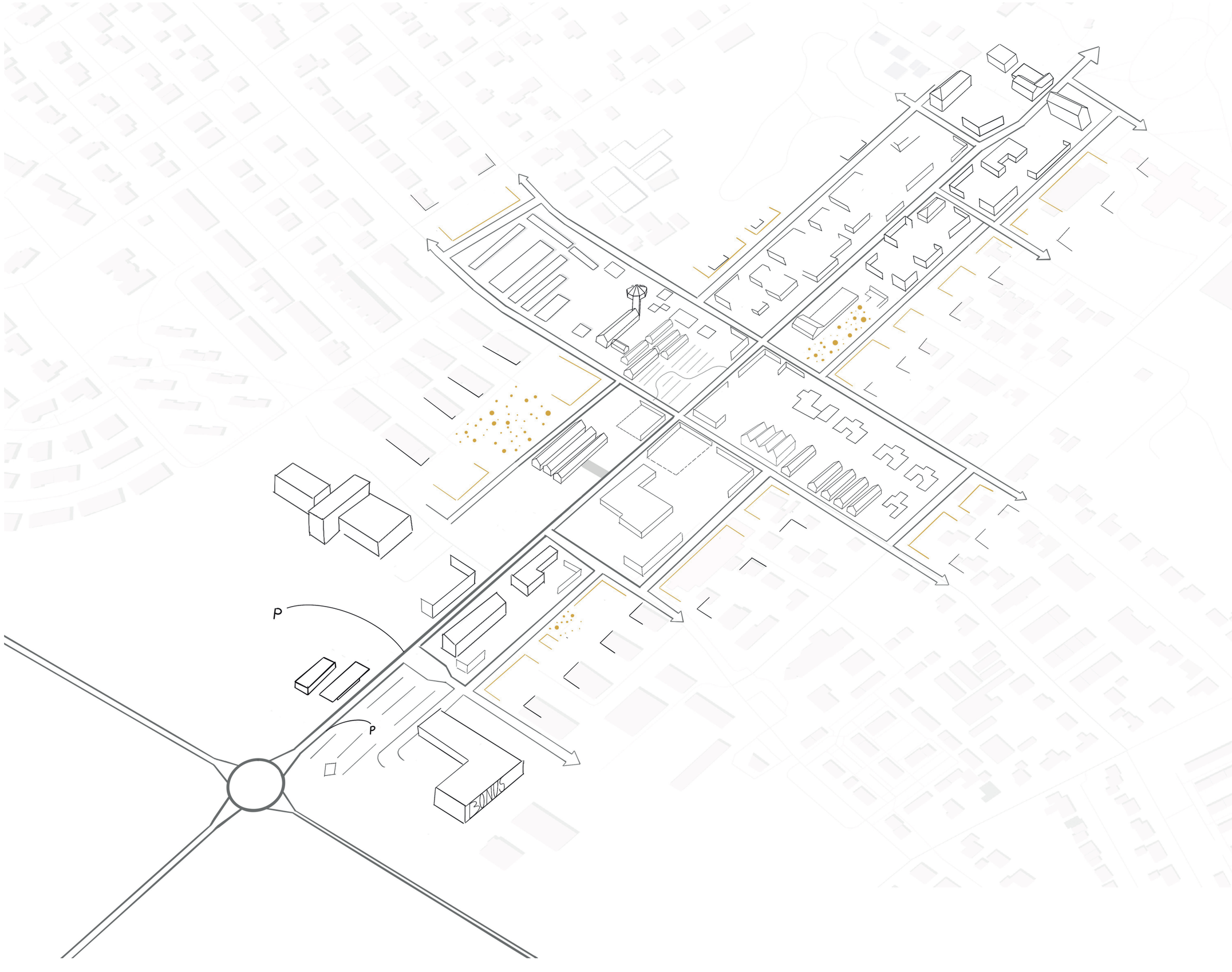
The section again shows the current situation of how the street with both cars and pedestrians are blocked off from functions by either closed borders or parking spaces. The edge with the housing area is either an undefined big open space, or a very narrow area with greenery.



Section of the future situation

In the future situation, the buildings will interact with the now larger public space, with open edges and facades along the pedestrian lane. New functions are introduced at the backs of the building blocks.





Future situation of Hveragerði

The aerial view shows how Hveragerði would look if the framework is followed. The plan creates a street where tourists have a place to stay, instead of just passing by. With a clearly defined negotiation space where functions could be introduced that serve both the local and the cultural.

Group reflection

First of all, when visiting Iceland you get overwhelmed by its impressive natural elements, its stories and its culture. During the field trip we took in so much information that it was becoming increasingly difficult to steer to a topic of our interest, while there were so many interesting angles. This caused the vision making process to be a large part of the project.

As already explained earlier the casco concept is still undiscovered in the field of urban-planning and design. As the concept is mainly used in designing for landscapes rather than designing for the urban fabric it was difficult to get a grasp on the concept. However difficult the usage of the casco concept in the urban fabric is, we believe that it could be very useful in urban planning. The cultural casco concept introduced in the project could add value to the already existing casco concept by Dirk Sijmons.

We think the strategy we propose can be altered and tailored to another place's identity and implemented in other villages in Iceland as well. Hveragerdi could be a test case in this sense. In order to do this the project would need an extra step in defining which elements are generic and which elements are altered to the place's identity.

Lastly, designing for Iceland turned out to be a real challenge because we have mainly learned to design for the Netherlands; a country that is close to full. In contrast Iceland is a country where only a small amount of land is occupied by humans. This asks for a whole other approach to vision and strategy making than we are used to. This led to a general struggle throughout the development of the project.

Reflection Kiki

Reflecting first on the cultural casco concept, I realize that it is hard to use a concept used in landscape planning within such a small scale urban design project. Most of my time went into figuring out the meaning and spatial divisions of the three zones within the casco concept, rather than designing these spaces. The parcellation design of the framework and negotiation space came relatively late in the project. This caused a lack in detailing in the design of the negotiation space. Because of the importance of this space it deserves more attention. As there are no literal references for negotiation spaces in the urban fabric it was hard to decide on their form, meaning and role within the village.

Reflecting on the design experiment in general I think the parcellation plan serves as a good structure for the growth Hveragerði is facing.

Reflection Yoshi

Reflecting on my individual project, I found it especially hard to design for the negotiation space. I tried to find something to hold onto in the existing, which in the end I think limited my design. Instead of designing something totally new I took a long time just analyzing what was there already and trying to understand how to use the casco concept in a proper way for these elements. In the end this may have resulted in less time for the design than I should have put into it. Even though I touched upon the detail level I wanted to, an extra step could have been made.

Still I think the design holds a lot of interesting elements which could surely benefit Hveragerdi and surroundings.

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ARNALDS, O. 2023/05/05. Presentation on Icelandic soil and general threats to the land [PowerPoint presentation]. Agricultural University of Iceland.

Reconnecting...

unifying human processes and natural systems

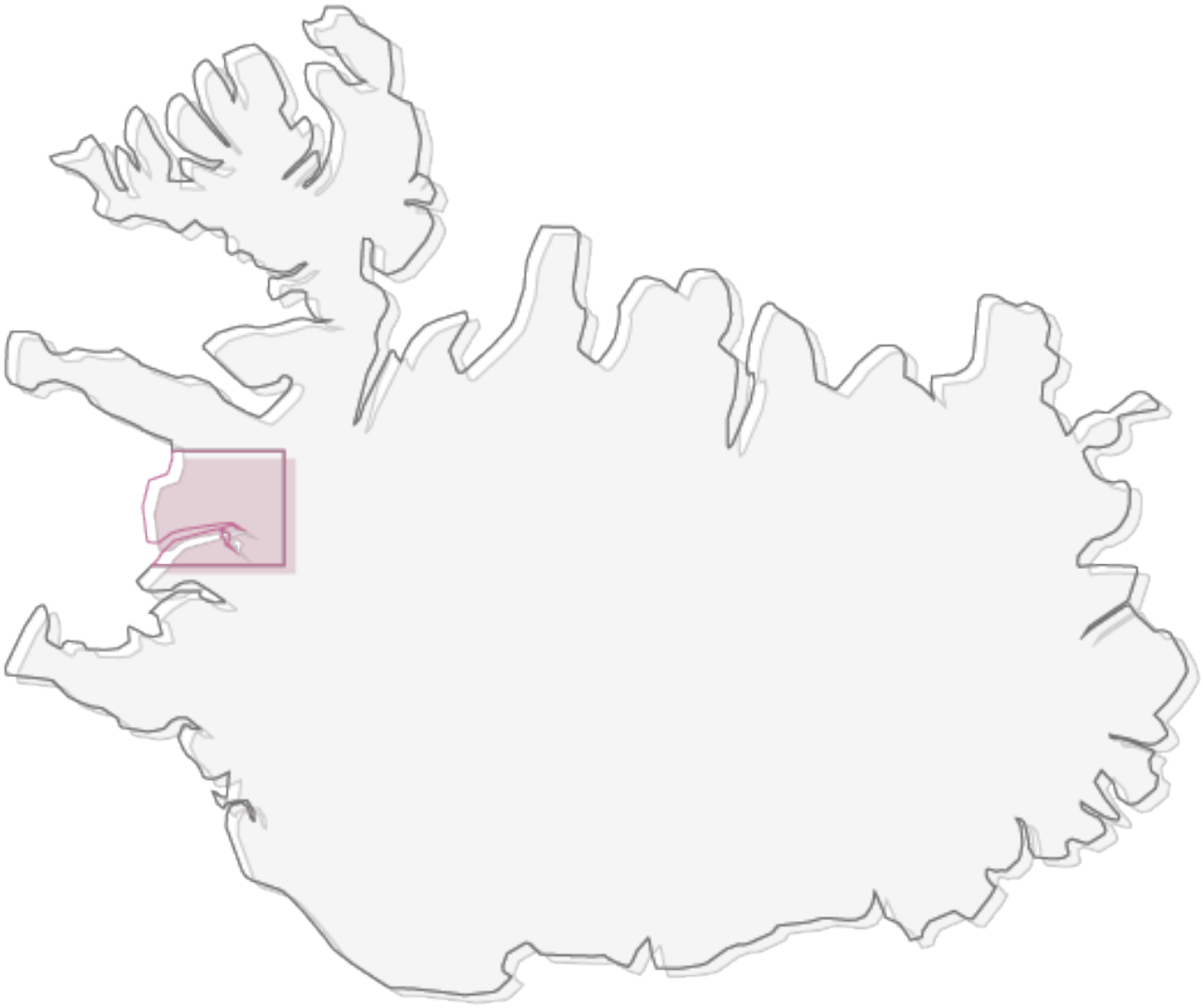
Lieke van Lun
Laurens Plender
Sanne van Rees
Max van der Waal

2022-2023 IED
Infrastructure and Environment Design
July 2023





Typical West-Icelandic Landscape by Max van der Waal



Introduction

The Borgarbyggd valley is located in western Iceland. From the moment the first settlers set food on the Island small groups of people have been living in this area. It also appears in multiple Icelandic Saga's that are situated in the 10th century. The region can be considered a rural area, with small villages and agricultural practices. The region derives its identity from wetlands, sheep farms and the agricultural university located in Hvanneyri.

This report consists of design experiments that together form a case study research on the Borgarbyggd valley in Iceland and especially the town Hvanneyri. The aim was to investigate the interrelation of the water-energy-food-mineral systems (WEFM nexus), to contribute to the WEFM nexus research conducted by phD candidates of the department of Urbanism at TU Delft. This report is a product of the course Infrastructure and Environment Design of the master Urbanism at the TU Delft.

To gain a better understanding of the landscape and culture of the region a site visit was included in the course. After visiting the area and spending time at the agricultural university the experiences on site contributed to the vision and strategy for the region.

This report starts with an explanation of the conceptual framework. This includes the context and problem field in the region, the aims and concept for the projects and the referential theories and practices. Secondly the critical landscapes and tectonics are analyzed. In this section the landscape identity, palimpsest and conflicts of the region are defined. The third section shows the regional vision and guidelines for the individual lenses. From the fourth section onwards the individual lenses are explored with a personal manifesto and design experiments zooming into a part of the region. The four design experiments are in order of appearance: ecological re(connection), rethinking the food system, eco-tourism as a sustainable tool and Hvanneri as the center of the region. Together the design experiment contributed to the regional strategy for the Borgarbyggd valley.

1.

Conceptual Framework

Context and Problem Field

The case study area of this report is in and around Hvanneyri, a village in the Borgarbyggd valley in western Iceland. The settlement has approximately 304 inhabitants, and is a testament to Iceland's rich agricultural heritage and religious history. The village traces back to the Settlement Sagas, around the 9th and 10th centuries. The historical significance of Hvanneyri is further enhanced by the legacy of Snorri Sturluson, a renowned Icelandic historian, poet, and politician. His former house that lies in Reykholt, just outside of Hvanneyri, draws the attention of many tourists.

Today, Hvanneyri serves as an agricultural center, housing the Agriculture University and an Agricultural School & Museum. The commitment to farming and agricultural practices is a significant part of the village's identity and economy. However, the potential of the village as a knowledge hub, especially on Icelandic agricultural practices, is not yet being used to the fullest. The field trip to the village, which was a part of this course, revealed a quiet and small campus that does not teach many students. On another note, the agricultural practices show several problems in the area, such as a degradation of biodiversity, erosion, landslides, dust fields and the disappearance of forests and vegetation, mostly due to extensive sheep grazing and use of fertilizers.

The village's unique wetland area however, is a biodiversity hotspot, as it forms a breeding ground and landing spot for various native and visiting bird species. Unfortunately, not enough conservation efforts are in place to protect these wetlands, as roads and farms break up the ecological areas and animal habitats.

Despite its size, Hvanneyri is a vibrant community that represents the identity of Iceland's rural life. Its scenic landscapes, rich history, unique wetlands, and agricultural university campus make it an interesting and central spot in the Borgarbyggð valley. This context makes Hvanneyri an ideal setting for exploring the interplay between human processes and nature in rural Iceland.

Problem Statement

The Borgarbyggð valley is currently facing a multitude of interconnected challenges that threaten the biodiversity, economy, and potential for sustainable development. Human and natural processes are competing, leading to fragmented natural and agricultural landscapes and an underdeveloped economy.

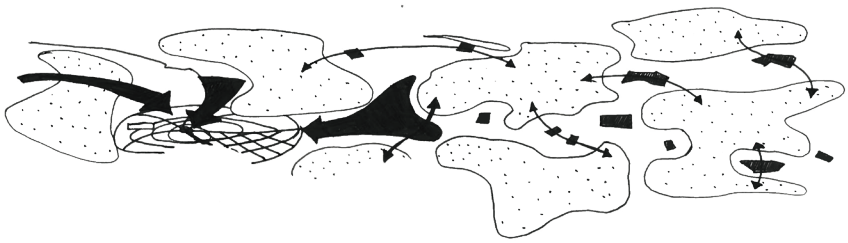
Firstly, the valley's protected wetland area, a crucial habitat for a variety of bird species, is under threat from human activities. The construction of roads and the implementation of agricultural practices are disrupting the ecosystems, potentially causing harm to the bird populations that rely on them. This not only impacts biodiversity but also disrupts the balance of the local ecosystem.

As another result, the valley's forests are diminishing due to the grazing habits of sheep. This deforestation not only reduces the area's natural beauty, which could be a potential draw for tourists, but also has broader environmental implications such as landslides in the mountains and dust storms.

Despite the village's rich history and unique cultural and natural features, it has been unable to attract significant numbers of tourists. This lack of tourism revenue hinders local economic growth.

Lastly, the Agricultural University of Hvanneyri, despite being a potential center of knowledge and innovation, is not fully utilized. The university could serve as a hub for teaching and experimenting with sustainable farming practices, which could not only benefit the local area but also contribute to broader knowledge in this field.

In summary, the Borgarbyggð valley faces several challenges - environmental disruption, deforestation, economic stagnation, and underutilization of educational resources. However, these challenges also present opportunities for sustainable development, for instance in the form of a circular campus and a circular economy boosted by eco-tourism and innovation in the agricultural practices of Iceland, which could ensure the long-term prosperity of the valley and its inhabitants.



Aims of the Project

The overarching goal of the project is to address the environmental, economic, and educational challenges while preserving the unique cultural and natural heritage of the region. By unifying human and natural processes, the balance can be restored and multiple systems can enhance each other.

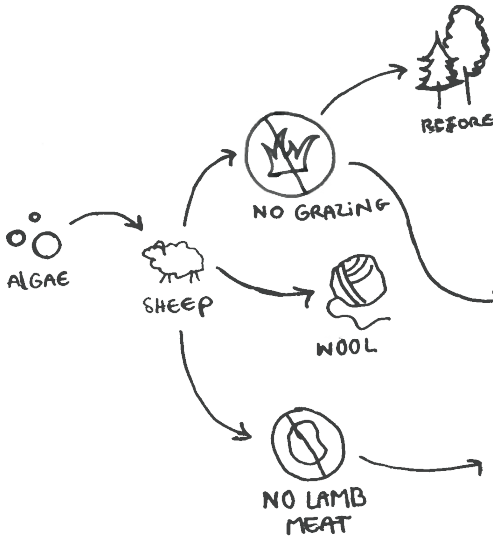
To protect the wetland area and its bird habitats, we propose implementing stricter regulations on human activities in these regions. This could include rerouting roads, modifying agricultural practices, and creating buffer zones around sensitive areas. Public education can raise awareness about the importance of these habitats and promote responsible behavior, especially under tourists.

To mitigate deforestation caused by sheep grazing, sustainable land management strategies should be introduced. This could involve rotational grazing systems, reforestation initiatives, fenced grazing areas and the introduction of alternative livestock and a change of local diet. These measures would not only protect the forests but also enhance the valley's natural beauty, potentially attracting more tourists.

To boost the local economy of Hvanneyri, we propose developing sustainable tourism initiatives that highlight the valley's unique features. This could include guided tours, cultural events, and eco-friendly accommodations. By promoting Hvanneyri as a destination for sustainable tourism, we can stimulate economic growth while preserving the village's character.

Finally, to use the potential of the Agricultural University of Hvanneyri, we suggest expanding its role as a knowledge hub for sustainable farming practices. The university could offer workshops and courses for local farmers, conduct research into sustainable agriculture, and collaborate with other institutions to share knowledge and best practices. The village of Hvanneyri could become an example for other agricultural villages, with a new sustainable circular economy.

In summary, the goal of the Borgarbyggð valley project is to create a sustainable future for the region that balances environmental protection, economic growth, and educational opportunities. By addressing these challenges in a holistic and integrated manner, we can ensure the long-term prosperity of the Borgarbyggð valley and its inhabitants.



Concept of the project



Geographic Scale

The territorial scale involves larger, overarching strategies that impact the entire Borgarbyggð valley. This includes the protection of the wetland area and bird habitats through stricter regulations on human activities. Rerouting roads, modifying agricultural practices, and creating buffer zones around sensitive areas are all territorial strategies. Additionally, sustainable land management strategies to mitigate deforestation caused by sheep grazing, such as rotational grazing systems and reforestation initiatives, also fall under this scale.

Landscape Scale

At the urban scale, the focus is on boosting the local economy of the village of Hvanneyri. To do this, sustainable tourism initiatives could be developed. This could include creating guided informational tours, bird-watcher spots and eco-friendly tourist accommodations. By promoting Hvanneyri as a destination for eco-tourism and educating locals about the uniqueness of the landscape, economic growth can be stimulated while preserving the diverse character of the landscape.

Tectonic Scale

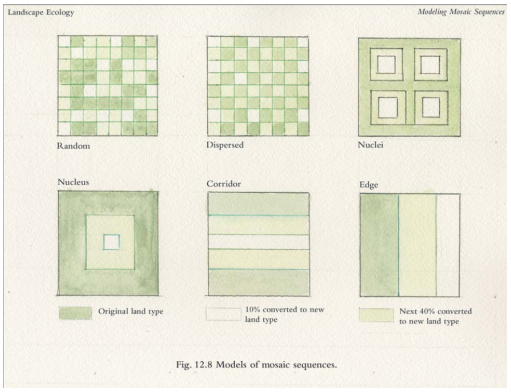
On a local scale, the solutions focus on the qualities of the community of Hvanneyri. The Agricultural University, for instance, could expand its role as a knowledge hub for sustainable farming practices. By offering workshops and courses for local farmers, conducting research into sustainable agriculture, and collaborating with other institutions to share knowledge, the local community will benefit. Together with forming a circular economy, sustainable development will also be met.

Referential Theories and Practices

Richard Forman's Land Mosaics

Forman's book "Land Mosaics: The Ecology of Landscapes and Region" emphasizes the idea that landscapes are composed of a mosaic of different patches or habitats, each with its unique characteristics. These patches together form a larger landscape pattern. Understanding this pattern is crucial for comprehending how ecological processes, such as species movements and resource flows, operate across landscapes.

In the context of creating ecological connections Forman's work provides valuable insights. Ecological corridors, also known als wildlife corridors or greenways are essentially linear strips of habitat that facilitate the movement of species between fragmented landscapes. These corridors play a crucial role in conserving biodiversity and enabling species to adapt to changing environmental conditions. By applying the principles of landscape ecology presented in the book, a better understanding was developed of how to create ecological corridors that facilitate species movement and enhance overall landscape connectivity.

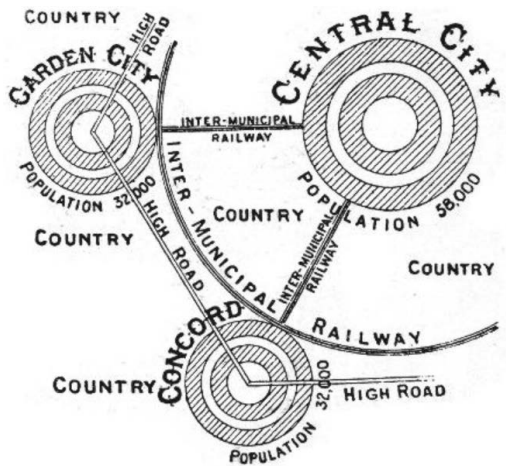


Land Mosiacs by Richard Forman

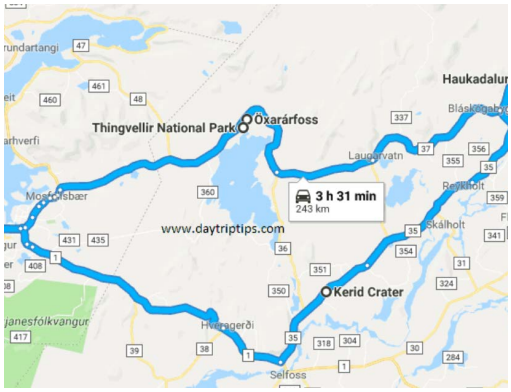
Ebenezer Howard's Garden City

Ebenezer Howard's book "Garden cities of tomorrow" presents a visionary urban planning concept known as the Garden City theory. This theory envisions an idealized form of urban development that integrates residential areas, agricultural land and a central town as a market function. In the context of Hvanneyri the connection to the Garden City theory lies in the potential to apply its principles to shape the development of the area and create a sustainable and livable environment for the community. By creating planned communities that strike a balance between urban and rural elements, ensuring residents have access to nature, fresh food and a high quality of life.

Howard envisioned a central town with commercial and civic facilities as a hub for economic and social activities, this is also what he envisioned for Hvanneyri. By drawing inspiration from this theory and incorporating its principles in Hvanneyri it is tried to create a sustainable community that embraces the natural environment, promotes local agriculture and offers a well-connected and thriving town center.



The Garden City by Ebenezer Howard



Golden Circle



Landbúnaðarháskóli Íslands Hvanneyri Faculty

Golden circle

The Golden Circle in Iceland is a renowned tourist route that showcases natural wonders such as geysers, waterfalls and tectonic landscapes. However many visitors have a passive experience, merely observing these attractions without actively engaging with the environment. In contrast, the Green Circle, inspired by the Golden Circle, aims to activate tourists, seeking a more immersive and sustainable nature experience.

Icelandic lectures

While at the agricultural university of Iceland various professors gave insights into the Iceland landscape and natural practices.

Magnea Magnúsdóttir showed land reclamation policies at the ON company. In this presentation she talked about river erosion and how to solve this with nature based solutions. One of the practices included tree trunks to stabilize the river bank. This theory natural practice example has been used in our project.

Ólafur Gestur Arnalds presented his book “The Soils of Iceland” in which he explains how the Icelandic landscape evolved. Centuries of erosion process resulted in the fact that most of the fertile soil in Iceland is gone. This started when the first settlers came to Iceland and cut down most of the trees for the use of timber, moreover they brought sheeps to the island that grazed everywhere and destroyed the remaining trees. When the vegetation disappeared wind erosion became more problematic, which degraded the landscape even more. With most of Iceland having no vegetation cover and soil that lack cohesion, the Icelandic landscape is vulnerable to natural hazards. This book and lecture by Arnalds were taken into account formulating the problem statement, vision and strategic interventions.

Bjarni Diðrik Sigurdsson presented insight on the forests of Iceland. Only 1,5% of the land is birch forests nowadays, while 30% of the land has a sufficient climate for forests. He emphasizes the importance of afforestation, the process of placing trees where there haven’t been any trees. As much of the land in Iceland is privately owned, there is a need for collaboration to increase the possibilities for afforestation. While visiting the Borgarbyggd valley we visited an afforestation project that is used as an experiment to import different types of trees. The only native tree of Iceland is the birch, other trees that grow well in the region are the Sitka Spruce, Pine, Rowan, Aspen and tea-leaved willow.

2. Critical Landscapes & Tectonics

SNORI STURLUSON
SETTLES IN REYKHOLT

1200

12TH CENTURY CHURCH
IN HVANNEYRI

EGILS SAGA TAKES
PLACE IN THE REGION

INGÓLFR ARNARSON
SETTLES IN REYKJAVIK

847



Palimpsest 847 - 1200

The map from 874 AD reveals a pristine valley adorned with lush forests. Human settlements are scarce, with small scattered farms, and the landscape is predominantly covered by untouched woodlands.

- Water or highlight
- Forest
- Mountain
- Settlement
- Road

N

0 — 4 km


Grisartunga
Muanarnes Huagar
Einbuanes
Snori Sturluson settled in Reykholt
1179–1241
s first church in
century
Places mentioned in the Egil's
Saga around 1000 AD
Medieval Borgarbyggð
874 - 1200

1950

1947 UNIVERSITY SETTLEMENT IN HVANNEYRI

1905 BUILDING OF CURRENT CHURCH BUILDING

1889 FARM SCHOOL IN HVANNEYRI

1800

ESTABLISHMENT OF BORGARNES



Palimpsest 1800 - 1950

The map from 1900 demonstrates a significant transformation of the valley. Forests have receded due to expanding settlements, resulting in a decrease in forest cover. The presence of farms has increased, indicating human influence on the landscape.

- Water or highlight
- Forest
- Mountain
- Farmland
- Settlement
- Road

N

0 4 km



Nineteenth century Borgarbyggð
Based on maps from 1928

2023

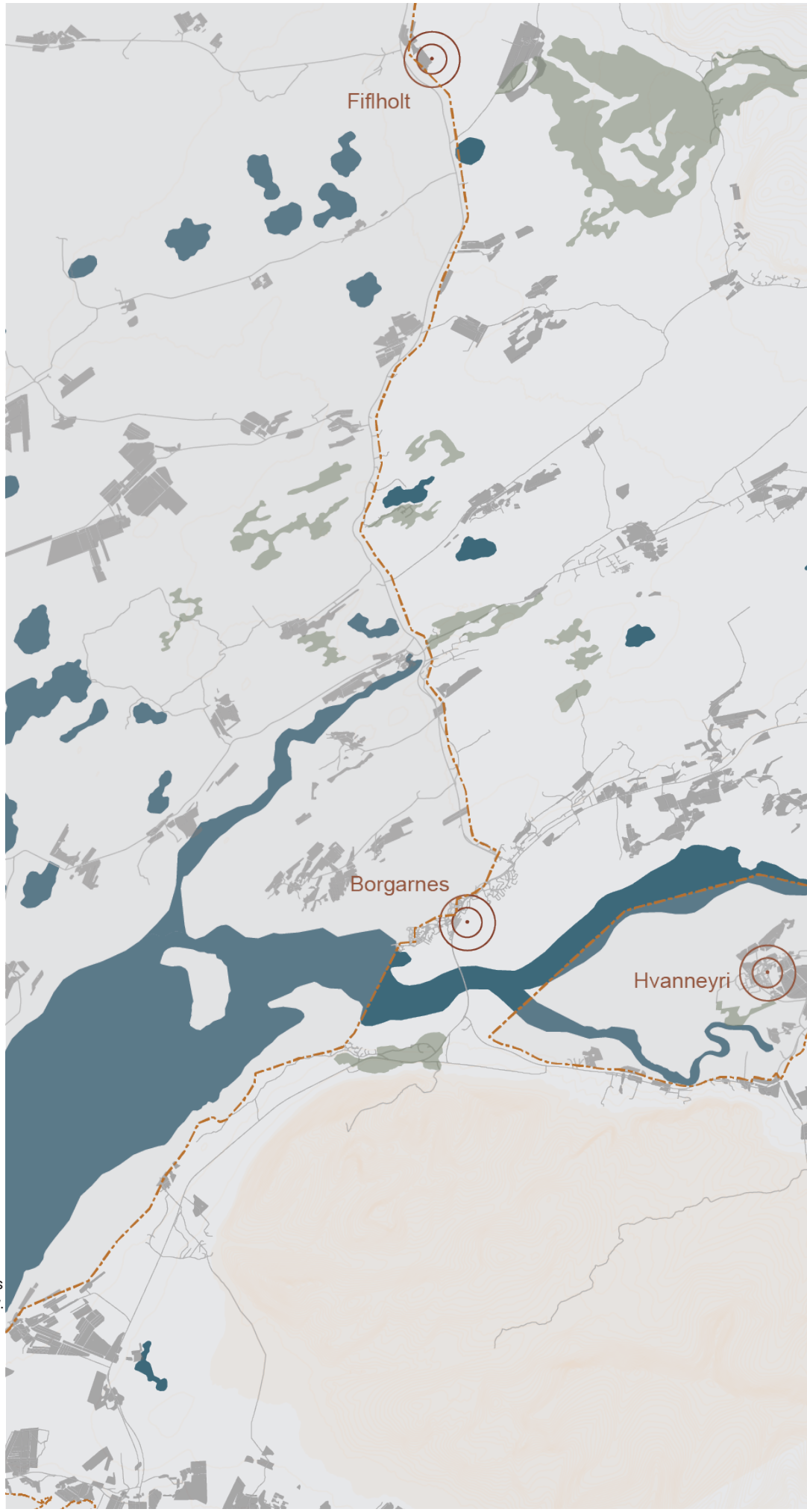
2013 DESIGNED RAMSAR SITE AROUND ANDAKILL & HVANNEYRI

2002 HVANNEYRI FIRST HABITAT PROTECTED AREA IN ICELAND

1980 FORBIDDEN TO SHOOT ON BIRDS

1965 AGRICULTURAL RESEARCH INSTITUTE MOVES TO HVANNEYRI

1950



Palimpsest 1950 - 2023

The map from 2023 portrays a valley where the impact of human activities is strikingly evident. Forests have considerably diminished, giving way to extensive farmland. The expansion of settlements and agricultural practices has altered the natural landscape significantly.

- Water or highlight
- Forest
- Mountain
- Farmland
- Settlement
- Road

N

0 — 4 km

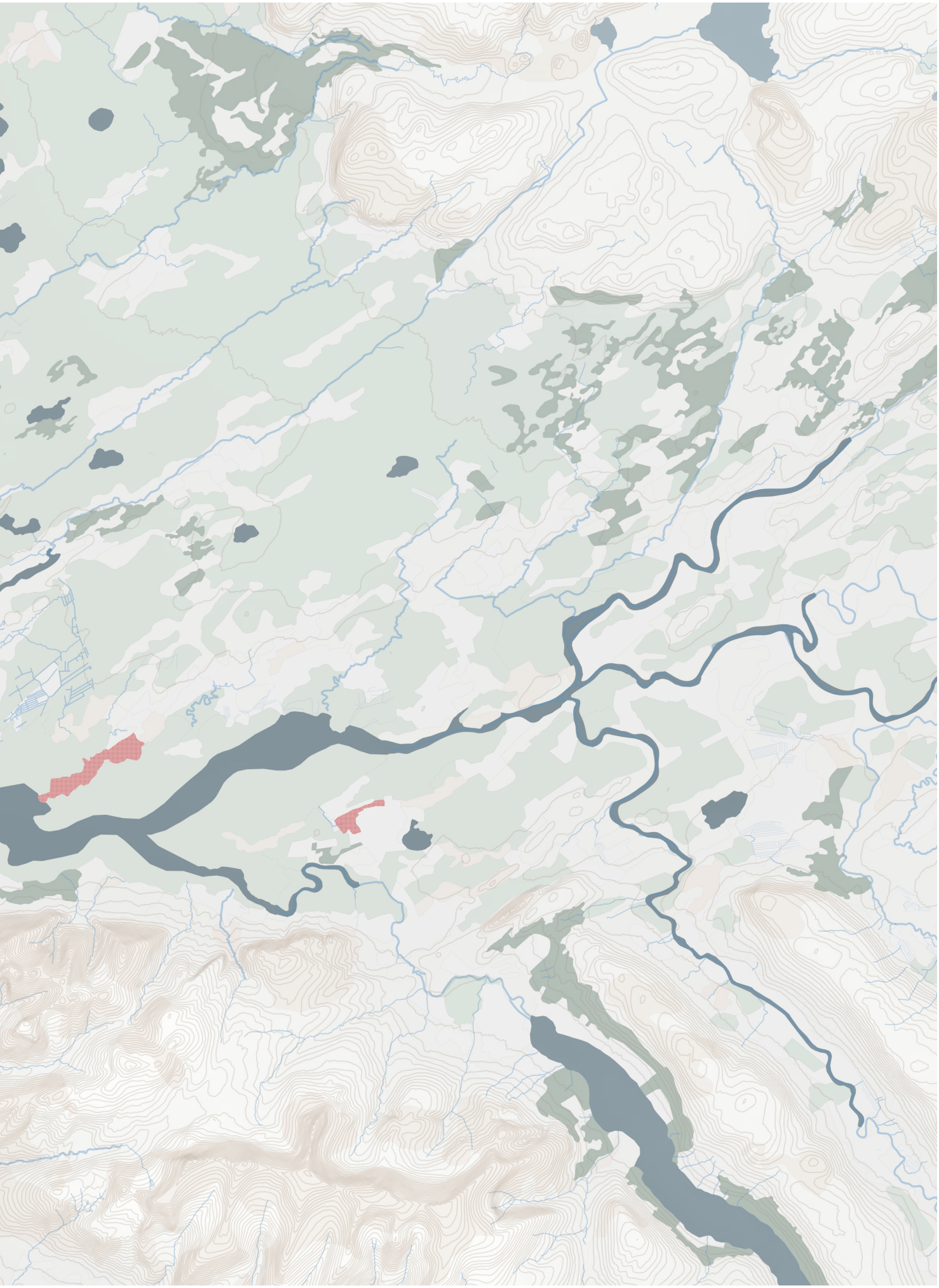


Contemporary Borgarbyggð
2023

Landscape Identity

The Borgarbyggd valley is characterized by a wide barren landscape with sheeps farms on the horizon. The wide scenery makes it possible to almost always see the ocean on one side and the inland highlands on the other side. The landscape is not as empty as in other parts of Iceland, but





Landscape Identity

The Borgarbyggd valley is characterized by a wide barren landscape with sheeps farms on the horizon. The wide scenery makes it possible to almost always see the ocean on one side and the inland highlands on the other side. The biggest part of the lower valley is covered by wetlands. Some parts of the wetlands are drained for agricultural purposes, but most of the wetland land cover is protected natural area. Moreover there are three protected bird habitats in the valley. Unfortunately, not enough conservation efforts are in place to protect these wetlands, as roads and farms break up the ecological areas and animal habitats.

The sheep farms are the second important element of the landscape identity. There are many farms in the region, both big and small. The farms and natural ecosystems are competing, leading to fragmented natural and agricultural landscapes and an underdeveloped economy.

The third important identity element is the agricultural university situated in Hvanneyri. The university brings students and young people to the region, but they are never there to stay. Many students come to Hvanneyri to get their education and afterwards go back to their village in Iceland or pursue an academic career overseas. Nonetheless the university brings a lot of knowledge to the area. The university has projects in the whole region, regarding farming, forestation and natural preservation and therefore is an important identity for the region.





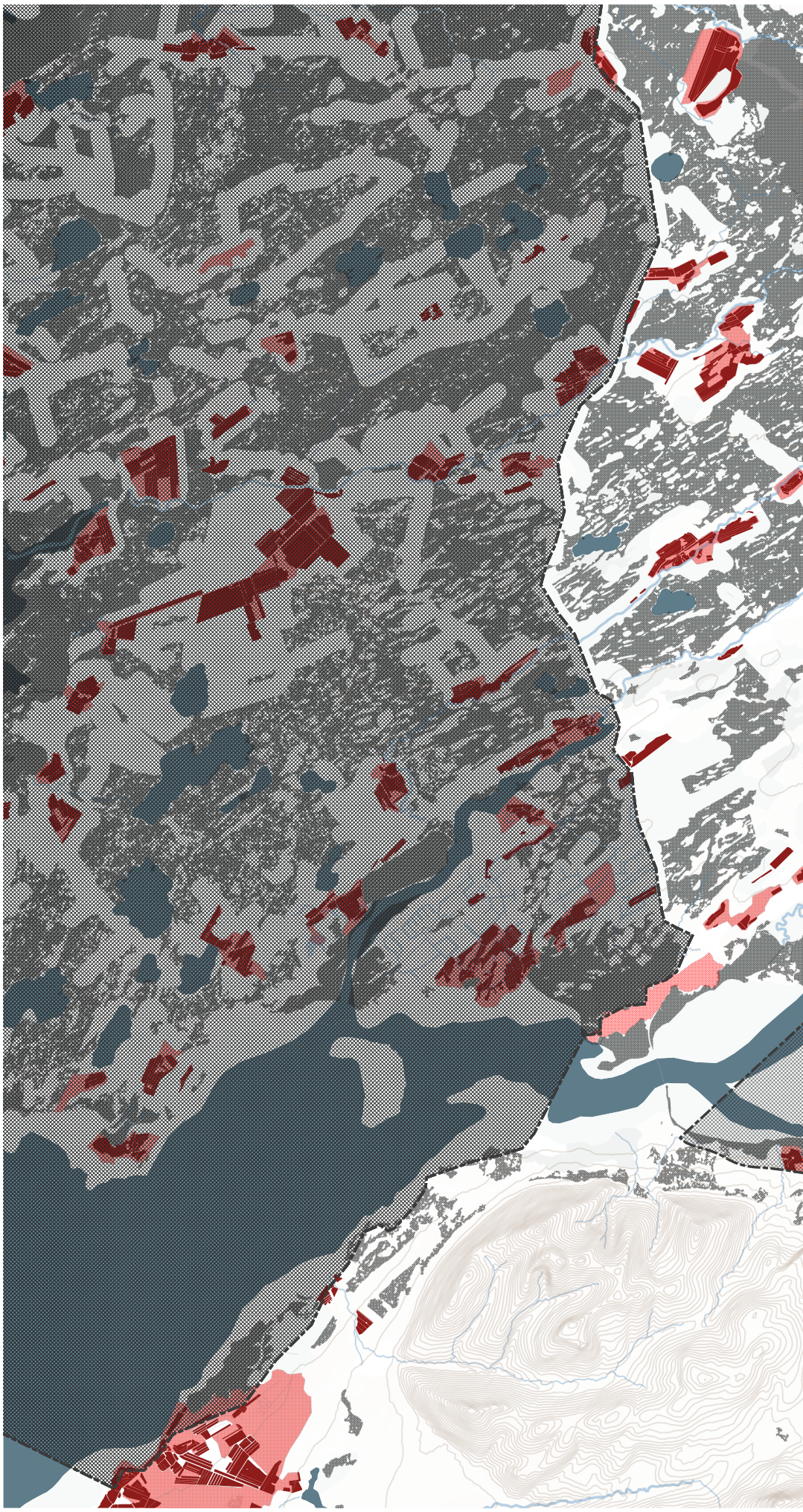

Landscape Identity, *own images*

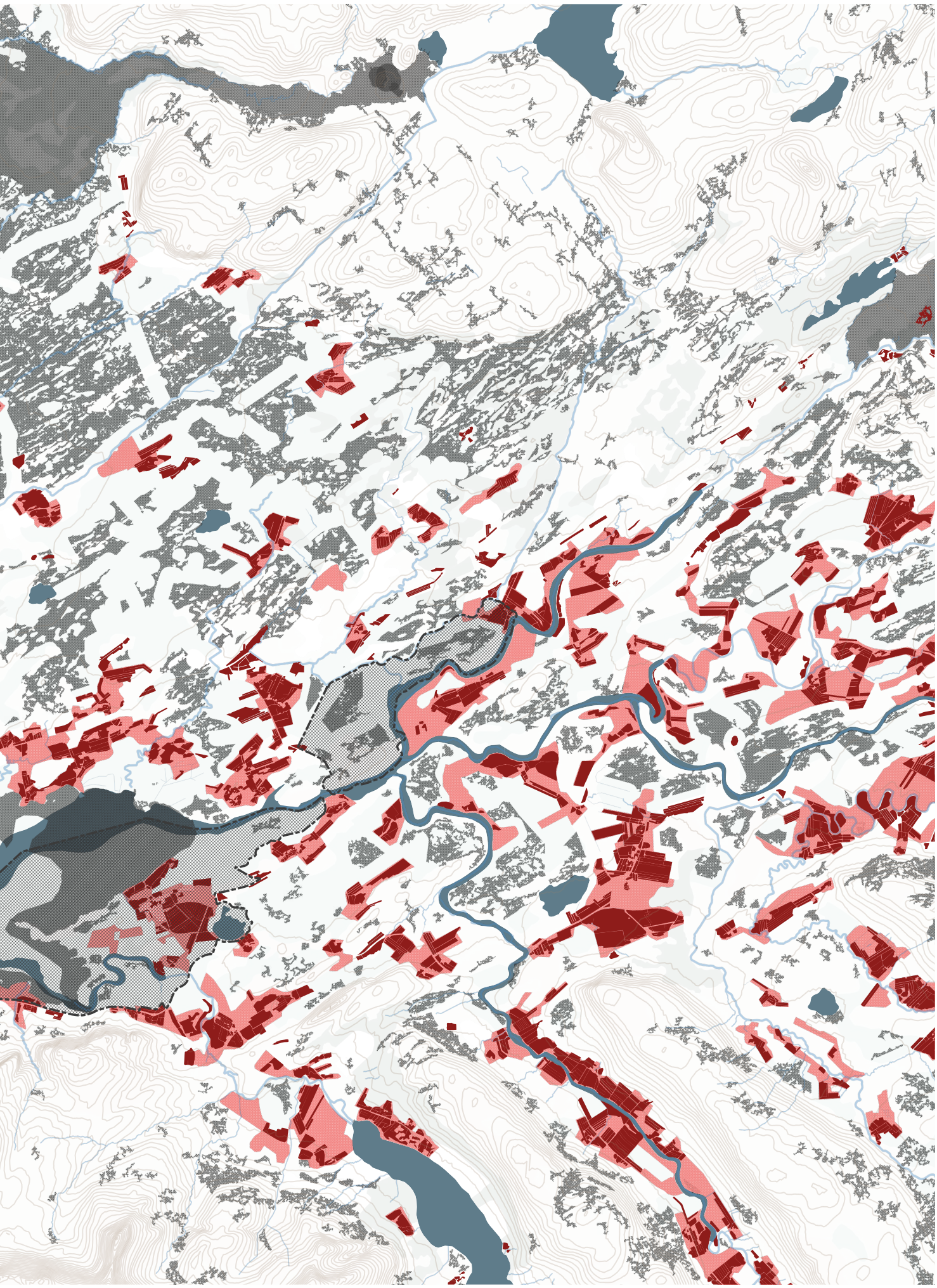
Conflict maps

In the problem statement it was explained that the natural and agricultural landscapes are fragmented and the ecosystems compete with each other. To show this, we used the natural ecosystems as the base for the conflict map and overlaid different practices that compete with the natural landscapes. The conflicts in the land use and landscape are established with the WEFM nexus in mind.

Food production & protected natural landscapes

The first conflict map shows the relation between food production and natural processes. The wetlands in gray are overlaid with the agricultural farms in red, connected with roads in white. This shows the fragmentation of the natural patches, caused by the placement of the farms. On top, the protected bird areas are hatched. These hatches overlap with the agricultural processes and the roads, which are in conflict with each other. Another interesting conclusion from this map, was that the protected bird area in the North of Hvanneyri, ends abruptly along the highway.

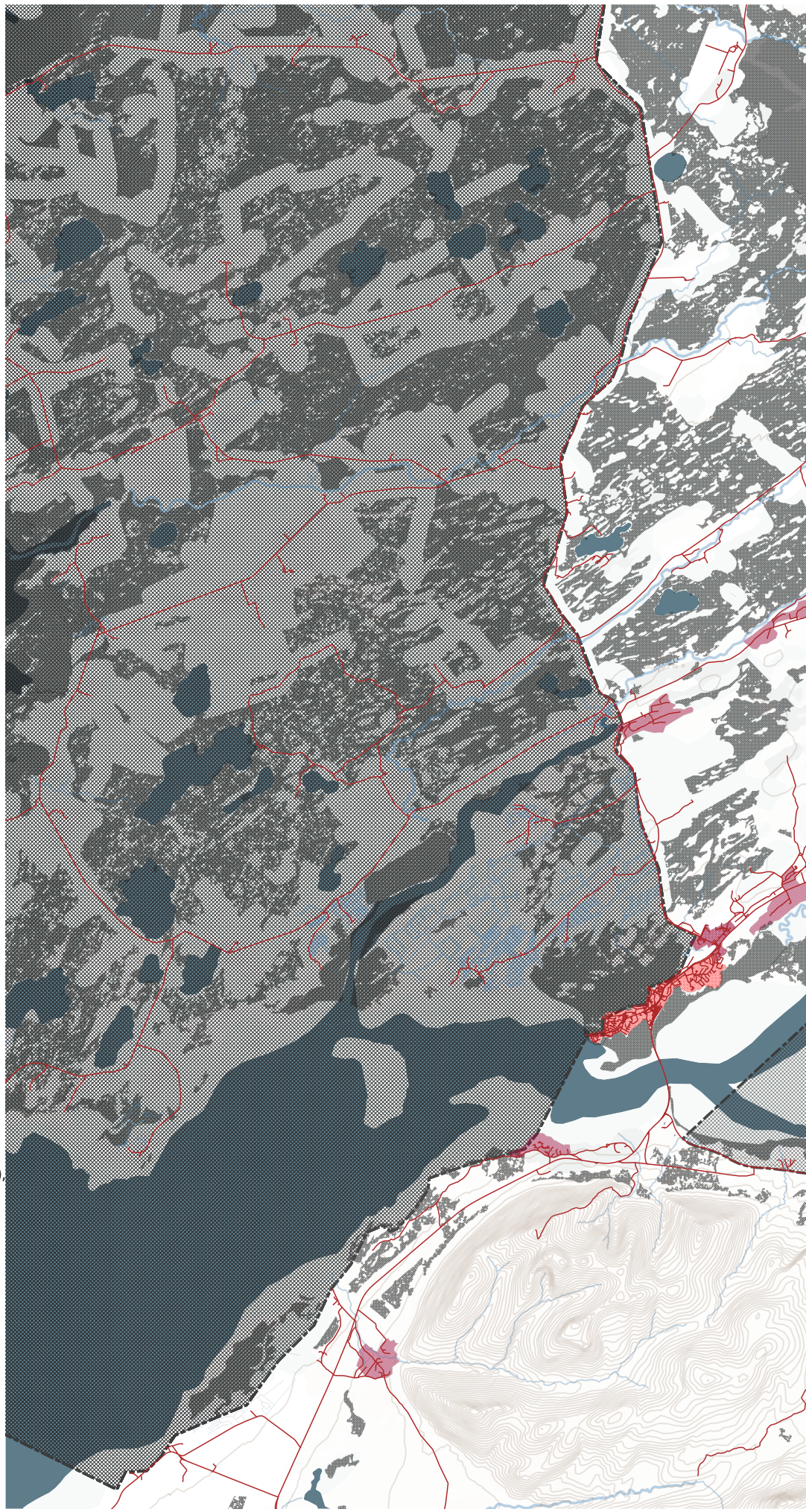


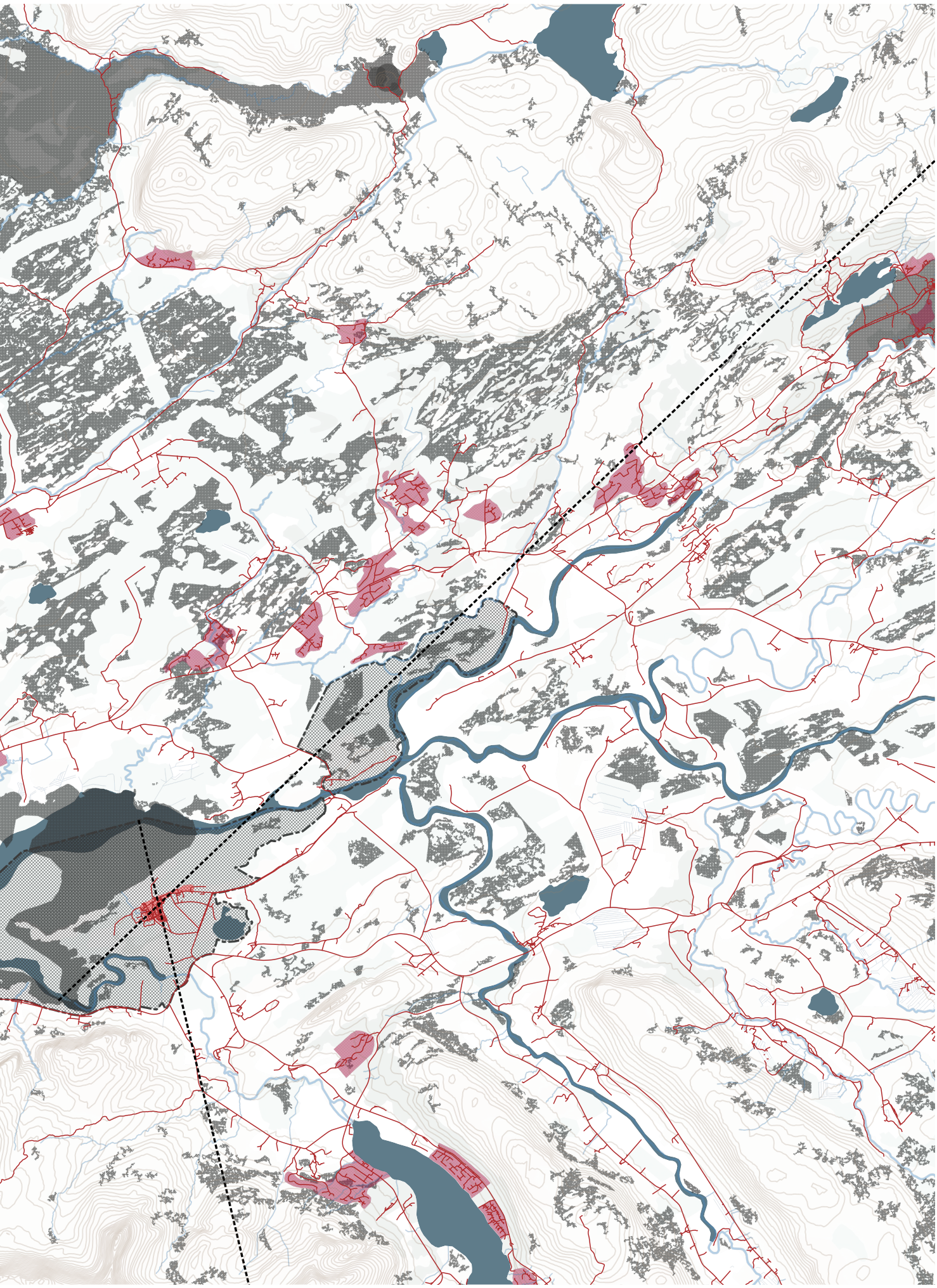


Human movement
& protected natural landscapes

The second conflict map shows the division of the wetland by the roads (in red). The gray area is separated into fragmented patches, which shows the conflict of the human infrastructure with the natural landscape. Apart from Hvanneyri, all settlements are positioned outside of the protected bird areas. However, at the location of Borgarnes (the biggest village), the protected bird area is split up. The assumption that the village is harmful for the bird habitats can be made from this observation.

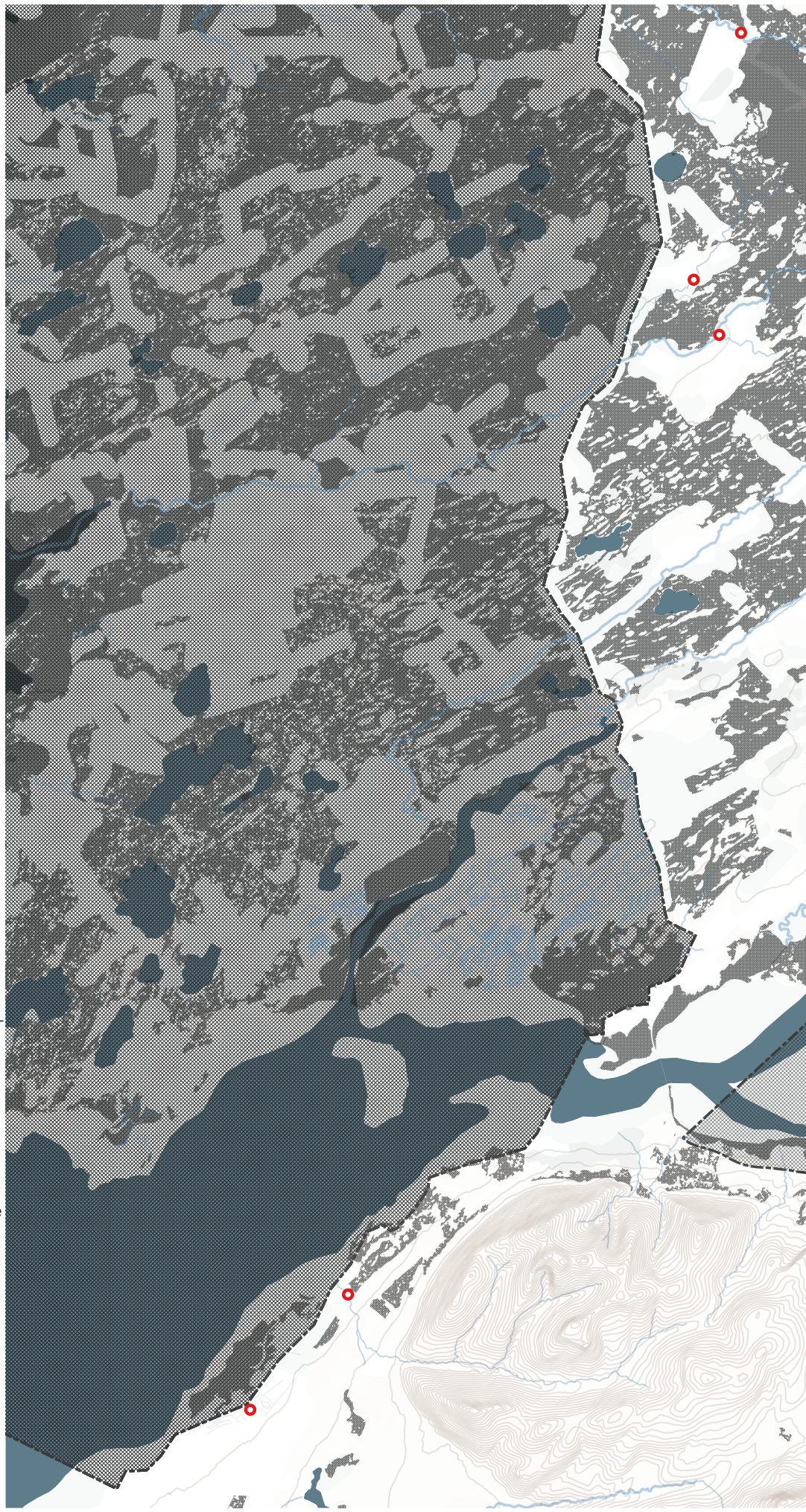
- Water or highlight
- Rivers
- Sealevel rise
- Mountain
- Etc
- Etc
- Etc
- Etc

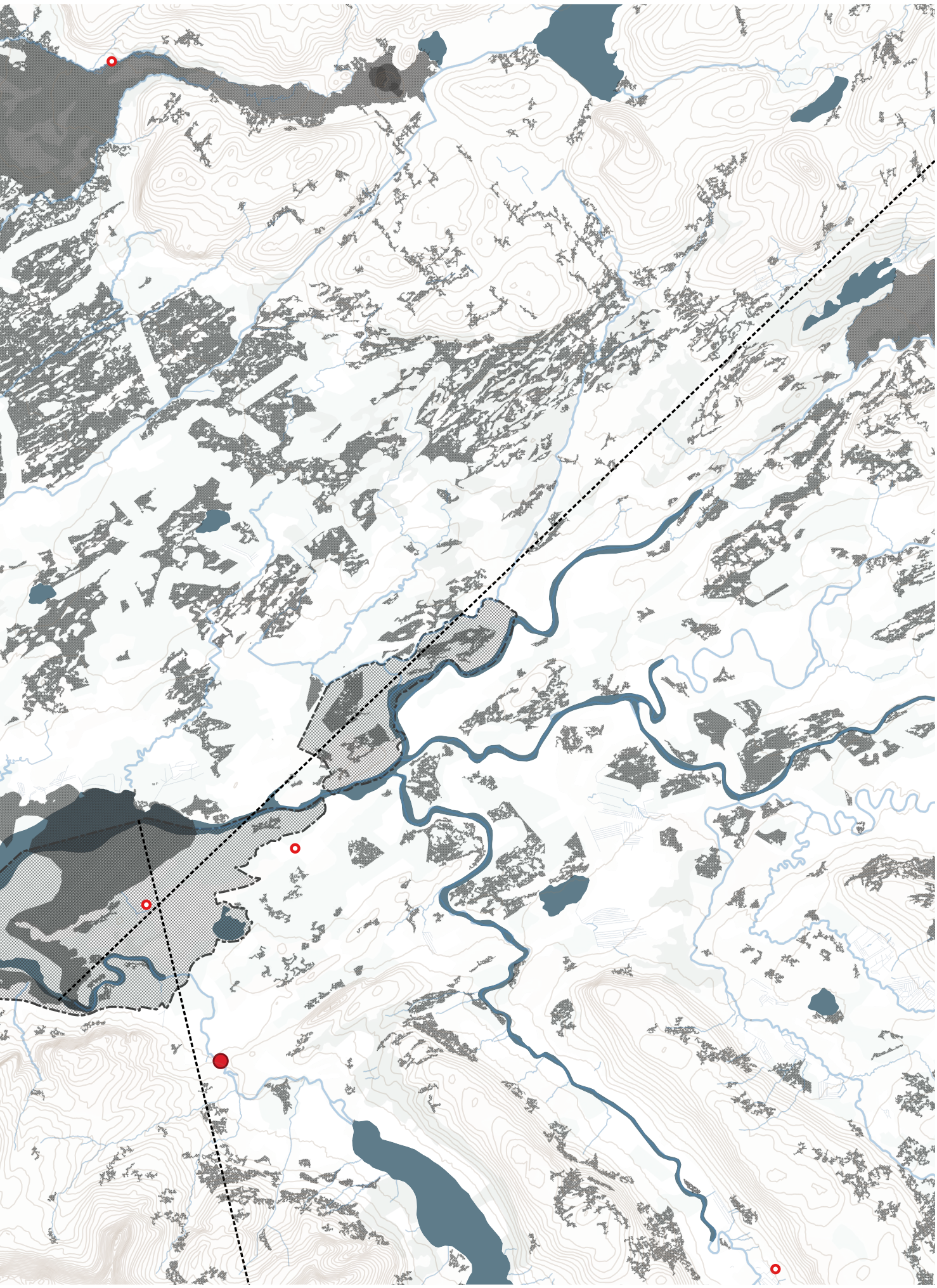




Energy production & protected natural landscapes

From the third conflict map about the relation of energy production with the natural landscape, it can be concluded that the energy production has influence on the water level of the lower part of the river, because most of the locally produced energy is produced by hydropower stations. However, since the energy is 100% renewable, and is produced and distributed locally, this conflict was found to be less urgent than the others. Therefore, the focus of this project lies not on energy production.



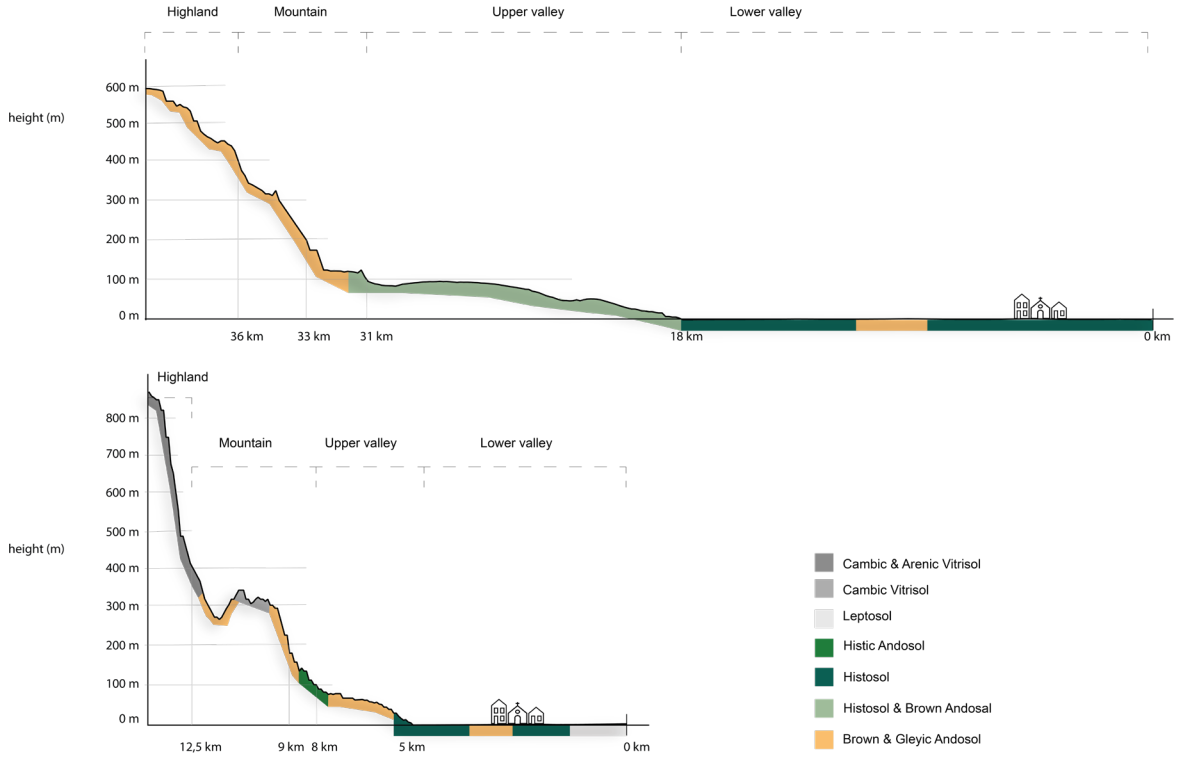


In section

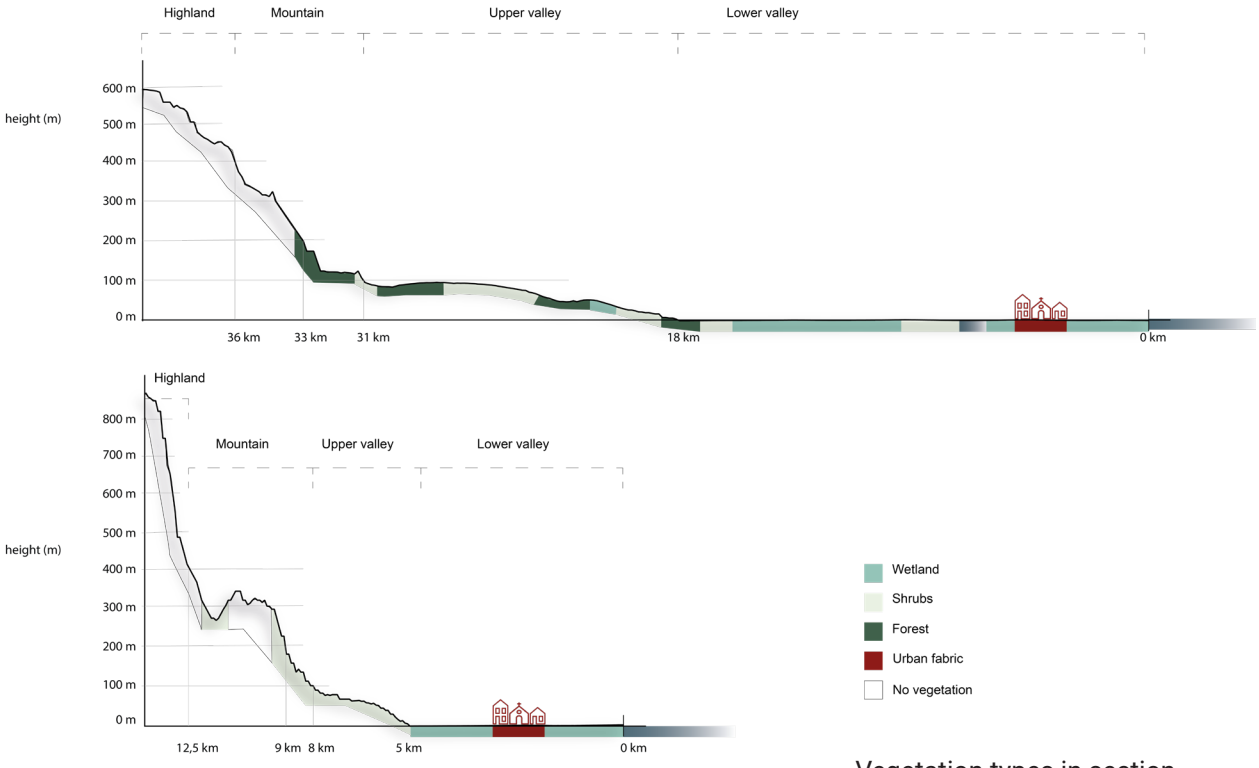
The Borgarbyggd valley has a unique constellation of different landscapes, projected over elevation planes varying from the height of 0 to over a 1000 meters. To highlight the diversity of the area, two sections were cut out. The first section is the long section. It starts just below Hvanneyri, and cuts through the landscape in North-East direction, ending at the start of the mountains behind the valley. The lower valley measured from the water, is 18 km in distance, which is ideal for agricultural practices. The distance towards the start of the steep mountain (the lower and upper valley accumulated) is 31 km.

The small section starts just above Hvanneyri, and cuts in the Southern direction through the mountains below the valley. In this section, the start of the upper valley is reached after just 5 km, and the steep mountain side starts already after 3 more km.

The different soils are presented in the sections. All andosols are insatiable soils that create a high risk of landslides. In both sections, a large part of the upper valley and the mountain contains types of andosols, causing the full valley to be at risk of landslides. This risk is expanded by the sheep grazing activities, which eliminate the vegetation that holds the soil together with its roots. Therefore, reforestation and better protection of the slope of the mountains is needed in order to protect the people and the landscape from landslides.



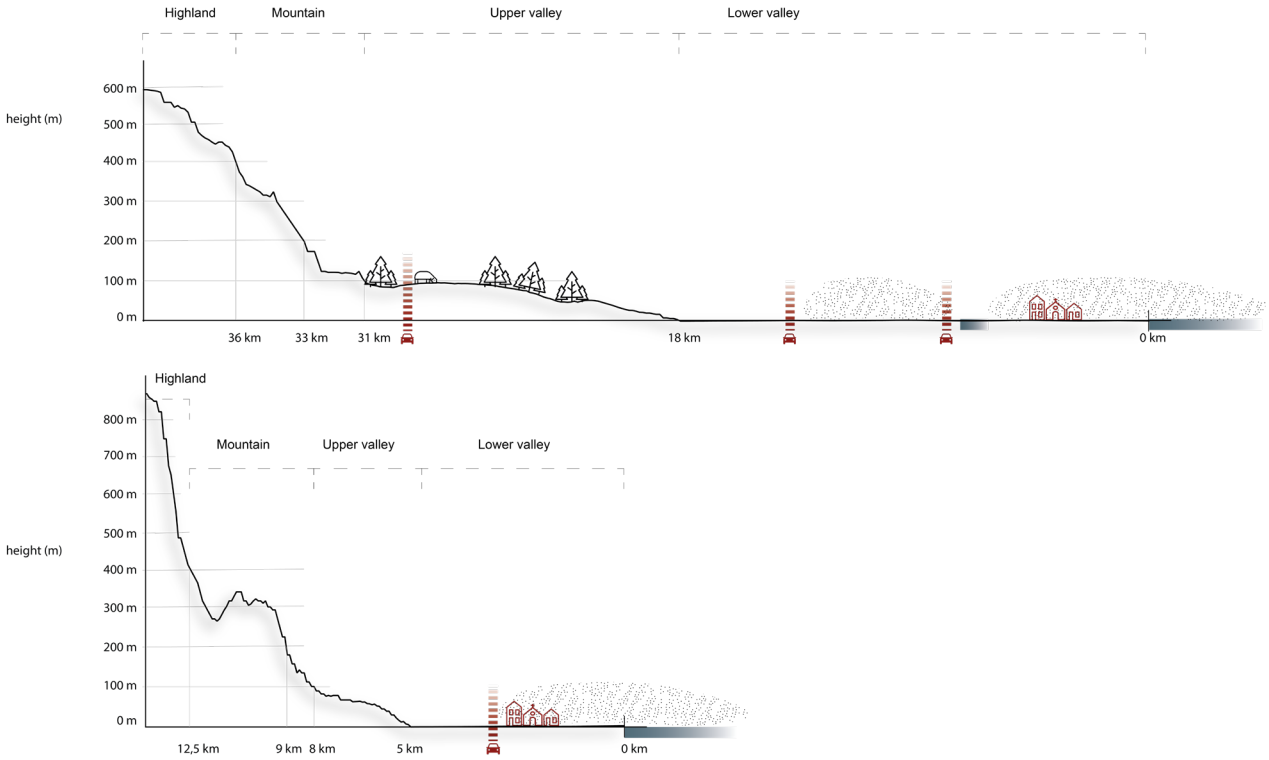
Soil types in section



Vegetation types in section

Conflict section

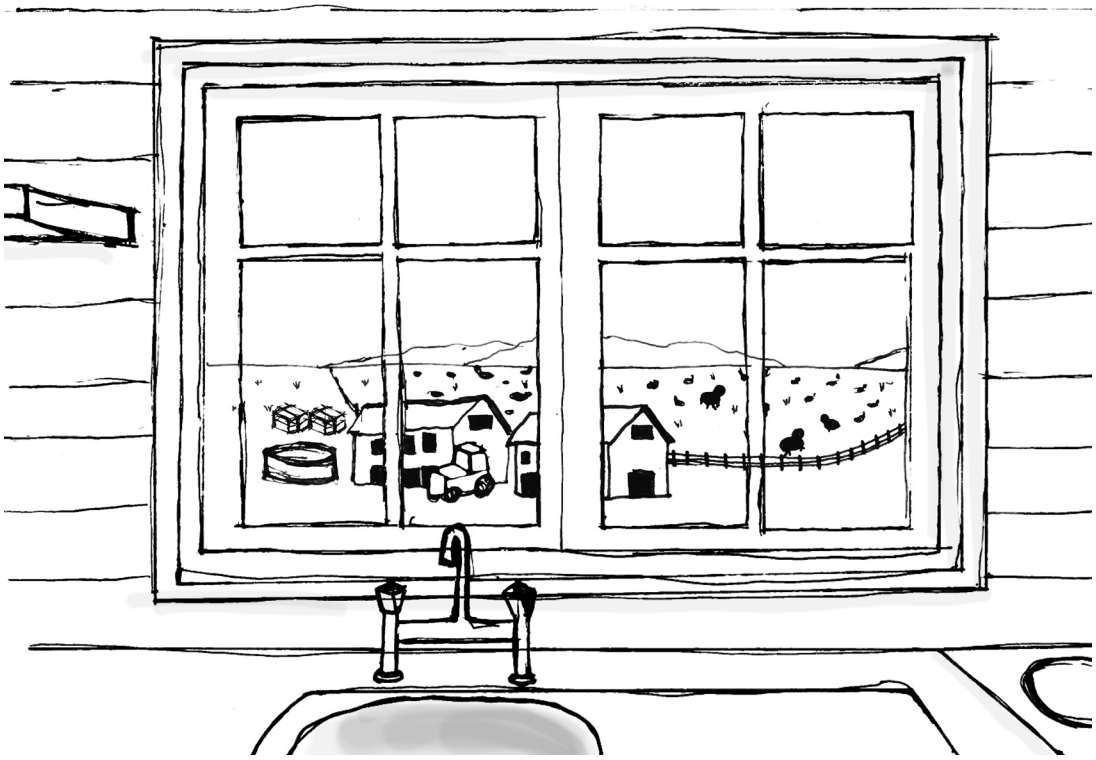
As visible in both sections, the protected natural area is disrupted by the car roads, showing the conflict of the infrastructure with nature. In the long section, the upper valley consists of forests that are broken up by roads, which is harmful for biodiversity in the area and adds to the deforestation problem. In the lower valley, the wetland with the protected bird area is separated by the roads and human settlements, which is harmful for the habitat of the birds.



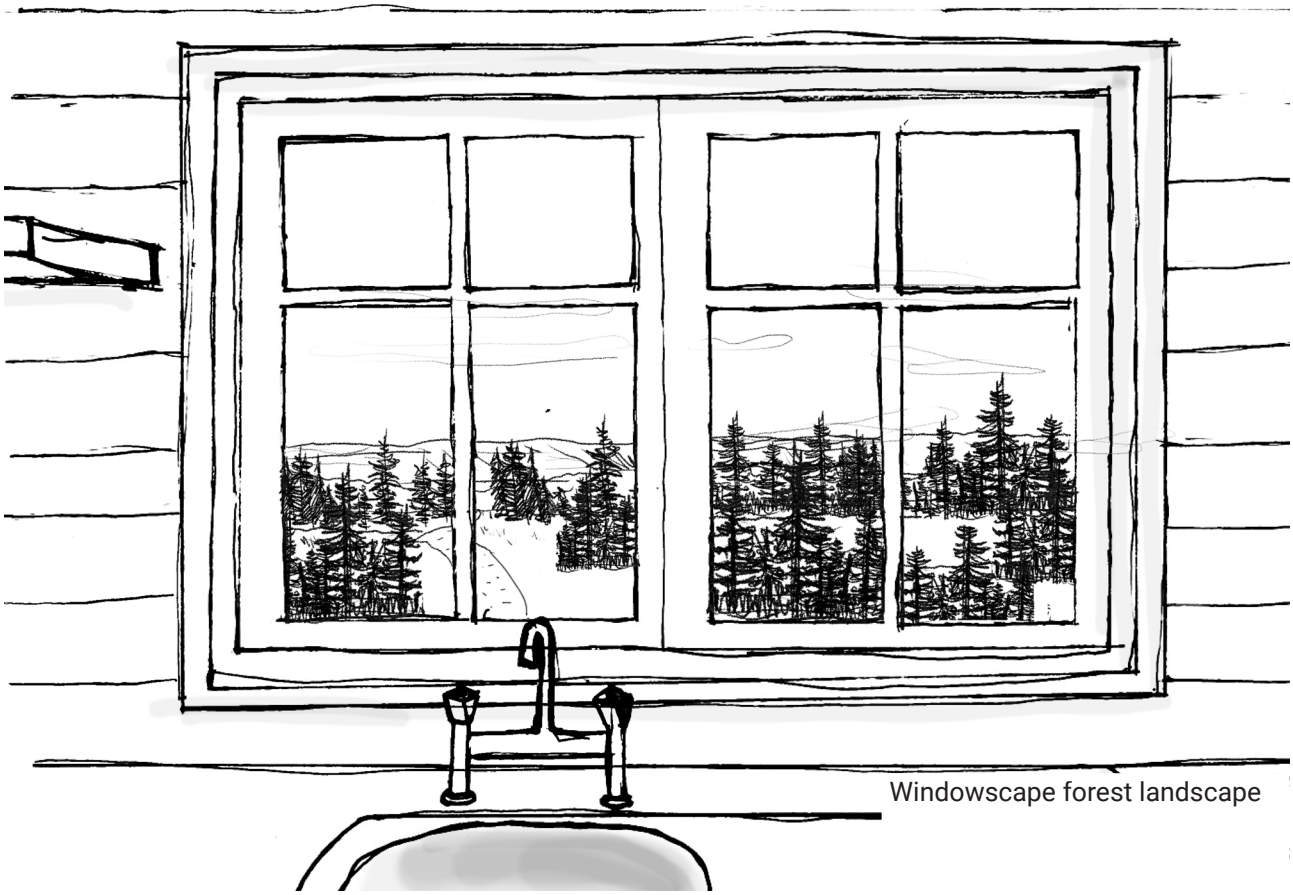
Conflicts with nature in section

Windowscapes

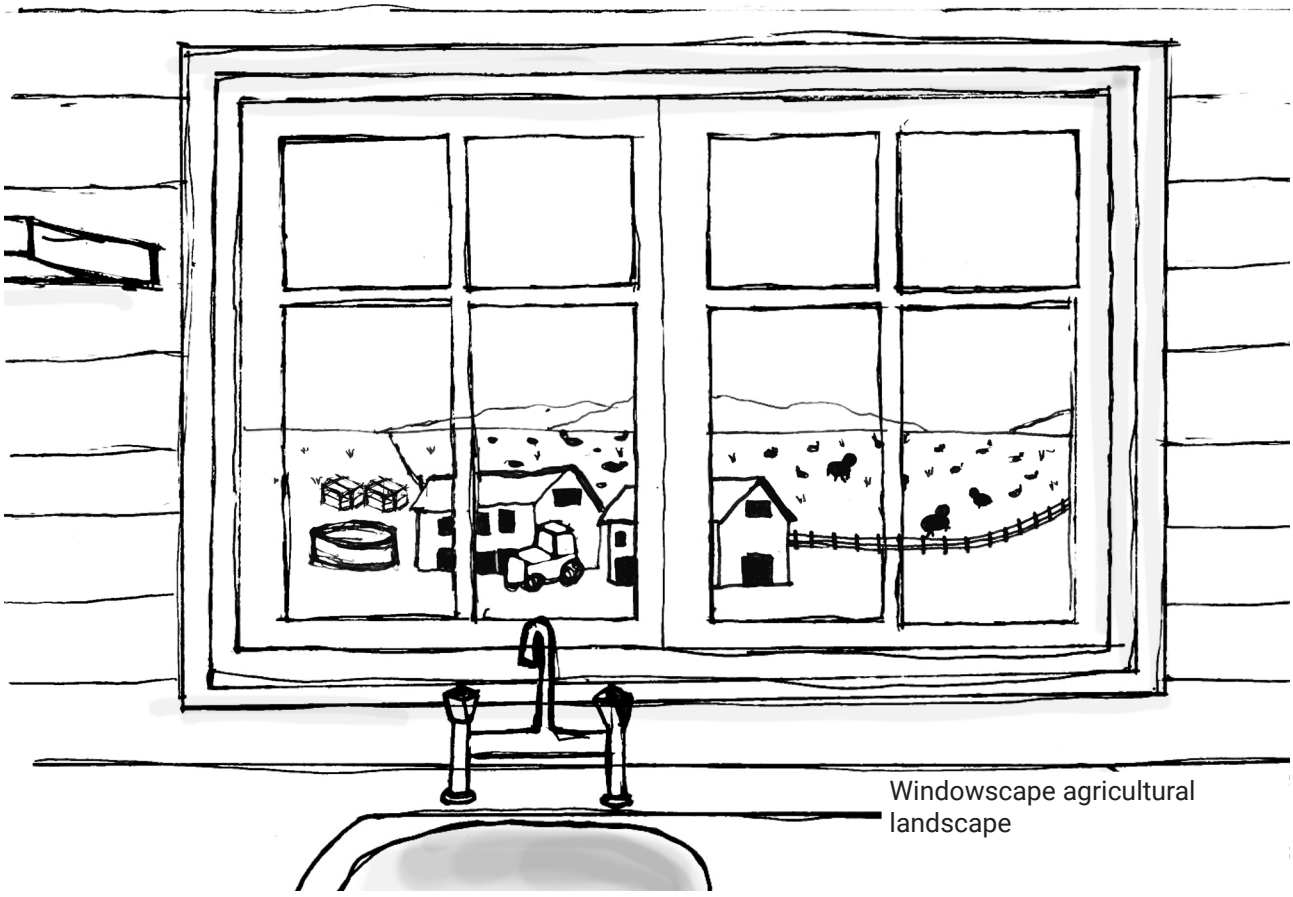
It was decided not to draw the windowscapes throughout history, but rather show the four different landscapes present in the valley. Throughout the years these four landscapes have always been present in the Borgarbyggd valley. Looking through any window in any house during any moment in history you either have a view of a small village, one or multiple farms, wetlands or a small forest. These four landscape identities have valuable characteristics and all contribute evenly to the identity of the valley. That is why our project does not focus on strengthening one landscape identity but integrating and enhancing the four landscapes together.



Typical windowscape Borgarbyggd,
Lieke van Lun & Sanne van Rees



Windowscape forest landscape



Windowscape agricultural landscape



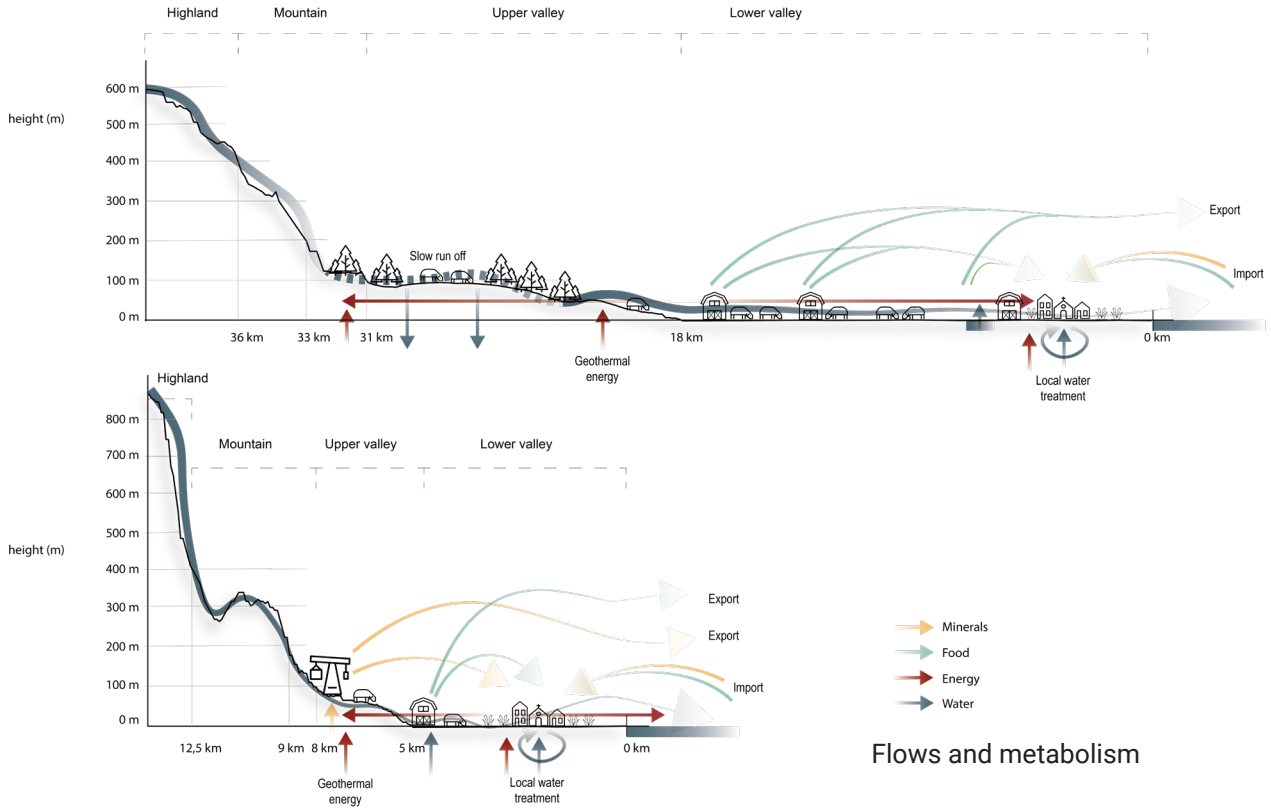
Windowscape wetlands



Windowscape urbanized landscape

Flows

The same sections as presented before, can be shown in relation with the WEFM nexus. The different systems interrelate in different ways along the two axes. In the long section, the elongated lower valley with the wetland landscape is used mainly for food production practices. In the short section, the steep mountain side is used for the exploitation of minerals in a mine. Furthermore, in both situations, food is imported and exported out of the region. Since all elements of the WEFM nexus are available in the region, local production and distribution could create a circular and sustainable economy at the local scale.



Flows and metabolism

3. Territorial Vision

Systems description and synthesis

Vision and strategy

We envision a future where the region serves as a model for rural regional planning emphasizing the coexistence of nature, people and economic development. The overarching goal of the project is to address the environmental, economic, and educational challenges while preserving the unique cultural and natural heritage of the region. The vision involves four lenses: Ecological (re)connection, rethinking the food system, Hvanneyri as a knowledge hub and eco-tourism as a tool. that were divided amongst the group members to develop design experiments within these themes.

To support ecological (re)connection there is a need for more attention to the wetlands & forests ecosystem. By implementing ecological connection zones the landscape can be strengthened. This can be done by ecological corridors, or wildlife corridors, that support the spreading of different species. Public education can raise awareness about the importance of these habitats and promote responsible behavior, especially under tourists.

Rethinking the food system and sustainable land management strategies should be introduced to be able to implement afforestation practices. This could involve rotational grazing systems, reforestation initiatives, fenced grazing areas and the introduction of alternative livestock and a change of local diet. The agricultural practices in the area could serve the local community and promote a local economy.

To boost the local economy of Hvanneyri, we propose developing sustainable tourism initiatives that highlight the valley's unique features. This could include guided tours, cultural events, and eco-friendly accommodations. By promoting Hvanneyri as a destination for sustainable tourism, we can stimulate economic growth while preserving the village's character.

Finally, to use the potential of the Agricultural University of Hvanneyri, we suggest expanding its role as a knowledge hub for sustainable farming practices. The university could offer workshops and courses for local farmers, conduct research into sustainable agriculture, and collaborate with other institutions to share knowledge and best practices. Hvanneyri will become an exemplary agricultural village, demonstrating a new sustainable circular economy that benefits both the environment and the local community.

Altogether we envision a future where human and natural systems are unified, which results in a resilient region that balances environmental protection, economic growth and educational opportunities.

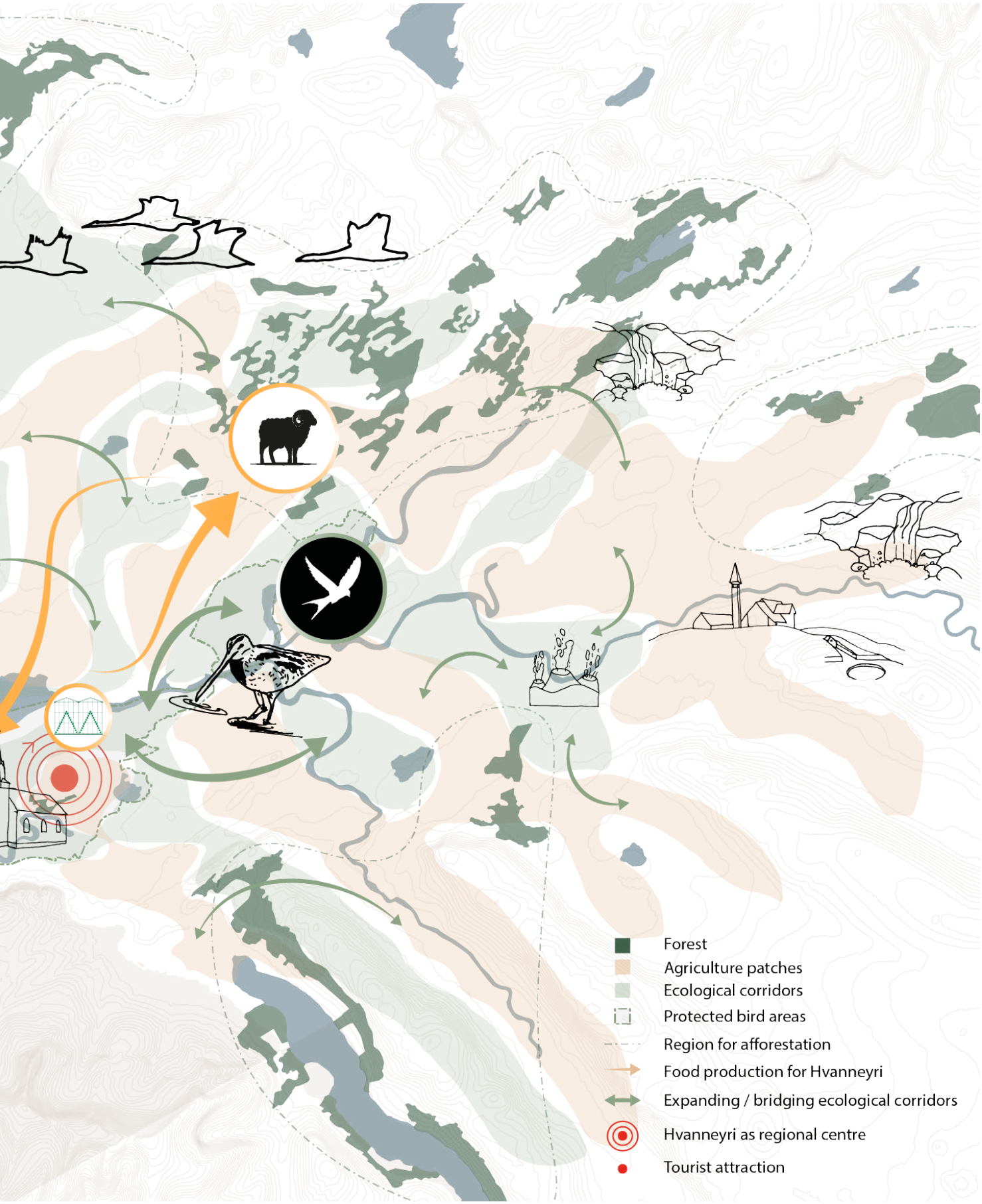


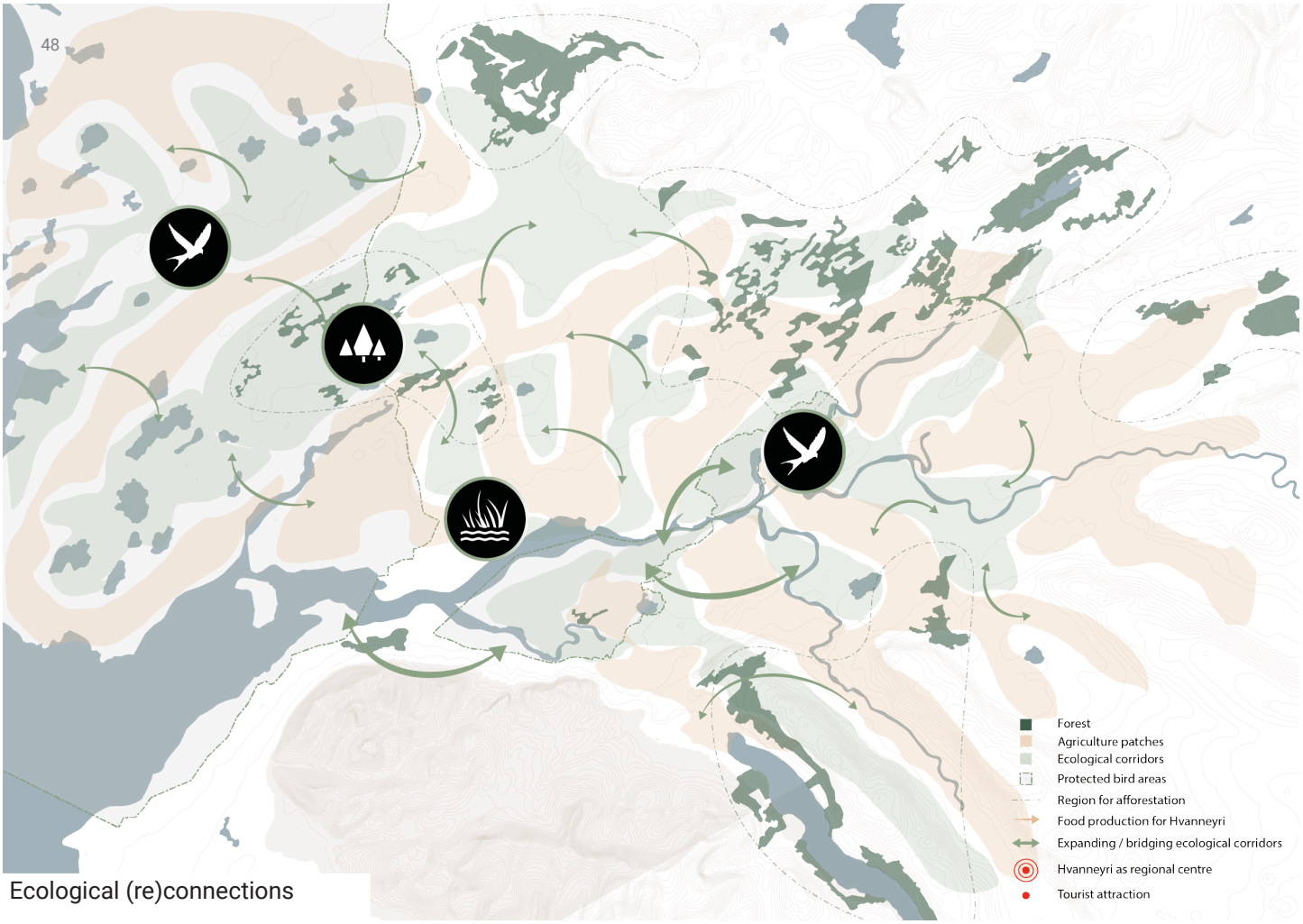
Vision

Our group vision for the Borgarbyggd-valley, combining innovative agriculture, eco-tourism, natural landscape restauration and the knowledge from the local university.

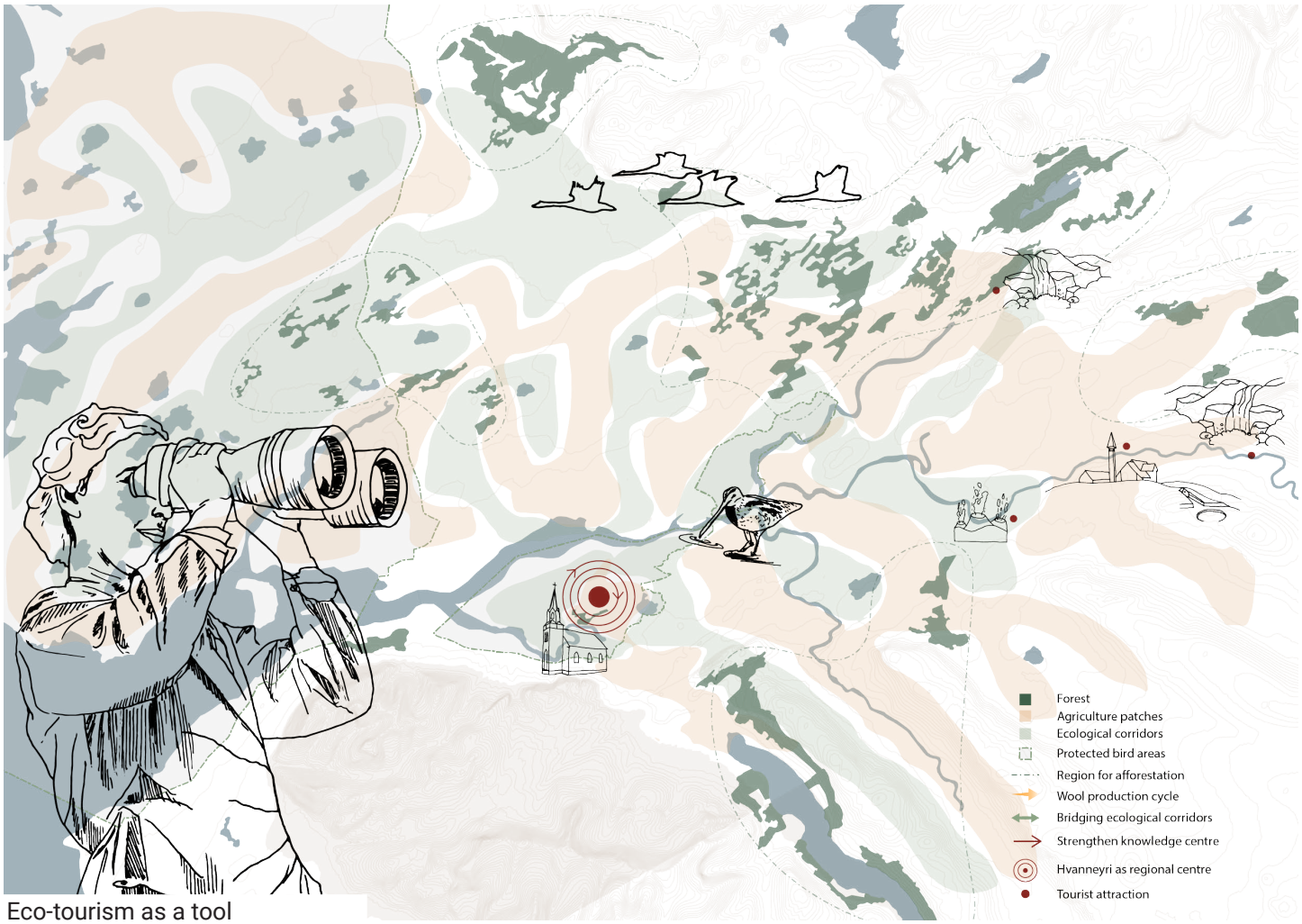
N

0 100 km


Forest
Agriculture patches
Ecological corridors
Protected bird areas
Region for afforestation
Food production for Hvanneyri
Expanding / bridging ecological corridors
Hvanneyri as regional centre
Tourist attraction

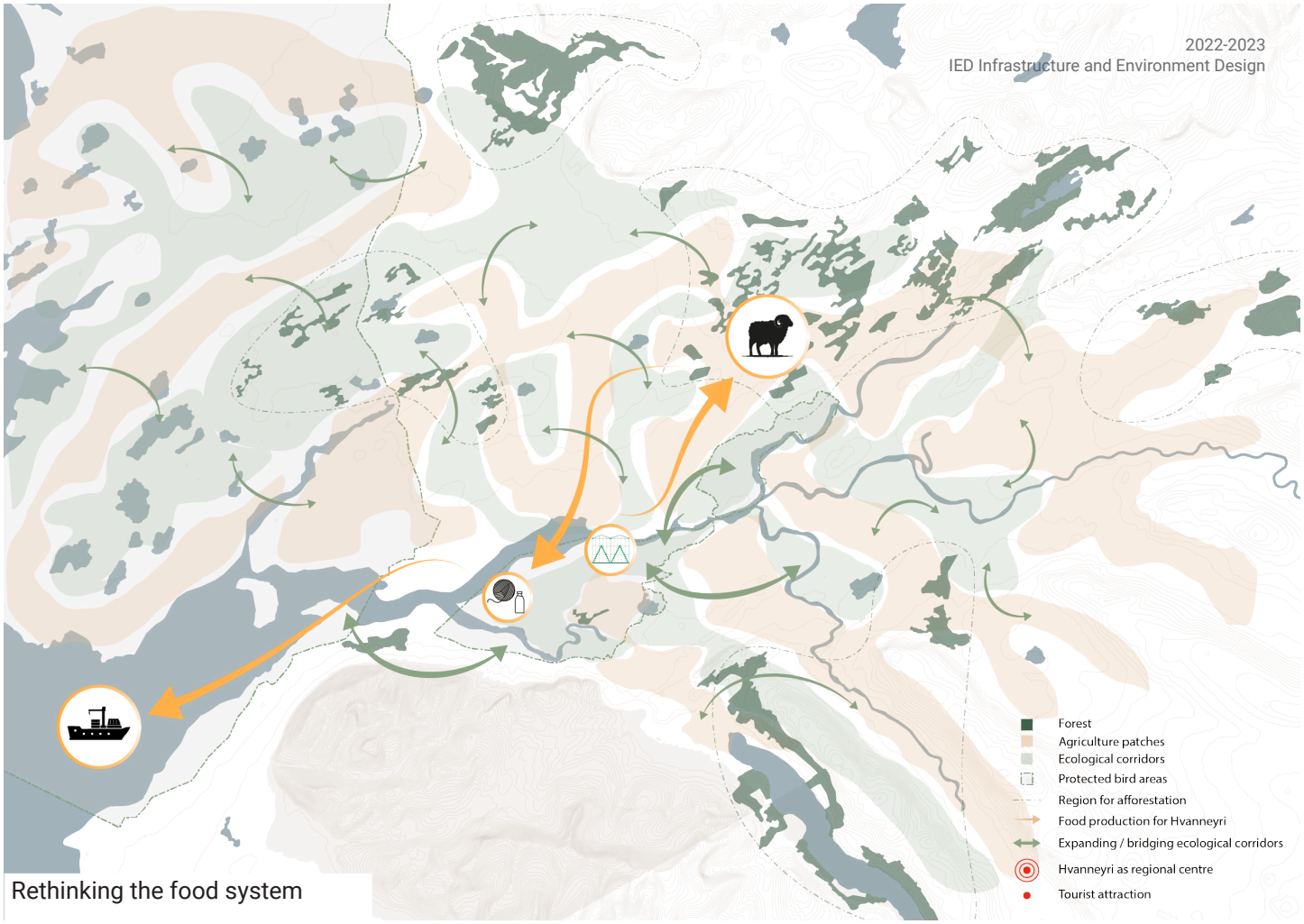


Ecological (re)connections

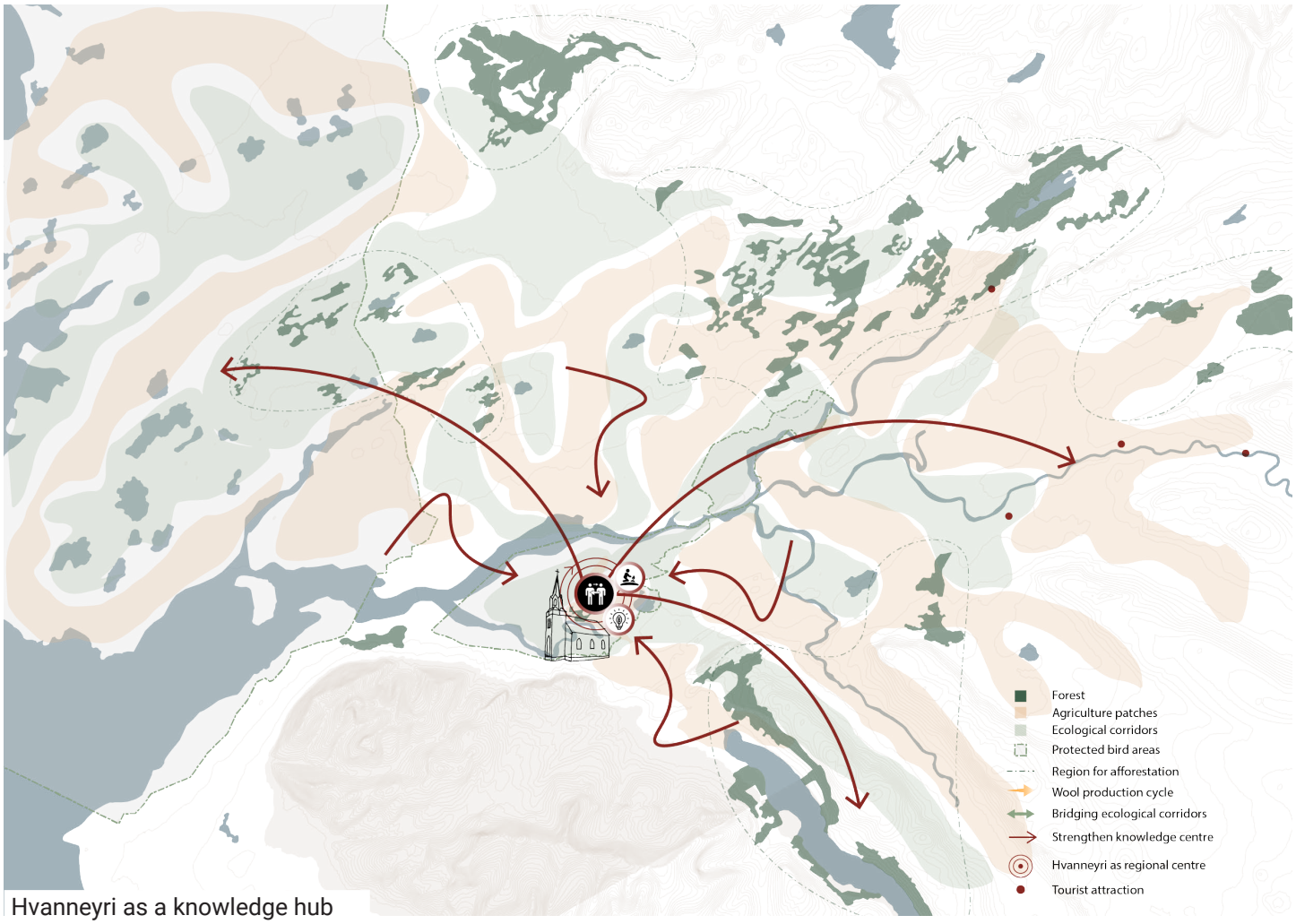


Eco-tourism as a tool

2022-2023
IED Infrastructure and Environment Design

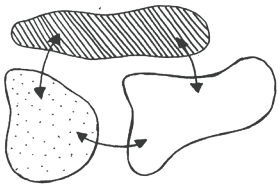


Rethinking the food system



Hvanneyri as a knowledge hub

ECOLOGICAL RECONNECTIONS



HVANNEYRI AS A KNOWLEDGE HUB



RETHINKING THE FOOD SYSTEM



ECO-TOURISM AS A TOOL



Guidelines

The four lenses were divided amongst the team members. To make sure they all contributed to our vision and would add up to a regional strategy guidelines were set for every lens.

For the ecological (re)connection the goal is to connect and enlarge the natural ecosystem with special attention to the specific animals habitats. Central in this lens was to design for nature and design for the different species in the region, without pushing out the human activity. Unifying the human and natural systems is important to grow the attention and appreciation for the unique natural environment in the Borgarbyggd valley.

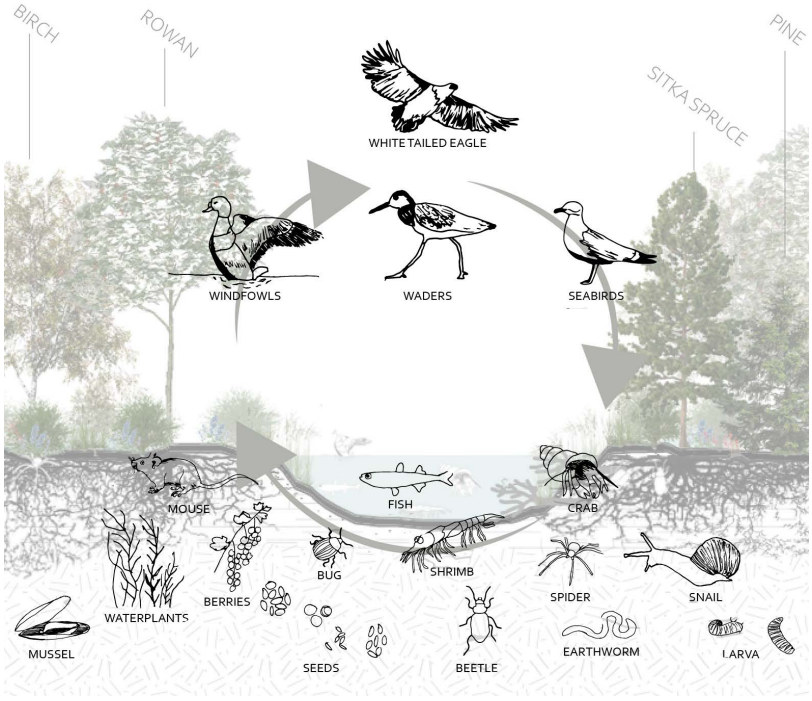
The food system lens focuses on creating a more sustainable food supply chain by enhancing locality and circularity. It puts limits on the land needed for sheep grazing, which could be transformed into forests or wetlands integrating these two land uses.

Ecotourism could be used as a tool to support the local economy and grow the appreciation and attention to the unique landscape. An important element of the ecotourism lens is to identify the spatial implications of growing the tourism industry in the valley and formulating a strategy to attract the tourists that support sustainable practices.

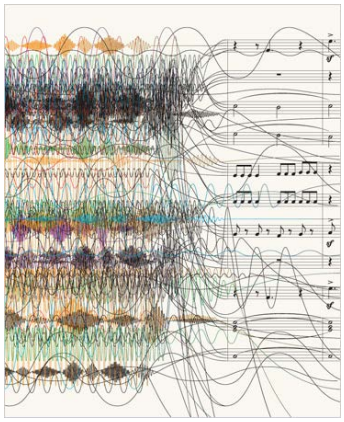
Lastly, Hvanneyri is the place where all the practices are going to come together. It is the place where tourists and students will meet and educate each other. And where the village, which has an increase in activities, is right next to the most important bird habitat of Iceland. The fourth lens focuses on the urban plan of Hvanneyri and the spatial implications to bring all the different people in the region together. The town functions as a center where educational, economic and natural practices meet each other.

4. Ecological (re)connection

Lieke van Lun


BIRCH
ROWAN
PINE
SITKA SPRUCE
WHITE TAILED EAGLE
WINDFOWLS
WADERS
SEABIRDS
MOUSE
FISH
CRAB
BUG
SHRIMB
BERRIES
SPIDER
SNAIL
WATERPLANTS
MUSSEL
SEEDS
BEETLE
EARTHWORM
I.ARVA

Manifesto



The goal for the ecological lense is to strengthen and enlarge the ecological system with special attention to the unique bird habitat in the region. As already explained in the conceptual framework, the Borgarbyggd valley has a unique natural habitat, with a large amount of land covered by wetlands and Icelandic forests. Nonetheless these structures are interrupted by the many farms and grazing areas also present in the region. The diversity is an important identity of the region, so while focusing on the flora and fauna in this lense the human activity can not be forgotten or pushed out of the area.

An important inspiration was the notion of the ambient walkman. The ambient walkman was an experiment by New Yorker Noah Vawter, who tried to turn ambient sounds into music. Instead of isolating the sounds by putting on a noice canceling headphone, we have to let the word back in and hear and see what happens arond us (Hoffman, 2006). It is a great metaphor for the relationship humans should have with the natural environment around them (Alvarsson et al., 2010).

As a start the book “Land Mosaics: The Ecology of Landscapes and Region” by Richard Forman (1995) was used to understand the landscape composition. The book emphasizes the idea that landscapes are composed of mosaics of different habitats. These patches together form a larger landscape pattern. By applying the theory in the book a better understanding was developed of how to create ecological corridors that facilitate species movement and enhance overall landscape connectivity. Next to this book different articles and reference project were taken into account to establish six interventions that will strengthen the ecological network of the Borgarbyggd valley. These interventions are: Minimise the road barrier with suitable vegetation in the verges, create culverts underneath the road as wildlife passages, create guidelines for afforestation, design a bird watch hiking trail wth minumum interruptions of the wetlands, wildening the river to increase biodiversity and strengthen the river to protect farms.

Unifying the human and natural systems is important to grow the attention and appreciation for the unique natural environmet Borgarbyggd valley. This wel protect the unique bird habitat and strengthen the natural landscape

Ecological re(connection)
Lieke van Lun



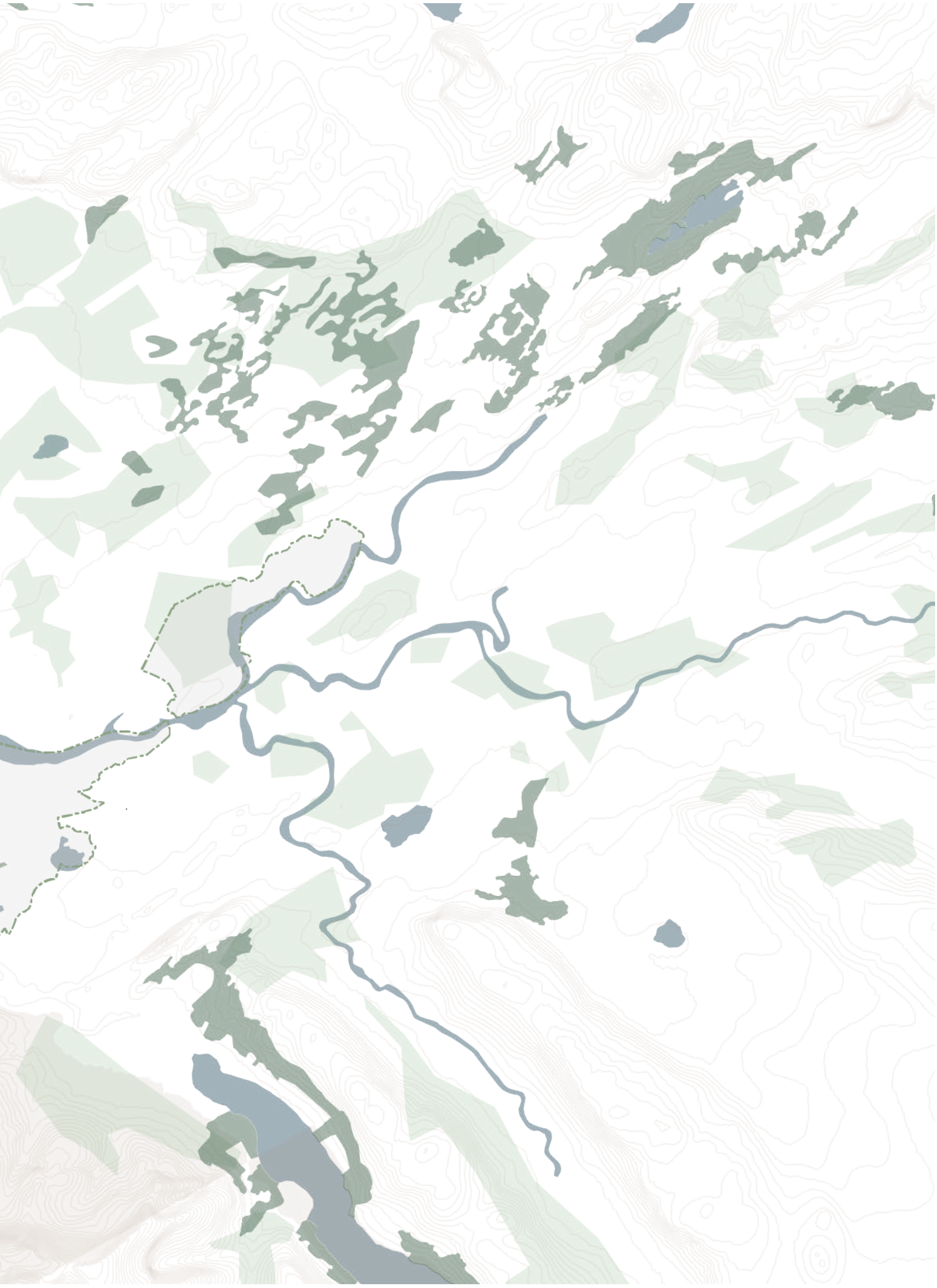
NATURAL LANDSCAPES

Protected landscapes, wetlands and forests are shown in this layer. The problem is that the natural landscape is fragmented.

- Wetlands
- Forests
- Steep terrain
- Protected bird area

N

0 1200 m





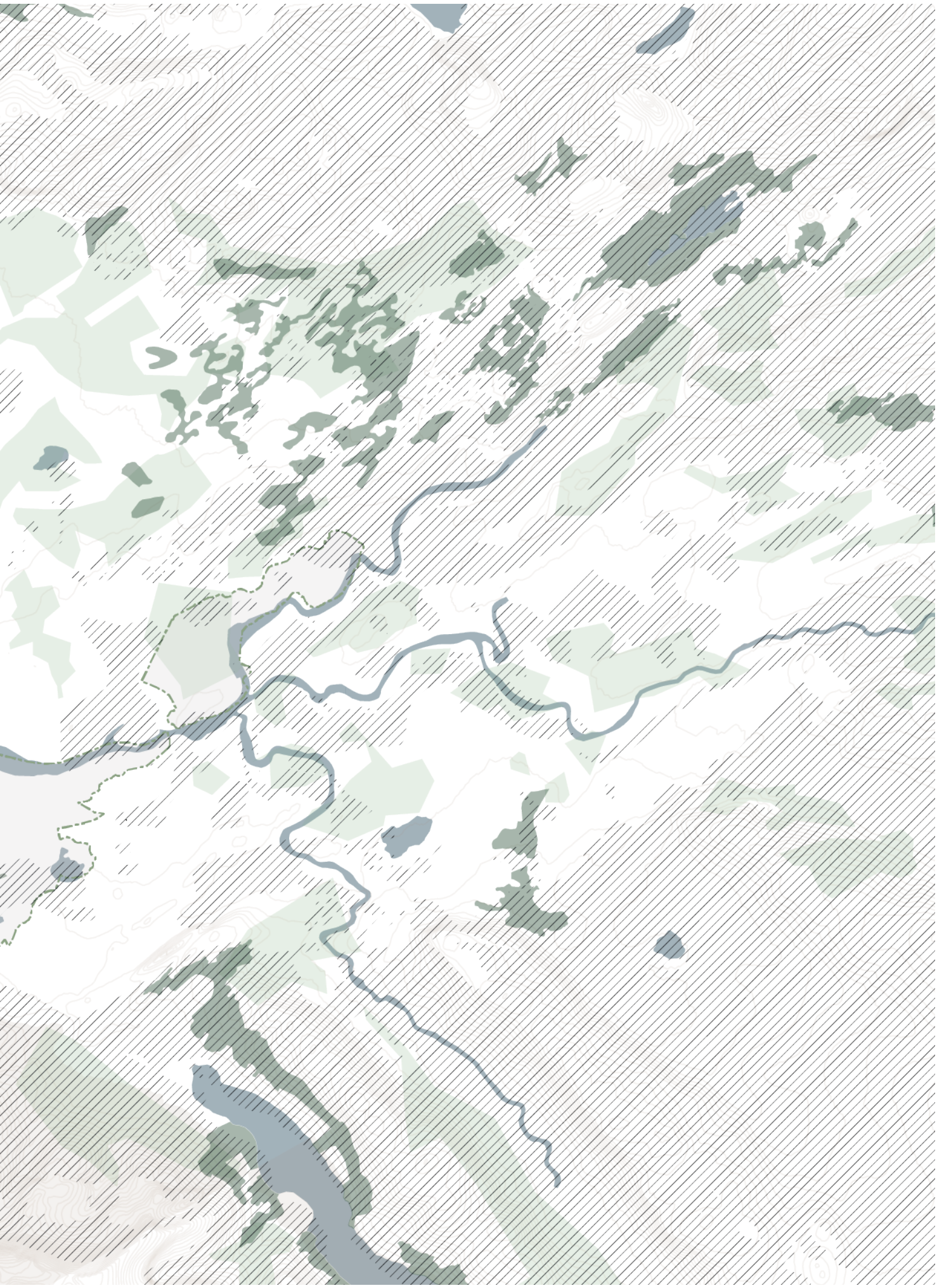
Vulnerable andosols

Andosol is a soil type that lacks cohesion and therefore can take up a lot of water. This causes a risk for landslides, especially in areas with steep terrain

- Wetlands
- Forests
- Steep terrain
- Protected bird area
- Andosols

N

0 1200 m





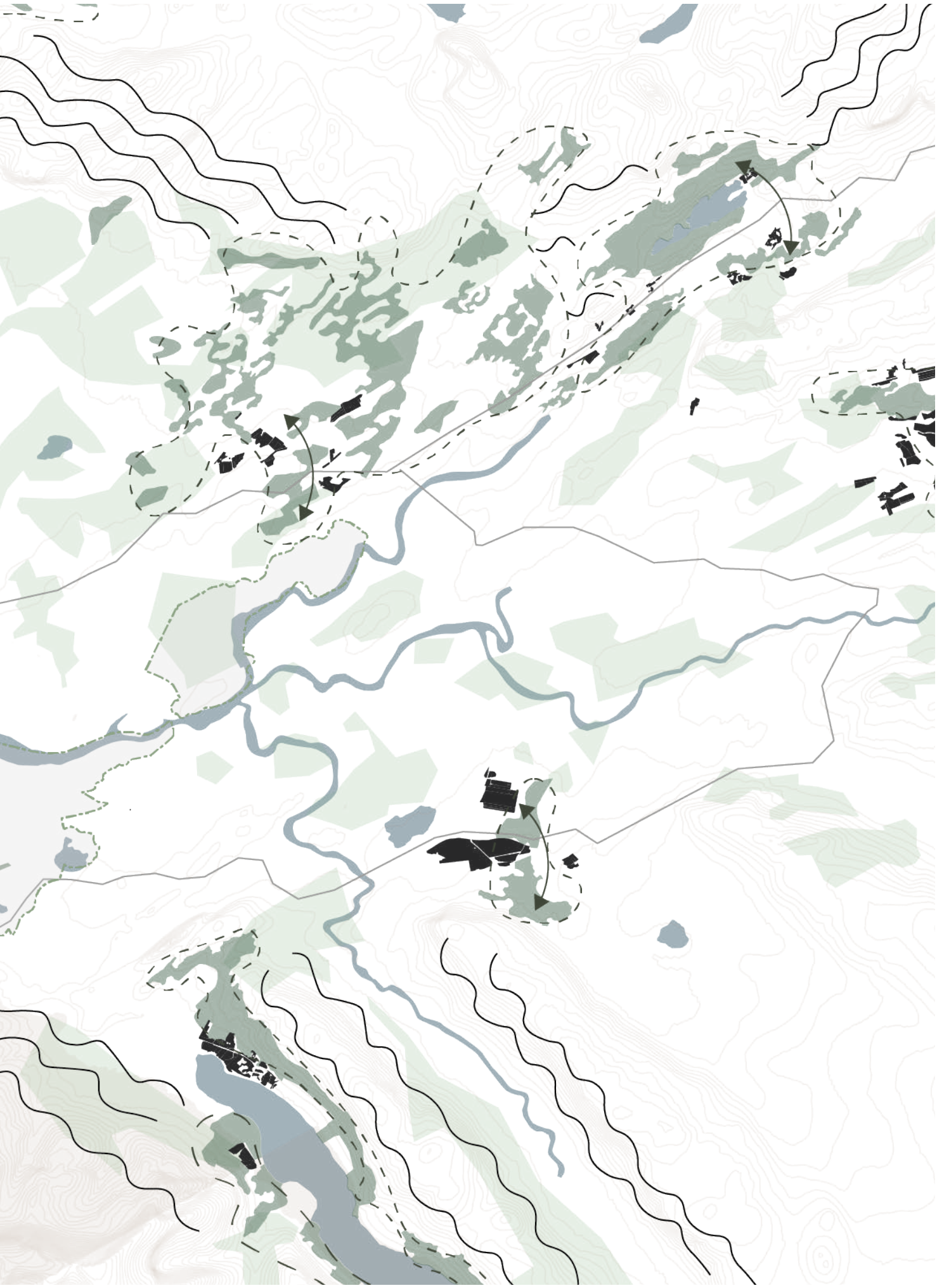
Ecological strategy

The ecology strategy is to connect the smaller patchees of forests with bigger afforestation projects. Additionally afforestation is needed in the areas with steep terrain and andosols. In the areas were afforestation is happening road barriers should be minimised to decrease the fragmented landscape. The farms that are in the areas suitable of afforestation can imlement agroecology practices to help different species in the region.

- Wetlands
- Forests
- Afforestation area
- Protected bird area
- Agroecology farms
- Crossing road barrier
- Afforestation against landslides

N

0 1200 m

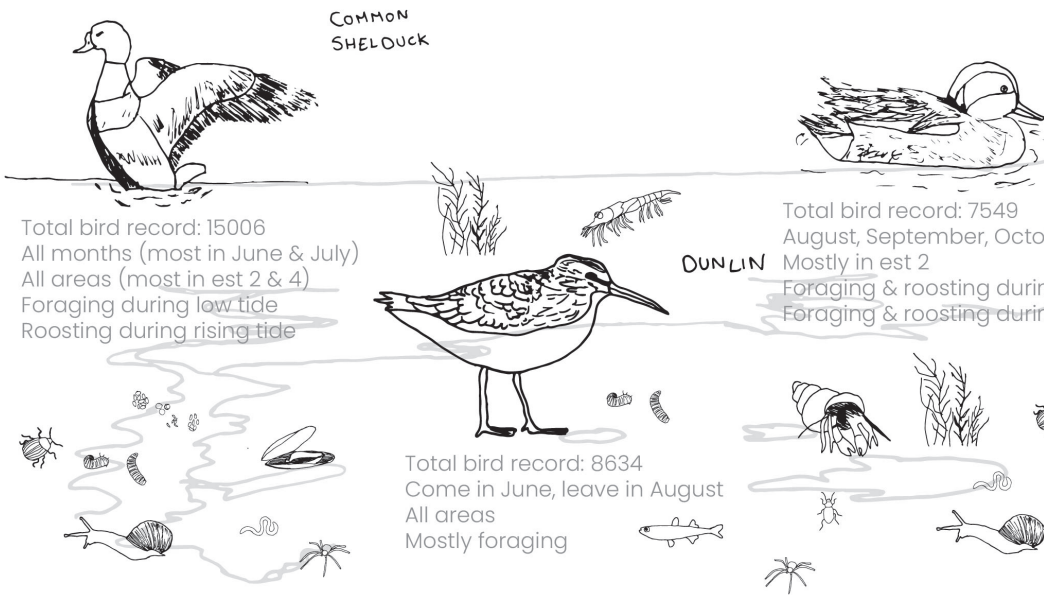


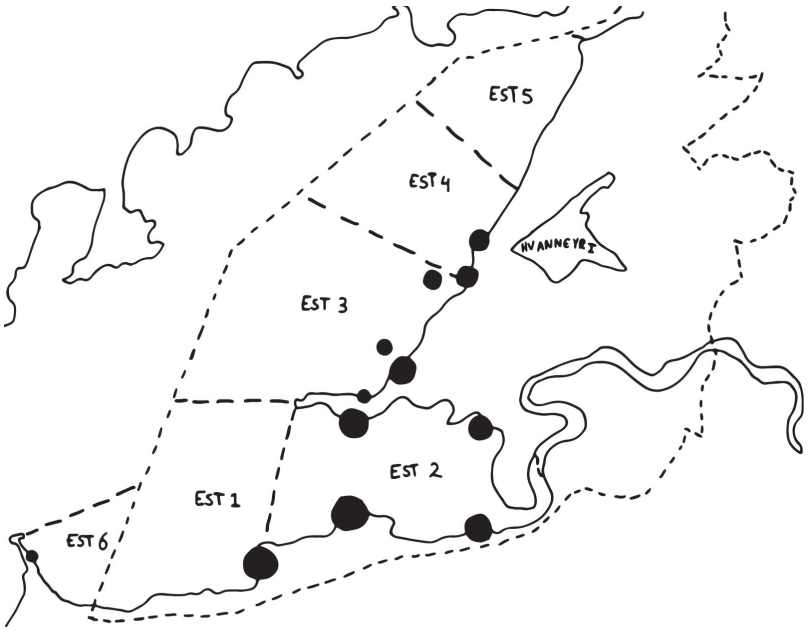


Hvanneyri as migration route between Greenland and Scotland

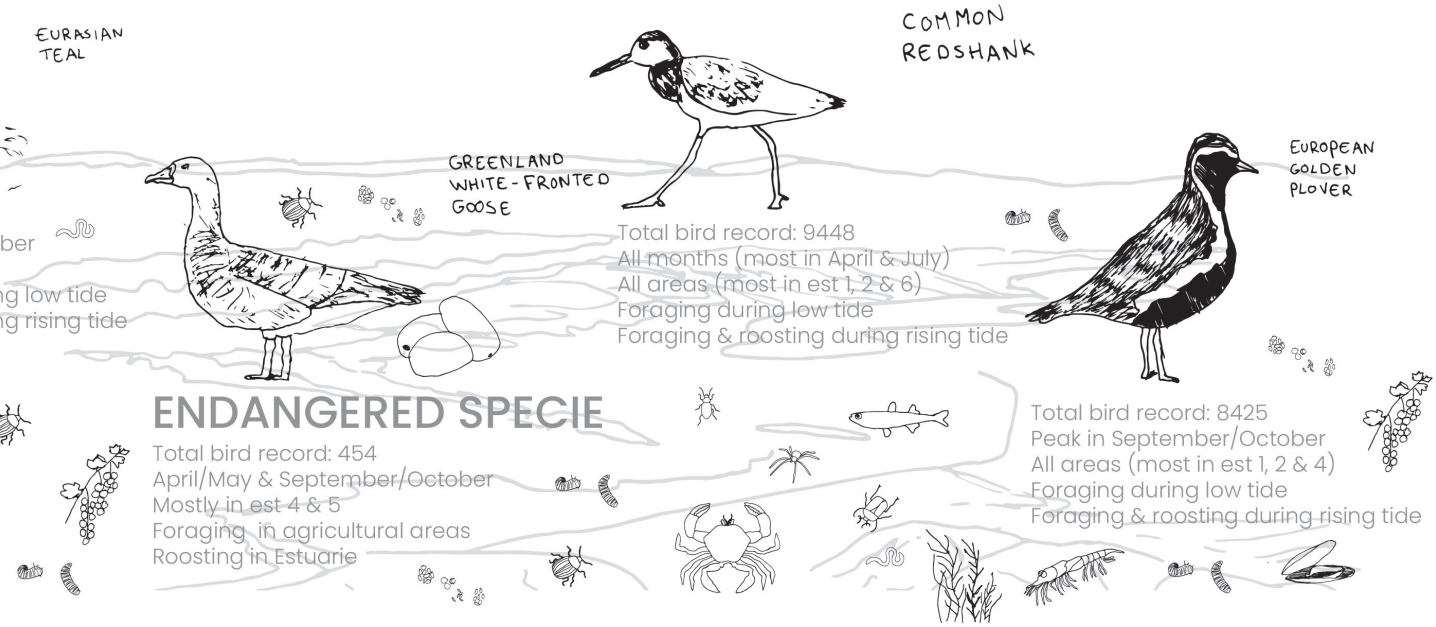
Flora & Fauna

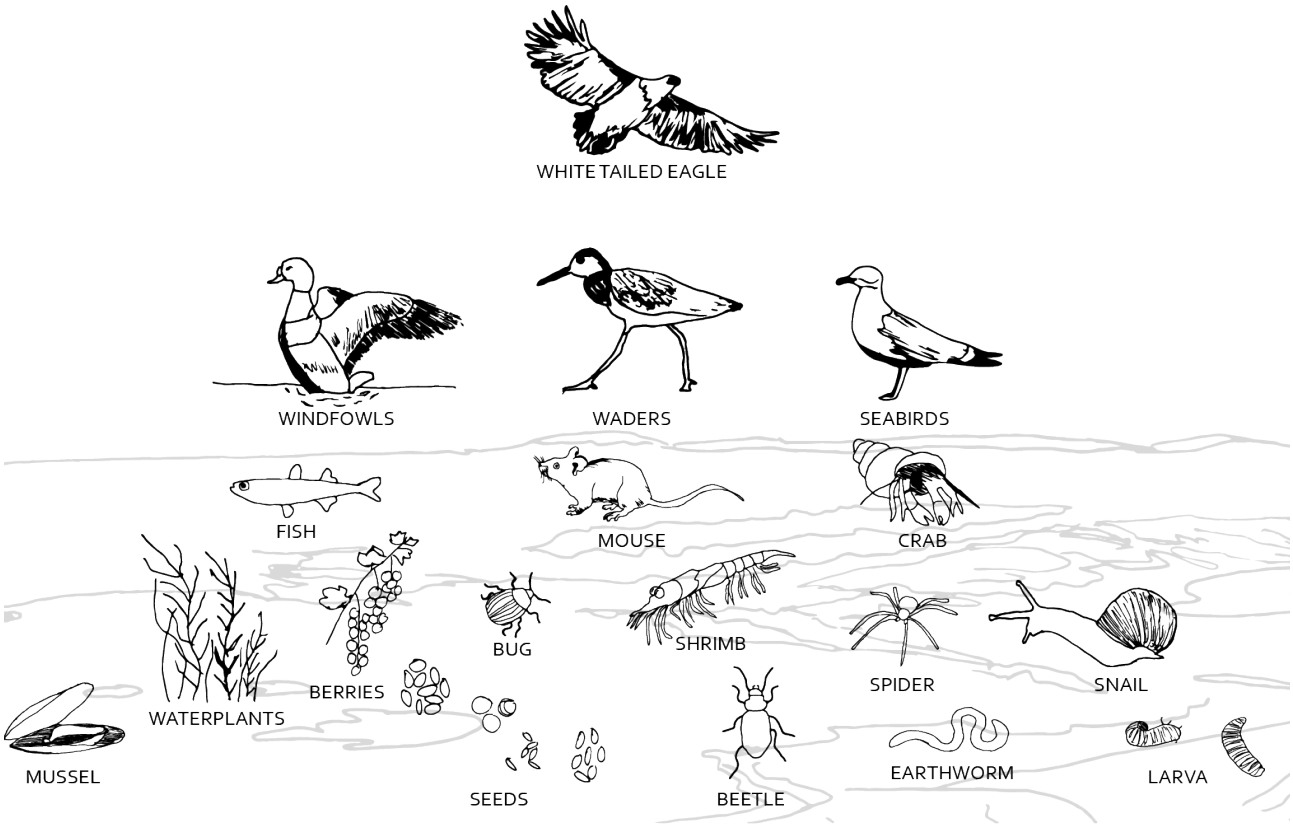
The Hvanneyri Ramsar site is an important bird habitat for 43 water and seabird species. It is a breeding area for 21 species (Tierney & Tierney, 2022). Moreover the Hvanneyri region is an important migration route between Greenland and Scotland. In Iceland 90% of wetlands has been partially drained since 1950. Nevertheless cultivated land has benefits for birds: Waders like grasslands, white fronted goose need hayfields and shelducks use houses, containers and building material. Hvanneyri farm even has the highest abundance of breeding birds. The birds can be divided into three specie groups:
-Windfowls (Geese, Ducks)
-Waders (Sandpiper, Redshank)
-Seabirds (Gull, Puffins, Cormorant)
The bottom image the 5 most recorded birds are visualised.





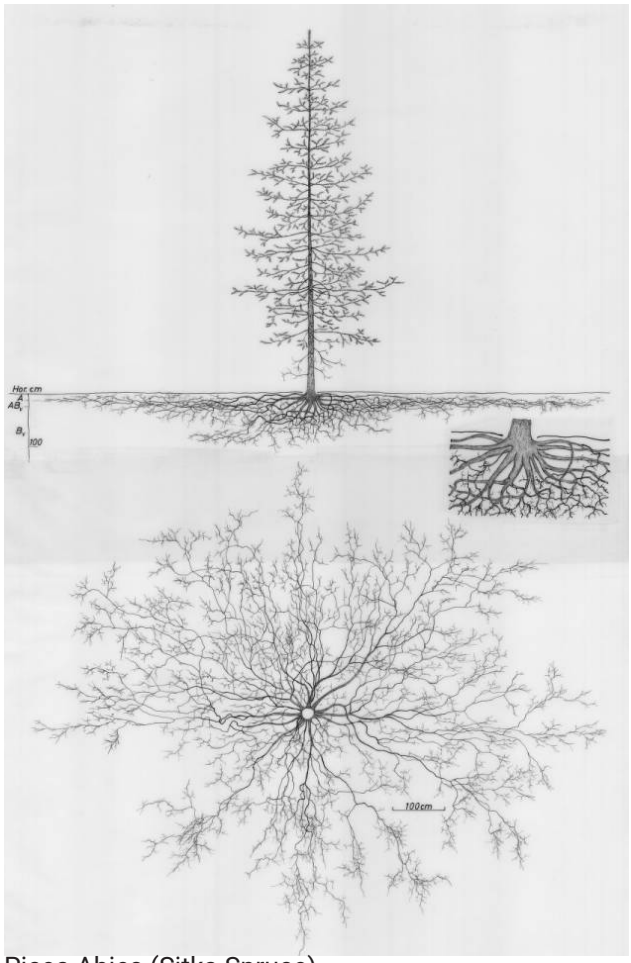
The bird survey in Hvanneyri was conducted in 6 estuaries.
In black there are 12 important root sites recorded



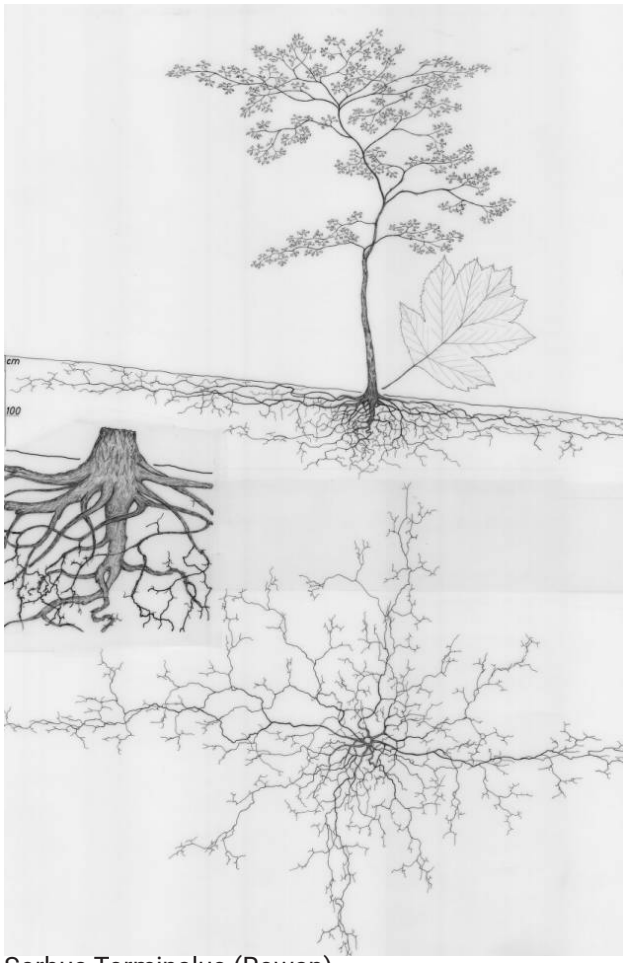


Flora & Fauna

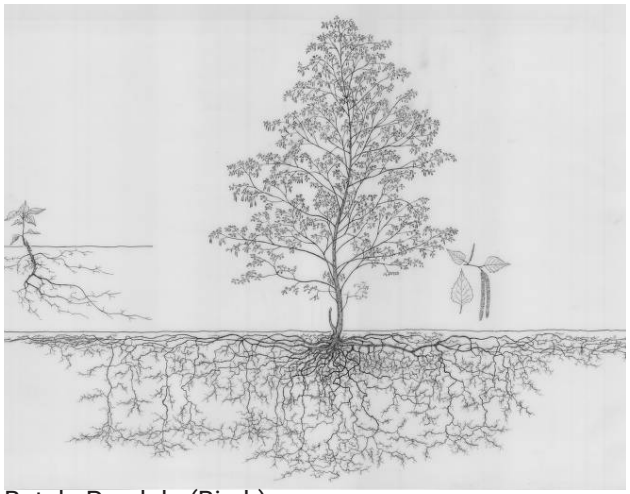
On the top left the food chain in the wetlands is shown. Next to birds there are mainly small mammals, crustaceans, invertebrates, spiders and different small fish and insects. On the right drawings from the priority trees for afforestation are shown. These drawings are from the tree root collection of Wageningen University. The Betula Pendula (birch) is the only native specie in Iceland. The Sorbus Torminalis (rowan) is a tree that has been used in other afforestation projects (Mossy Earth, z.d.) and provides berries for different birds. The Picea Abies (sitka spruce) and Pinus Sylvestries (pine) are both imported from Alaska and have shown to adapt to the Icelandic climate really well. All these four trees are suitable for both forests and wetlands (Sigurdsson, 2023).



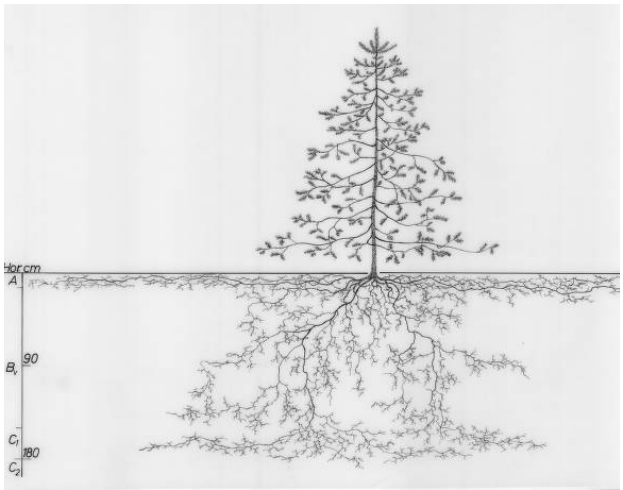
Picea Abies (Sitka Spruce)
Drawing by Kutschera & Lichtenegger (2002)



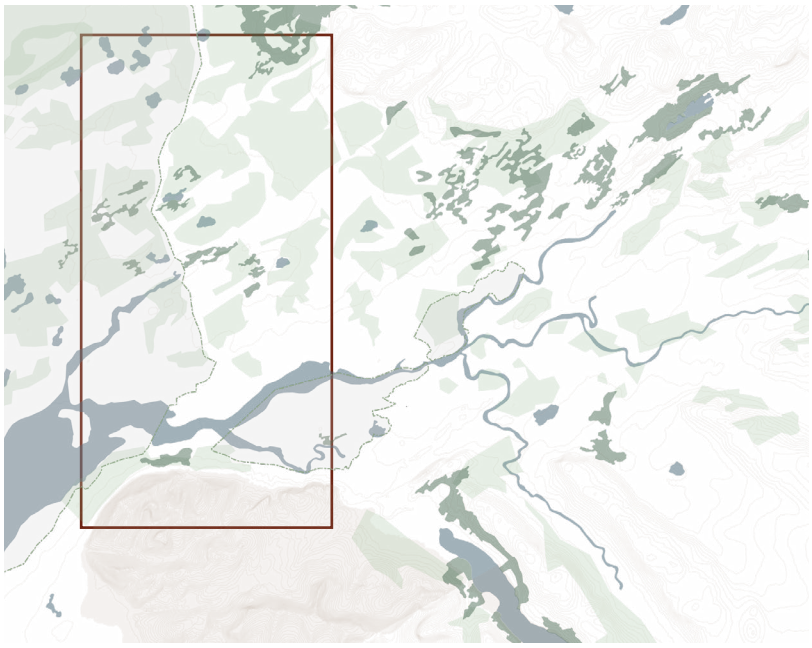
Sorbus Torminalus (Rowan)
Drawing by Kutschera & Lichtenegger (2002)



Betula Pendula (Birch)
Drawing by Kutschera & Lichtenegger (2002)



Pinus Sylvestris
Drawing by Kutschera & Lichtenegger (2002)



Mental Map

This mental map zooms into road 54 up to Fiflholt. The road is the barrier between the protected bird habitat on the west site and the other wetlands and forests on the east site. Both Hvanneyri and Borgarnes are indicated with a red bull's eye. Most zones along to road are empty wetland. But there are a few zones that have multiple function. One of those areas is indicated with a red bull's eye. It was decided to further zoom into this area were the river estuary meets the afforestation region. It is also the zone were farms and houses are close to the road, river, afforestation and wetlands. Which makes it the most interesting area to experiment with unifying human and natural processes.

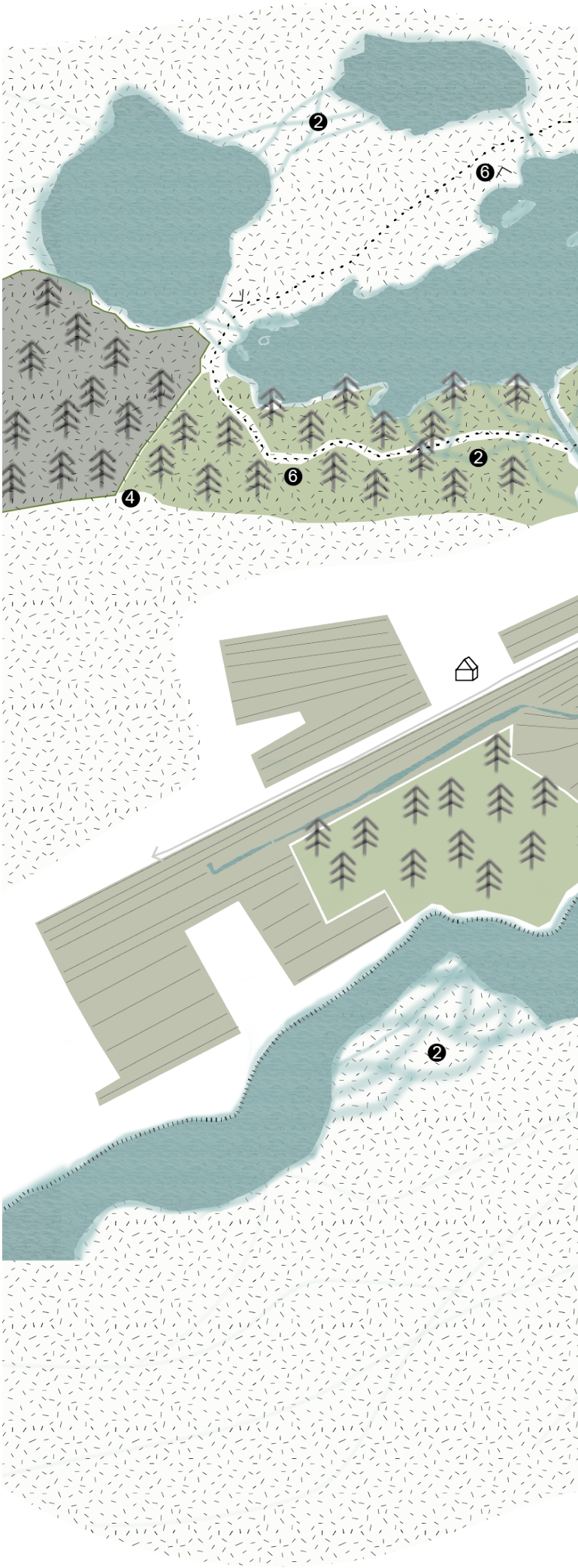

FIFLHOLT
BIFRÖST
REYKJAVIK



Ecological Plan

In this region the river, road, wetlands, forests and farms all come together in a relatively small area. The six interventions are numbered in the map. Strengthening the river is important to protect the farmland from erosion, while on the other hand wildening the river is a good implementation in the wetlands to increase biodiversity. To overcome the road barrier culvert passages are designed for the small mammals and other animals in the area. The vegetation along the road has a gradual transition, minimising the barrier effect. The afforestation is divided into open and closed forestation. Closed afforestation are areas were humans are not or barely coming and open afforestation is open to human activity for example the new bird watching trail. This trail goes through the wetlands and new forests to multiple bird watching huts. This will support active tourism and grows the appreciation for this unique natural habitat .





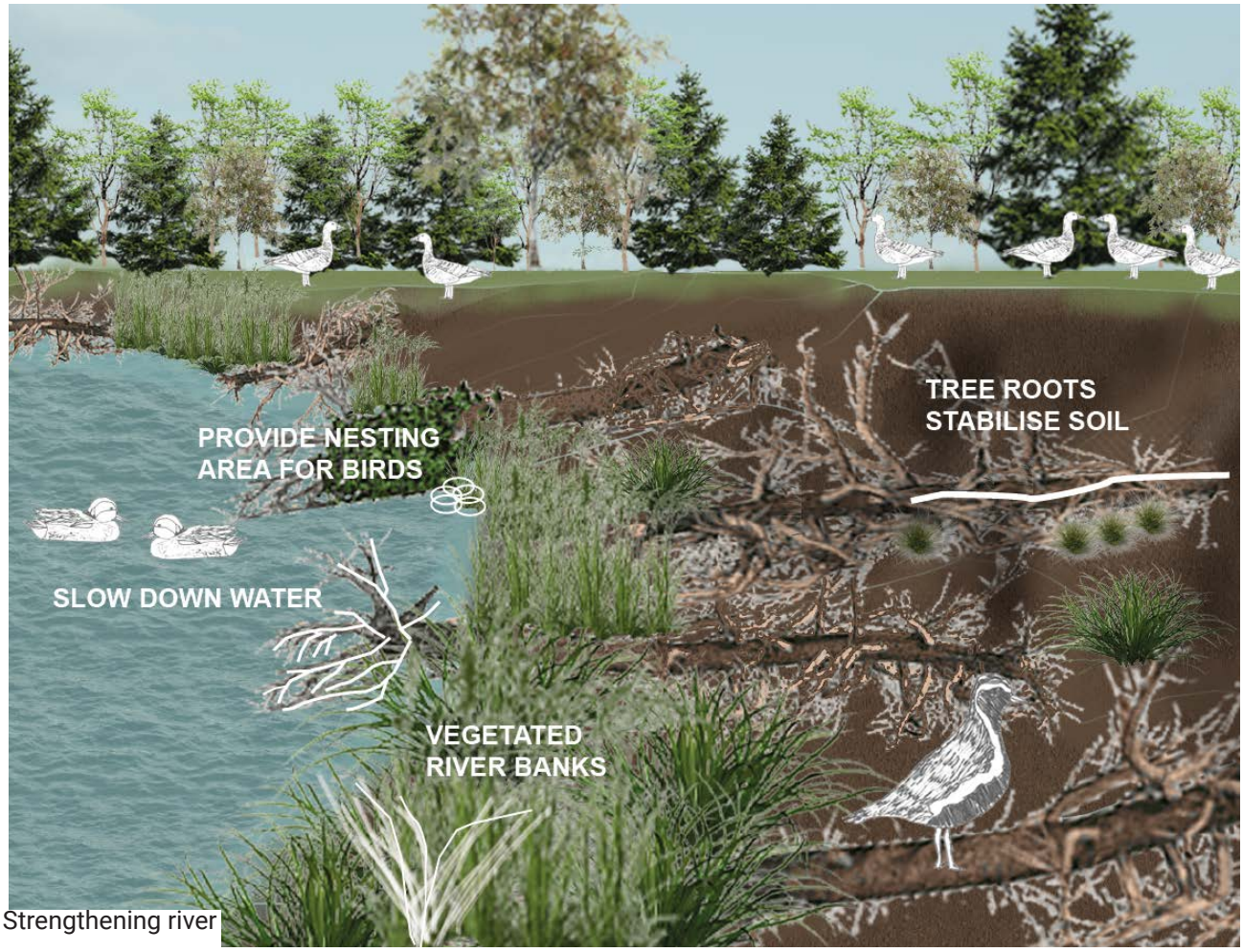

1
2
3
4
5
6

Interventions and principles

The rivers and streams are defining landscape elements in the Borgarbyggd valley. They provide important habitats for different kind of animals. By wildening a river the river will split up into more streams, which increases the biodiversity (Mossy Earth, z.d.). This can be done with carefully manmade dams, that do not trap the fish but do spread out the water. A slow river landscape creates an augmented water surface, this leads to less erosion and increases biodiversity (Superpositions, z.d.). To strengthen the riverbank close to human activity a nature based solution is to use both death and alive tree trunks to stabilise the riverbank (Magnúsdóttir, 2023). Together with vegetating the river bank this will lead to less erosion and a strong riverbank.



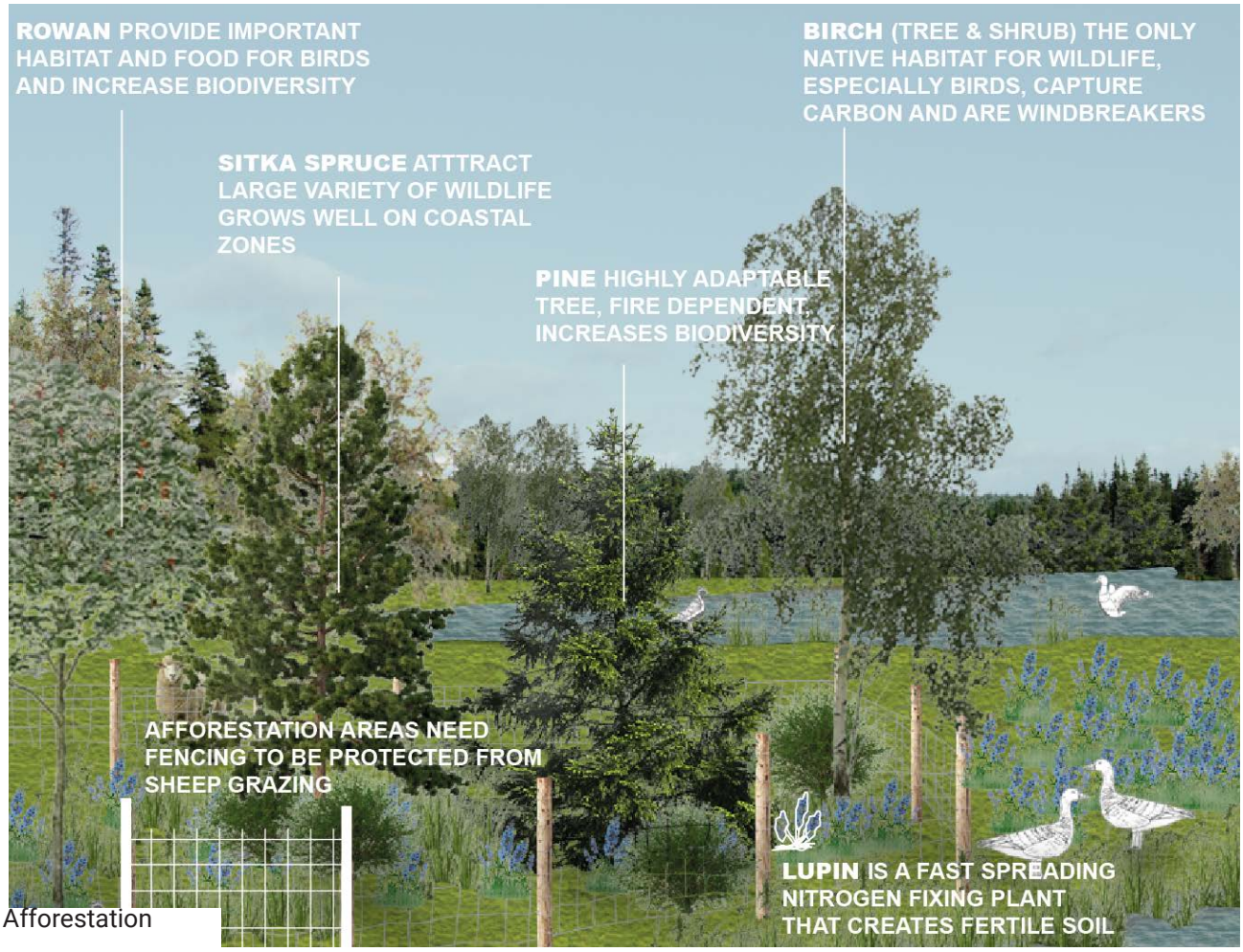
Wildening river



Strengthening river

Interventions and principles

For the afforestation four priority tree species are established. Next to these trees the plant Lupin is an interesting specie to fertilise soil. It is a nitrogen fixing plant and fertileses soil, which makes it very suitable to plant before an afforrestation project. But Lupin is invasive a can spread 100 m / year. It is a beautiful looking plant, so planting it carefully can do great thinks for the vulnerable Icelandic soil. Lastly if forrestation is close to or inside a grazing area, the forests (or sheeps) should be fenced, to protect the trees from the sheeps eating them (Mossy Earth, z.d.). To grow the appreciation for the unique wetland area and educate people about this habitat, new bird watching trails are going to be set out. It is important to use a trail that is lifted from the ground surface to minimise interruption. Moreover these walkways can easily go over streams and wetlands. Bird watching huts suit between 4-8 people to minimise bigger disturbing groups in the bird habitat (Stroud & Tierney, 2017).



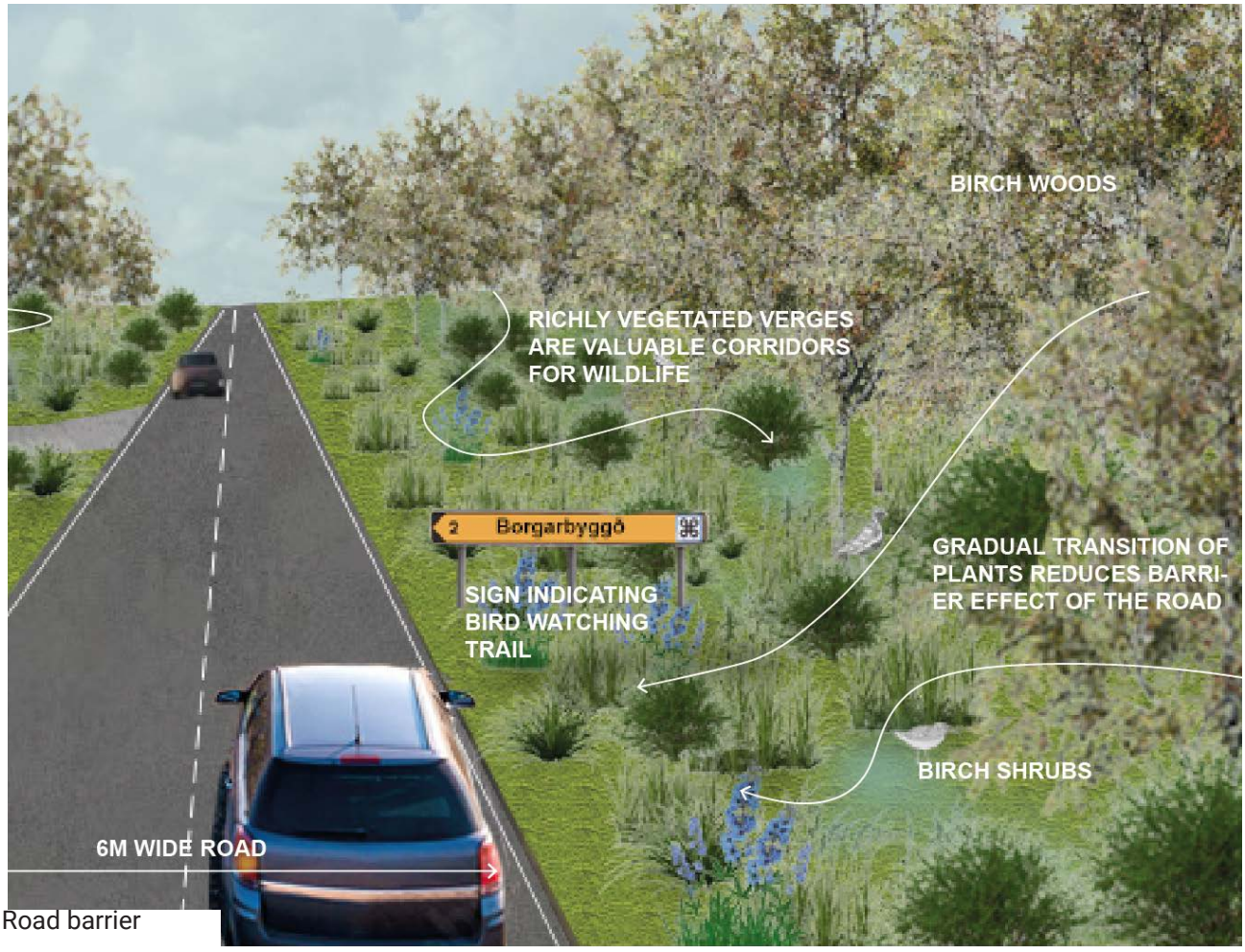
Afforestation



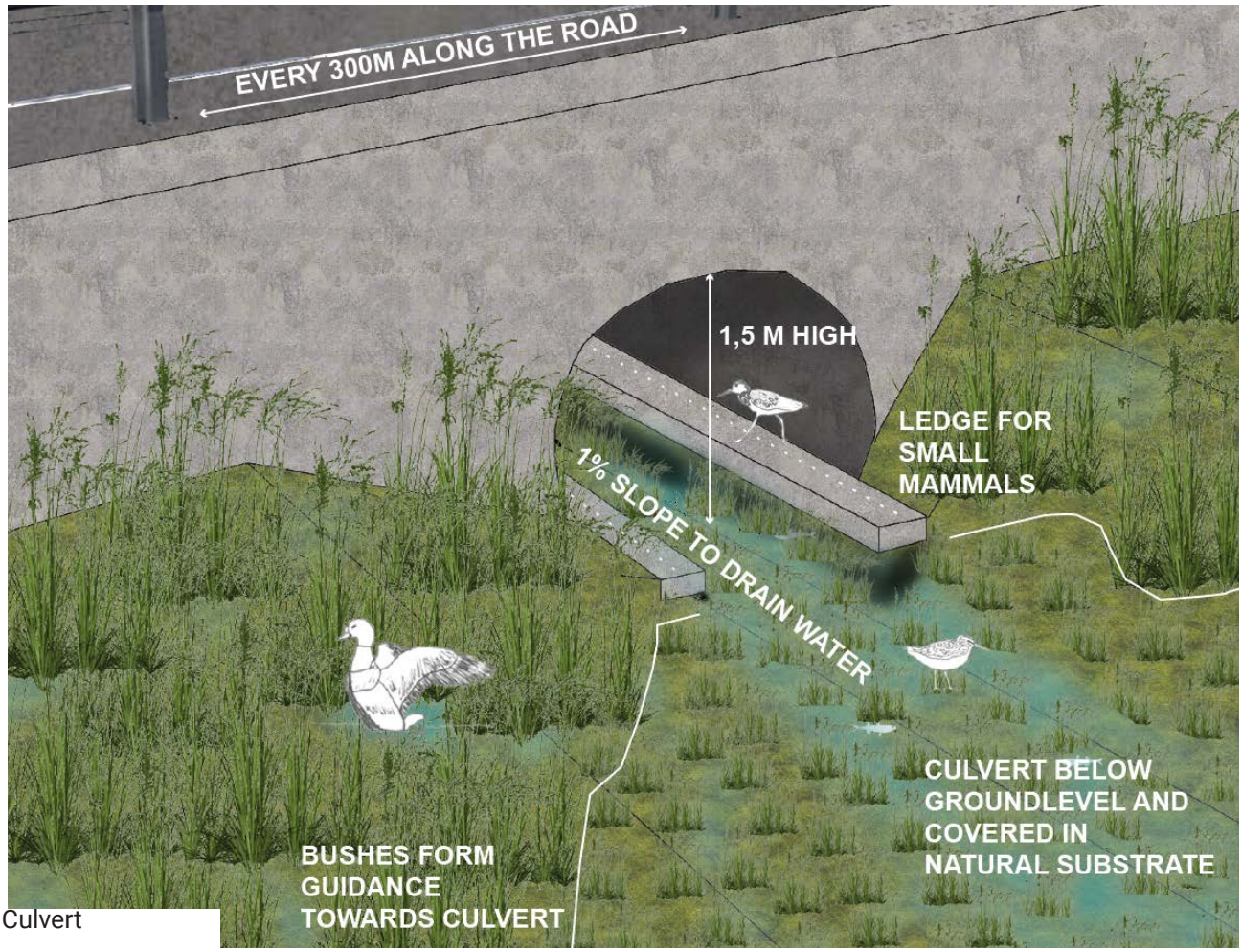
Bird watching trail

Interventions and principles

The road barrier is a disturbance for wildlife, it causes habitat loss and traffic motrality, but the sites of the road are also considered a corridor for movements (Seiler, 2022). To minimise the road barrier effect vegetatation should have a gradual transition. Moreover with hgihly vegetated verges the area becomes an important habitat for small animals. Road kill can not be halted, but can be minimised by creating safe passages for small mammals, fish and insects through culverts. Culverts are underpasses at a road. The culvert should be designed with the animals in mind, important design guidelines for culverts are shown on the right (Handbook wildlife traffic, 2022). It is important to guide the animals towards the culvert and block them from entering the road with a fence or concrete wall. The culvert should be covered with natural substrate and can help drain water if there is a surplus of rainfall. It is important to have multiple culverts repeating along a road to increase the habitat and ecological corridor.



Road barrier



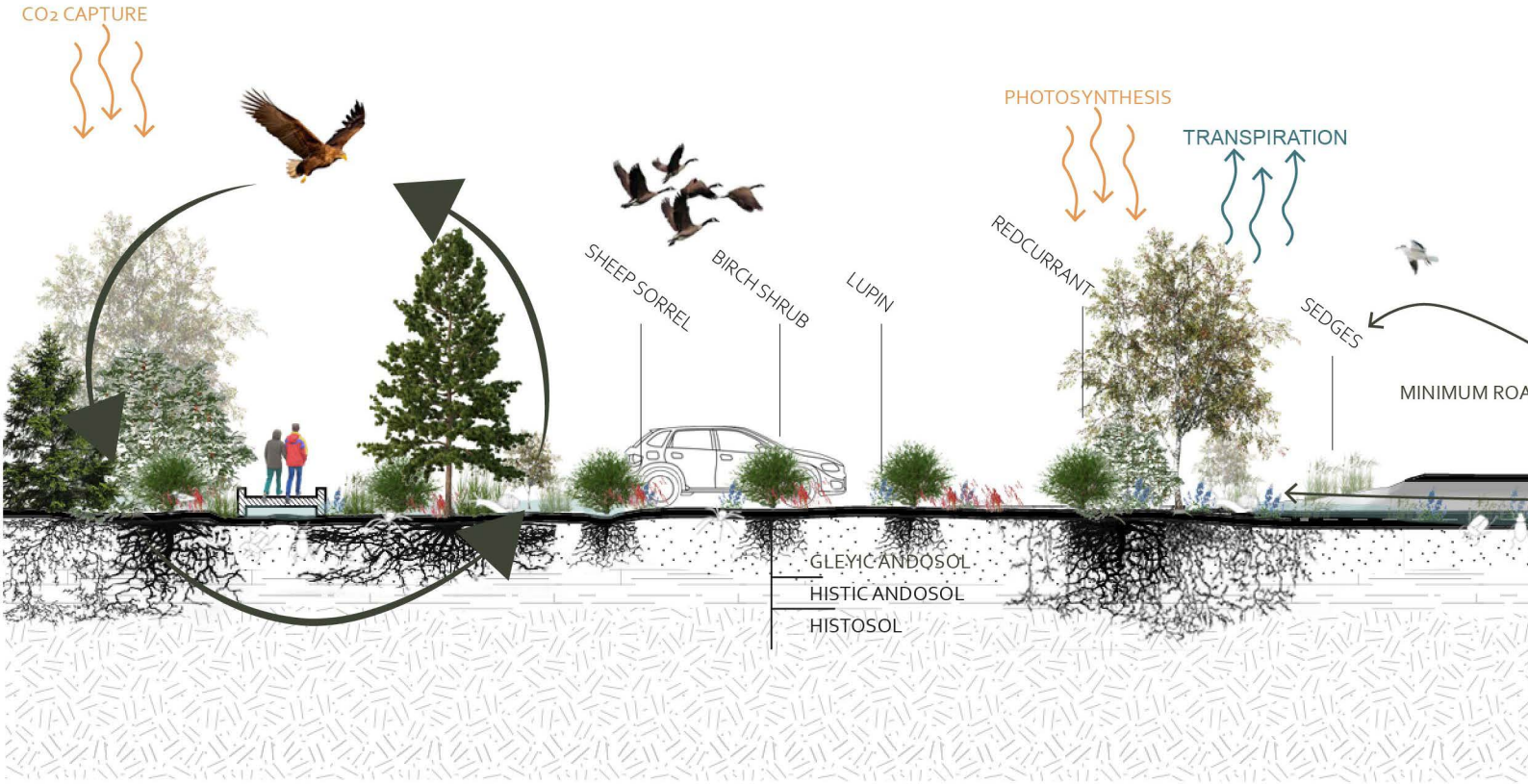
Culvert



Design

Zooming into a small part of the ecological plan it is visible how all the interventions and there principles come together in a design. The afforestation corridors is clearly visible, it is important to minimise the road barrier by having a gradual transition of vegetation and consistent vegetation on both sites. People can stop at the parking lot and go for a walk along the bird watching trail. One trail goes to the lake and one to the river. Along this part of the river vegetation is used to strenghten the river bank and decrease erosion. Up stream the river and forest have a wilder appearance. This is the closed afforestation were no humans are coming. The culverts enhance the spreading of the different species and are also used for the small wetland streams to go through. All together this design creates a vibrant ecosystem were flora and fauna are strengthened, while humans are not forgotten.

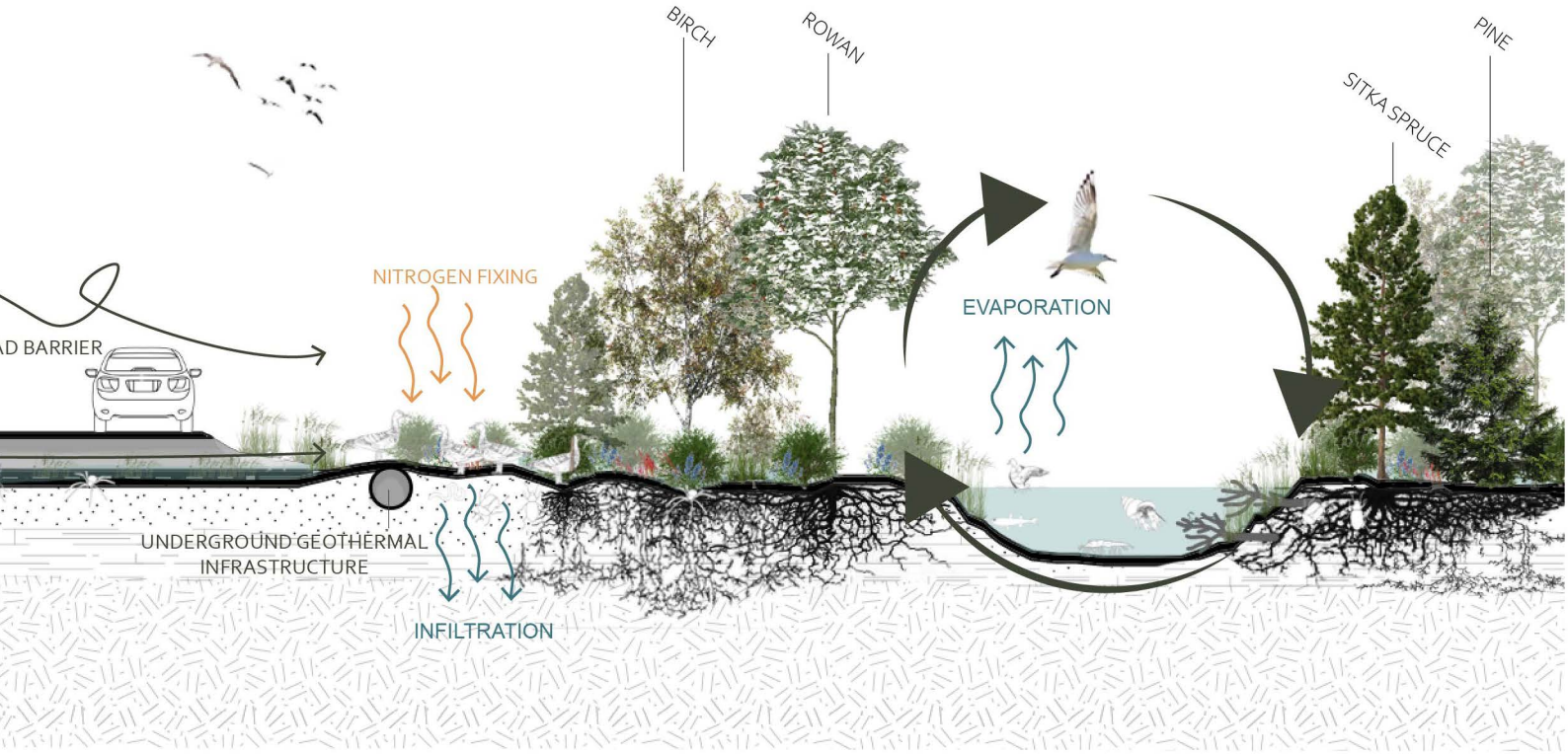




Section

In addition to the map, the section shows the coexisting relationship of the different systems. The new plants and trees will capture CO_2 and nitrogen, while stabilising and fertilising the soil. This will improve the quality of the soil and increae the amount of insects and invertebrates. This is how fish, small birds and mice have more food and consequently bigger birds have more food. The bird droppings contain valuable nutrients that return to the soil, completing the cycle by fertilizing it and supporting the growth of trees and other plants. This intricate web of interactions ensures the sustainability and balance of the ecosystem.

0 2 m


BIRCH
ROWAN
PINE
SITKA SPRUCE
NITROGEN FIXING
EVAPORATION
AD BARRIER
UNDERGROUND GEOTHERMAL
INFRASTRUCTURE
INFILTRATION

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Reflection

On one hand, unifying human and natural processes can foster a deeper connection and appreciation for the unique natural environment of the Borgarbyggd valley. By involving and engaging local communities, the project can create a sense of ownership and responsibility towards the preservation of the bird habitat and the overall landscape. This approach can also lead to increased awareness and understanding of the ecological significance of the region, potentially resulting in long-term conservation efforts.

On the other hand, the concept of unifying human and natural processes may face challenges in implementation. The project does not provide a detailed plan for how this concept will be put into practice. Without a clear roadmap, it becomes difficult to assess the feasibility and potential obstacles that may arise during the project. A potential obstacle is the fact that most land in Iceland is privately owned. It is not clear how much of the wetlands are privately owned. While it looks like a public natural habitat, it is plausible this is not the case. This can cause resistance from the local farmers and other landowners for the project. A strategy for stakeholder engagement would strengthen this project. Additionally, the document lacks information on the phasing of the project, which is crucial for understanding the timeline and prioritization of interventions. Without considering the phasing and implementation aspects, the project may encounter difficulties in achieving its intended outcomes. Phasing and implementation of the project should be the next step to put this design experiment in practice.

5. Eco-Tourism as a Tool

Sanne van Rees

‘Eco-tourism as a Tool’: the program of the Green Circle in the Borgarbyggd valley and the synergy of a reforestation program and vacation park.


ACCEPTING OF CULTURE
MINIMAL IMPACT ON NATURE
PROFIT FOR LOCAL COMMUNITY
EDUCATIONAL TOURISM
USE OF LOCAL RESOURCES



Manifesto

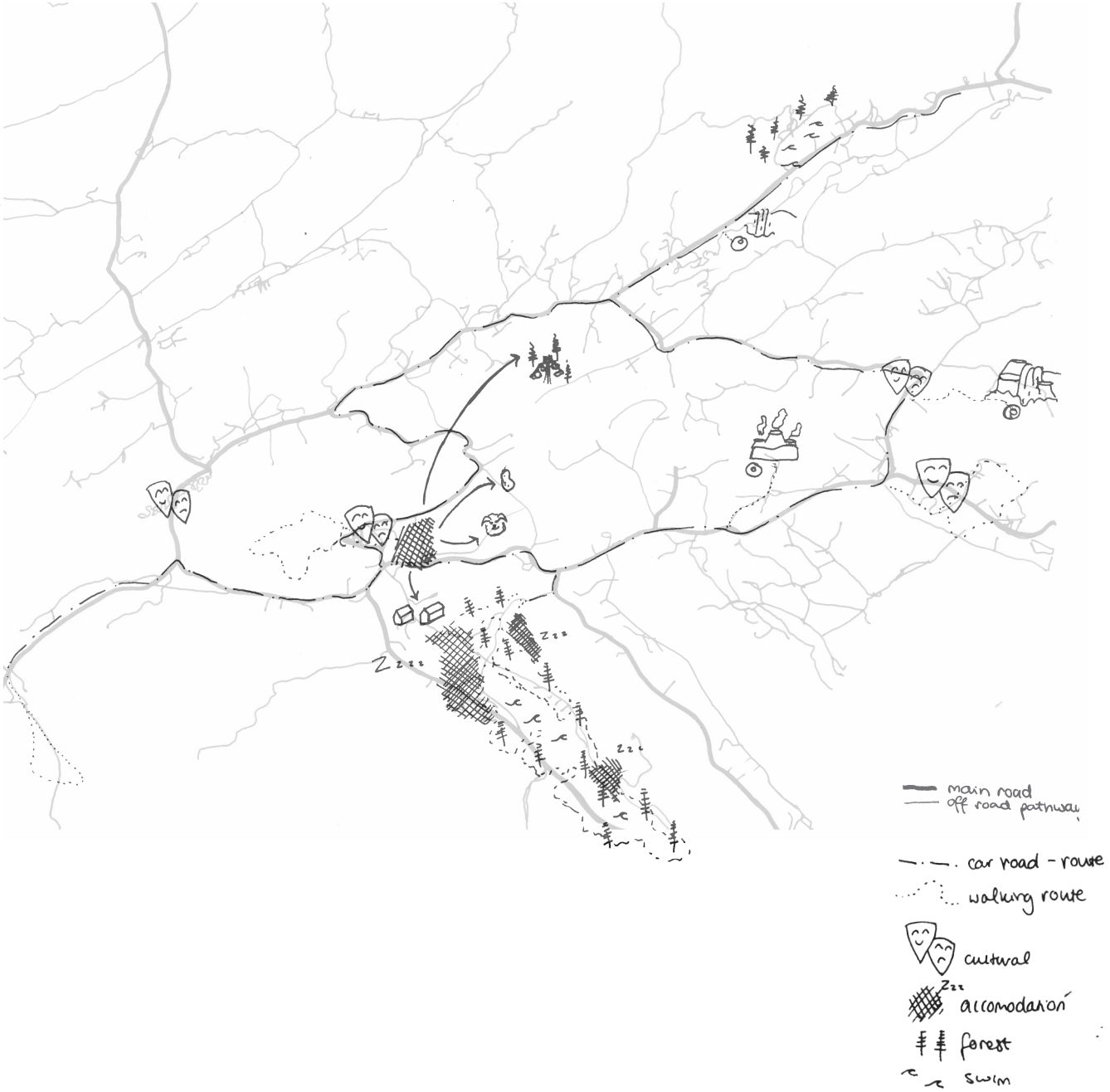
With the design experiment ‘Eco-tourism as a Tool’, the benefits of conjoining nature and the human visitor in the Borgarbyggd valley are explored programmatically and spatially. Within our vision, finding the synergy between human and nature is central for the valley, due to our findings of the conflict between human activity and natural processes. Tourism is considered to have negative effects on the Icelandic environment, even more so in the future, as it is growing. However, positive relations between the two are imaginable. We believe that natural processes can benefit from tourists, for instance via funding for reforestation processes and awareness campaigns. The other way around, visitors can learn from the environment and promote sustainable growth elsewhere.

The question for this design experiment therefore is: How can a touristic program be realised in the Borgarbyggd valley, in a sustainable way, that is beneficial for the local community ánd the natural processes?

For this design experiment, five key principles are used (see the figure to the left). The design has to be accepting of the local culture and the local identity has to be maintained (1), it has to have a minimal (negative) impact on nature and natural processes (2), it has to benefit the local community, instead of the government or big companies (3), it has to be educational for the visitor (or local), to raise awareness about the natural environment and teach about sustainable tourism (4), and it has to make use of local resources and aim to be circular (5).

In this design experiment, first, a general strategy for the touristic route called ‘The Green Circle’ is created, based on an analysis of the human and natural processes and highlights in the valley, combined with an analysis of the types of visitors. It is built upon the principles from the general vision and those mentioned above. Second, a vacation park with different and unique building typologies is designed at a suitable location within the valley, to accommodate certain tourists that are drawn to the Green Circle. The design of this park follows the same principles, and is designed to fit the specific environment. It goes together with a reforestation program in the same area, to illustrate how human activity and natural processes can be programmed and designed to benefit from and enhance each other.

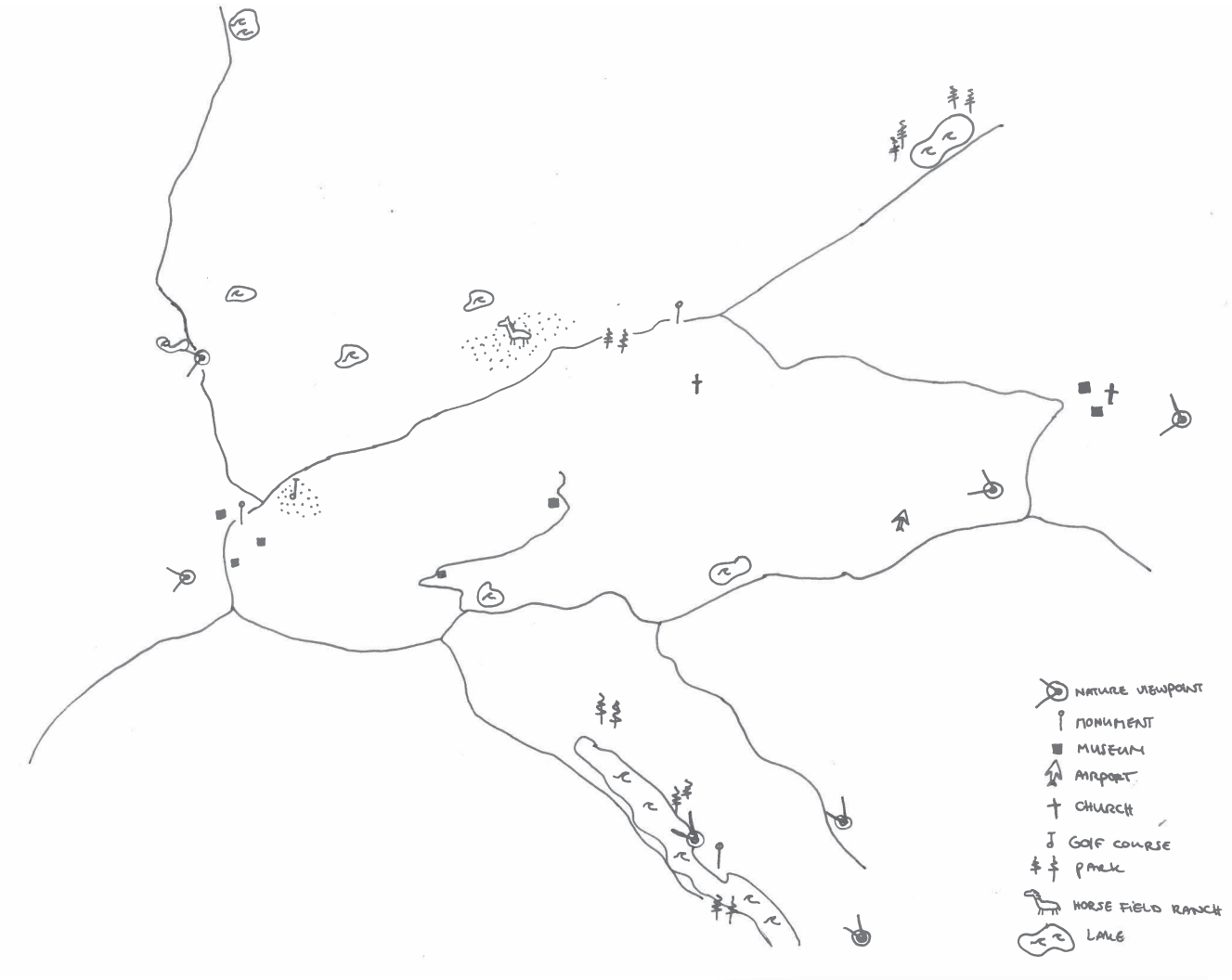
Sanne van Rees

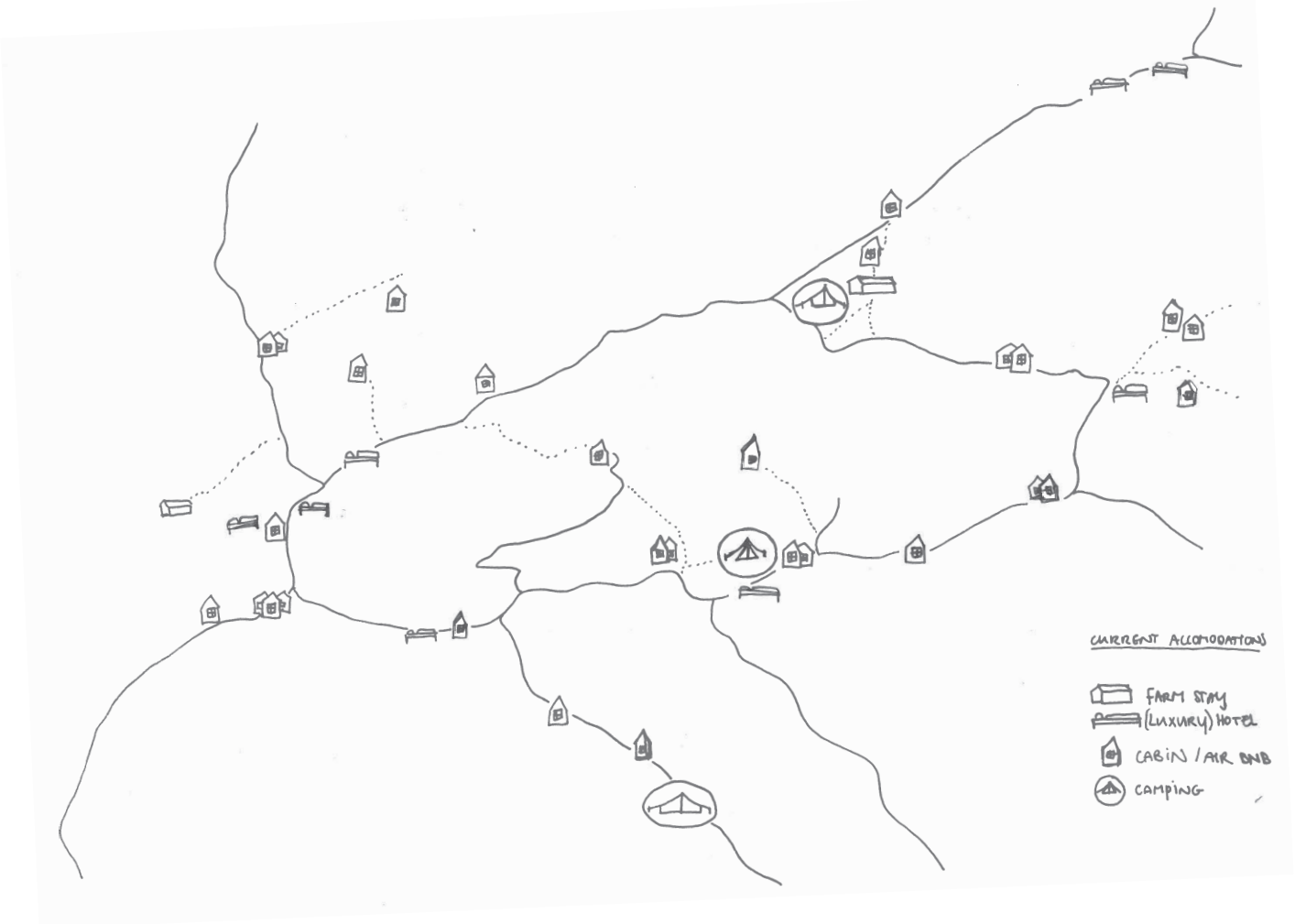


Current Situation

The current situation of human involvement in the valley consists of a few settlements, connected with a highway that follows a ring form. Along the highway, farms and natural wonders are connected via unpaved roads. There are already some accommodations in place, but they are scattered over the valley and they will not be sufficient in the case of a tourist hotspot in the area. Therefore, when designing a tourist program for the Borgarbyggd valley, the design and location of new tourist accommodations need to be thought of as well.




NATURE VIEWPOINT
MONUMENT
MUSEUM
AIRPORT
CHURCH
GOLF COURSE
PARK
HORSE FIELD RANCH
LAKE


CURRENT ACCOMODATIONS
FARM STAY
(LUXURY) HOTEL
CABIN / AIR BNB
CAMPING

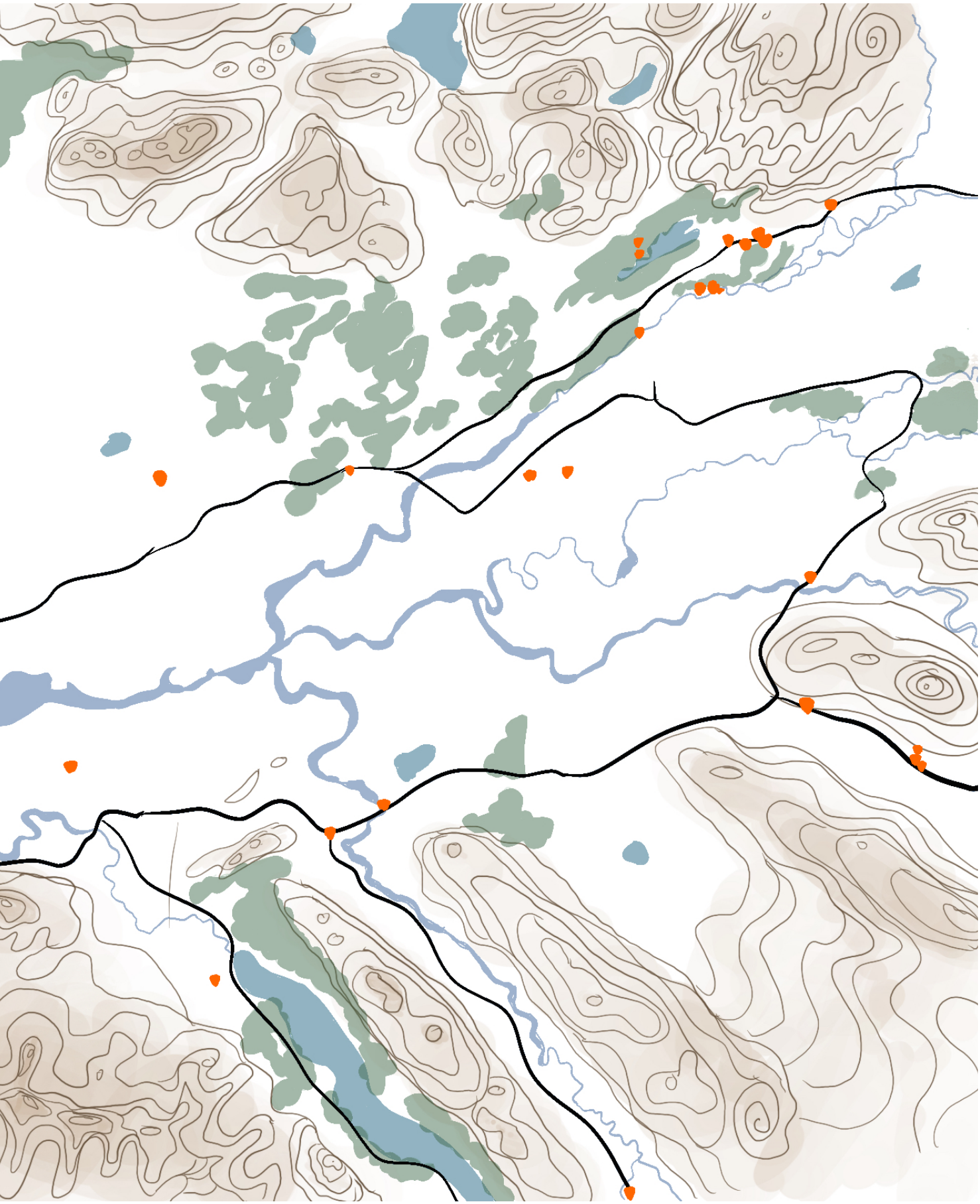
Conclusion current Situation

From above, the valley almost looks like the Golden Circle, a touristic route in South Iceland. However, when looking at the diverse program along the circle, that includes rural, cultural and historical elements as well, the two circles appear to be very different. From this comparison, the question for the design arose:

How can a sustainable and educational touristic route be created in the Borgar-byggd valley?

The result was the idea of the Green Circle, an ecological and educational alternative for the Golden Circle.





Stakeholder Analysis

In order to create an integrated program that incorporates the wishes of all stakeholders, a stakeholder analysis was conducted. Six different profiles of stakeholders of a touristic program in the Borgarbyggd valley were created:







The local: a resident from a village as Hvanneyri, for instance a baker, professor or bar owner.

Locals are often not aware of the uniqueness of the landscape and the environment. It would be beneficial for natural processes and biodiversity to educate locals about the natural systems. This accounts for the farmer as well. Furthermore, the locals are interested in preserving the local identity of the rural area and promoting the local economy of the community.

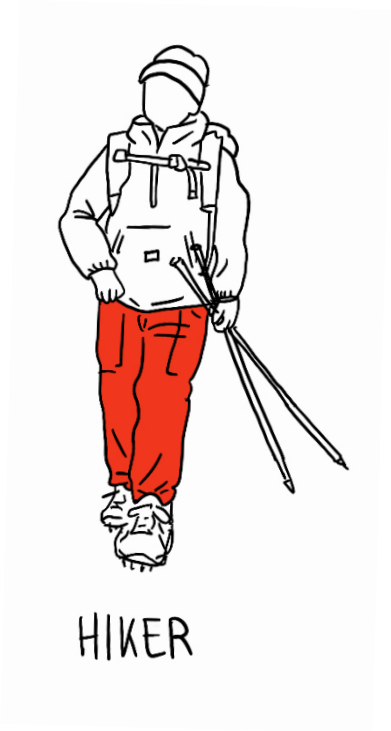
The farmer / fisher: lives on a ranch in the valley or in one of the villages.

The farmer is interested in keeping the land for food production practices and the grazing of their sheep. However, by educating them of the benefits of enhanced biodiversity, such as improved soil conditions and less erosion, the farmer is more likely to contribute in the process. Furthermore, via subsidies, farmers can be stimulated to incorporate sustainable food production methods, which can set an example for other regions. A surplus of tourists and visitors to the region and the farms themselves, can increase the earnings of the farmers.

The backpacker: a solo tourist or a group of people travelling through Iceland, passing by the Borgarbyggd valley (by chance) and on a budget.

The backpacker is less interested in an organised tour, and would rather explore the surroundings themselves and participate in budget friendly outdoor activities. They mostly travel by car, and stay in accommodations near the main road. The backpacker is interested in learning about the local culture, history and natural landscapes.







The birdwatcher: a type of tourist that is drawn to the wetlands with the protected bird areas in the Borgarbyggd valley.

The valley is now not known among the tourists as a hotspot for special bird habitats, but introducing these tourists could be beneficial for the area. Via tourists taxes and contributions, modifications and protection policies can be implemented to preserve the protected area and improve the bird habitats. However, this needs to be well designed and very careful, as the birds should not be disturbed and pollution could be harmful for them.

The hiker: a type of tourist (or local) that is interested in walking through the mountains and the landscapes, to enjoy the views of the surroundings.

The hiking experience goes together with well-designed cabin-like off-grid accommodations that allow for privacy in a peaceful and quiet surrounding, to be able to relax after a long walk. The hiker would enjoy well-marked trails through the different types of landscapes, where they could have the opportunity to spot local wildlife or historical and cultural sites. Because of the harsh environment of Iceland, resting spots that are covered from the wind and the rain are desired, for instance at the lee side of the mountain.

The student. Students can learn from the touristic plan for the area as well, for instance by exploring the natural environment, historical sites, and cultural aspects of the valley.

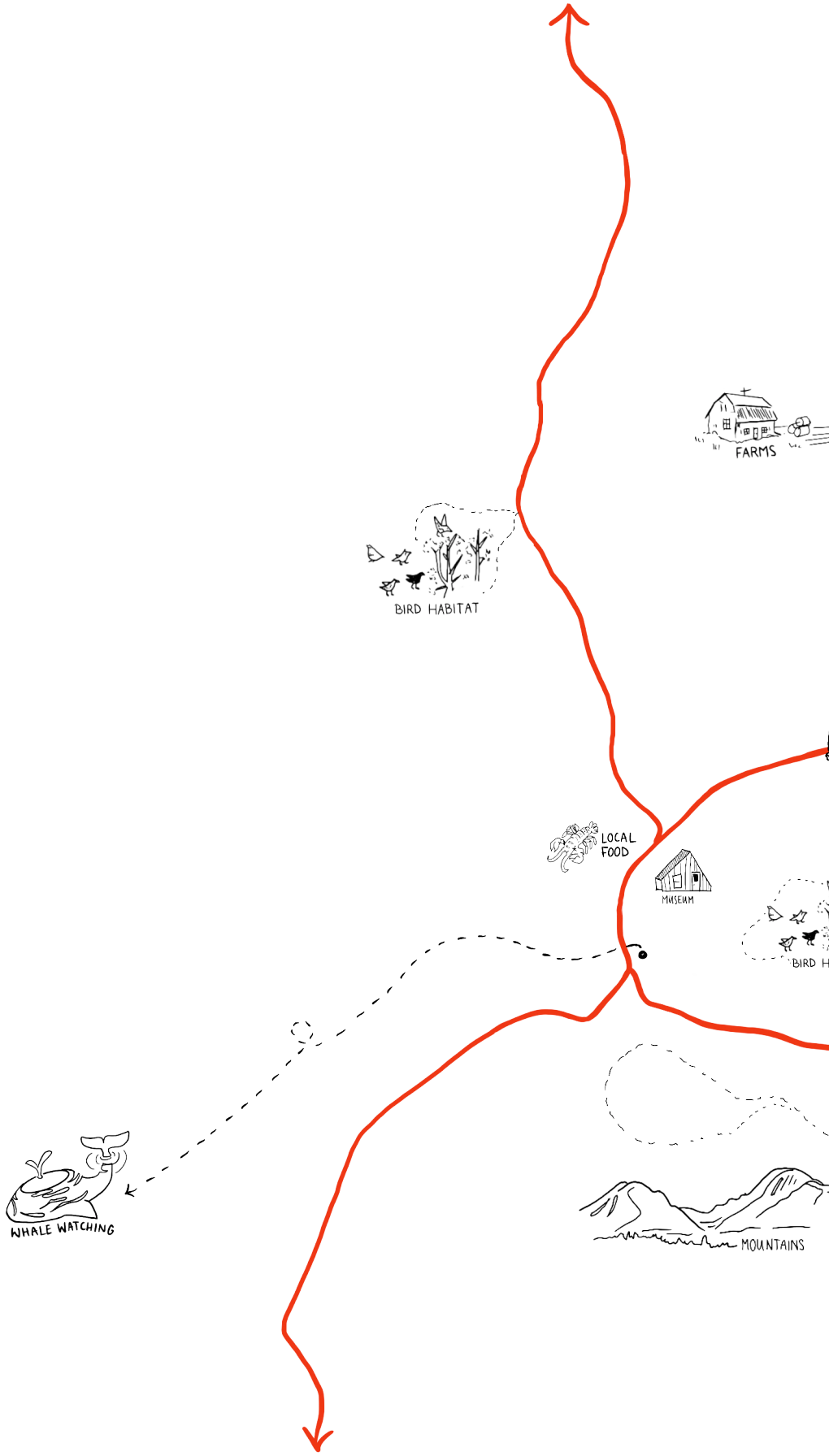
Programs can be created where tourists, particularly those interested in sustainable agriculture, can visit the university to learn about innovative farming practices. The students, in turn, can learn from experiences of various tourists around the world and compare ideas. This also provides for networking opportunities and financial support from visitors.

Program of the Green Circle

The Green Circle is a sustainable alternative for the Golden Circle, and ensures a unique travel experience that has more to offer than just the beautiful scenery of the landscape. It offers the chance to learn from and engage with local residents, communities, university students, indigenous and innovative farmers and Icelandic history experts. At the same time, natural wonders and various different landscapes, from protected wetland areas with special bird habitats to bare mountain sides and dense forests can be admired. Villages are also part of the route, to support local communities and learn from the inhabitants. For instance the settlement of Hvanneyri with its community, innovative agricultural practices and university can educate tourists and spread the word about sustainable agriculture. Reykholt with its rich cultural heritage could teach visitors about the identity and history of Iceland.

A program for the Green Circle

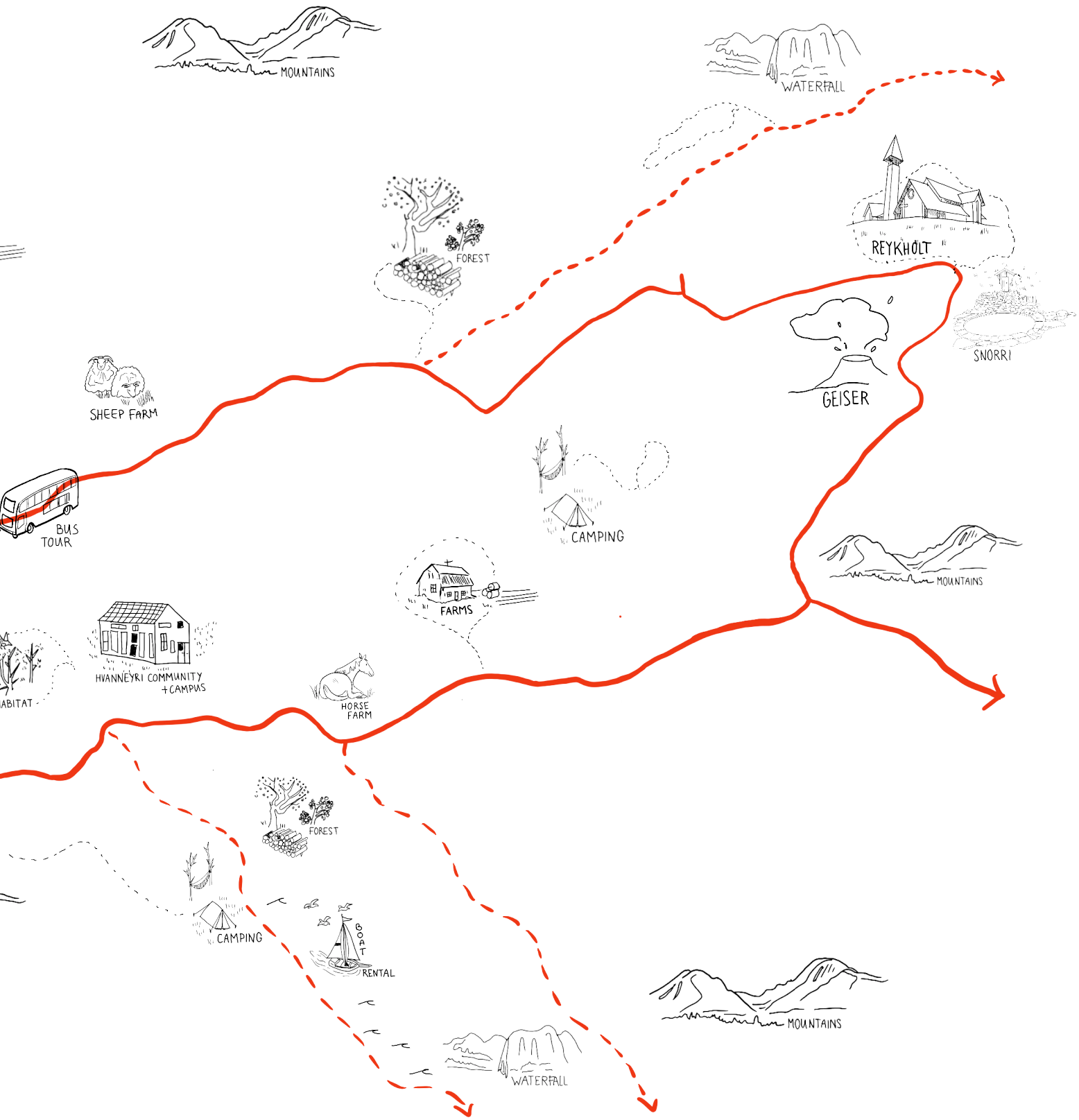
Starting Point - Lake Skorradalsvatn: where the tourist information centre and the majority of the accommodations are located.
Stop 1 - Hvanneyri. The first stop could be the village of Hvanneyri, where visitors can explore the Agricultural University and learn about sustainable farming practices. Furthermore, they can engage with the local community and visit the wool centre and greenhouses.
Stop 2 - Wetland Area. Next, the route could lead to the protected wetland area, where visitors can observe the unique bird habitats and learn about the importance of wetland conservation. More about this location is explained in the design experiment on ecology from Lieke.
Stop 3 - Agricultural Farm. The route could then lead to an agricultural farm, where visitors can learn about indigenous Icelandic agricultural practices. They could meet a local farmer, gain insights into sheep farming, and understand the challenges and solutions related to overgrazing.
Stop 4 - Grábrók Crater. Tourists can learn about the volcanic history of Iceland at the spot of this volcanic crater.
Stop 5 - Glanni Waterfall, which shows the beauty of the natural wonders of Iceland.
Stop 6 - Reykholt: a historical site where visitors can learn about Snorri Sturluson, one of Iceland's most important historical figures.
Stop 7 - Deildartunguhver Geothermal Geysers: Visitors can learn about geothermal energy and its importance in Iceland.
Stop 8 - Forest: Here, visitors could learn about the importance of forests and the impact of overgrazing.
The route would then go back to Lake Skorradalsvatn, completing the Green Circle.



Highway Green Circle

N

0 100 km


MOUNTAINS
WATERFALL
REYKHOLT
FOREST
SNORRI
GEISER
SHEEP FARM
BUS TOUR
CAMPING
FARMS
MOUNTAINS
HVANNEYRI COMMUNITY +CAMPUS
HORSE FARM
FOREST
CAMPING
BOAT RENTAL
MOUNTAINS
WATERFALL

A program for the Green Circle

Some additional recommendations for tourists are:

Sólbyrgi: a biological farm where tourists can learn more about local farming practices and biodiversity.
Krauma: a wellness spa. Here, visitors can enjoy geothermal baths and saunas, which is important in Icelandic culture.
Lake Langavatn: a lake in the wetlands, known for its rich flying fish population. Fishers or birdwatchers might be interested in this spot.
Húsafell: a tourist service hub near Reykholt. It includes a swimming pool and a golf course, and is surrounded by waterfalls, caves and natural hot springs. It is not included in the Green Circle, because it has a full day program of its own and is located a little far off the highway. It is however only a 40 minute drive from lake Skorradalsvatn, so it is a perfect day-trip for tourists that stay there.

Design Reflection

The Green Circle tour with 8 stops is much longer than the Golden Circle tour with only 3 major stops, but the distance area is smaller as well. Since the Green Circle tour is designed in combination with a permanent vacation stay, the tour can be spread out over multiple days as well. For instance, on day 1, the bus would lead to the first, the second and the third stop. On the second day, the tour would start at the fourth stop, and so on. The more days the tour consists of, the more additional recommendations can be added. Furthermore, when driving individually, which fits the backpacker type of tourist, the stops can be chosen individually.



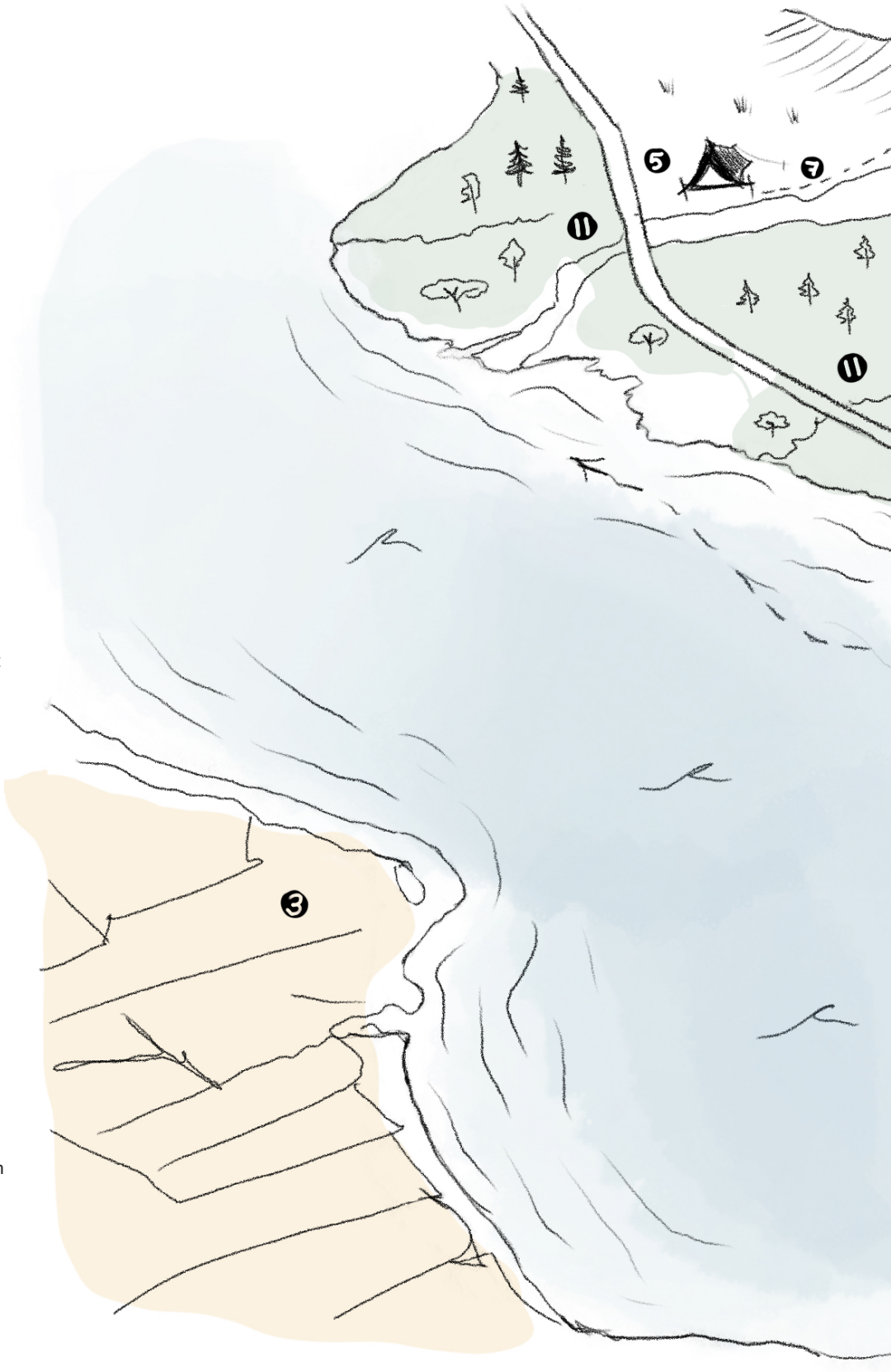

MOUNTAINS
WATERFALL
FOREST
REYKHOLT
SNORRI
GEISER
SHEEP FARM
BUS TOUR
CAMPING
FARMS
MOUNTAINS
HVANNEYRI COMMUNITY +CAMPUS
HORSE FARM
FOREST
CAMPING
BOAT RENTAL
MOUNTAINS
WATERFALL

Design Location

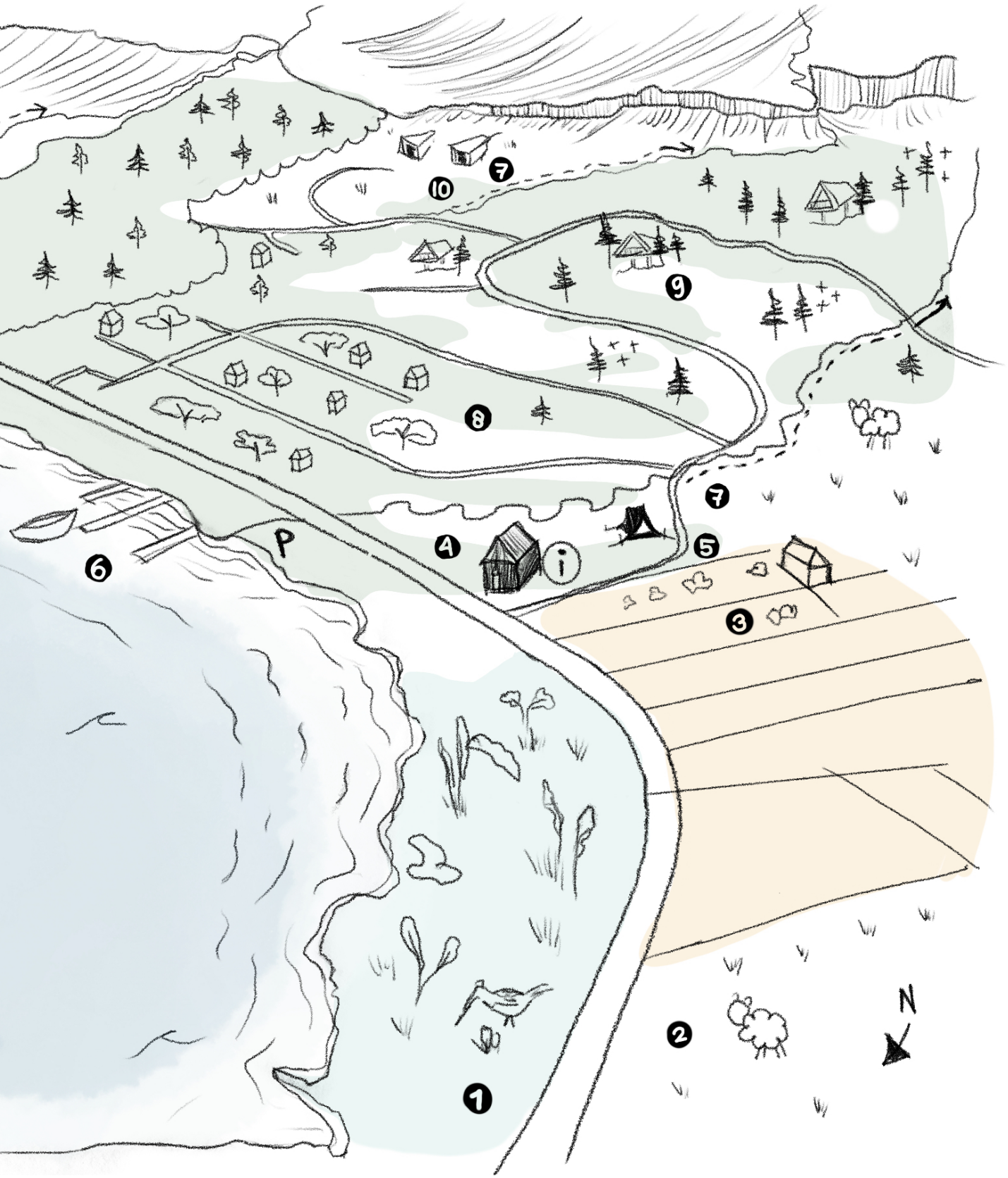
For the accommodations, a vacation park can be designed near the lake (lake Skorradalsvatn). This is a suitable location, because the lee side of the mountain can provide shelter against the harsh weather conditions. Furthermore, this area is located out of the protected bird zone, but close to the Green Circle. Lastly, redesigning this area could go hand in hand with a reforestation project to enhance biodiversity and protect the area against landslides. For these reasons, the project now zooms into the area near the lake, in the South-West of the valley.

Program of the Lake

When driving to the accommodation, the views of the wetlands accompanied by agricultural farms will eventually lead to a welcoming visitors centre. This is also the place where tourists gather for the bus tour along the Green Circle. By the water is a small beach with a boat rental facility. Further up the mountain, a local village is located within the forest of the lower valley. Here, food and clothes produced in the nearby surroundings are sold on a local market. The same street is extended through the vacation park, which is located in the upper valley, further up the mountain.



Water
Agriculture
Forest
Mountain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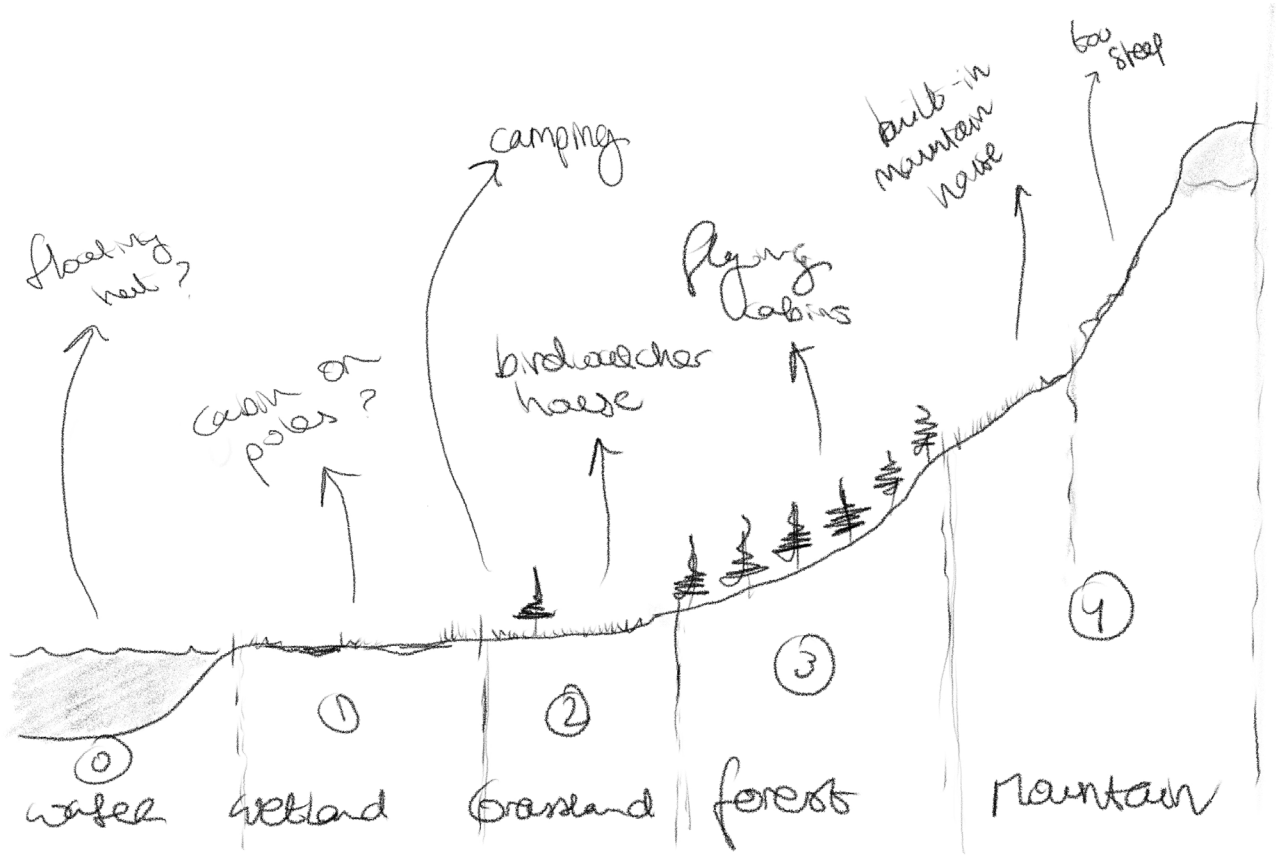


Section 1: sketch design idea

Sections of the Design

When drawing the section of the mountain next to the lake, the conclusion was made that the landscape types differed for a different elevation (section 1). Wetlands with bird habitats were located near the water, on 0 elevation. Next to the wetlands, grasslands, agriculture fields and grazing areas are located. Further up the mountain, until an elevation of 200m, is where the forests are. From 200 to 400m, the mountain is parsley vegetated or covered in grass. From 400m and higher, the highlands consist of bare rock and are often covered in snow. Because each type of landscape attracts a different type of tourist, the accommodations should be designed differently per landscape type, to fulfil the wishes of the different user types. This also provides the opportunity to design the exterior of the accommodations according to the surroundings they are placed within.



Image 1: “Land on Water”- Danish Maritime Architecture Studio MAST - Image: © KVANT-1

Land on Water — MAST. (n.d.). MAST. https://mast.dk/land-on-water



Image 2: Dollard - De Kiekkaaste - Buitendijkse Vogelkijkhut - Image: © Gerrie Abel

Vogelkijkhut.nl. (n.d.). Dollard - De Kiekkaaste - Buitendijkse Vogelkijkhut. https://vogelkijkhut.nl/view/172/



Image 3: Bjarg Borgarnes

West Iceland Marketing Office. (n.d.). Bjarg Borgarnes. West Iceland. https://www.west.is/en/service/bjarg-borgarnes



Image 4: Looking Glass Lodge by Michael Kendrick Architects - Photography: Tom Bird.

Looking Glass Lodge – Michael Kendrick Architects – RIBA award-winning Architects in Leamington Spa, Warwickshire. (n.d.). https://michaelkendrick.co.uk/ux-portfolio/looking-glass-lodge/



Image 5: The YOUNA Nature Resorts - Italian Dolomites - Peter Pichler Architects - Image: Peter Pichler Architecture + Spectrum

YOUNA Nature Resorts - Peter Pichler Architecture. (2023, February 13). Peter Pichler Architecture. https://peterpichler.eu/projects-item/35-youna-nature-resorts-alpine-region-europe/



Image 6: ZJJZ - Woodhouse Hotel 2018

ZJJZ | | Woodhouse. (n.d.). http://www.zjjz-atelier.com/?page_id=20317



Image 7: Icelandic Turf houses - Image: Vadim_Nefedov/Getty Images - retrieved from:

Waterson, L. (2022, October 14). Turf houses: Iceland’s original ‘green’ buildings. BBC Travel. https://www.bbc.com/travel/article/20221013-turf-houses-icelands-original-green-buildings



Image 8: Øyna Cultural Landscape Hotel, Norway

Dahl, B., & Dahl, B. (2021). Øyna Cultural Landscape Hotel | Cool Material. Cool Material |. https://coolmaterial.com/travel/oyna-cultural-landscape-hotel/

References of accommodations

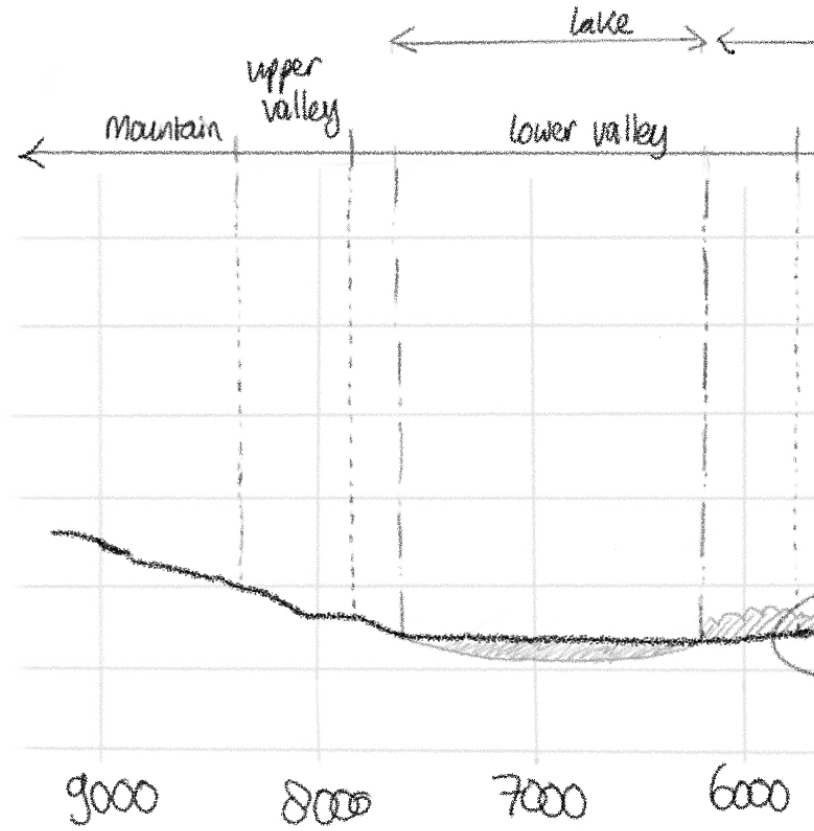
On the water, floating cabins can be realised, for instance. A reference used for these houses is the “Land on Water” project by the Danish Maritime Architecture Studio MAST (figure 1), which is a system of a floating foundation made from local reinforced recycled plastic and can house almost any structure to be built on water (Land on Water — MAST., n.d.). The system is also flexible, it can be used for different purposes over the year and can move around on the lake.

In the wetlands, cabins that have a similar look as birdwatcher houses can be created (figure 2). These houses would be placed on poles above the wetland, to minimise disturbance of the ecosystem underneath them. The houses would be connected to the land via walking docks.

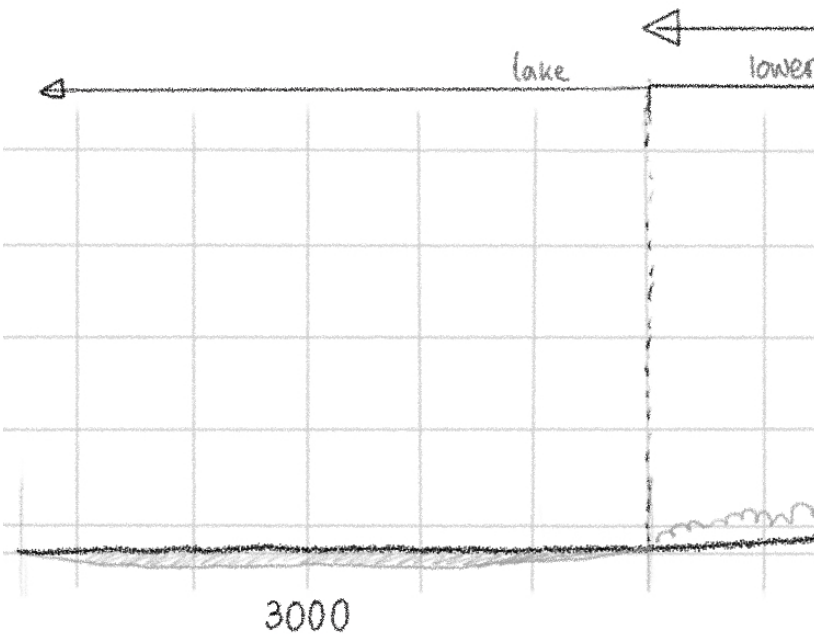
In the grasslands, the accommodations can be placed on a farm, and can match the existing farmhouses. In this way, tourists can learn from the farmers, and the farmers can earn extra profits from the tourists. Bjarg Borgarnes is an example of such a farm in the Borgarbyggd valley (figure 3).

In the forests, the houses can be designed to be hidden between the trees. These houses are lifted from the ground again. Examples of reference projects are the Looking Glass Lodge by Michael Kendrick Architects (figure 4), The Youna Nature Resorts in the Italian Dolomites by Peter Pichler Architects (figure 5), and the Woodhouse Hotel by ZJJN in 2018 (figure 6).

The last typology, in the mountain side, can be carved out of the mountain and hidden under the wild grass and mosses. The inspiration for this typology is the old Icelandic turf houses (figure 7). The accommodations could look similar as the hotel in figure 8, but then placed more apart from each other, to create more privacy.



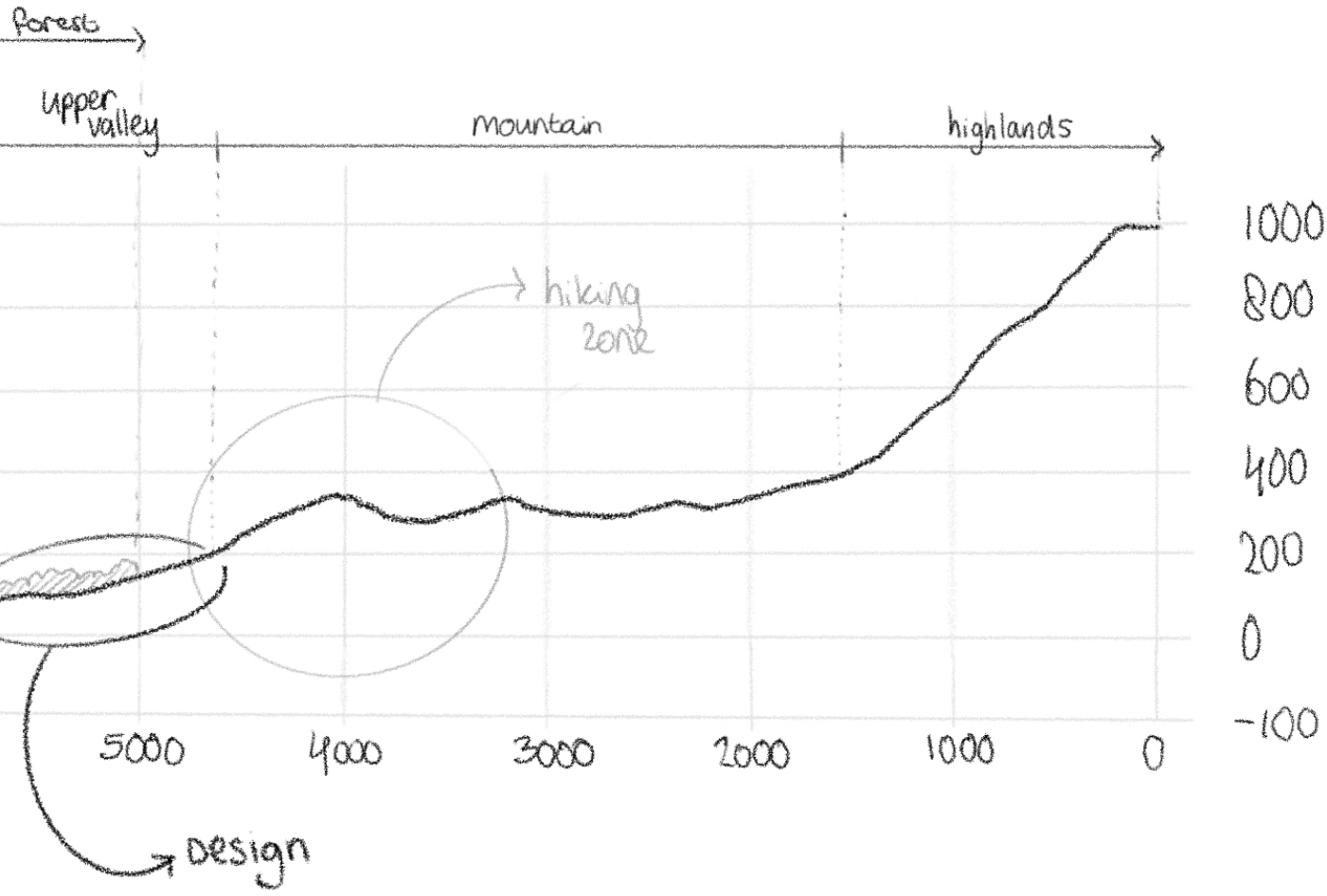
Section 2: full valley

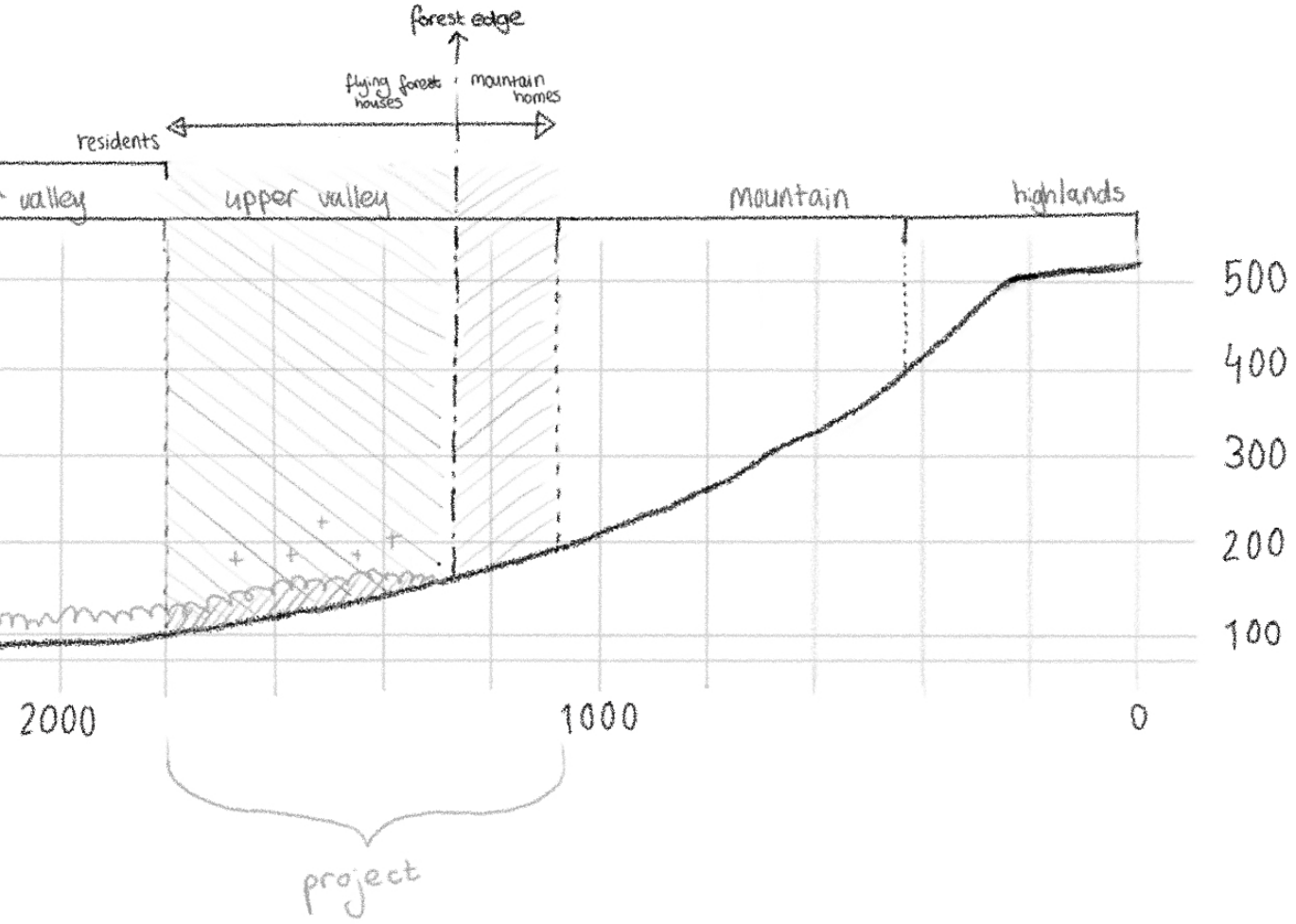


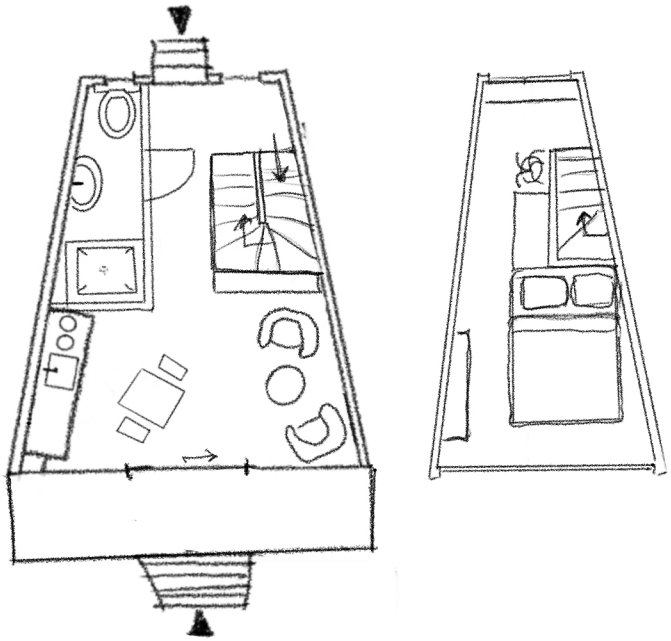
Section 3: design location

Valley Sections

When looking at the full valley section of the location of the lake, it is visible that the design location (from 100 to 200 metres in elevation) mainly consists of the forest landscape in the upper valley, together with a bit of the mountain (section 2 and 3). Therefore, the last two typologies (forest and mountain accommodations) are further explored in this design experiment.


forest
upper valley
mountain
highlands
hiking zone
1000
800
600
400
200
0
-100
5000
4000
3000
2000
1000
0
design


forest edge
flying forest houses
mountain homes
residents
valley
upper valley
mountain
highlands
500
400
300
200
100
2000
1000
0
project

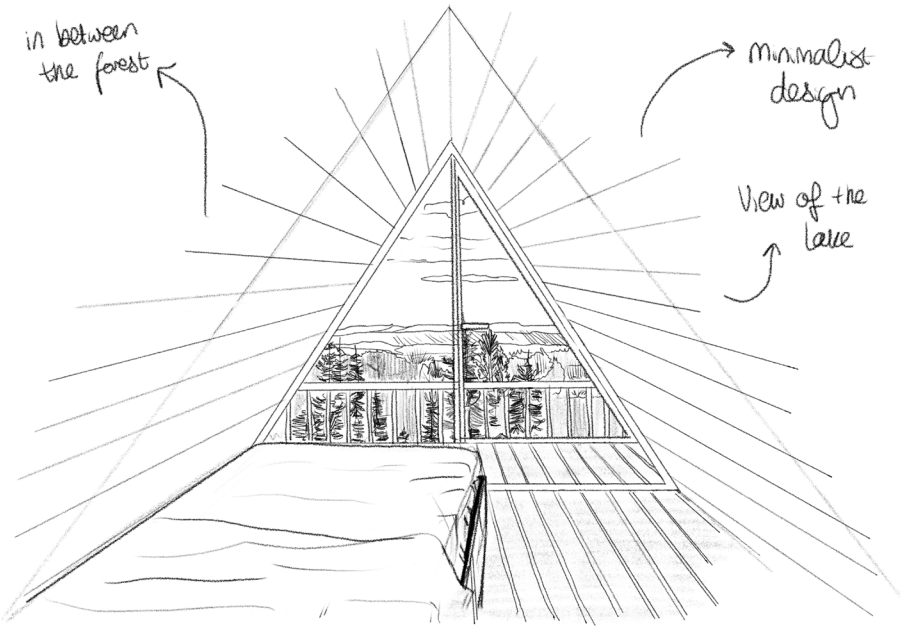




Typologies

Different types of tourists wish for different types of accommodations and experiences. Therefore, each typology comes in different sizes, and some accommodations are placed further away from the road than others. The main target audience for this vacation park is the hiker, as the accommodations are situated higher up the mountain and into the forest, surrounded by hiking trails. Some accommodations are therefore designed as off-grid and compact self-sufficient tiny homes.

The houses in the forest are built upon poles, to minimise ground impact and leave the vegetation and the soil underneath intact as much as possible. The material used for these houses is locally produced timber. Dark brown, grey, green and black colours are used to match the surrounding pine forest in general weather conditions of the area. Sheep wool from nearby Icelandic sheep farms is used for the insulation. The shape of the buildings is triangular, to fit the environment of the pine trees even better. This also insinuates a tent-like exterior, matching the hiker-experience. The plan of the houses is compact and cosy. The walls of the accommodations are more closed towards the back of the forest and the road, and open up with a big glass facade towards the view over the valley and the lake. This still remains private, because the accommodations are arranged and hidden between the trees in such a way that other accommodations are not visible from within.



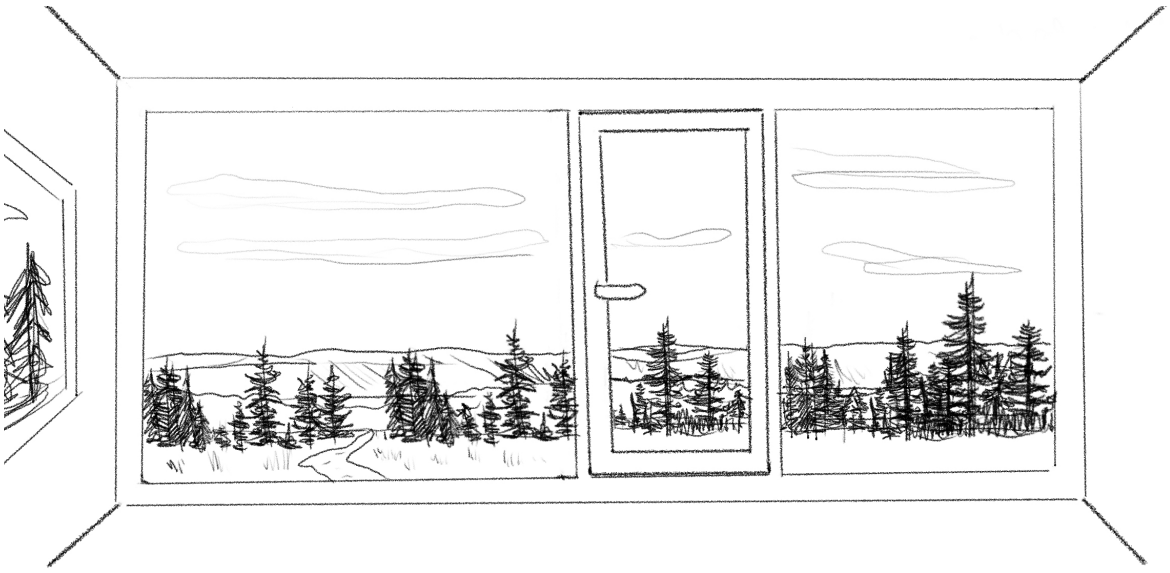

Reforestation against erosion
locally produced timber & sheepwool as insulation
flying design - minimal ground contact
untouched nature & moss for biodiversity
hidden in pine forest
cars parked out of sight
lower pathway



Typologies

The houses in the mountain side are hidden within the mountain and the soil, and are covered in the surrounding grass, rock, moss and vegetation. The technique used for this, is lifting up the top layer when digging, and placing it back on top on the same spot once the construction is finished, as Magnea Magnúsdóttir (2023) from the ON Energy Center spoke about in her lecture during the site visit. These houses are inspired by the iconic Icelandic turf houses that are covered in grass and are a subtle hint to the Icelandic cultural heritage.







Zoning Map

The program is here drawn in a zoning map near the lake.

Protected forest
Mountain
Water
Reforestation

N

0

100 km


11
mountain housing
10
9
forest housing
Reforestation
Grazing
2
hiking Route
7
7
5
Camping
farm



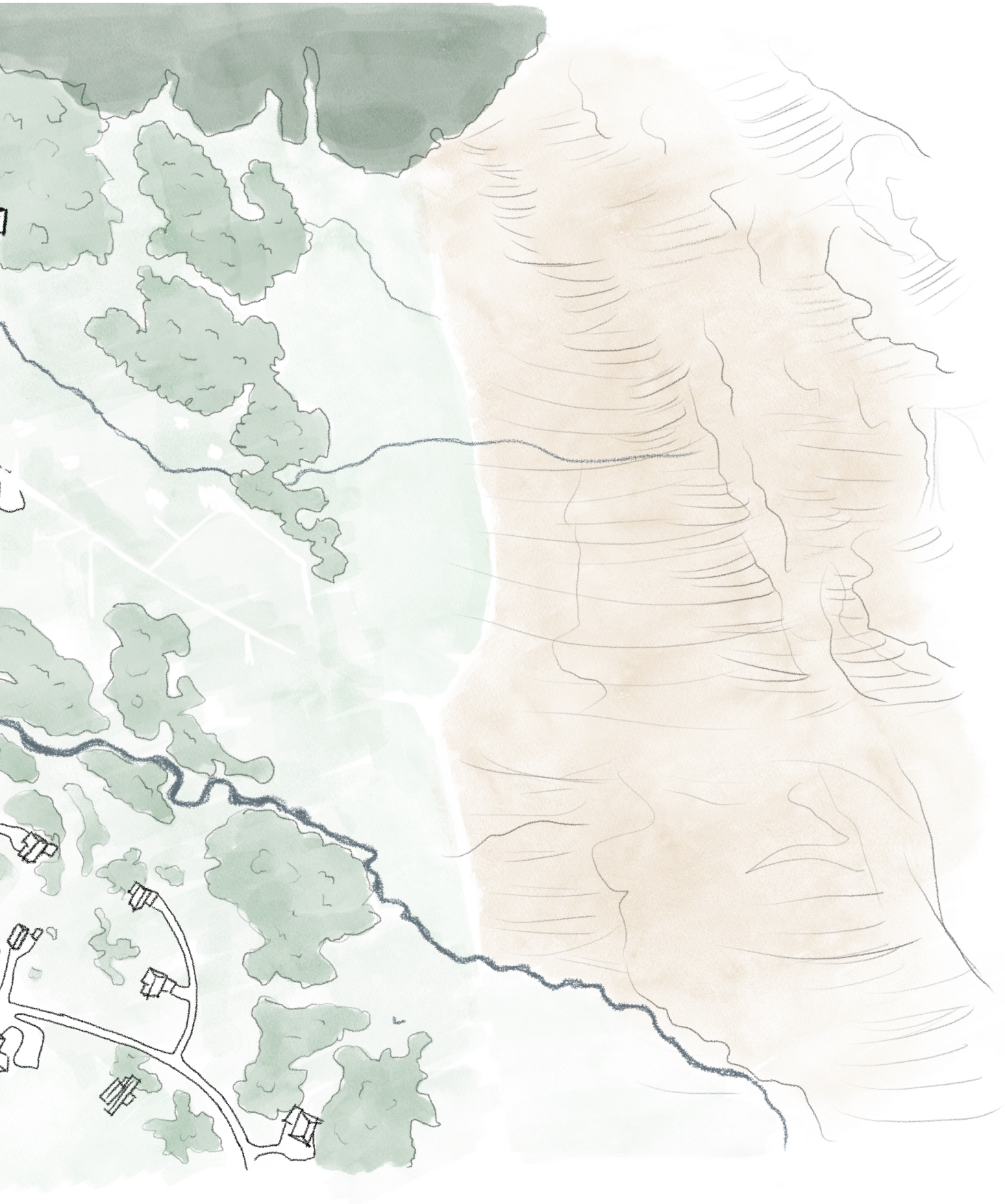
Design Location

When zooming into the upper valley near the lake, the current housing and forest situation is revealed. The current situation in the design location shows an existing village in the forest and empty fields in between them.

Forest
Mountain
Water
Grass

N

0 100 km





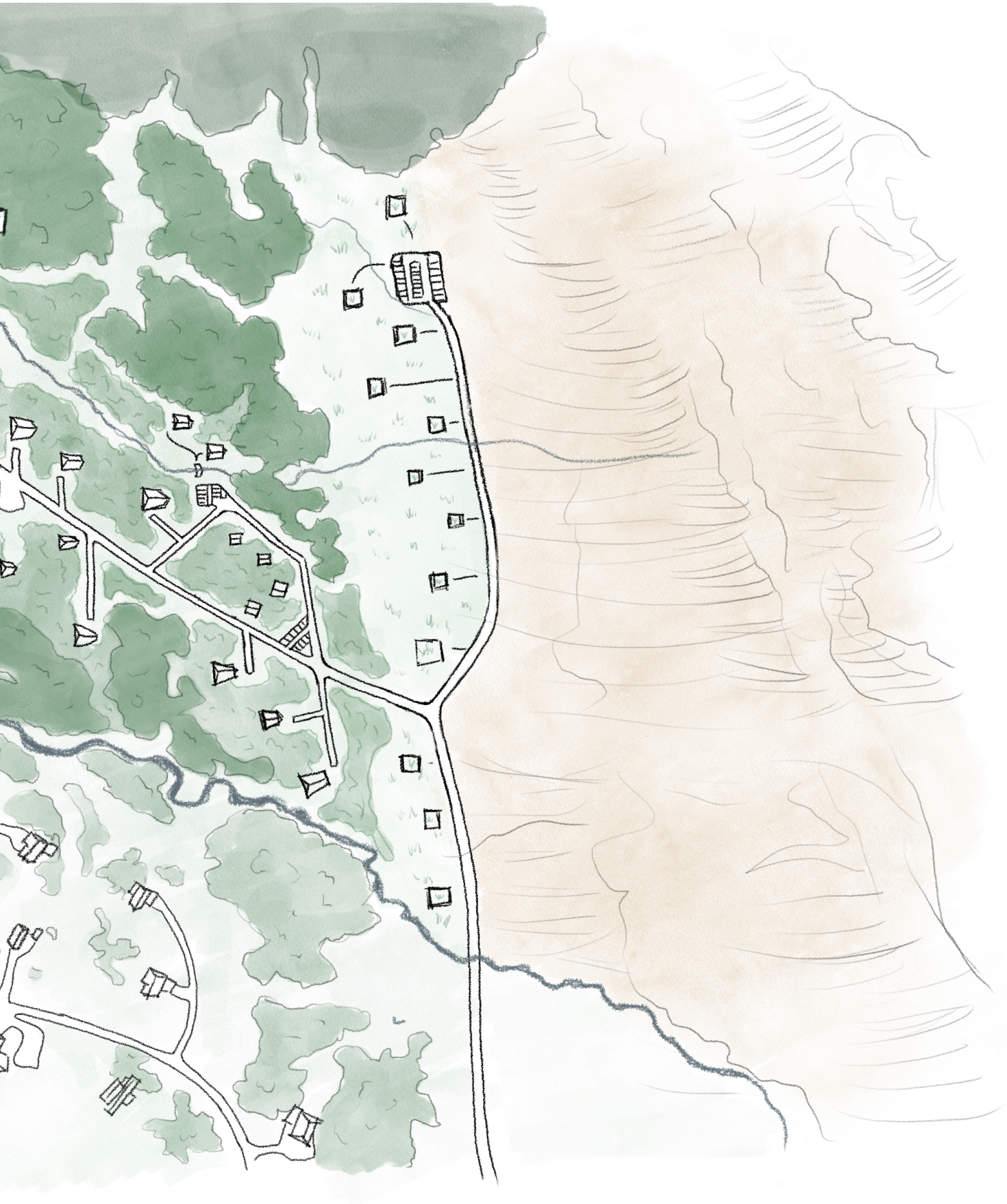
Design Plan

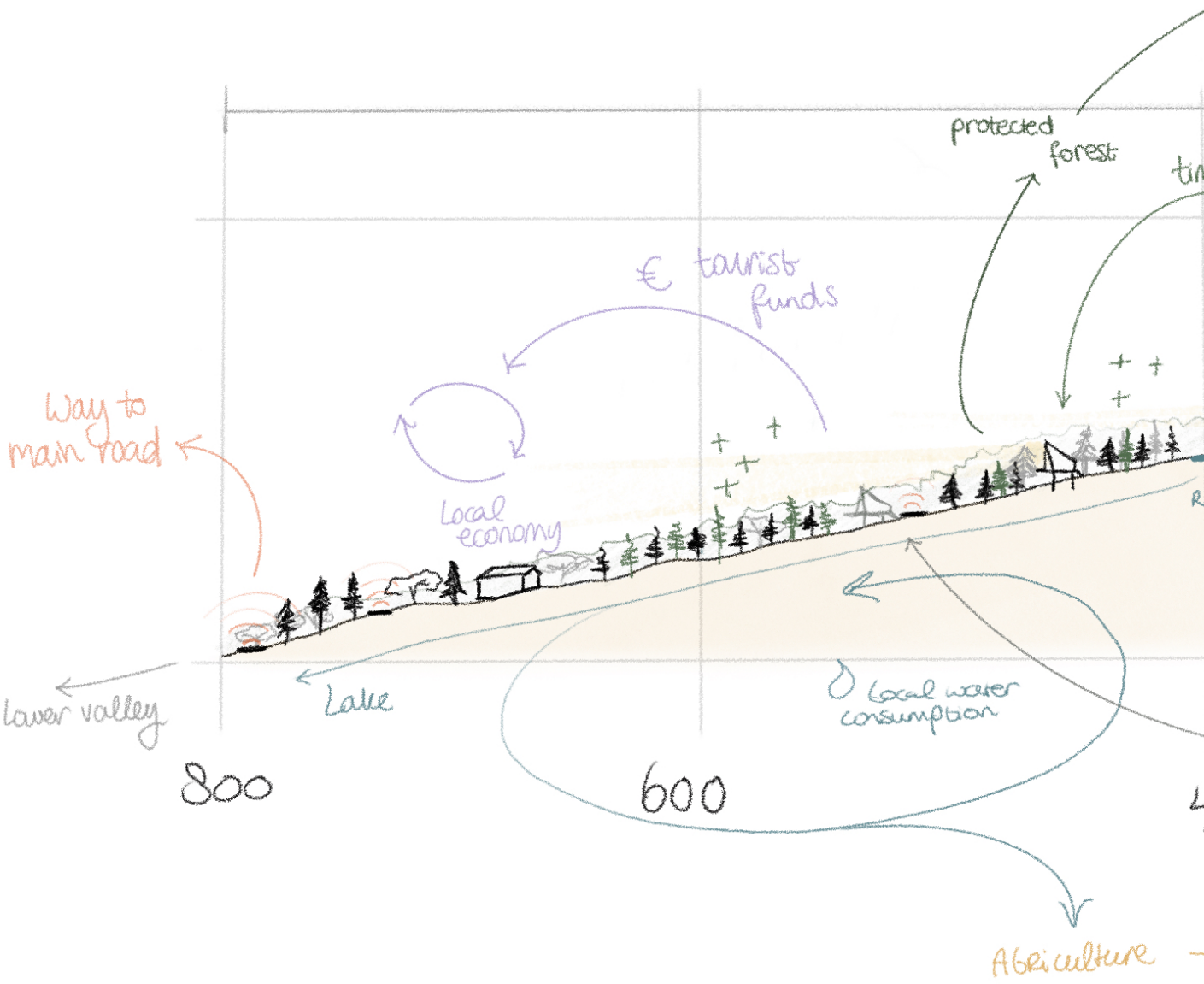
The reforestation program and the creation of the protected forest go hand in hand with the project of the vacation park. To minimise impact on the environment, the houses are built around existing tree groups and the existing road is extended, rather than adding new ones. To minimise the amount of extra road that is built, most houses are accessible via walking trails that bring the visitor from the general parking space to their accommodation. In between the houses, the now sparsely vegetated area will be reforested, using native tree species such as the birch and the pine. The arrangement of the accommodations therefore allows for a private experience as well, as they are hidden between the trees. The mountain accommodations are dug into the mountain side and covered in grass. The road lies behind them, further up the hill, so that it is not visible from within the accommodations. Because the houses are covered in grass from behind, the view of the accommodations in the back remains the same.

Protected forest
Reforestation
Forest
Mountain
Water
Grass

N

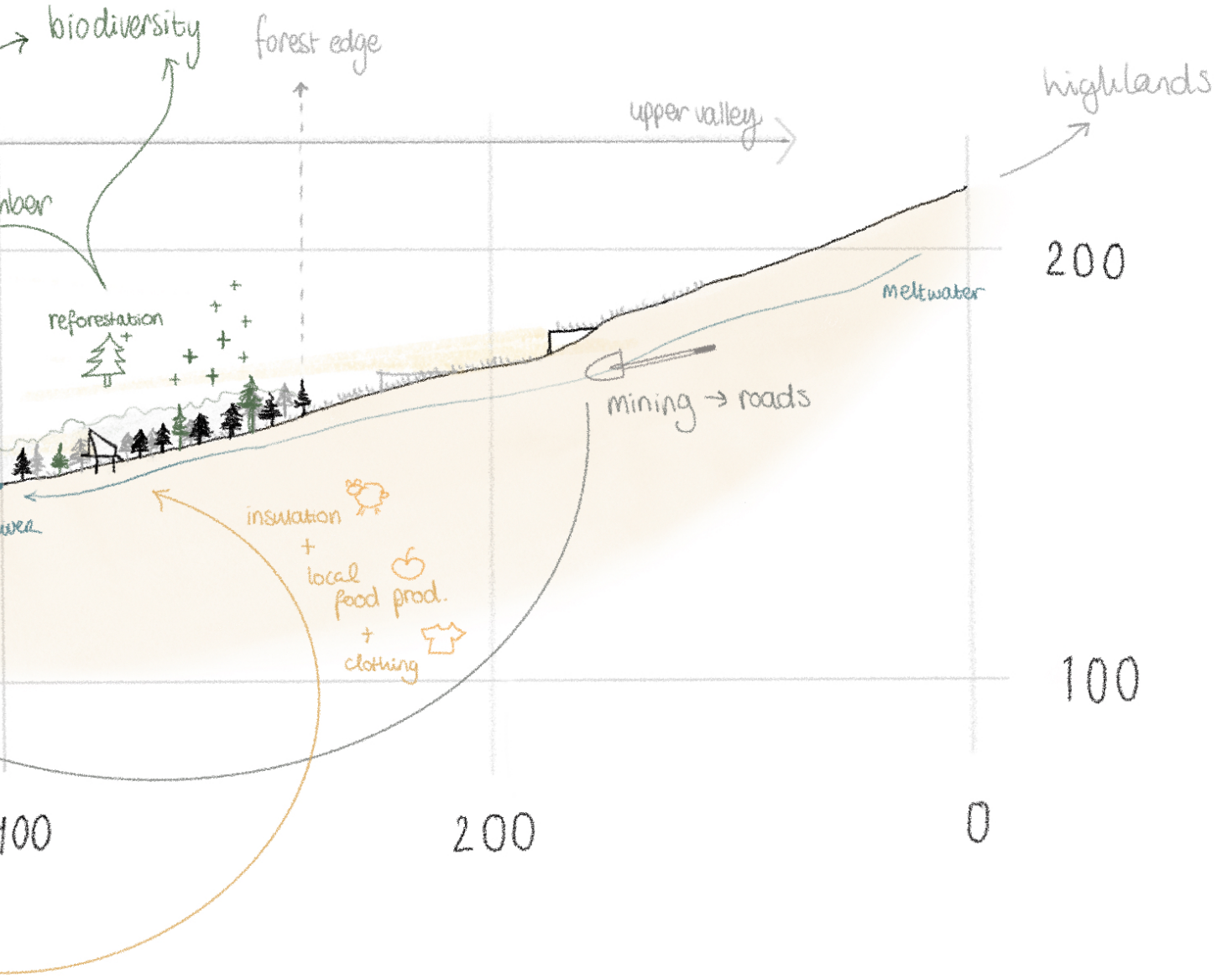
0 | 100 km





Section & the WEFM nexus

In the section (AA') of the project intervention, the WEFM nexus relations are highlighted and the design principles come forward. For instance, the accommodations make use of rainwater and meltwater from the mountains, local timber production provides wood for the construction of the cabins, sheep from nearby farms provide wool for insulation and interior items and the mining that is needed for the construction of the mountain accommodations provides material for the roads that are built. Shops, restaurants and markets in the village sell locally produced products and food from the farms and fisheries nearby, which supports the local economy.


biodiversity
forest edge
upper valley
highlands
reforestation
meltwater
200
mining → roads
insulation
+
local
food prod.
+
clothing
100
100
200
0



Reflection

When looking back at this course, I think of a fun time with a close group of students and tutors. The trip to Iceland was magical to me, and showed me the wonders of the Nordic environment. The lectures and visits to the geothermal centre and the forest were very informative and interesting. Our group also had the luxury of having stayed for a night at the Hvanneyri campus, so we actually experienced our design location, which was very useful in the design process. However, during the discussion after the presentations we realised that the trip was planned in an inconvenient time in the process. It felt like we did not have enough time beforehand to really dive into the background research of the area. We also did not know our intervention location while we were there. If that would have been the case, we might have interacted with locals to see their perspective and learn from them. I was however very impressed by Sami and her knowledge and connections, that led us to the sheep farm at the very last minute.

Designing a vacation park was not my initial plan, but once I started sketching ideas, I enjoyed doing it and I think that it completes the Green Circle design. Overall, I liked working in the small group with Lieke and Max, because we went on the trip together and shared the same ideas. Therefore, I think that our vision comes nicely together and I am proud of the result we produced in just 3 weeks. In my opinion, only the agricultural vision of the group does not come forward enough in our designs combined. This could have improved the overall strategy. It was a challenge, designing a future vision for a whole valley somewhere far abroad, but we proved that a lot is possible in a short time. I will take the thinking about different systems in relation to each other and on the global and local scale, and the various landscape conditions of different places on earth with me in my future career.

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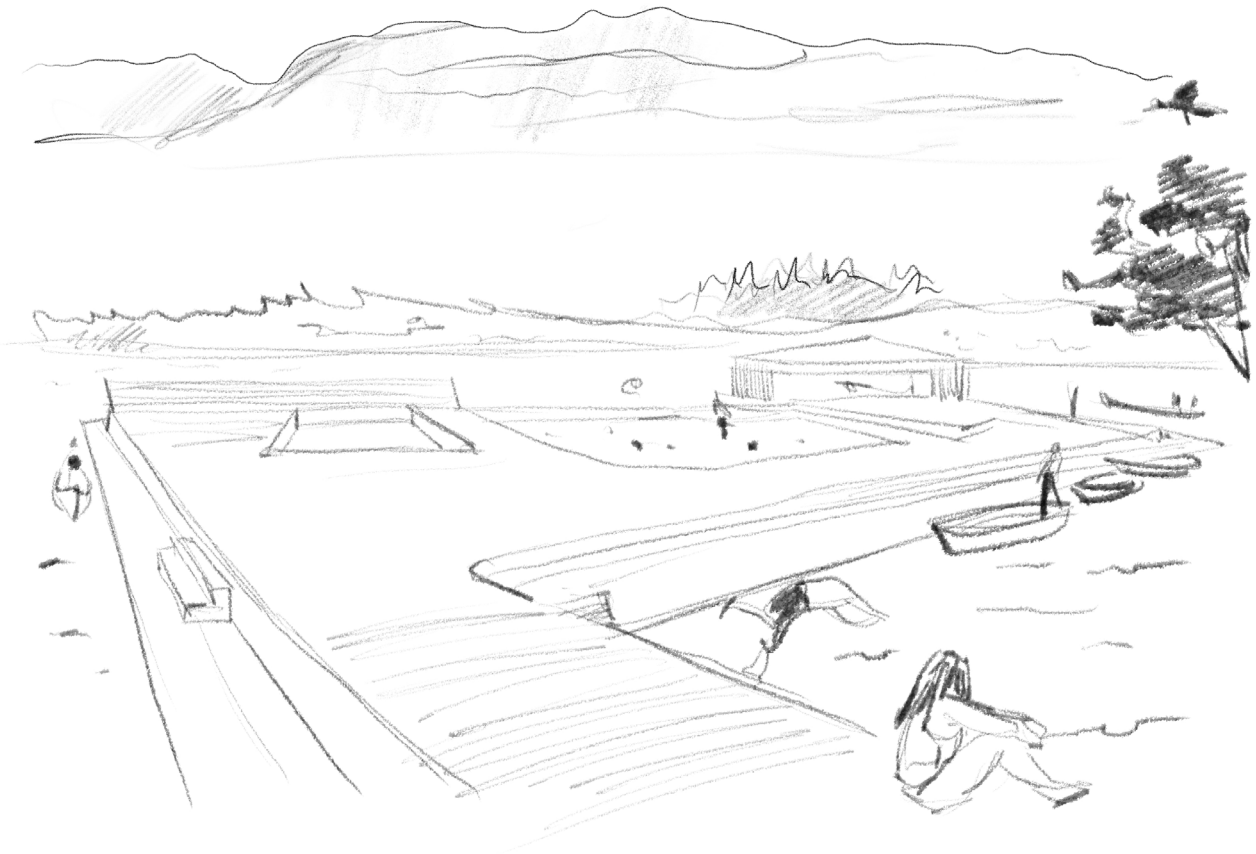
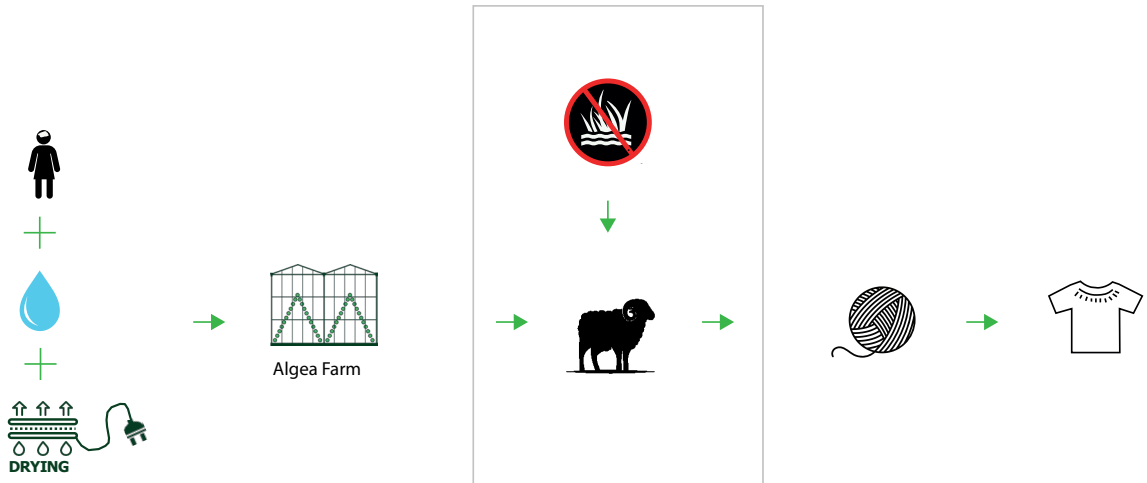


6. Redefining The Animal food system

Laurens Plender





alternative foodstock

less grazing:
more space for nature

add value locally

Manifesto

Iceland is an exceptionally beautiful country with many opportunities due to its location on and near geothermal sources and strategic location between two continents. In addition, Iceland also has challenges. One of the country's biggest challenges on a national scale is the impact of overgrazing. The ecological consequences of this overgrazing by sheep can be called disastrous. Iceland's native forest and woodlands decreased by 94% in the last 200 years. A consequence of this is the continuous erosion of the landscape and a destruction of Iceland's fragile ecosystem. Large parts of what is considered original landscape today is essentially the result of a disturbed ecosystem.

On a regional scale, the Borgarbyggð valley today faces its own ecological and economic challenges. Despite being designated as a Natures reserve, habitat protected Area (Ramsar), the wetland landscape is fragmented and the agricultural use of the land competes with the ecological system of wetlands.

Does an intervention in the animal food system offer a solution to the above problems?

One possibility is to give the sheep a different form of food, so that grazing takes up less of the landscape. Research by Wageningen University has shown that algae can be a good substitute. Algae powders are already widely used as a raw material for animal feed in Asia and Russia. Within the EU, regulations still stand in the way of the use of algae. The fact that Iceland is not part of the EU offers opportunities for the introduction of algae as animal feed. To produce algae, 3 basic ingredients are needed: highly trained personnel, cheap energy and clean salt water.

To produce algae on a big scale, a algae farm or factory is needed. Despite the positive influence of an algae complex on the national (animal) food system, the disruptive influence of an algae complex is considerable at the local level. At its core, it acts like a parasitic or linear metabolism. In the design proposal, a way was sought to build an algae complex that no longer functions as a linear metabolism but as a circular metabolism. To achieve this, a paradigm shift is required. The idea of the symbiotic city provides the theoretical framework for this. What is the ideal of the symbiotic city?

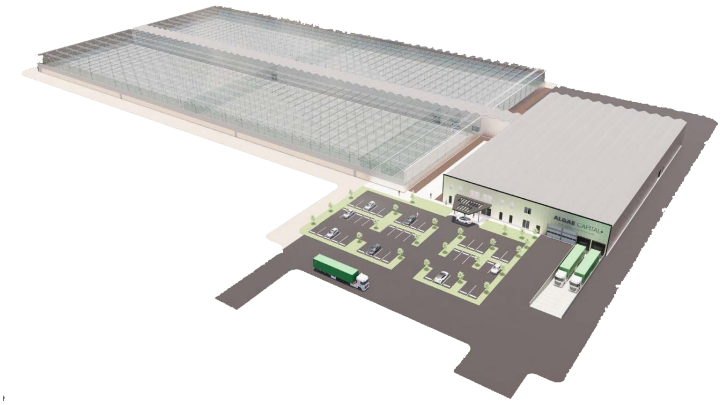
-Build cities in a way that they become meaningful for nature, the environment as well as human (Stuiver). Intergrating ecosystems and urbansystems so that they are benificial to eachother.

The presented design proposal attempts to be a symbiosis between the existing ecosystem and the introduced industrial biological system. It explores the possibilities of integrating two dissimilar organisms in such a way that both systems benefit and play a role unify the landscape again.

Redefining the food system

Laurens Plender

The company Algea Capital was contacted for the design proposal. Algea Capital wants to realize an algae factory in the vicinity of Reykjavik in the coming years. The most efficient form of algae consists of an industrial complex of 6 greenhouses of 200m by 100m and a central factory. The total complex is approximately 4 hectares. Despite the positive influence of an algae complex on the national (animal) food system, the disruptive influence of an algae complex is considerable at the local level.



Algea Capital Factory

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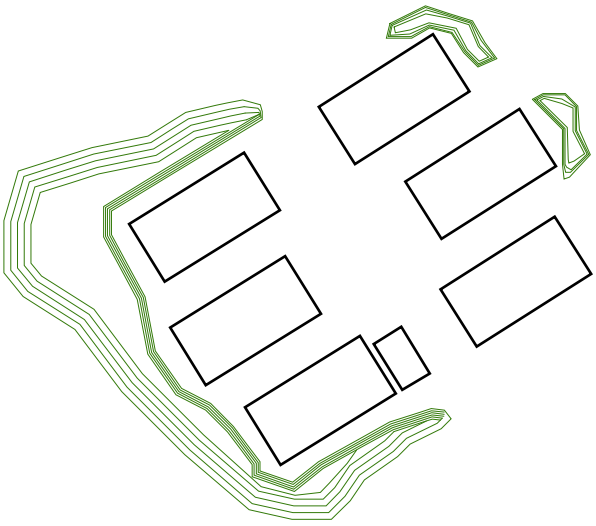
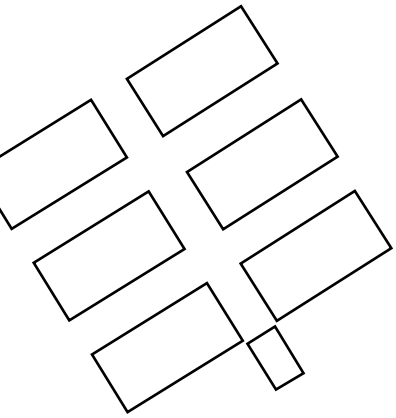
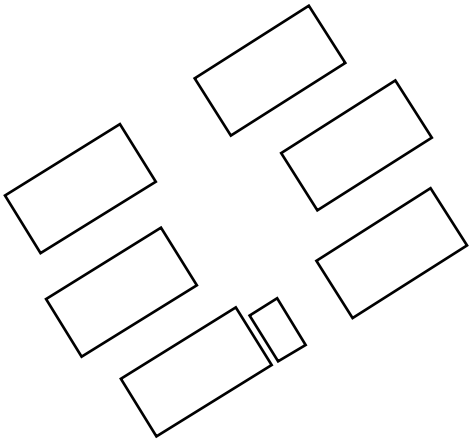


4) An ecological channel is dug between the greenhouses. The excavated soil will be used to construct a dike around the complex. The dike partially discovers the complex for the eye.

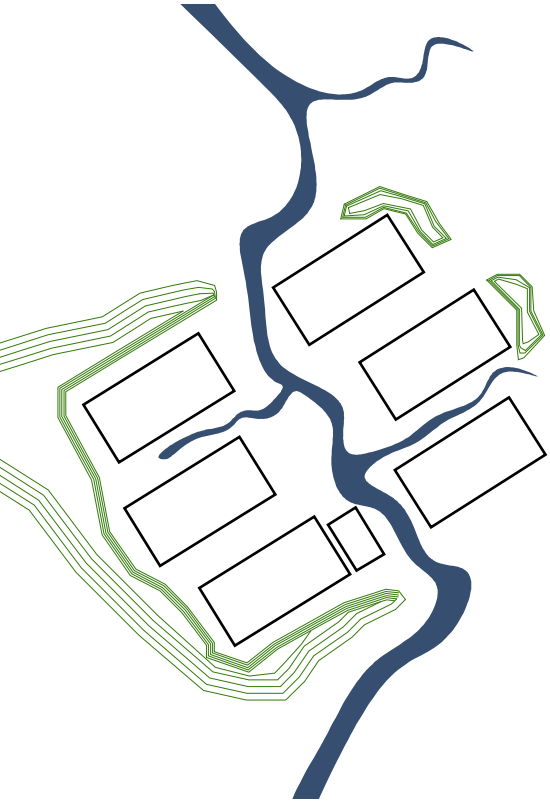
5) Ar
tween the



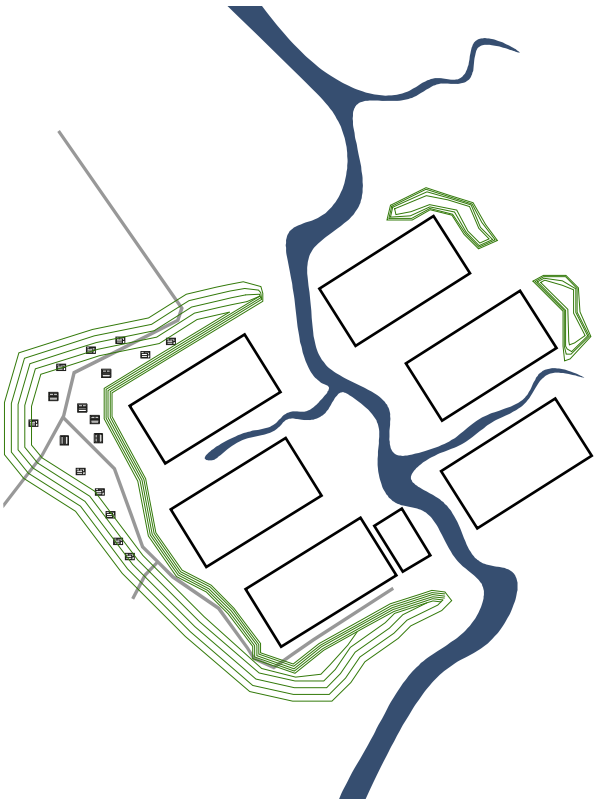
lgea Capital's algea farm with 6 greenhouses
ted in Hvanneri.



3) Algea Capital's design has been modified by creating more space between the greenhouses.

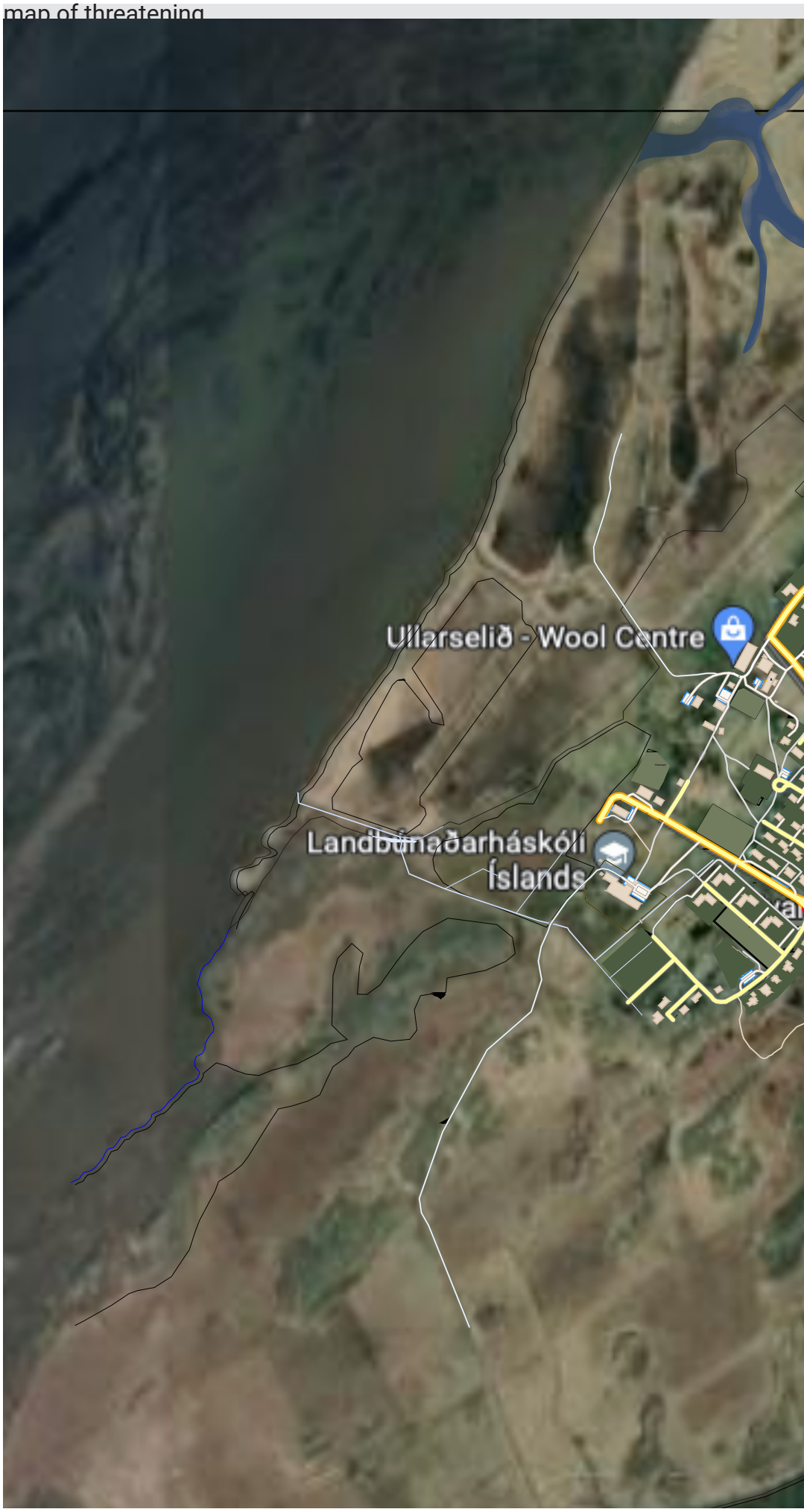


n ecological connection is made be-
existing wedlands



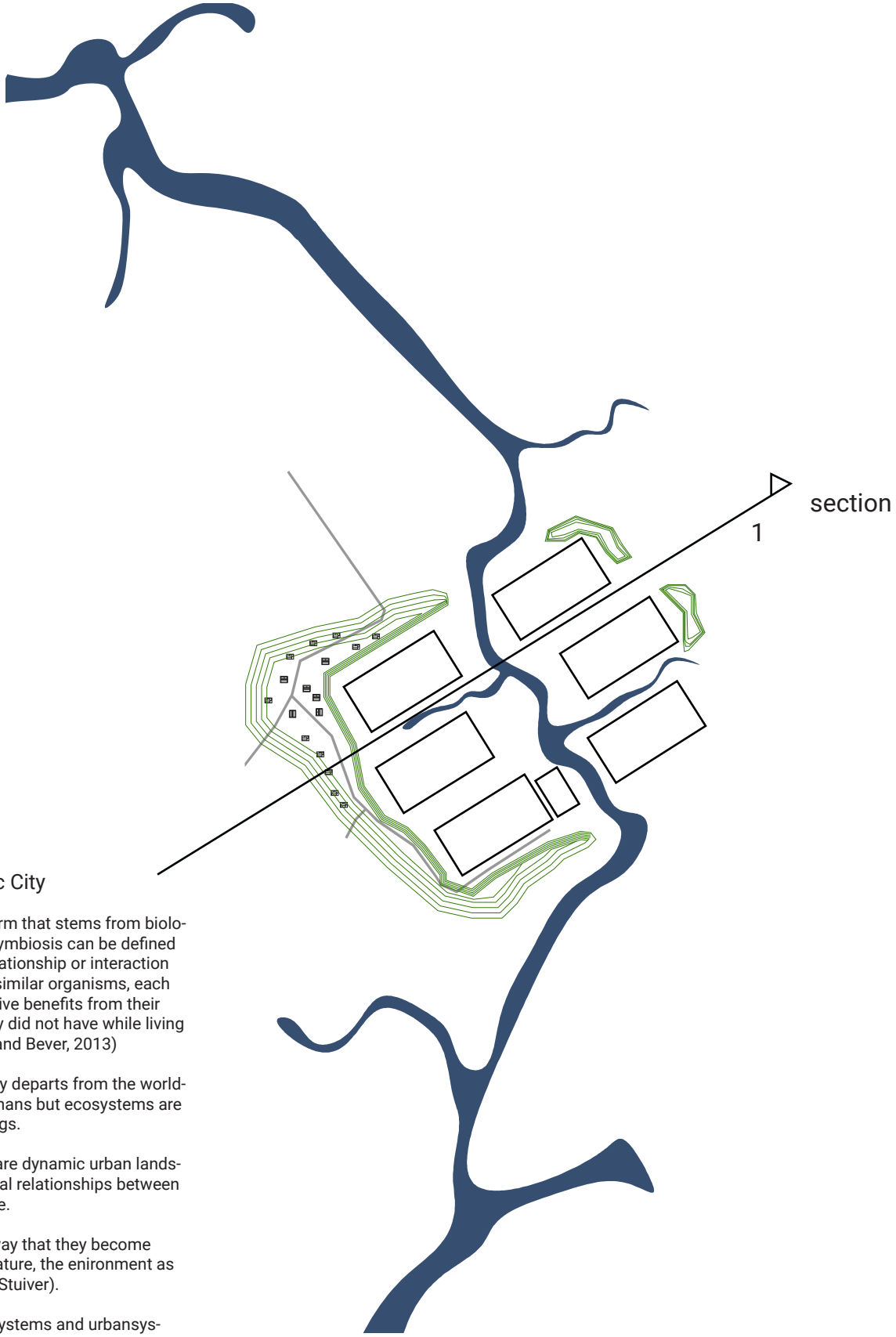
6) Residential environment is added. The houses will have a regenerative design. The algea factory takes water from the new wedland connection. The new ecological connection offers space for flora and fauna.

map of threatening



Symbiotic Algea Farm in Hvanneyri





The Symbiotic City

Symbiosis is a term that stems from biological sciences. Symbiosis can be defined as any kind of relationship or interaction between two dissimilar organisms, each of wich may receive benefits from their partners that they did not have while living alone (Angelard and Bever, 2013)

The symbiotic city departs from the worldview that not humans but ecosystems are the centre of things.

Symbiotic cities are dynamic urban landscapes of beneficial relationships between people and nature.

Build cities in a way that they become meaningful for nature, the enironment as well as humans (Stuiver).

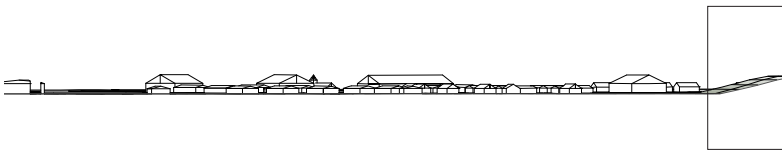
Intergrating ecosystems and urbansystems (housing, infrastructure, industry, etc).







Section 1



Integrating systems

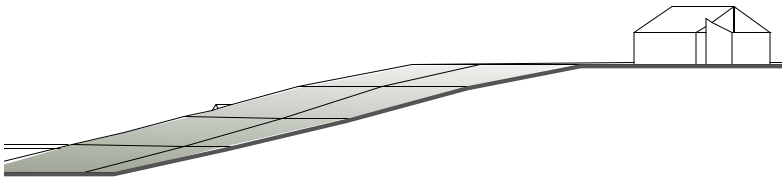
In the design four systems are integrated:
-algea industry system
-ecology system
-food system
-housing system

The aim is that al the systems benifit from each other and strengthen each other.



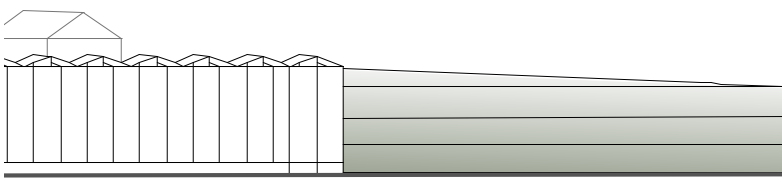
Section 1.1

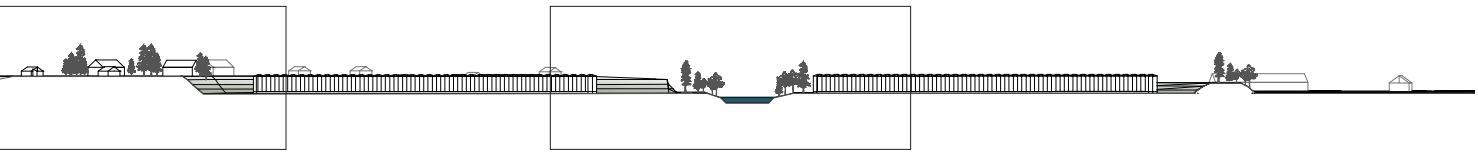
Regenerative village



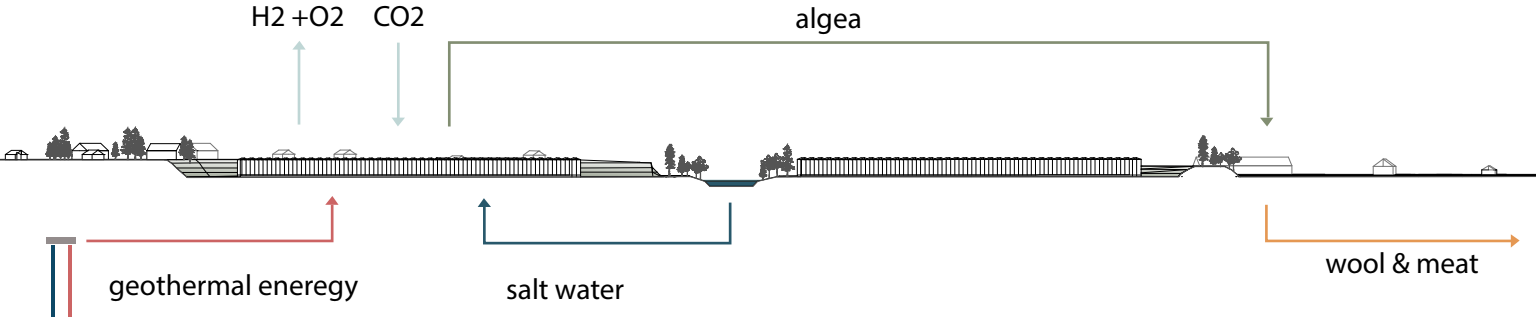
Section 1.2

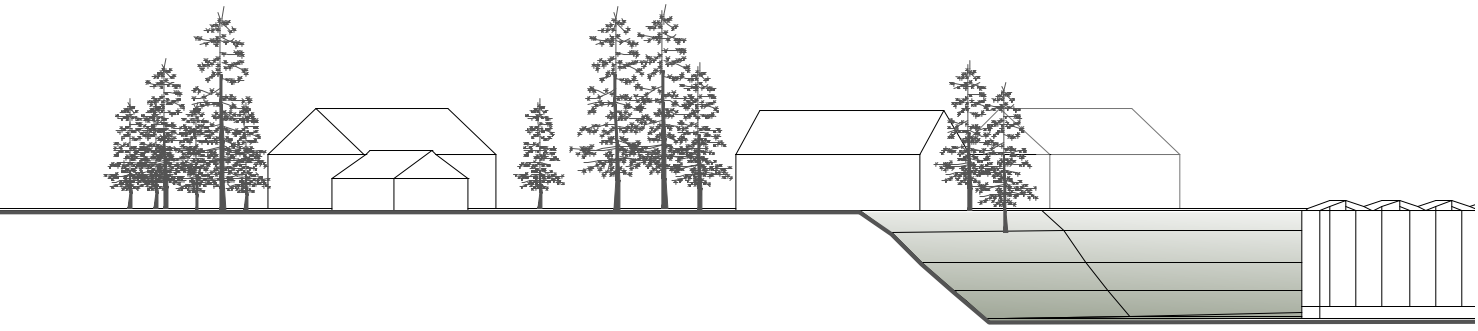
The man-made wedlands create a ecological zone between glasshouses. The greenhouses provide a sheltered environment that promotes the growth of trees. The algae factory extracts salt water from the wedlands.

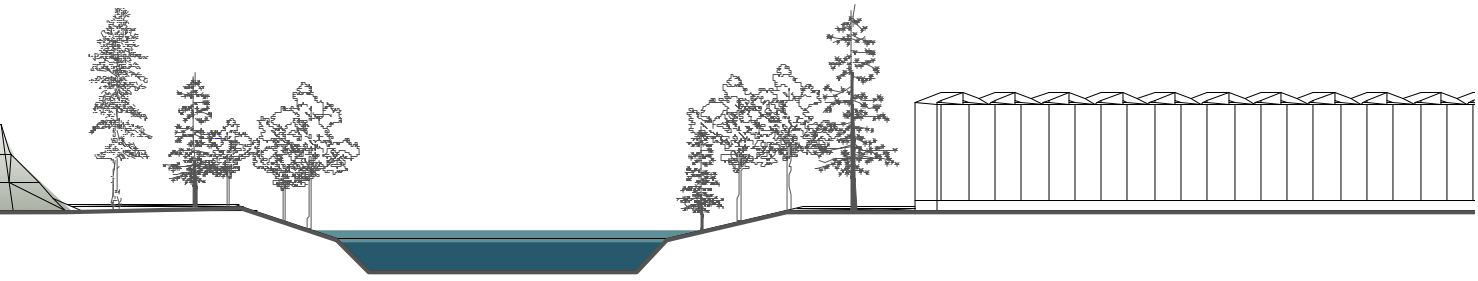




1.1 1.2







Reflection

To re-enroll in university after 13 years was a big step. At the same time, after that first step, it felt familiar again. The purpose of my registration and taking various courses was to get inspired again about the design of city and landscape. To my own surprise, registration for the master course EID Elective brought me to Iceland. It was a great experience to be shown around this impressive country with a group of students and teachers by passionate speakers and guides. This gave us a unique insight into the opportunities and challenges of Iceland. The course has inspired me to look at urban design in a different way, namely from the perspective of linked systems. In particular, the idea of the symbiotic city, in which systems are not enemies but rather reinforce each other, is an idea that I would like to explore further.

The delivered individual design can be called rudimentary, it still requires a number of design strokes to make it into a fully-fledged design. The 4 weeks were too short for this. I strongly believe in the possibilities of the underlying idea: adapting the animal food system by implementing algae as food. It is an idea that can be applied worldwide on a much larger scale and can actually make the world a bit more beautiful and cleaner.

Working with a new generation was inspiring and opened my eyes to new perspectives.

On to the next course!

Laurens Plender
30 juni 2023
Delft



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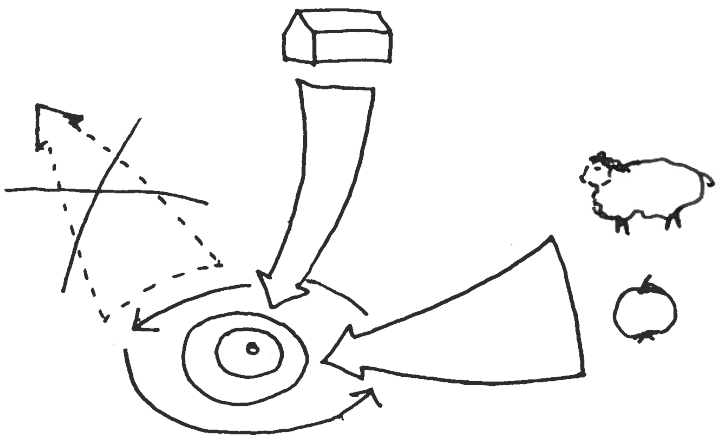
https://www.effekt.dk/regenvillages

7. Hvanneyri as a knowledge hub

Max van der Waal



HUANNGYRI AS CIRCULAR CAMPUS

Manifesto

The ‘Hvanneyri as a knowledge hub’ perspective is a is a thoughtful response to the unique context of Hvanneyri, which is home to a mix of farmers, students, and researchers from the Agricultural University of Iceland. The design is partly based on the application of Ebenezer Howard’s Garden City concept, demonstrating its enduring relevance in the 21st century.

The Garden City concept offers a framework for this transformation by emphasizing self-contained, manageable communities, balanced land use, and harmonious integration of residential, commercial, and agricultural spaces. In addition to increasing the population of Hvanneyri, the goal is to do so in a way that preserves the sense of community, prevents overcrowding, and strengthens the village’s distinct identity.

The idea of the “Living Lab” served as a major source of inspiration for this approach. With its Agricultural University, Hvanneyri presents a unique opportunity to be transformed into a practical demonstration site for the potential of innovative ecological farming techniques like aquaponics, hydroponics, aquaculture, organic farming, fungiculture, silvopasture, and agroforestry. These methods not only help the village maintain its independence, additionally they also act as an accessible demonstration of the potential of sustainable agriculture, offering helpful educational opportunities for university students and researchers.

The local showcase perspective proposes several key interventions to realize this vision: the creation of a main ring road to facilitate movement and logistics; the establishment of community gardens and green spaces for recreation and local food production; the expansion of the main street with local shops, a grocery store featuring local products, a museum, and a visitor center; and the development of tourist attractions such as bird watching trails and accommodations.

The Agricultural University’s presence in Hvanneyri is a significant asset, providing a source of knowledge and innovation that can drive the village’s transformation. The local showcase perspective stimulates a dynamic, complementary relationship between the university and the community by closely linking the university’s research and education activities with the development of the village.

In essence, the local showcase perspective envisions a future in which humans coexist with their environment, contributing to its sustainability while harvesting its benefits. It provides a model for similar transformations elsewhere by demonstrating how modern ecological farming practices, local agriculture, nature, and tourism can be integrated into a vibrant, self-sustaining community, embodying the principles of the Garden City concept in a contemporary context.

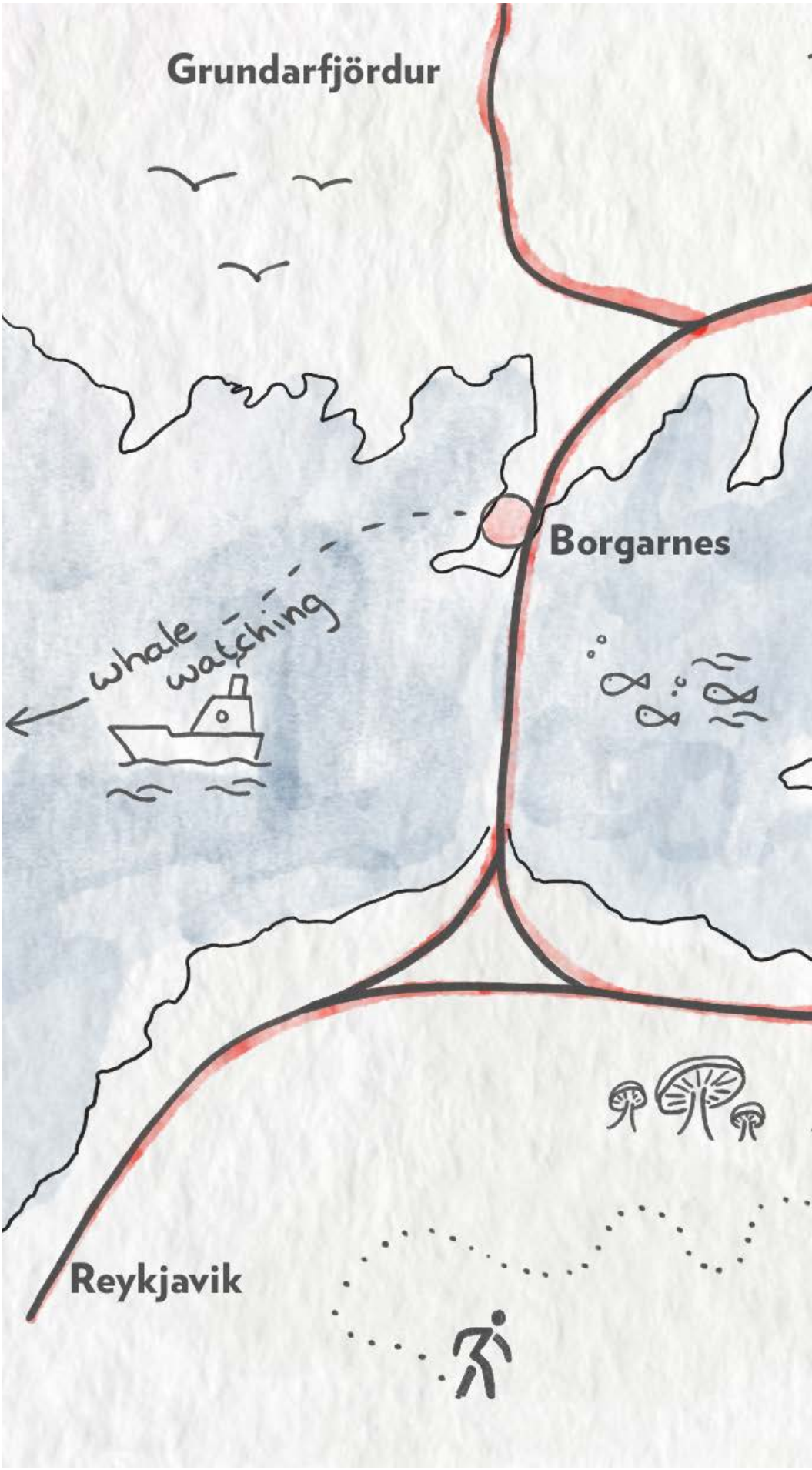
Hvanneyri as a Knowledge Hub

Max van der Waal

Hvanneyri in the region

Hvanneyri is situated in center of the Borgarbyggd valley, surrounded by wetlands, hillsides, lakes, and scattered patches of forest. The Borgarbyggd-valley has the potential for a variety of touristic activities, ecological agricultural practices, and natural landscape restoration. This mind map represents the Borgarbyggd-valley program and landscape as it relates to the redevelopment of Hvanneyri, as well as the proposed visions from the other lenses in this project: “ecological (re) connection”, “rethinking the food system”, and “eco-tourism as a tool”.

Hvanneyri has the potential to connect all these different systems and link them to the local residents.



University

Greenhouses

Conventional agriculture

Protected bird area

Wetland farming

Forest

Algae production

Fungiculture

Hiking trail

Road

Main road

N

Mental Map (not to scale)


Hvanneyri



The ‘Green Circle’; by Sanne van Rees

Putting Hvanneyri on the map

Making Hvanneyri more accessible to a larger audience is one of the goals of this design experiment. Hvanneyri is currently 2.5 kilometers from the main road and requires two 90-degree turns to get there. Hvanneyri will become a more appealing destination for the general public by increasing visibility and creating a direct connection to the main route.

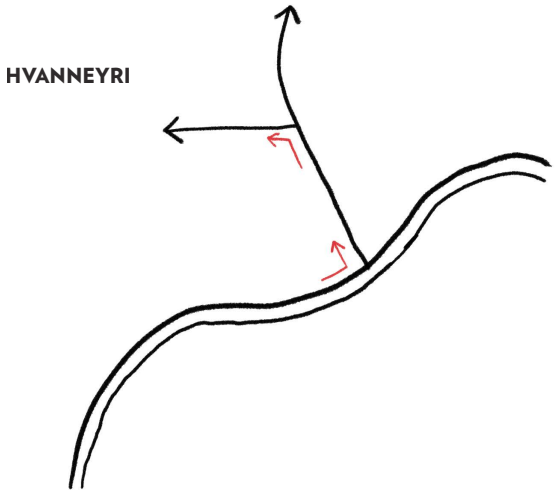
The intervention in the infrastructure consists of two parts:

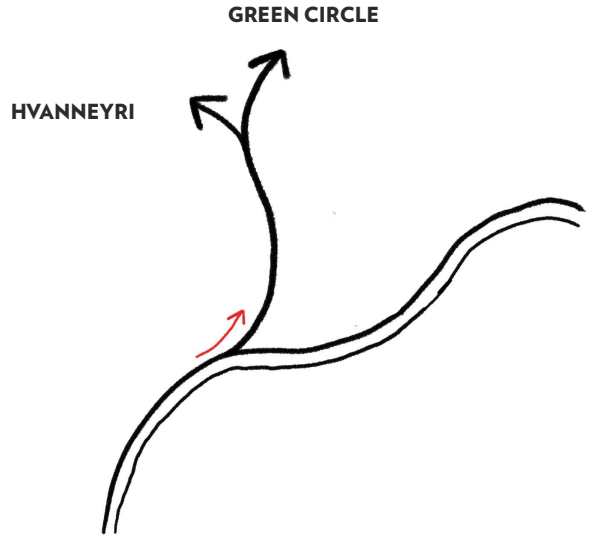
1. Enhancement of the road exit: The road exit will be changed to make it more readily apparent and recognisable. This intervention reroutes the Hvanneyri access road and includes enhancing road markings, upgrading signage, and providing precise directions to Hvanneyri.

2. Direct Connection: A new road segment will be constructed to establish a direct connection between Hvanneyri and the main route. This will eliminate the need for multiple turns, simplifying the journey for visitors and making it more convenient for the common man to access Hvanneyri.

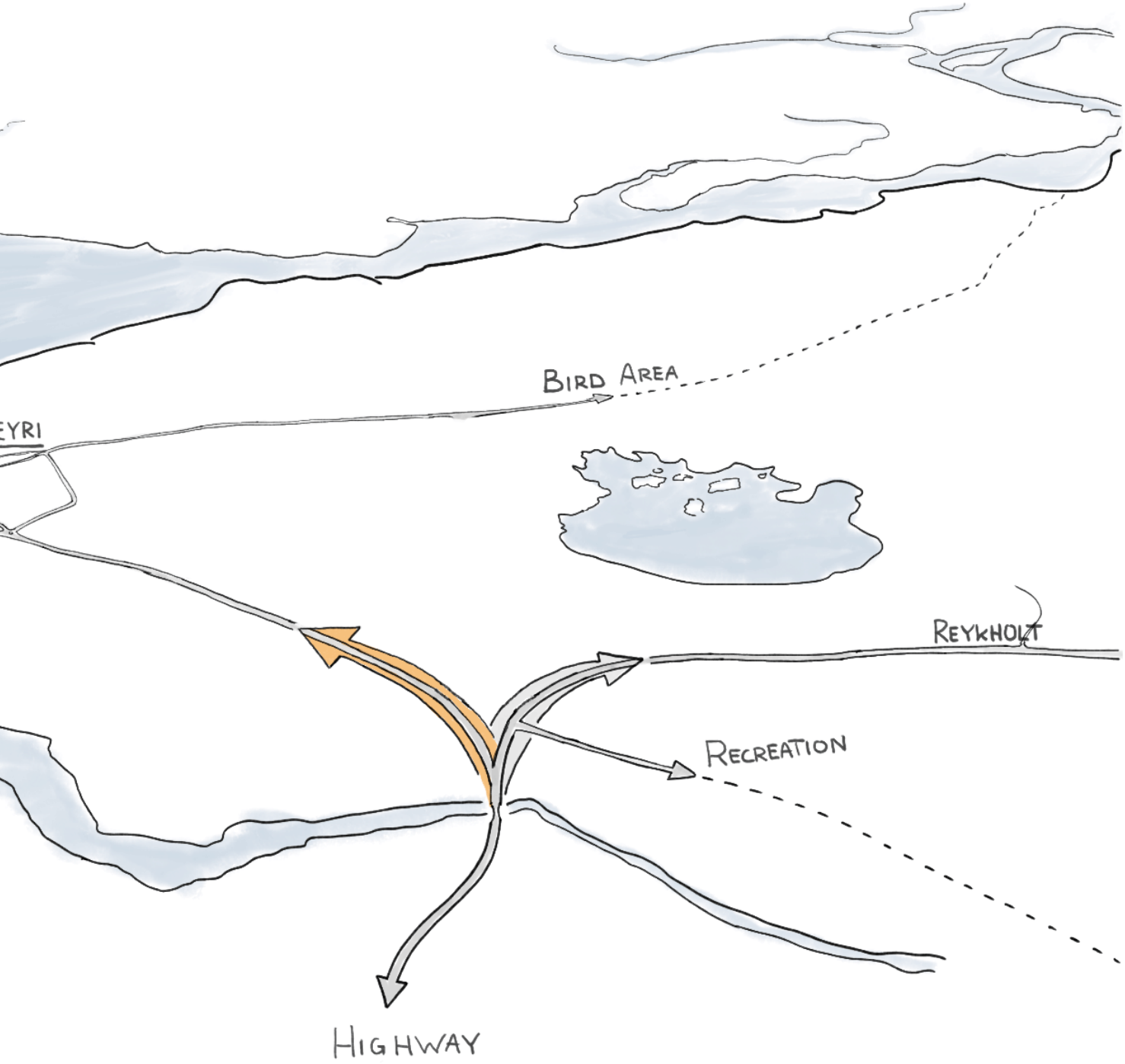
Besides this infrastructural intervention a programmatic design intervention is proposed. By connecting Hvanneyri to the ‘Green Circle’ from the ‘Eco-tourism as a Tool’-lens, the town could be part of something bigger. Making it a perfect stop for tourists and travelers.







Infrastructural intervention for connecting Hvanneyri to Route 53



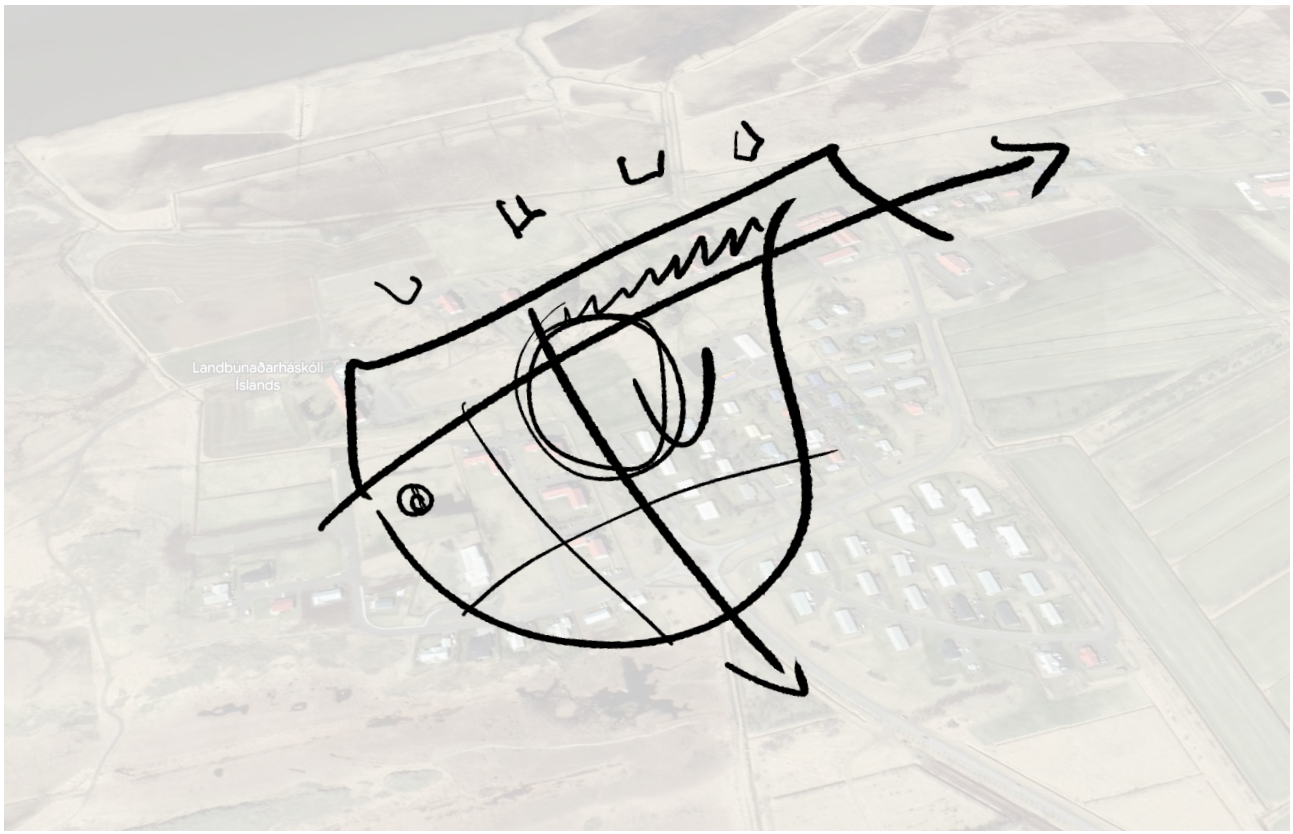
Lack of structure

Hvanneyri's current state shows a lack of organization and a coherent vision. At the center of the village, a grassy area is dotted with uses and spaces. Furthermore, the main entrance route leads to a roundabout without clear street hierarchy. In addition, the roundabout is the only connection between the three main roads, and two of them end in a dead end. Reorganizing the main streets and creating connections that reconnect these disjointed elements could significantly improve the village's overall quality.

Filling the gaps

The proposed design for the main structures addresses the issue of fragmented elements through multiple connections. First, a ring road is recommended as a way to connect various roads, get rid of dead ends, and create connections to wetlands. To make it simpler to access the heart of the town, the two roads leading to the village center will also be connected. The street profiles of these roads will be transformed, giving slow traffic priority to improve local movements and promote foot and bicycle traffic. A more pedestrian- and bicycle-friendly environment will result from this adaptation, which will also increase mobility and encourage interactions among local users.


Landbúnaðarháskóli
Íslands


Landbúnaðarháskóli
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Adding program

Hvanneyri, with its potential to become a regional center, requires an increase in population to accommodate additional functions and programs. The proposed redesign and zoning plan are visually represented in the provided zoning map. The additional program focuses on four categories: 'Education/Research,' 'Residential,' 'Food Production,' and 'Commercial.'

The arrangement of the main structures and program elements results in the formation of three distinct clusters: a knowledge-food production cluster in the Southwest, a residential-food production cluster in the Southeast, and a commercial cluster in the North. The program aims to foster self-sufficiency, promote education, and raise awareness about ecological food production (Russo & Cirella, 2019).

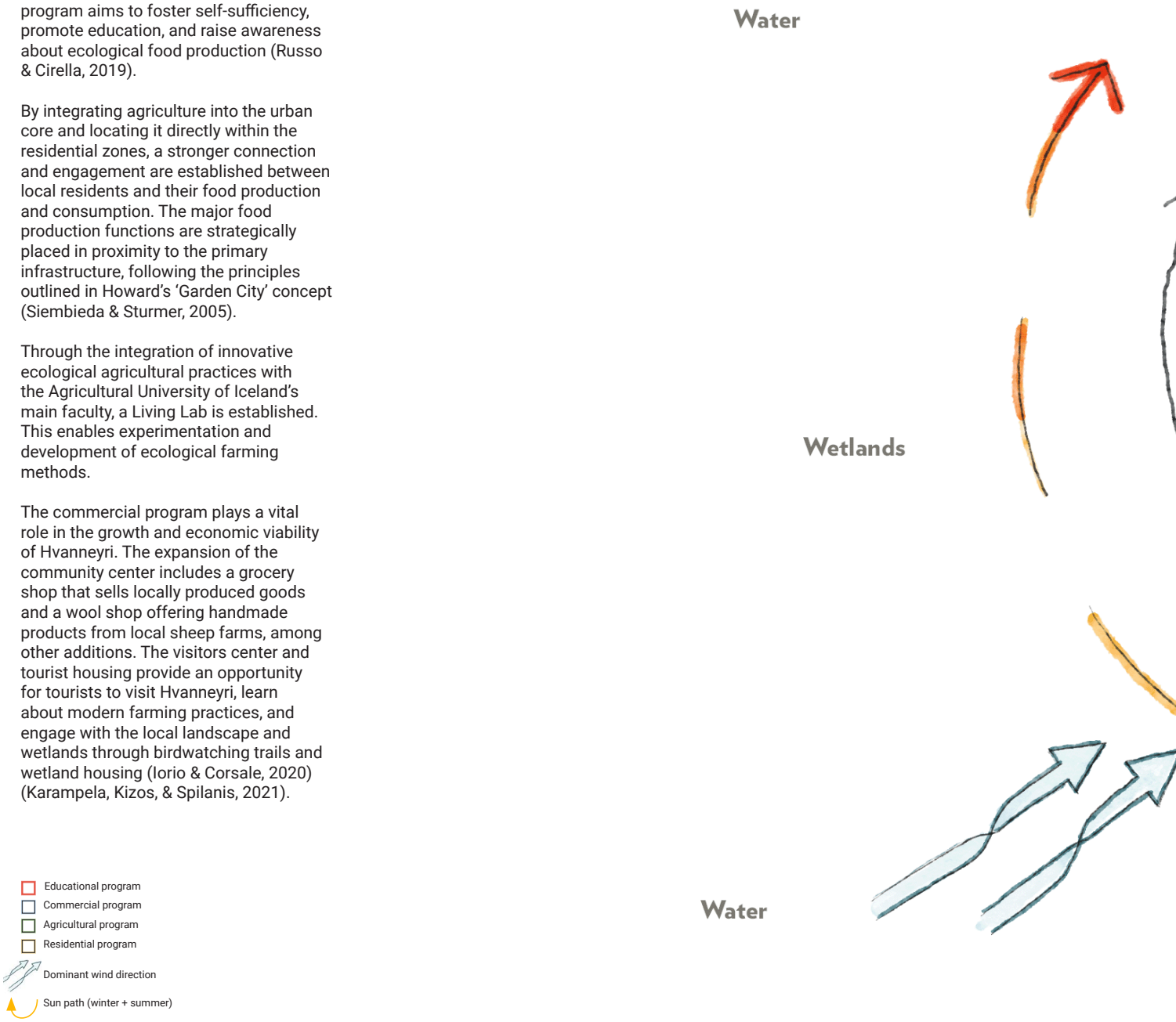
By integrating agriculture into the urban core and locating it directly within the residential zones, a stronger connection and engagement are established between local residents and their food production and consumption. The major food production functions are strategically placed in proximity to the primary infrastructure, following the principles outlined in Howard's 'Garden City' concept (Siembieda & Sturmer, 2005).

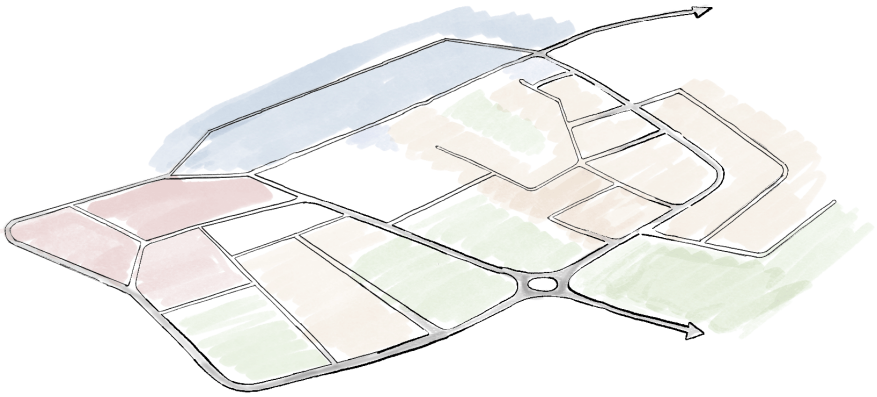
Through the integration of innovative ecological agricultural practices with the Agricultural University of Iceland's main faculty, a Living Lab is established. This enables experimentation and development of ecological farming methods.

The commercial program plays a vital role in the growth and economic viability of Hvanneyri. The expansion of the community center includes a grocery shop that sells locally produced goods and a wool shop offering handmade products from local sheep farms, among other additions. The visitors center and tourist housing provide an opportunity for tourists to visit Hvanneyri, learn about modern farming practices, and engage with the local landscape and wetlands through birdwatching trails and wetland housing (Iorio & Corsale, 2020) (Karampela, Kizos, & Spilanis, 2021).

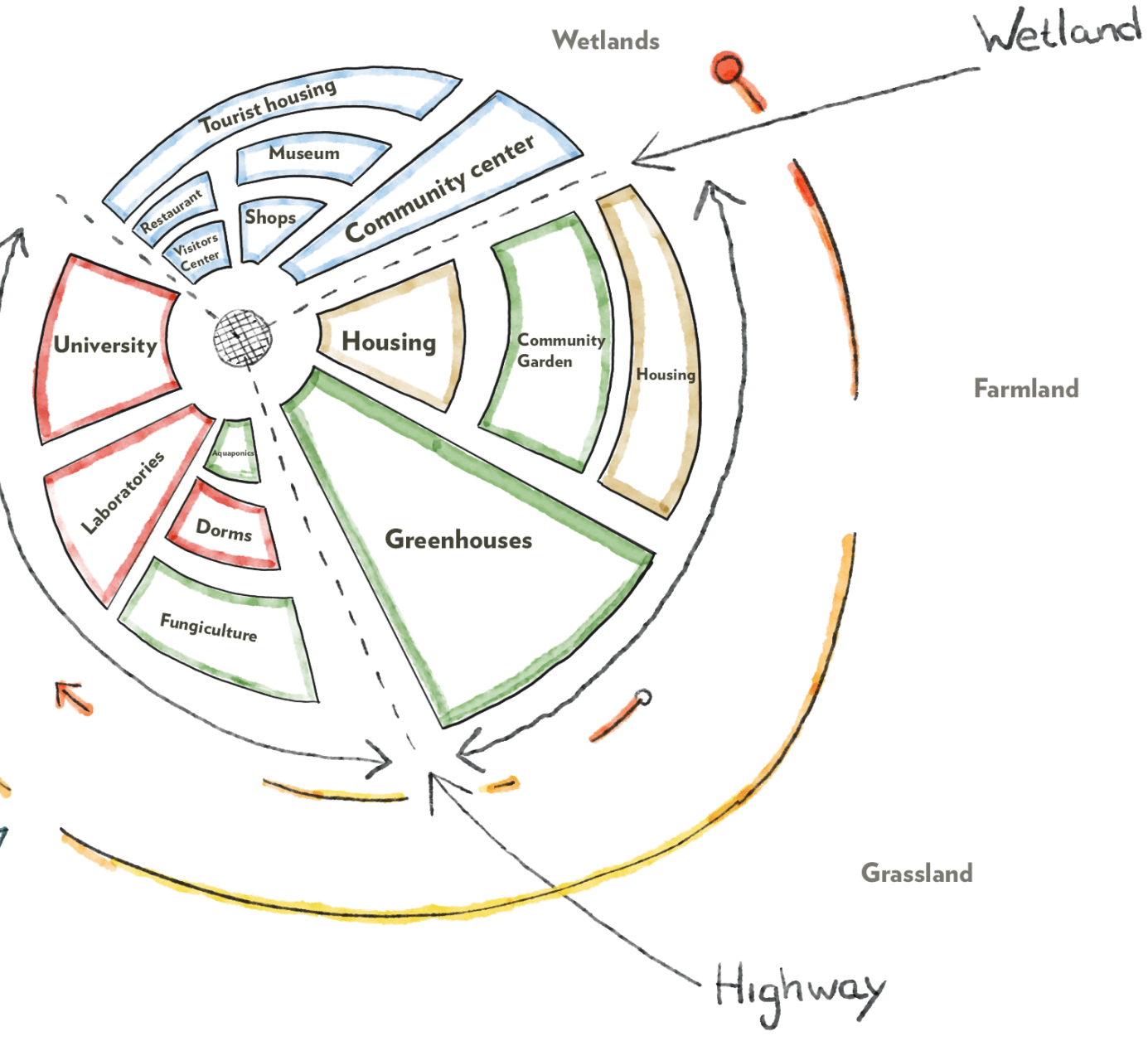


Zoning map translated to the situation





Zoning map with proposed new main structure



Planning the redesign

The design interventions for Hvanneyri aim to transform the village by rerouting infrastructure, introducing various functions and programs, incorporating green spaces, and enhancing the connection with nature. The following sequence describes the key elements of the design and their spatial integration within Hvanneyri:

1. The main structure of the design revolves around a central ring road that prioritizes motorized vehicles, connecting different zones within the village. Two main exit roads link Hvanneyri to the region, while smaller streets leading to the village center are designed for slower traffic, promoting walking and cycling.

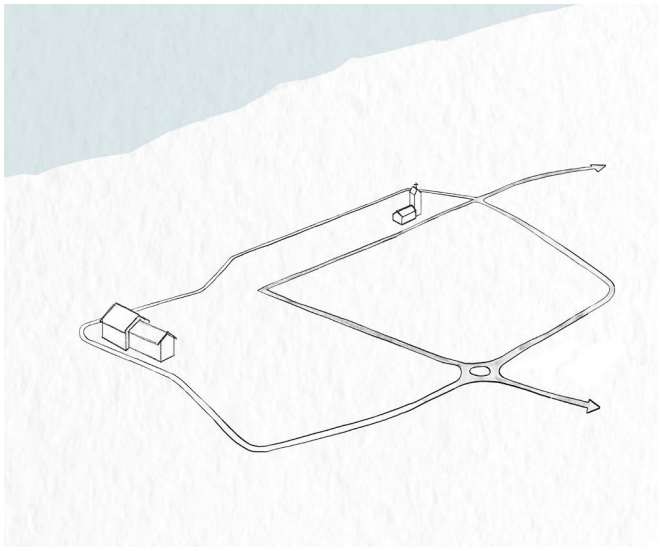
2. The village center is reimagined with two distinct main streets meeting at a central square. This design intervention resolves the current lack of structure and provides qualitative public space. The enclosed main square becomes an intimate gathering spot, surrounded by buildings dedicated to food production, education, residential, and commercial functions. This multifunctional square serves as a meeting point for diverse users, with the architectural typologies reflecting the functions they house.

3. Food production is integrated within the village borders through the inclusion of geothermally heated greenhouses. These greenhouses facilitate local food production and heighten awareness of food sourcing. Furthermore, space is allocated for innovative farming practices such as aquaponics, hydroponics, fungiculture, and algae production. The village becomes a Living Lab connected to the university, enabling research, improvement, and exploration of these ecological farming methods.

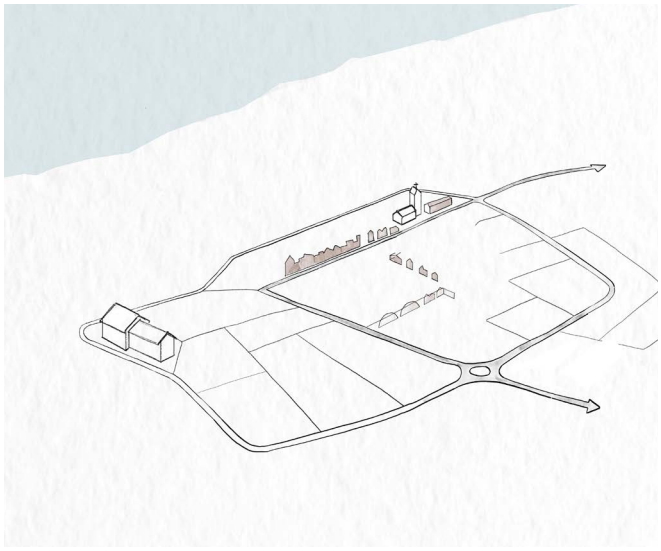
4. The campus is expanded to include additional research facilities and dormitories. By placing the university buildings amidst the innovative farming structures, a close relationship between research, education, and practice is fostered. A sports and cultural facility located near the main square provides opportunities for students to interact with each other and engage with the local community.

5. The connection to the natural environment is strengthened through the introduction of hiking trails within the wetlands. This ecologically diverse area attracts hikers and birdwatchers, with limited tourist accommodations available to generate income from eco-tourism. The funds generated can be reinvested in ecological food production research and the preservation of the natural landscape.

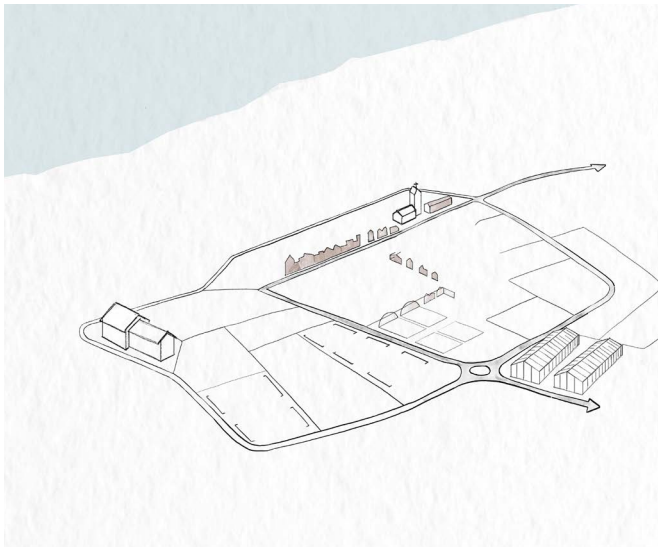
6. The residential area borders the main square and main street, forming a U-shaped configuration around a communal garden. This design allows residents to engage in recreation, socialize, and participate in food production. With a higher density than the current situation, the residential area ensures that all residents have direct access to public spaces, promoting a stronger sense of community.



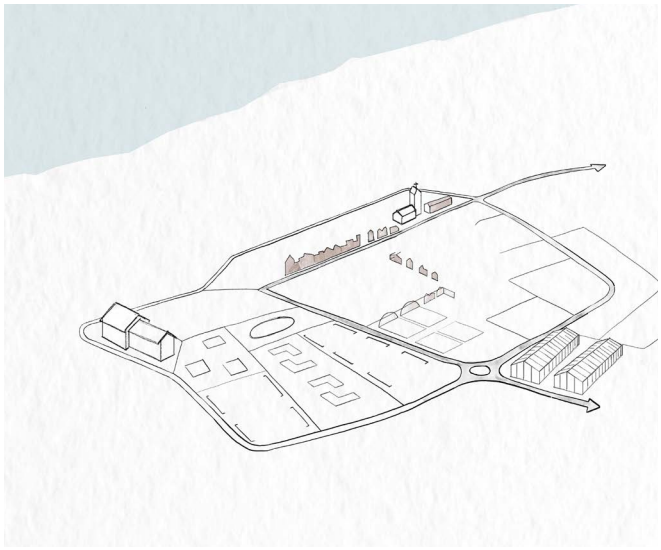
1. Introducing the new main structures



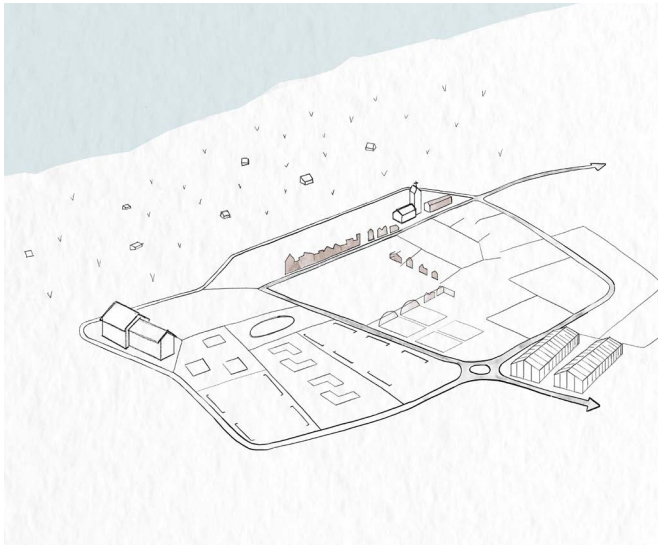
2. Creating a village center



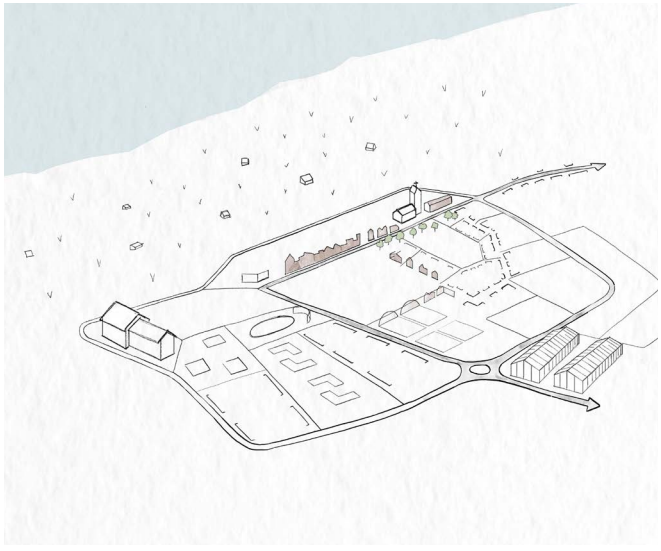
3. Introducing food production



4. Growing the campus



5. Introducing tourism in the wetlands

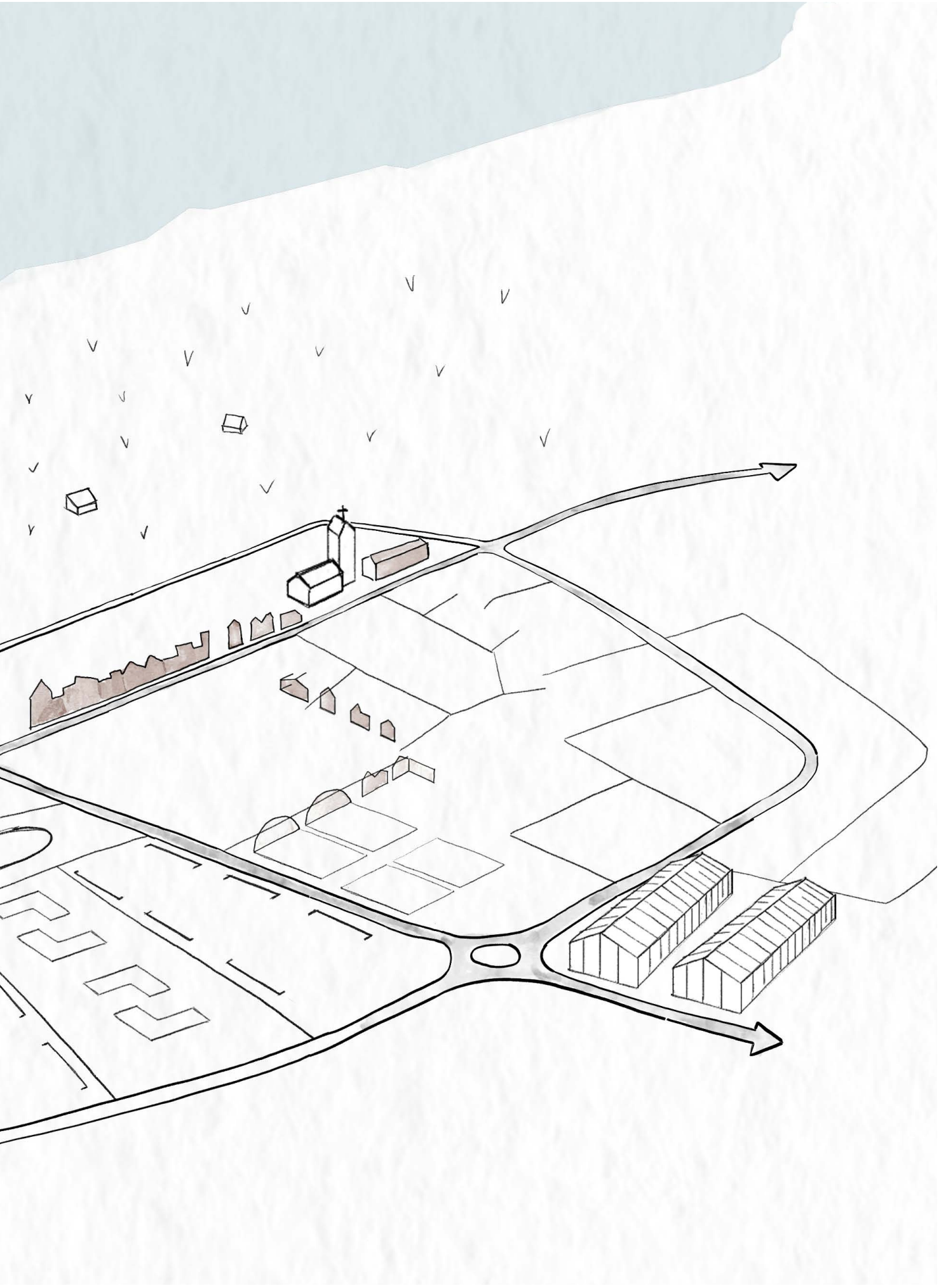


6. Redeveloping the residential area

Redesign of Hvanneyri

The proposed design for Hvanneyri entails extensive reconstruction intended to improve the community's livability, sustainability, and sense of connection to nature. Rerouting infrastructure, building a motorized ring road, and adding pedestrian-friendly streets to encourage cycling and walking are some of the major design interventions. Two main streets converge at a central square in the revitalized village center, which is encircled by structures serving agricultural, educational, residential, and commercial functions. The village incorporates greenhouses that are geothermally heated, promoting the production and awareness of local foods. In order to foster a close connection between academia and innovative farming techniques, the campus has been expanded to include research facilities and dorms. Hiking trails in the wetlands help people establish better connections with the outdoors, and the few tourist accommodations help promote eco-tourism.

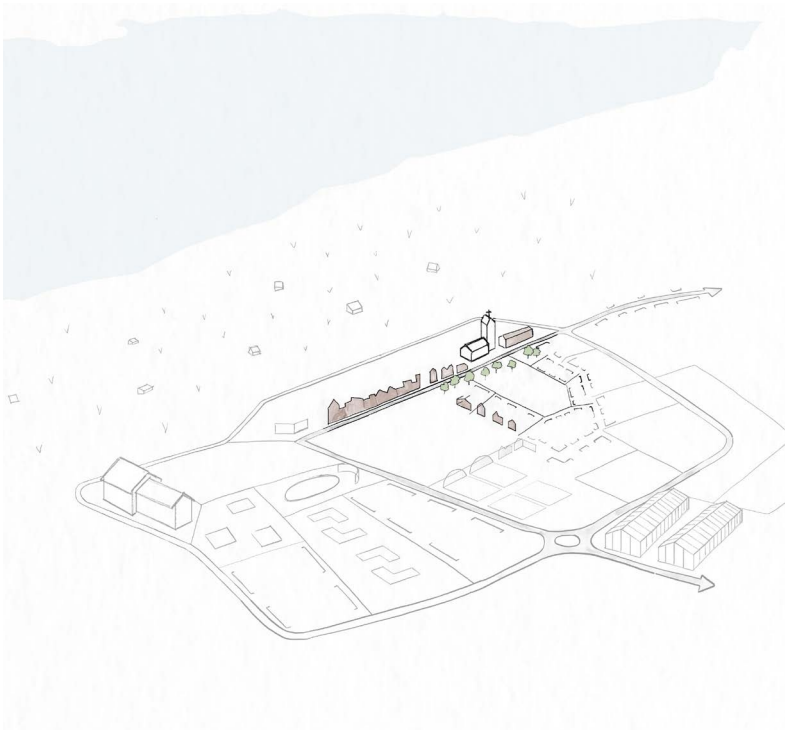


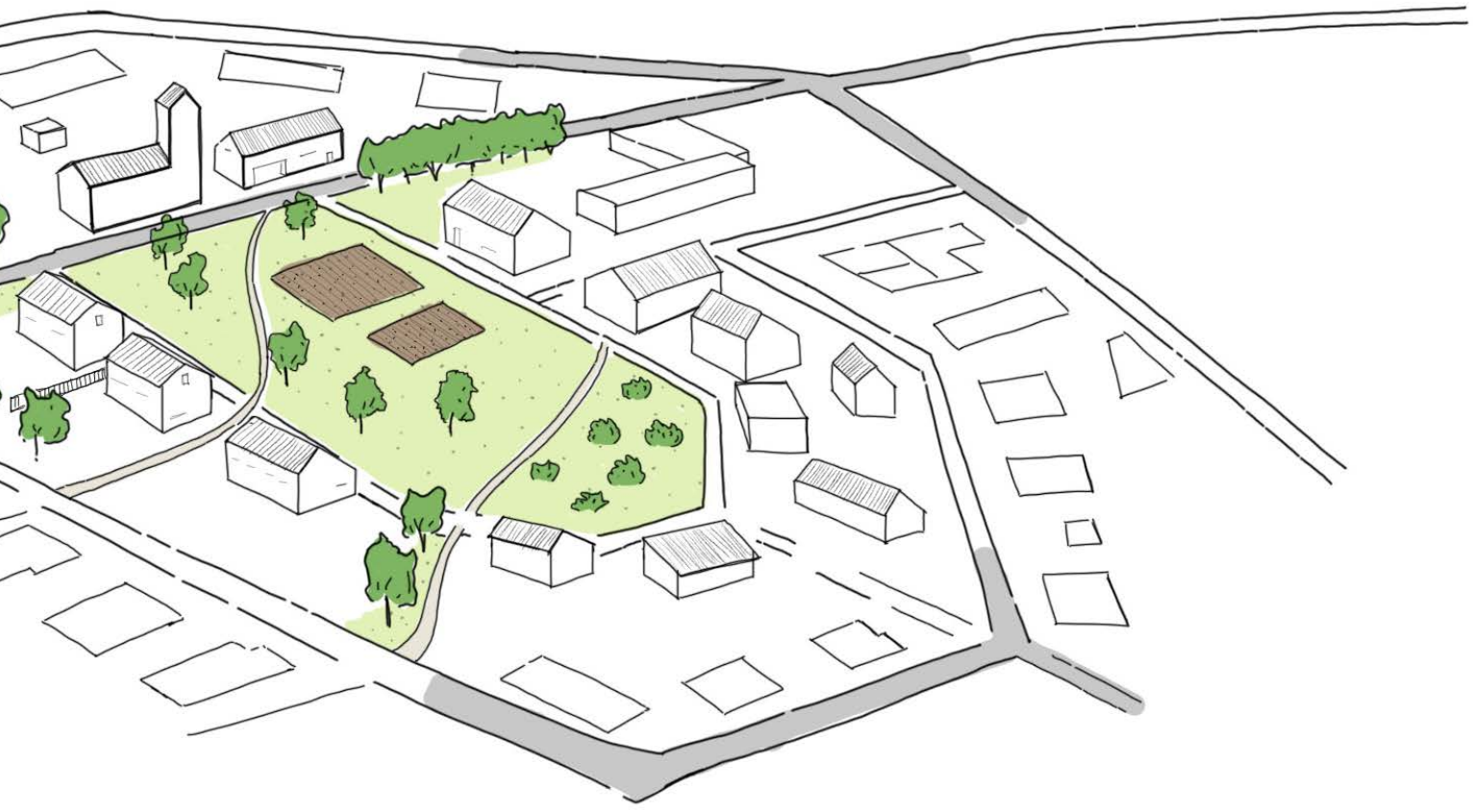




Birds eye view of residential area

A continuous green space connecting the communal garden with the wetlands, the main square and the residential area. The detached houses are aimed towards the community garden and are connected to the commercially and culturally focused main street.





3 Clusters

The Hvanneyri redesign can be divided into three main cluster as shown in the images. These impression show the spatial quality of those places together with specific design interventions per location.

Green campus

The Green Campus is a cluster existing of agricultural activities and educational functions. The cluster serves as a Living Lab for innovative food production practices, like aquaponic, hydroponics, fungiculture, geothermally heated greenhouses, algae production, and more. Besides this spaces for food production, this cluster facilitates for extensive student housing, directly connected to the Living Labs, new laboratories, a canteen, and sports facilities for the university.



Local Community

The main residential area will, similar to the university campus, have a strong relationship to the local food production. The cluster will be shaped in a U-shape, revolving around a community garden where people are encouraged to produce their own food. This common green space facilitates human interaction and improves the awareness and engagement between local residents and the agriculture sector. Besides that, local commercial functions as a local grocery store, wool shop, museum and café are placed along the street heading to the market square.



Nature & Tourism

The most northern cluster is focused on nature inclusive tourism. This area will be easily accessible by car and provide parking options to keep the village center and the wetlands car-free. The tourist accommodations are located in the wetlands and consist of typologies made from natural materials, heightened above the wetlands to have minimal influence on the local wildlife. The same accounts for the pathways.




HVANNEYRI
as a green campus
Agriculture Campus


HVANNEYRI
as a local community


HVANNEYRI
for nature & tourism
HVANNEYRI
Protected Wetland

Green Campus - design interventions

These interventions aim to promote innovative food production, improve campus facilities, create natural borders along infrastructure, establish a market square as a local center, encourage engagement with food production, and prioritize local movements and circularity within the village.

One key intervention focuses on implementing innovative food production methods on the campus. This entails utilizing a variety of food farming techniques, including fungiculture, aquaponics, hydroponics, and more. By adopting these innovative techniques, the campus develops into a center for cutting-edge agricultural practices, encouraging study and research into the production of sustainable food.

New high-tech campus buildings will be built to support the regional agricultural university. These cutting-edge facilities will offer the resources and infrastructure required to improve agricultural studies education and research. Students and faculty will be able to participate in cutting-edge agricultural practices thanks to the campus' modernization, which will encourage innovation and knowledge sharing.

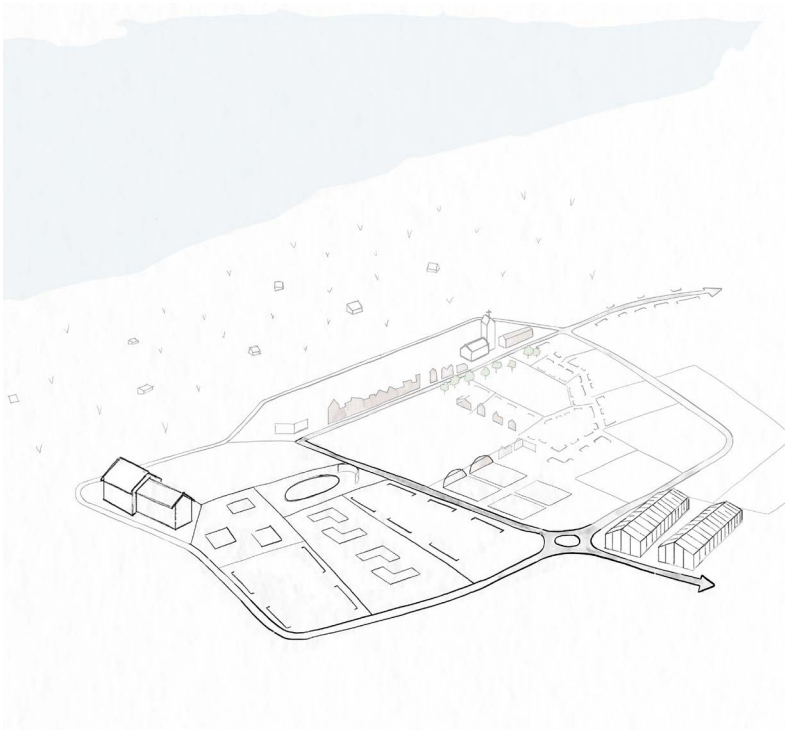
In line with the aim to harmonize the village with its surrounding natural environment, natural borders will be established along the infrastructure. This design intervention will create seamless transitions between the village and the surrounding nature, allowing elements of the natural environment to enter and merge with the village setting. The area's aesthetics and ecological harmony will be improved by this integration.

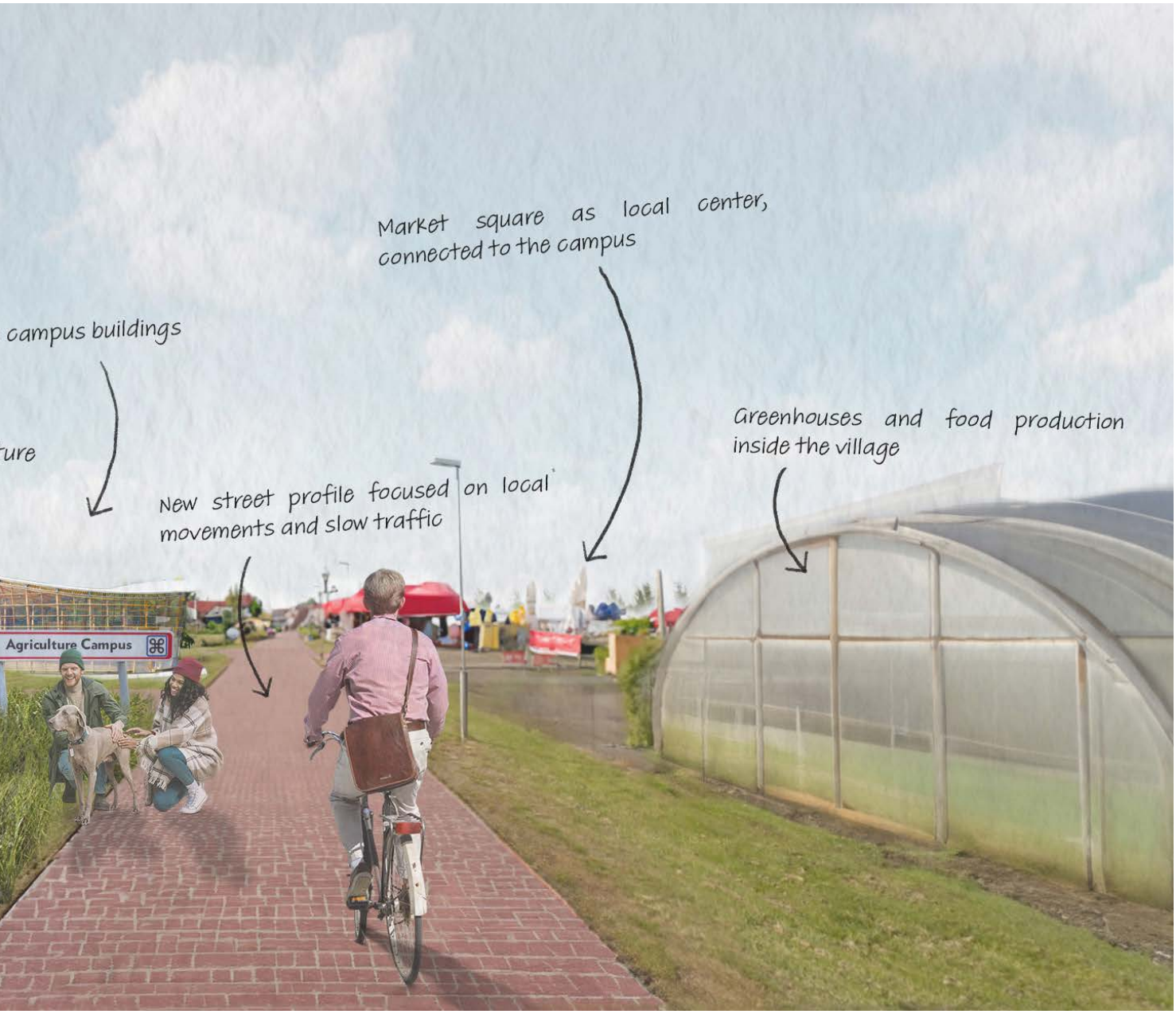
A market square will be created as a lively local center to act as the community's focal point. This focal point will act as a meeting place for locals and tourists, promoting social interactions, cultural events, and small-town business. The market square will enhance the vigor and identity of the community by transforming into a hive of activity and community involvement. (Biehl, Buzogany, Baja, & Neff, 2018).

In order to foster awareness and engagement with food production, greenhouses and food production areas will be established within the village itself. This initiative aims to bring food production closer to residents and students, promoting a deeper understanding of agricultural practices and fostering a sense of connection with local food sources. This integration will encourage collaboration and knowledge sharing between residents, students, and local farmers.

A new street profile will be implemented to prioritize local movements and slow traffic. This design intervention aims to create a pedestrian-friendly environment, enabling residents and visitors to move safely and comfortably within the village. By promoting local movements and circularity, the street profile will encourage sustainable transportation options such as walking and cycling, reducing reliance on vehicles and contributing to a greener, more livable community.






Market square as local center, connected to the campus
campus buildings
ure
Greenhouses and food production inside the village
New street profile focused on local movements and slow traffic
Agriculture Campus

Local Community - design interventions

The main residential area within the urban redevelopment project embraces a strong connection to local food production, akin to the university campus. The cluster is designed in a U-shape, centered around a community garden where residents are encouraged to cultivate their own food. This communal green space promotes human interaction, fosters awareness and engagement with the agriculture sector, and strengthens the sense of community. Additionally, local commercial establishments such as a grocery store, wool shop, museum, and café are strategically placed along the street leading to the market square.

Specific design interventions for the main residential area include:

Increasing Residential Density: By putting more residential areas within the village's boundaries, the goal is to boost population density and promote a stronger sense of community. Residents can interact more frequently as a result of this development, strengthening social ties and a sense of community.

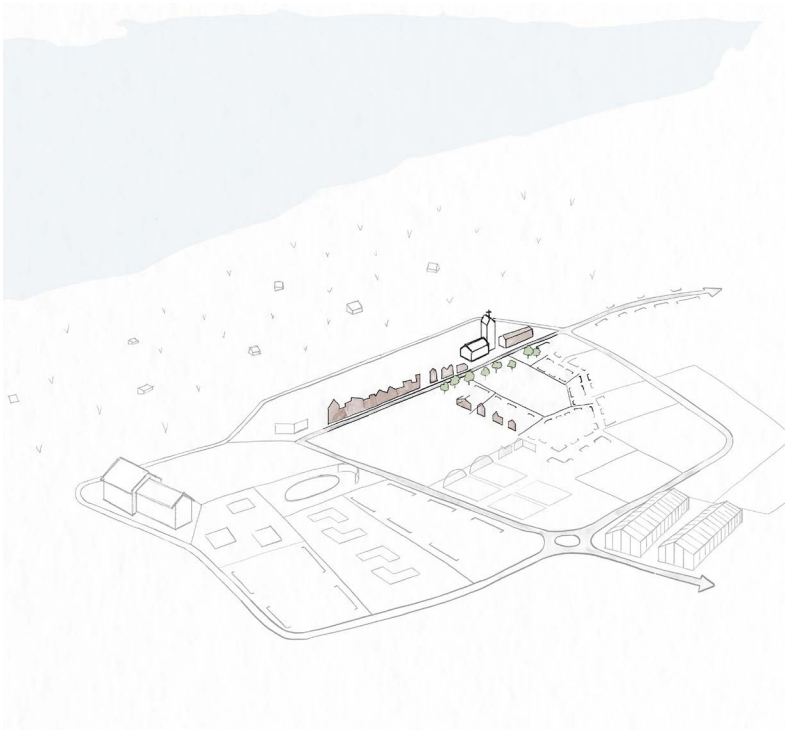
Community Garden: To promote recreation, social interaction, and food production, a designated community garden will be established. Residents are encouraged to actively engage in the process of growing their own food in this area, which promotes a deeper comprehension of food production and consumption. It acts as a platform for promoting sustainable agricultural methods. Through the practices of growing and sharing food in community gardens, a sense community is created (Holstein, 2017).

Street Profile Transformation: Transforming the street profile entails going from an 8-meter-wide asphalted road to a 2.5-meter-wide paved street with border profiles. This change aims to prioritize cycling and walking, improve human interaction, and create a more conducive environment for slow traffic. A sense of community and safety is promoted by the narrower street design, which encourages direct interactions between cyclists and pedestrians.

Local Businesses: There will be plenty of room set aside for neighborhood businesses, including a grocery store that sells products made in the village and the area around it. A café will also offer a community gathering place, and a wool shop will sell goods made with wool from the nearby sheep farms. These establishments serve to support the local economy and create opportunities for residents and visitors to engage with the community (Iorio & Corsale, 2020).

Through these design interventions, the main residential area of the urban redevelopment project aims to cultivate a vibrant and closely-knit community. The emphasis on local food production, the establishment of a community garden, the transformation of street profiles, and the inclusion of local shops contribute to an environment that encourages social interactions, promotes sustainability, and strengthens the connection between residents and the surrounding region.






Local shops and other communal functions along main street
ide village
Greenhouses and food production inside the village
Chaning street profile to focus on slow traffic

Nature & Tourism - design interventions

The nature & tourism area within the project focuses on creating a nature-inclusive tourism experience. This particular cluster, located in the northern region, is designed to be easily accessible by car, while prioritizing the preservation of natural spaces. Specific design interventions for this area include:

Parking Facilities: Parking facilities will be built at the boundary between the village center and the wetland reserve to maintain a car-free environment within these areas. This arrangement ensures visitors have easy access while maintaining the peace and beauty of both the village and the wetlands.

Low Density: To have as little impact as possible on the environment, the area will have very low density development. This strategy aims to maintain the natural areas' pristine qualities so that visitors can fully immerse themselves in the untouched surroundings.

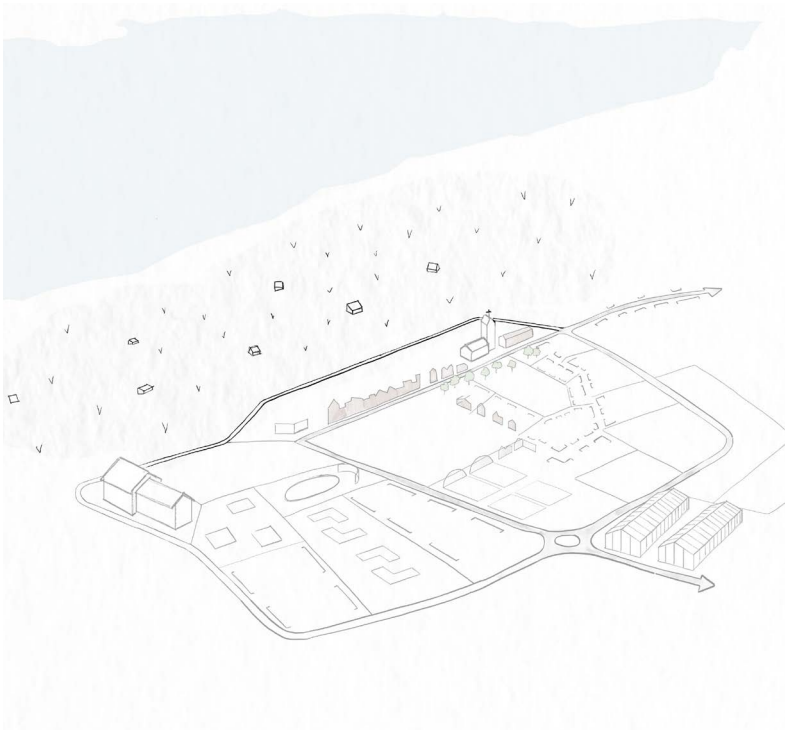
Elevated Pathways and Accommodations: There will be elevated walkways and lodging for tourists above the ground or water. The goal of this design intervention is to prevent unnecessary harm to the natural environment, to local wildlife, and to the wetlands' ecological balance.

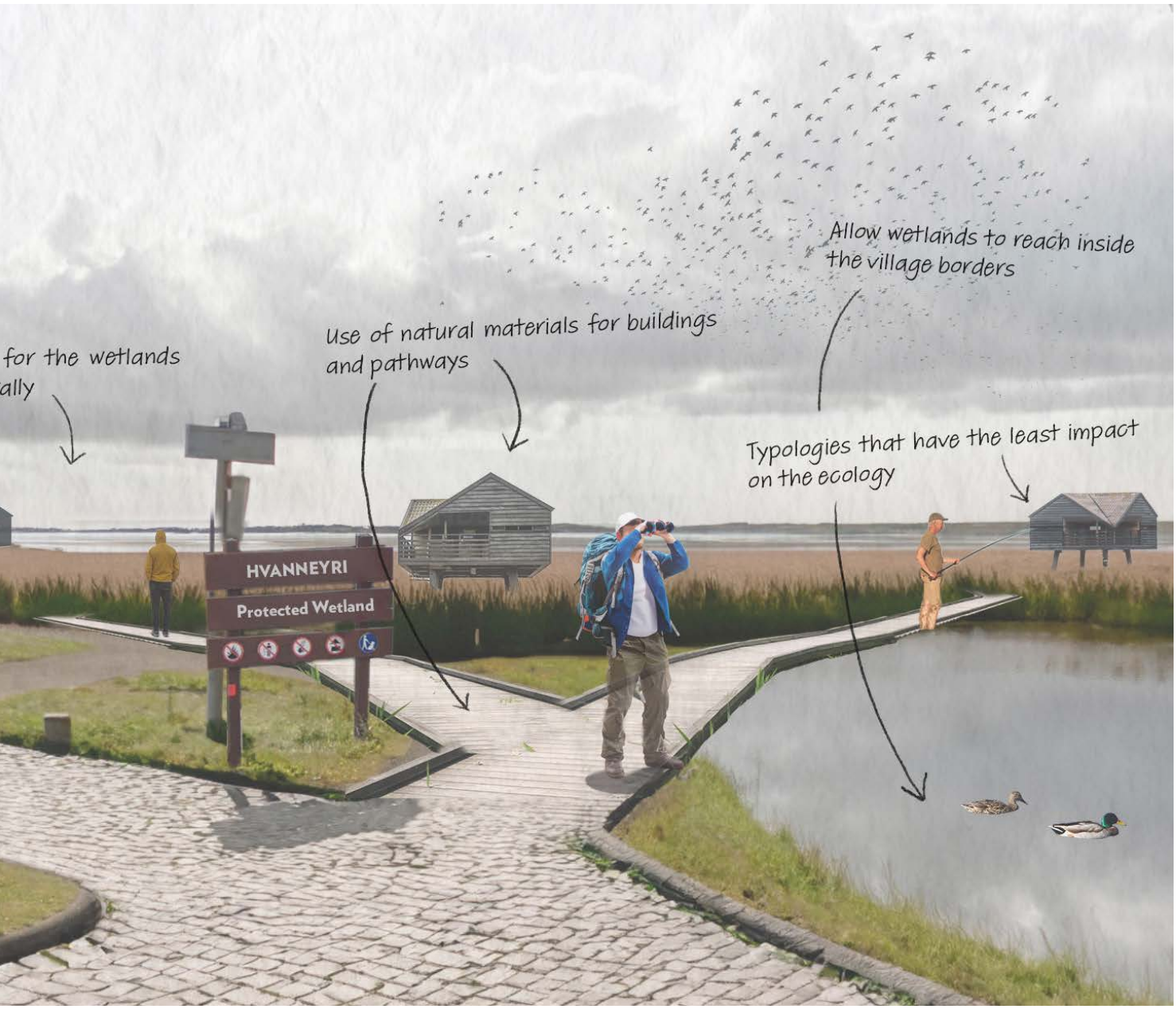
Use of Natural Materials:In order to blend seamlessly with the wetland environment, pathways and tourist accommodations will be built from natural materials like wood. The structures will have little effect on the local flora and fauna thanks to the use of natural elements, which also help them blend in with the landscape.

Integration of Wetlands into the Village: A gradient between the natural wetlands and the built environment is created, which extends wetland areas into the village borders. With this integration, the ecological connectivity will be preserved, biodiversity will be increased, and there will be a smooth transition between the village and the nearby natural areas.

These design interventions for the nature & tourism area of the urban redevelopment project prioritize sustainable tourism, environmental conservation, and the harmonious integration of human activity with the natural landscape. The implementation of car-free zones, minimal ecological footprint, elevated structures, use of natural materials, and the incorporation of wetlands into the village all contribute to creating a unique and immersive nature-based tourism experience while preserving the integrity of the natural surroundings.






for the wetlands
ally
Use of natural materials for buildings
and pathways
Allow wetlands to reach inside
the village borders
Typologies that have the least impact
on the ecology
HVANNEYRI
Protected Wetland

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Reflection

Reflecting on my experience with this IED-course for Hvanneyri in the Borgarbygð valley in Iceland, I am filled with a sense of accomplishment and growth. This project encompassed a wide range of elements, including both natural and unnatural landscapes, natural processes, and human interventions. The sheer breadth of the subject matter introduced me to numerous new academic materials and concepts, challenging me to expand my knowledge and understanding.

One of the significant challenges I faced throughout this project was the integration of an academic approach with the practical aspects of design. Balancing theoretical concepts with the realities of implementing them in a tangible way was a constant learning process. However, this combination proved to be highly educational, allowing me to bridge the gap between theory and practice.

Working collaboratively within a group to develop a shared vision was both interesting and at times demanding. Understanding the boundaries of individual responsibilities within the project was not always clear, leading to occasional confusion. Nonetheless, this experience taught me the importance of effective communication and clearly defining roles within a team setting.

Another hurdle I encountered was the lack of a defined scale and scope for the project. With no predetermined boundaries, it was challenging to determine where to begin. Eventually, I decided to focus on the smaller scale, even though it was not my usual preference. However, this choice aligned best with the overall strategy of the group, and it provided me with an opportunity to delve into the intricacies of designing for a complete village.

Throughout the project, I acquired a wealth of knowledge about programming, redesigning main structures, and infrastructure design for a village. Additionally, I developed skills in visualizing and presenting my design ideas effectively. Unlike my usual research and analysis-based approach, this project required me to think more creatively and present my concepts using tools like birds-eye view perspectives and collages. Although these methods were new to me, I embraced the challenge and expanded my repertoire of design techniques.

Overall, I consider this project to be a remarkable experience. The location itself was inspiring, and the collaboration within the workgroup and project team was exceptional. I am grateful to the course guides, lecturers, and guides who supported us throughout the journey. I also extend my gratitude to my project group for their dedication and cooperation throughout the project.

Giving a Dam about Austurland

East Iceland as an experimental zone for nature restoration and revitalization of local economies

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Vera Vince

2022-2023 IED
Infrastructure and Environment Design
July 2020



Hálslón,
Author: Ulrich Latzenhofer

Introduction

The region of East Iceland stands as a testament to the delicate balance between human progress and environmental preservation. However, the adverse effects of anthropogenic appropriation, such as the construction of dams for power generation and overgrazing, have created critical landscapes that demand immediate attention.

One example is the Karahnjukar Dam, built in East Iceland to harness power for the aluminum smelter. This imposing structure has fundamentally altered the landscape, transforming once-flowing rivers into subdued water bodies. Dams disrupt the natural habitat and migratory routes of aquatic species, leading to dwindling fish populations and affecting fishing communities. The reduced downstream flow also disrupts sedimentation patterns and nutrient distribution, causing further ecological disturbances.

Overgrazing has further contributed to criticalities in East Iceland. The relentless grazing by livestock, especially sheep, exceeds the carrying capacity of the land. This excessive grazing depletes vegetation, causing soil erosion and creating barren landscapes vulnerable to degradation. The trampling of hooves disrupts natural regrowth, leading to a decline in soil quality, decreased water retention, and loss of biodiversity. These changes impact the ecological balance and the livelihoods of communities dependent on these landscapes. The delicate balance of the ecosystem has been disrupted, with native flora and fauna struggling to survive amidst the deteriorating conditions. It is crucial to address these ecological challenges to restore the natural resilience of the region.

To ensure the success of this somewhat radical endeavor, an extensive knowledge and research sector will be implemented throughout the entire area. This sector will play a pivotal role in monitoring and understanding the effects of the proposed changes, including the influence of climate change on the environment. Through systematic data collection, analysis, and scientific exploration, this project will contribute to a comprehensive understanding of the complex interplay between human activities, environmental factors, and the overall well-being of East Iceland.

By dismantling the Karahnjukar Dam, revitalizing the primary economic sector, and nurturing a thriving knowledge and research sector, East Iceland aims to forge a new path towards a sustainable and resilient future. This holistic approach seeks to reestablish the harmony between human endeavors and the natural world, promoting ecological restoration, economic diversification, and scientific progress. Together, we embark on a transformative journey to reclaim East Iceland’s future, ensuring that generations to come can experience these unique landscapes in all their unspoiled wonder.

1.

Conceptual Framework

Context and Problem Field

Situated in the North Atlantic, Iceland is a nation known for its striking radical landscapes, natural beauty, geothermal energy, and robust fishing industry. Its eastern region, however, presents a rather complex picture. With landscapes ranging from the Central Highlands, with elevation exceeding 400 meters, are the location of the Karahnjukar Dam and the flooded Halslon Reservoir to the Fljotsdalur valley, a bustling center for agriculture, tourism and reforestation efforts, and where Egilsstaðir, the region's largest town, is located. The fjords are dotted with small fishing towns, including Seyðisfjörður and Reyðarfjörður, the latter hosting the Alcoa aluminum smelter.

In recent years, the establishment of the Karanjukar Dam and the Alcoa aluminium smelter in East Iceland has altered both the region's economy and natural state. It is important to note that the smelter employs some 450 local people, and is an important part of the national and global material economy. However, Iceland is undercharging greatly for both the energy, location and human resources which the smelter relies on. Even though in theory, aluminium is „the green metal", in reality its production and life cycle pose many environmental issues, from the bauxite mining process producing toxic chemicals which pollute the waters at extraction and refining sites, to problematic working conditions in the mining, processing and smelting facilities. The Alcoa smelter does not partake in any recycling activities, regardless of the fact that aluminium is infinitely recyclable and recycling requires only 5% of the energy needed for initial production.

The dam was built in 2007, exclusively to power the smelter. Even though initially, Icelandic Minstry of Environment denied to issue a licence due to a report stating it would cause irreversible damage to sensitive ecosystems, the decision was later changed due to political pressure. Five years after it was completed, a new report came out, stating the dam is responsible for a total ecosystem decline in the Lagarfljot lake. It has also resulted in the formation of dust clouds, adversely impacting air quality and posing health risks to humans and wildlife. Moreover, the dam was built over an active fault, putting the infrastructure and the downstream communities at risk in case of an eruption or earthquake.

Simultaneously, the valley around the Lagarfljot Lake is a key region for sheep rearing. Sheep are a part of Icelandic identity, landscape and daily routine, however the overgrazing has all but decimated Icelandic forests over the years, and now it is causing soil erosion that has led to desertification and landslides. High winds are not rare in East Iceland, particularly in the highlands, although topographical features can also cause strong gusts of wind in the lowland areas. Combined with all the aforementioned issues, these can cause extreme dust storms, some of which have even reached the continent. Further potential impacts of climate change, including raising sea levels, drier summers and glacier melt, could have profound consequences for the area.

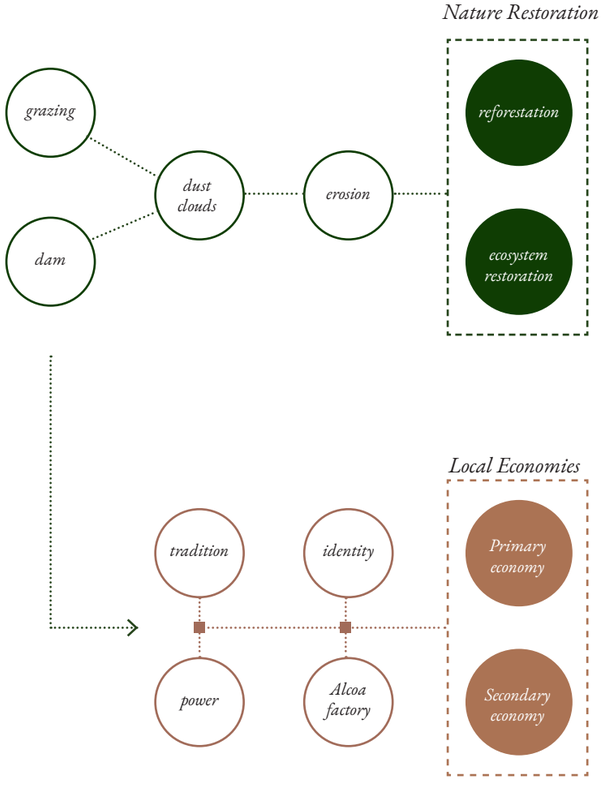
Problem Statement

Anthropogenic appropriation of natural landscapes for resource extraction, such as the construction of the Karanjukar Dam and the establishment of the aluminum industry, has led to the creation of critical landscapes in East Iceland. These critical landscapes are characterized by severe environmental degradation, including the formation of dense dust clouds, air pollution, declining ecological integrity of lakes and aquatic ecosystems, desertification, erosion, and landslides. The delicate balance of the ecosystem has been disrupted, threatening the survival of native flora and fauna. These adverse effects highlight the urgent need to address the consequences of anthropogenic appropriation and restore the natural resilience of the region.

WEFM conflicts	*Food - Soil - Water*	*x*	*Energy - Soil - Water*
Native Ecosystems	 Birch forests		 Jökla rivers, Lagarfljót lake
Anthropogenic Appropriation	 Extensive livestock grazing		 Kárahnjúkar dam
Critical Landscapes	 Densification & dust storms		 Dust clouds

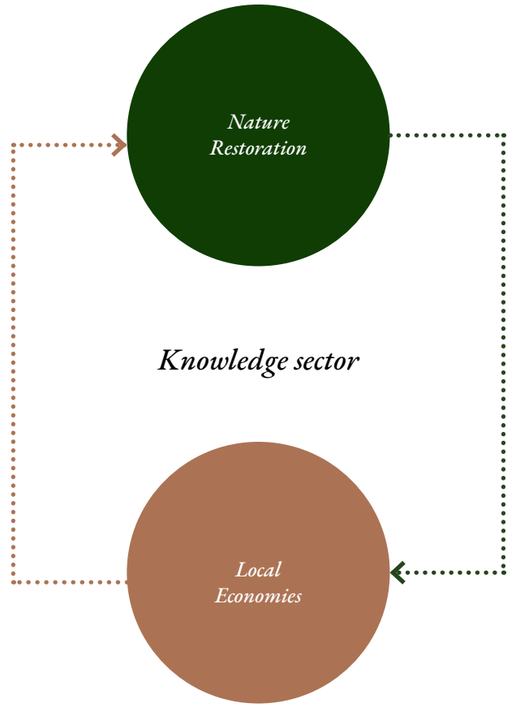
Aims of the Project

The aims of this project are to dismantle the Karahnjukar Dam, revitalize the primary economic sector, and nurture a thriving knowledge and research sector in East Iceland. By doing so, the project aims to promote ecological restoration, economic diversification, and scientific progress. Through systematic data collection, analysis, and scientific exploration, the project seeks to understand the interplay between human activities, environmental factors, and the overall well-being of East Iceland. The ultimate goal is to forge a sustainable and resilient future, reestablishing harmony between human endeavors and the natural world, and ensuring the preservation of this unique region for future generations.



Concept of the project

The project is founded on the idea of a network of feedback loops, in terms of material, knowledge and ecosystem feedback loops continuously moving the project forward. The main base for this is the nature restoration itself, but the connecting tissue and the most valuable output is the knowledge experiment which seeks to understand and modify the project itself.



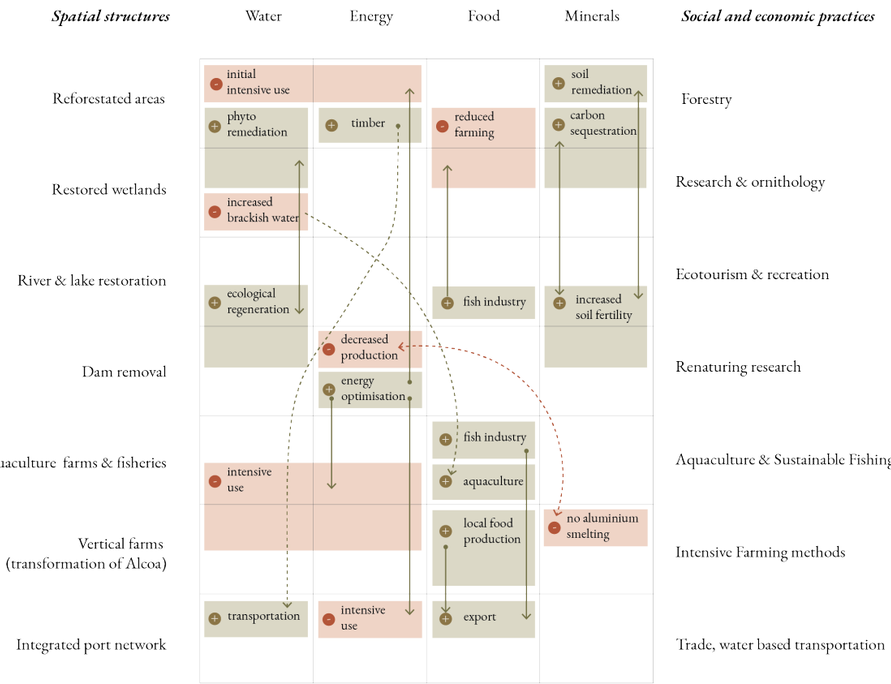
Referential Theories and Practices

Studying the historical development to understand the impact of the critical processes through the process of mapping the palimpsest, better understanding of the conflicts of the anthropogenic activities was possible. The idea of scripting and rescripting of the landscape by human interventions provides the frames in time which can be used to identify conditions we can regain using design projections. The project also proposes the interventions that require a large scale of time to fully operationalise. The impacts and processes of the design projections are time dependent in terms of sequencing and also forming conditions to react to uncertainties. The concept of long durée, coined by Braudel in 1958, is used to investigate the long-term effects and potentials of the solutions. The ability to plan and explore over long periods of time gives up avenues of investigation that would be hard to pursue under shorter time limitations. Technological opportunities that can be developed and realised can be explored over longer periods of time. Extreme thinking enables for pushing the frontiers of design thinking, imagining alternate futures, and transforming pedagogical approaches (Vigano, 2010).

The primary theoretical concept is to strike a balance between landscapes as infrastructure and infrastructure as landscapes. When landscapes are viewed as infrastructures, design initiatives can be launched that alternate between short instant interventions that are gradual and sequenced over a long period of time with significant geopolitical and ecological consequences. Infrastructures, if landscapes, can be strategic interventions that span extremely brief and instantaneous intervals across several scales. (Bélanger,2013)

Ecological rationality is the ability of human and natural systems to deal with the ecological and urban problems of complexity, irreducibility, time and spatial fluctuation, and uncertainty. (Viganò, 2013). Territorial resilience is strengthened by several mechanisms that manifest various forms of ecological rationality as infrastructures. The territorial organisation is the spatial function of this rationality.

The Water-Energy-Food (WEF) Nexus seeks to depict the intricate and interconnected structure of our world's resource systems. (FAO, 2014). Extraction operations have always been subjected to inorganic capital accumulation and local climatic conditions, resulting in surpluses and scarcity of far too many resources (Hickel et al., 2022). The WEF Nexus strategy attempts to operationalise integrated resource management by identifying trade-offs and synergies between resource extraction processes.



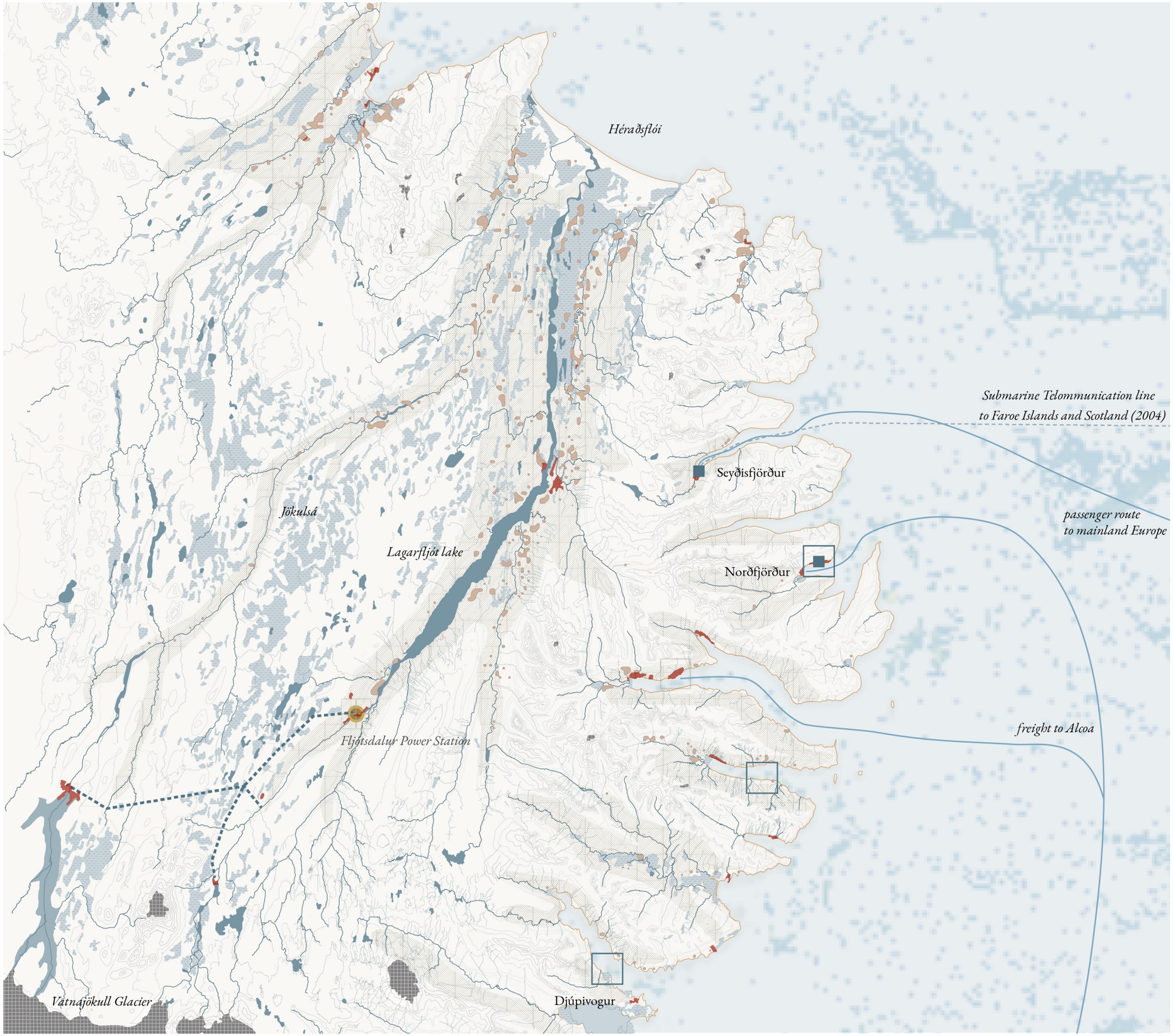
2.

Critical Landscapes & Tectonics

Mapping WEFM

Iceland itself is an island rich in water, energy and food. Looking at the WEFM maps, we can see East Iceland can also boast an abundance of a wealth of water elements, including glaciers, rivers, lakes, and rich wetland habitats. The region also enjoys easy access to the sea, further enhancing its potential for water-related activities and industries. Moreover, while East Iceland may not be as geothermically active as other parts of the country, it still possesses significant reserves of cold temperature geothermal sources, making it a valuable energy hub. Also, the construction of the Karanjukar dam and hydro power plant make it one of the most energetically productive areas. Food-wise, the region has been historically known for its fishing industry. Even though in recent times the fishing has somewhat reduced, it still supplies a large amount of goods both locally and island-wide. Other than that, the Fljotsdalur valley is the home of many sheep and livestock farms. Even though minerals are rarely mined on a large scale in Iceland, there are many extraction sites for gravel, used in building and road construction.

Water


Héraðsflói
Jökulsá
Lagarfljót lake
Fljótsdalur Power Station
Vatnajökull Glacier
Seyðisfjörður
Norðfjörður
Djúpivogur
Submarine Telommunication line
to Faroe Islands and Scotland (2004)
passenger route
to mainland Europe
freight to Alcoa
Sea bathymetry
Rivers and streams
terrain
Intensive fishing
Wetlands
Disturbed wetlands
Water body
Glacier
Historical forests
Urban settlements
Hydropower plant
Ports
Closed cage fishery
Submarine cable
Marine transport
Roads
Higlands boundary
N
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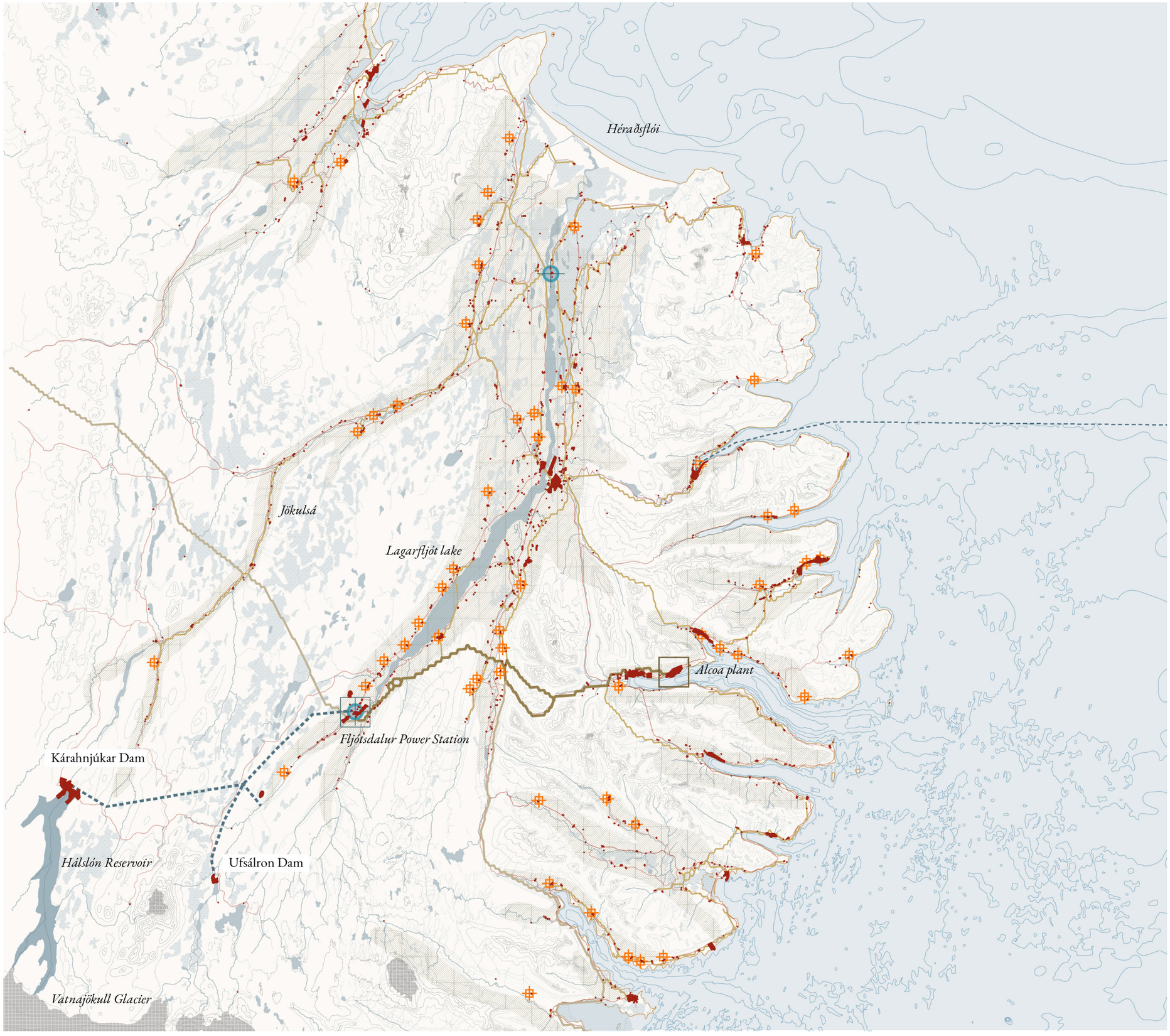
10 km

Energy


Héraðsflói
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Lagarfljót lake
Alcoa plant
Fljótsdalur Power Station
Kárahnjúkar Dam
Hálslón Reservoir
Ufsálron Dam
Vatnajökull Glacier
Domestic geothermal plants
Electric lines
Sea bathymetry
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Ports
Closed cage fishery
Submarine cable
Marine transport
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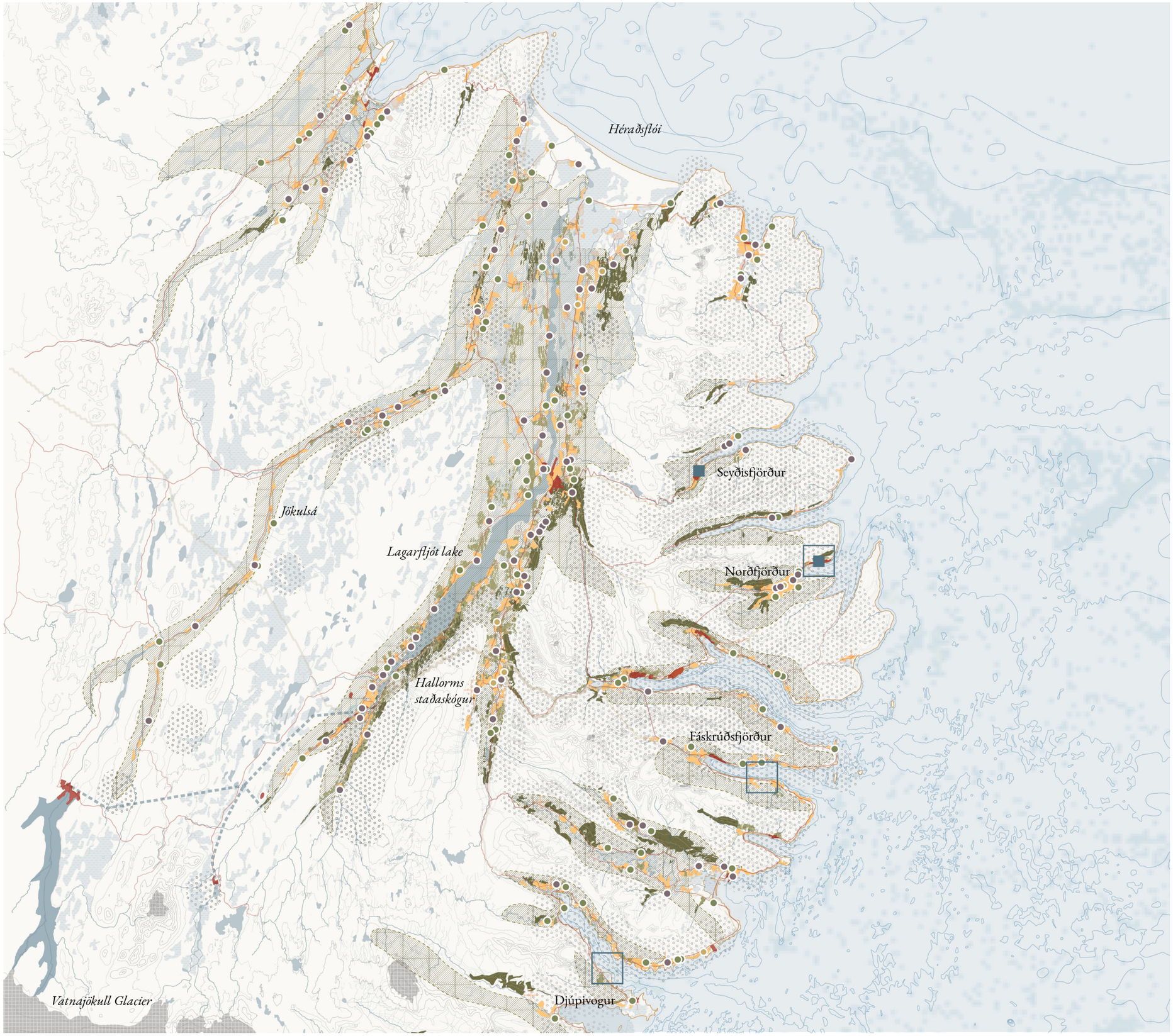
Food


Héraðsflói
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Jökulsá
Lagarfljót lake
Norðfjörður
Hallorms
staðaskógur
Fáskrúðsfjörður
Djúpivogur
Vatnajökull Glacier
Agriculture
Sheep farms
Horse farms
Cattle farms
Sea bathymetry
Rivers and streams
terrain
Intensive fishing
Wetlands
Disturbed wetlands
Water body
Glacier
Historical forests
Urban settlements
Hydropower plant
Ports
Closed cage fishery
Submarine cable
Marine transport
Roads
Higlands boundary
N
0
10 km

Minerals


Héraðsflói
Seyðisfjörður
Jökulsá
Lagarfljót lake
Norðfjörður
Fljótsdalur Power Station
freight to Alcoa
Vatnajökull Glacier
Djúpivogur
Sand
Fine chemicals
Gravel
Sea bathymetry
Rivers and streams
terrain
Intensive fishing
Wetlands
Disturbed wetlands
Water body
Glacier
Historical forests
Urban settlements
Hydropower plant
Ports
Closed cage fishery
Submarine cable
Marine transport
Roads
Higlands boundary
N
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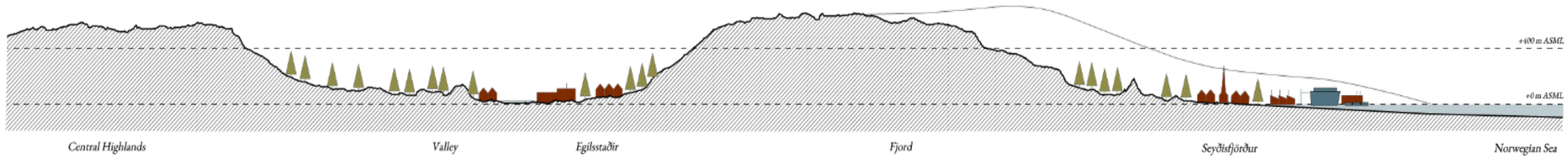
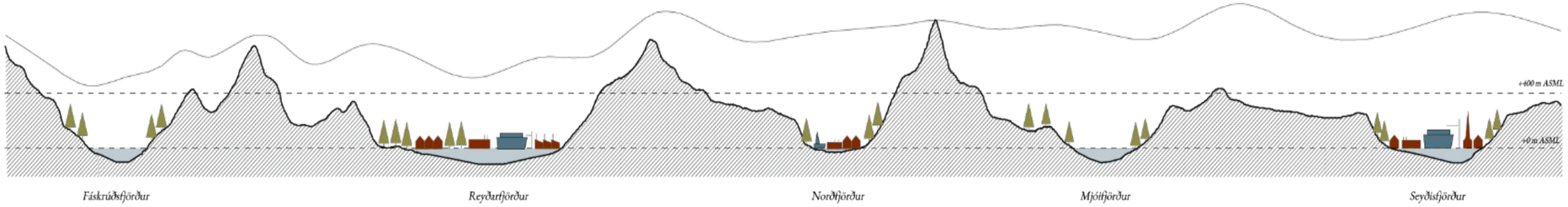
10 km

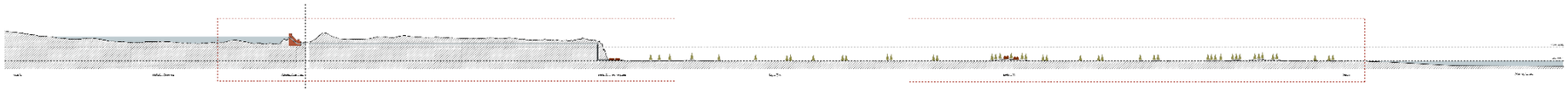
Landscape composition
Valley and fjords

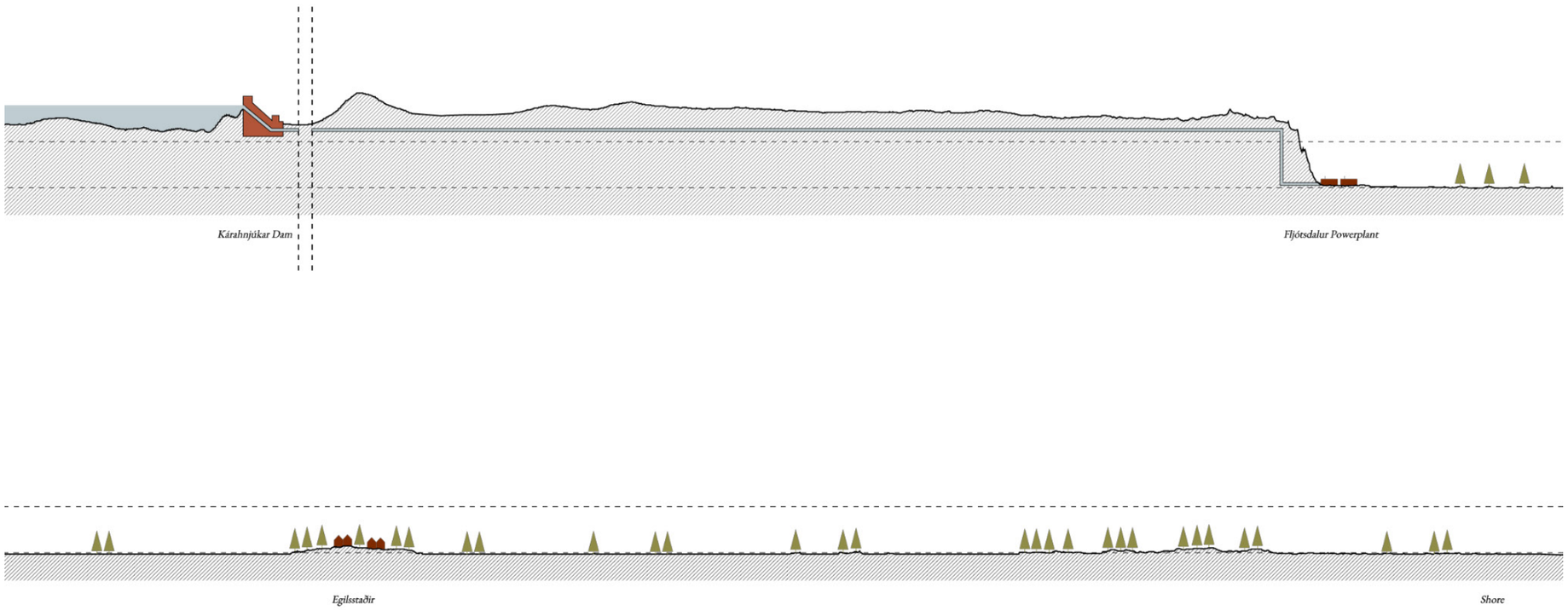






Landscape composition
Highlands and valley





Palimpsest

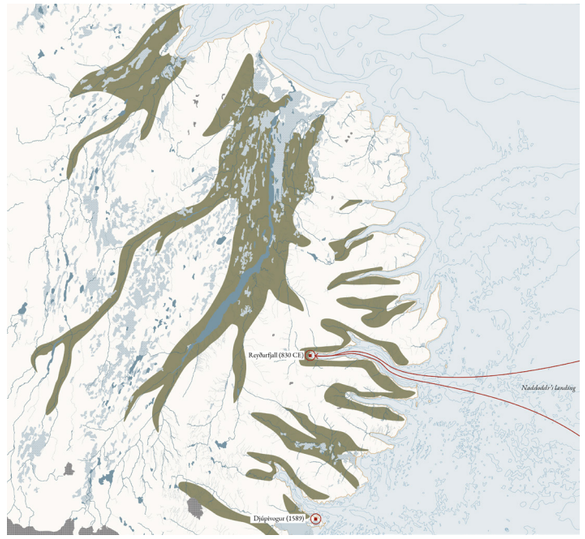
The anthropogenic alteration of Iceland’s natural landscape began later compared to other European countries. Therefore, the first layer of the palimpsest dates back to 870 CE, when the initial Icelandic settlers arrived, and the untouched nature prevailed.

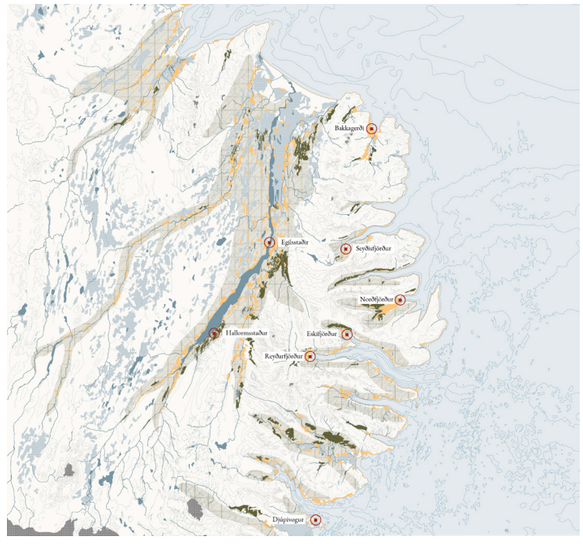
During the pre-human era, it is estimated that approximately 20-30% of Iceland was covered in forests. In the context of Northeastern Iceland, this means that most of the valley and fjord areas below 400 meters were forested. Wetlands were also prevalent in the valleys.

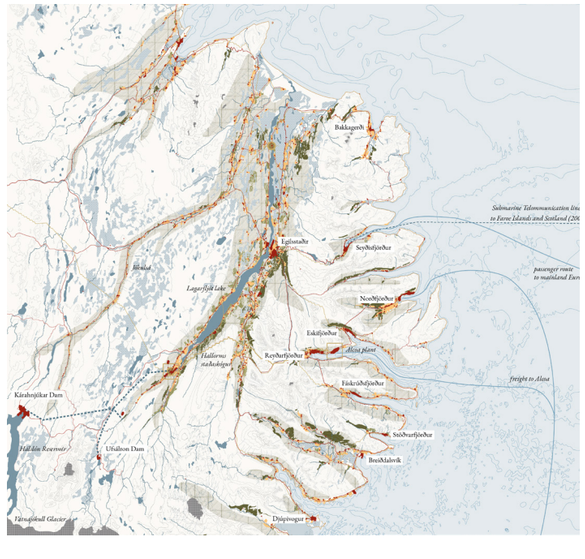
By the beginning of the 20th century (1900), almost all the forests had disappeared due to human activities. The wood was extensively used for construction, fuel, or overgrazed by sheep. The cold and extreme climate and occasional Vulcanic eruptions preventing any natural regeneration of the forest and therefore only 1% of the forest remained. At this time, there were no significant settlements in Northeastern Iceland, and the island remained relatively isolated from other countries.

In the post-war era, the urbanization rate increased significantly and bigger settlements started to emerge. The population grew from around 60,000 to 280,000 people and infrastructure development surged between 1900 and 2000. Within the valley Egilsstaðir emerged as the main city.

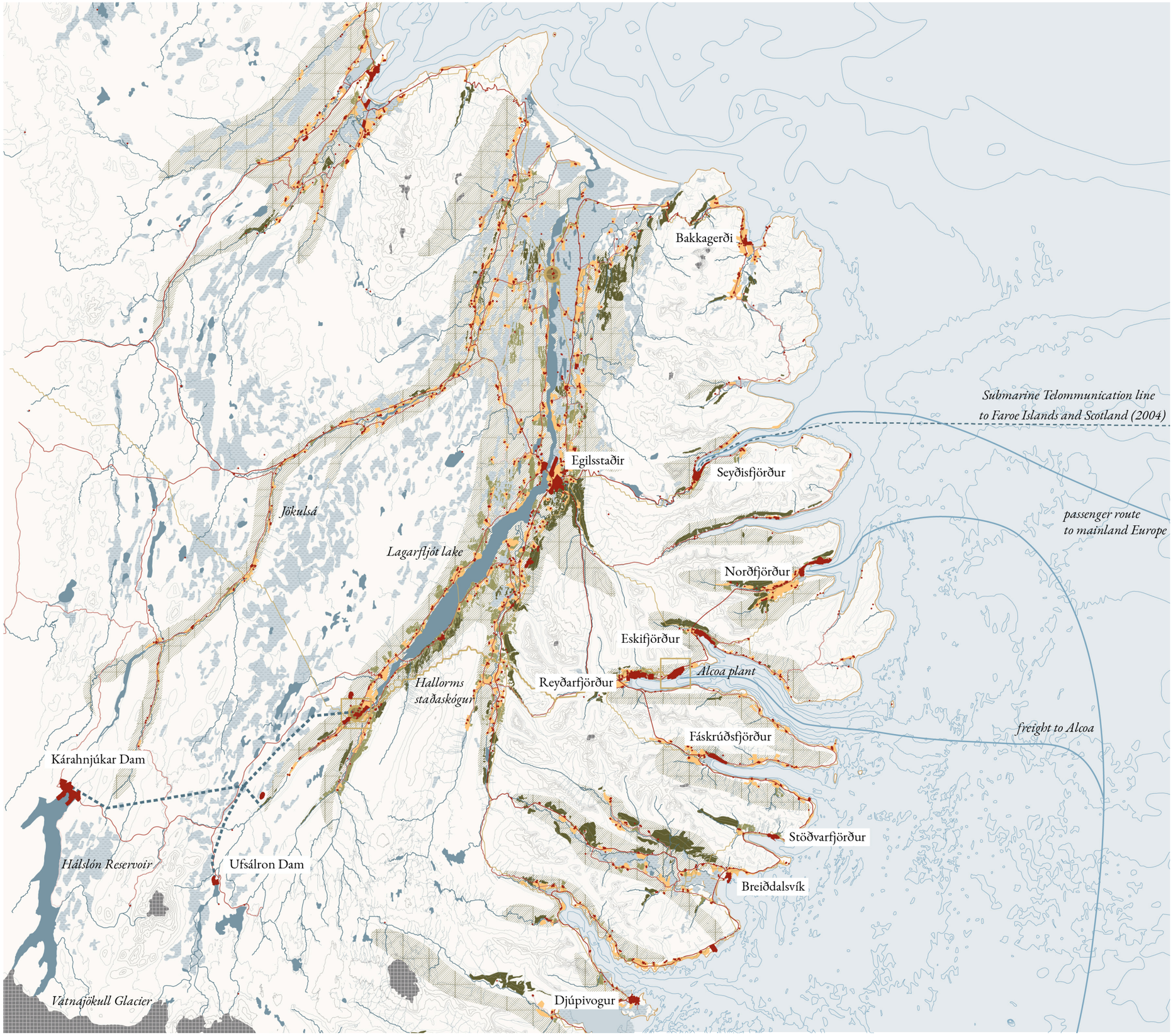
As of 2021, the last two decades have witnessed significant changes in the region. Notably, the arrival of the Alcoa plant and the construction of a dam and reservoir for aluminum smelting have had a profound impact. This has resulted in a major demographic shift. Prior to the construction of the Alcoa factory in Reyðarfjörður, the population was declining, but since its establishment, the population has been growing. The factory currently provides 450 direct and 300 indirect jobs. But the economic growth came at a costs for the nature and biodiversity within the area.







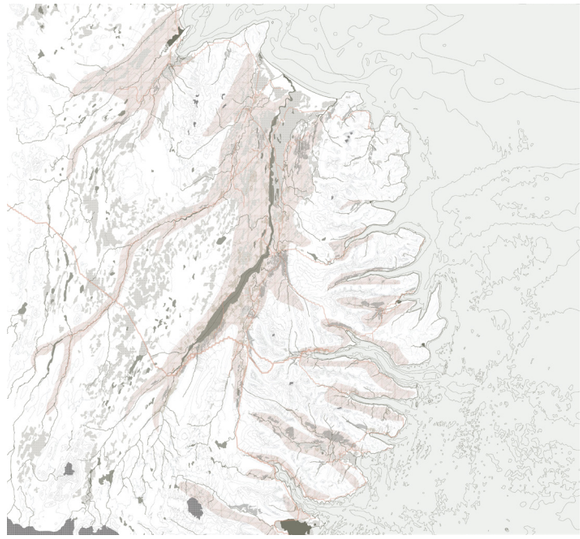
Palimpsest


Bakkagerði
Egilsstaðir
Seyðisfjörður
Norðfjörður
Eskifjörður
Reyðarfjörður
Fáskrúðsfjörður
Stöðvarfjörður
Breiðdalsvík
Djúpivogur
Kárahnjúkar Dam
Ufsálron Dam
Jökulsá
Lagarfljót lake
Hallorms staðaskógur
Hálslón Reservoir
Vatnajökull Glacier
Alcoa plant
Submarine Telommunication line to Faroe Islands and Scotland (2004)
passenger route to mainland Europe
freight to Alcoa
Terrain
Ocean Depth
Original native birch forests
Current native birch forests
Reforested areas
Wetlands
Watercourses
Waterbodies
Glacier
Agriculture
Settlements
Settlement patches
0
10 km
N

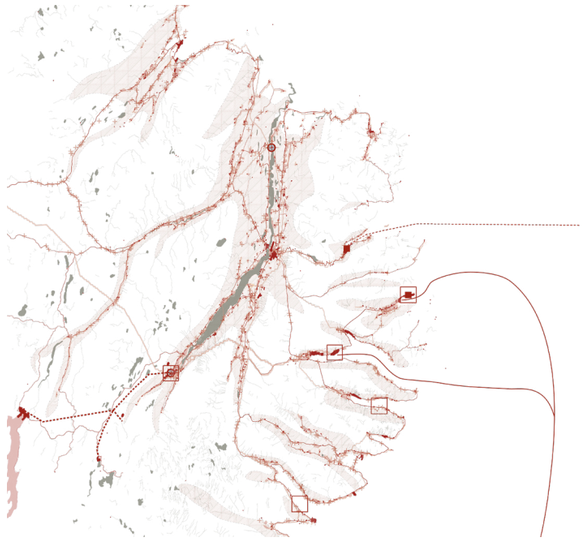
Critical WEFM processes

Iceland takes the lead globally in the WEF Nexus, with its robust water and energy networks. However, the inclusion of minerals slightly distorts this picture. Being a geologically young island, Iceland naturally lacks mineral resources. Nevertheless, it extensively utilizes its water and energy infrastructure for the production of mineral commodities, specifically silica and aluminum products. Quartz and bauxite, extracted from mining locations, are smelted at high temperatures that require abundant energy—a resource that Iceland is abundantly rich in.

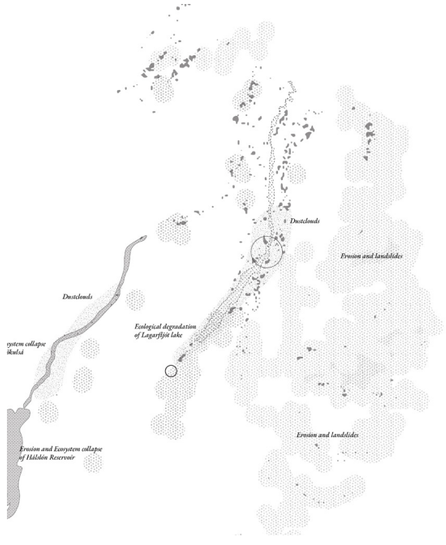
Examining the Alcoa aluminum smelter, we witness the adverse impact on the WEF Nexus in our region. The smelter demands a significant energy supply (4600GWh, surpassing the needs of the entire Icelandic population). Consequently, a hydroelectric plant and dam were constructed, resulting in the submersion of a vital biotope in the highlands, along with the destruction of a lake and wetland habitat. These actions aggravated erosion and desertification, depleting soil fertility and endangering future food production in the area. Taking a closer look at agricultural practices, specifically livestock, also reveals a disbalance in the system, endangering soil health, further reflecting onto the water element.



Natural processes

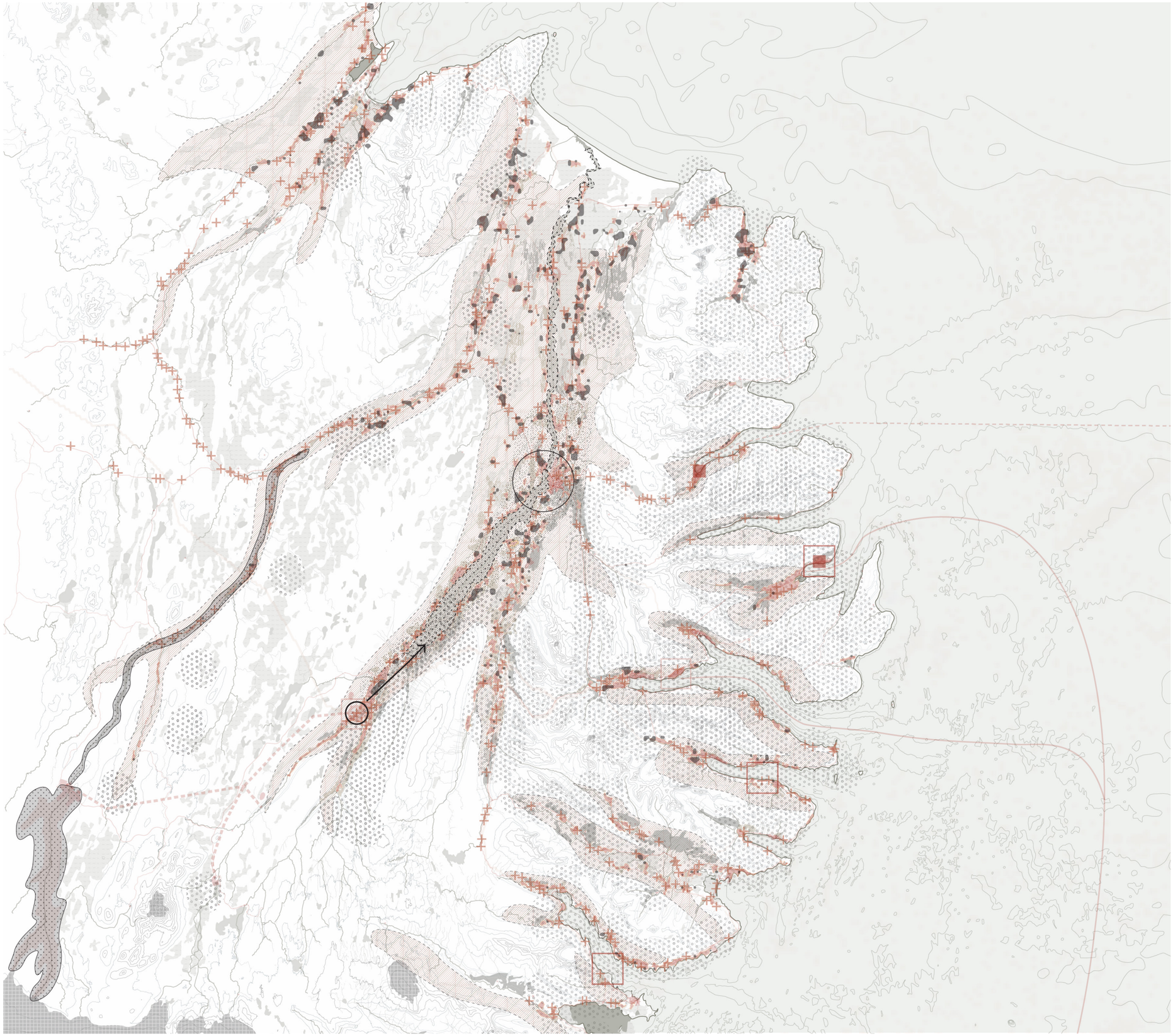


Anthropogenic structures



Critical processes

Critical landscapes



Natural structures

- Terrain
- Ocean depth
- Orignal native birch forests
- Current native birch forests
- Reforested areas
- Wetlands
- Watercourses
- Waterbodies
- Glacier

Anthropogenic structures

- Settlement patches
- Agriculture
- Livestock farming
- Close cage fishery
- Fishing port
- Hydropower plants
- Electric lines
- Transport network
- Submarine cables
- Mines

Critical processes

- Recorded landslide areas
- Disturbed wetlands
- Ecosystem degradation
- Ecosystem collapse
- Dust clouds

0 | 10 km

N



Jokla Series
Olafur Eliassion

3.

Territorial Vision

Extreme scenarios

The purpose of the scenarios is to explore extreme futures, which are often exaggerated. By gaining insights on both the positive and negative aspects of each scenario, decision-makers can make informed choices regarding their vision and strategy, considering the potential consequences and benefits associated with different courses of action.

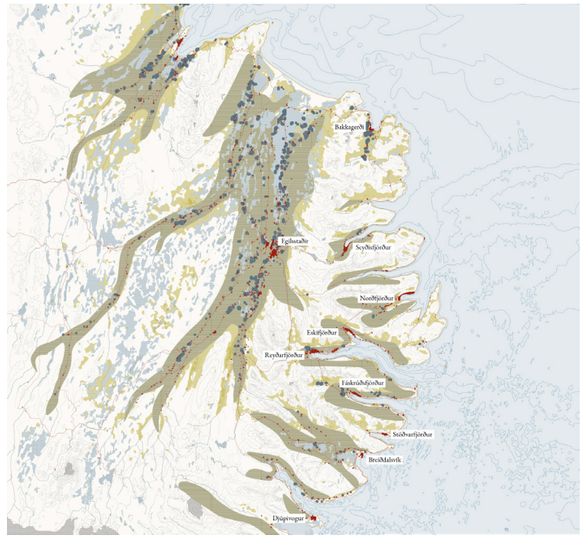
Wetlands and forests
The objective of this scenario is to restore critical landscapes to their pre-human state. To achieve this, the palimpsest map of 870 CE is utilized as a reference point for recreating the natural environment. The scenario is an ideal situation for nature, but it is important to acknowledge that this approach may result a potential decline of urbanization and local economies.

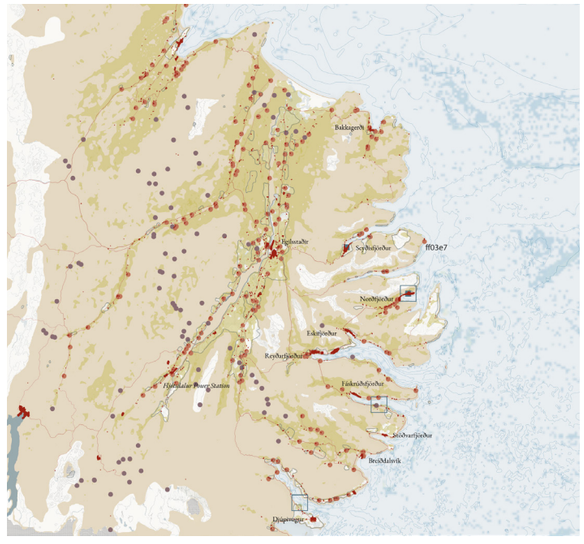
Beyond humans
In this particular scenario, the primary objective is to promote livestock production by increasing the number of grazing animals. The green areas depicted are naturally fertile and suitable for grazing purposes, although a significant portion of these regions is currently designated as protected land, which is not being considered in this scenario. The light-yellow area which is not fertile enough for the current number of sheep that graze these areas are also grazed by an even increased number of sheep. The scenario will inevitably result in overgrazing, causing erosion and a decline in natural diversity. On a positive note, sheep farming holds significant cultural value and is being preserved in this context.

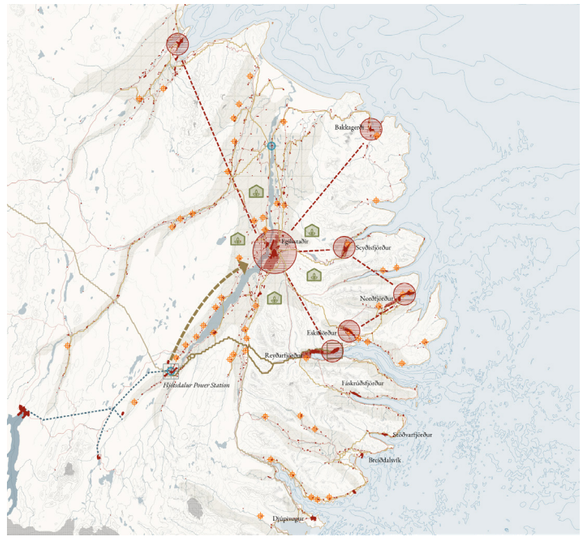
Built occupation
In this scenario the economy and the amount of people will grow. The urban areas are better connected, and the number of functions is increased. To provide energy for the new functions and household energy is produced by the power dam. The increased need for food production will happen in greenhouses. The scenario will result in a stronger economy, the downside of this scenario is that there is no attention for nature restoration.

N

0 100 km







Vision and strategy

The vision for the northeastern part of Iceland is grounded in the concept of WEFM nexus that is developed to gain more insight in resource management. The vision based on the analysis has identified two key problems. Besides this several scenarios have been made to explore potential futures. The analysis highlights two major issues: the detrimental impact of overgrazing by sheep on the natural landscape and the adverse effects of the Kárahnjúkar dam, which was constructed to generate energy for the Alcoa aluminum smelter. Both sheep grazing and the dam have caused significant harm to the local ecosystems and natural landscape. Moreover, the Alcoa smelter does not contribute significantly to the local economy.

To address these challenges, the vision introduces three primary layers. First, the ecological restoration layer aims to rehabilitate the landscape and restore the ecosystems that have been damaged. Second, the local economy layer focuses on fostering a more localized primary economy that can benefit the community. Finally, the knowledge sector acts as a bridge between ecological restoration efforts and the local economy, facilitating the exchange of expertise and resources. By integrating these layers, the vision seeks to create a sustainable and thriving future for the northeastern part of Iceland based on primary economies.

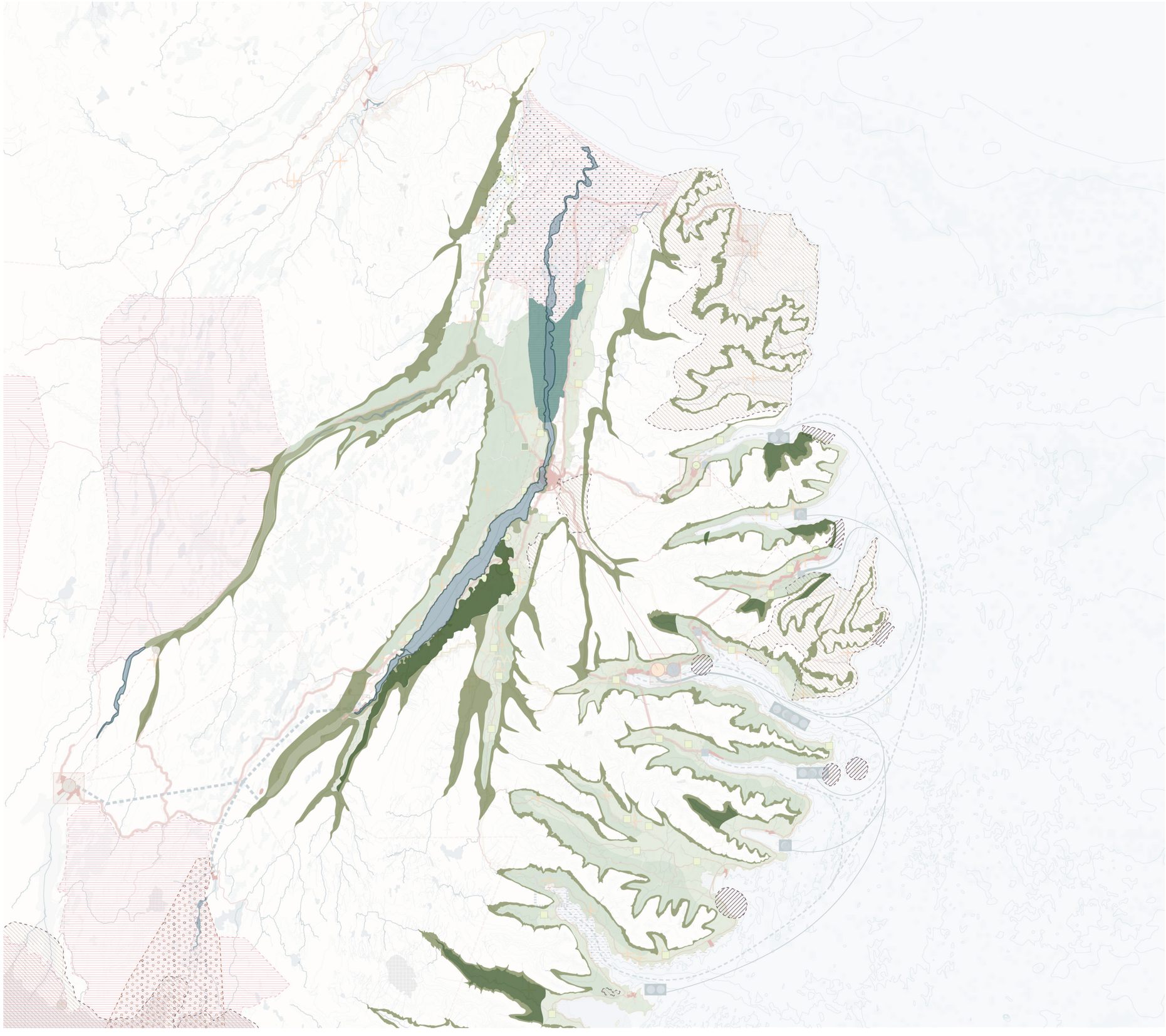
To achieve this vision four design experiments have been developed. The first design experiment addresses the de-damming process of the Kárahnjúkar dam and the nature and nature restoration of the highlands and the downstream river. The second design experiment addresses the reforestation projects within the valley. The project is from a natural perspective very important for erosion mitigation and restoring ecosystems, on the other hand does this create an opportunity for the timber industry as one of the alternative economies for the Alcoa factory. The third and fourth project are in the fjord and mainly look from an economic perspective. The focus of the third project is alternative forms of agriculture that are practices within the former Alcoa factory. The factory will be transformed into a campus where reforestation, vertical farming and aquaculture as the last project come together. The fourth projects create with aquaculture a new economy in Iceland that will be practiced in all the fjords.

Together the strategies will restore nature and provide new local economies that are sustainable. The main connector of the two layers is the knowledge layer where the information gained within this area can be used elsewhere.

Ecological restoration

The nature restoration layer includes two main elements. The first element focuses on restoring the river by removing the Kárahnjúkar dam, which is further elaborated in the first design experiment. Currently, the natural flow of the river has been altered and diverted to maximize energy generation. However, with the removal of the dam, the natural course of the river will be restored, allowing the ecology of the river banks to be restored. This step will help restore the natural ecosystem and habitats along the river.

The second element involves reforestation in the valley and fjords. By creating a forested layer along the 400-meter line, a significant amount of erosion can be reduced. In addition, several forests and wetlands are being protected to create natural habitats and protect biodiversity. These reforestation initiatives play a crucial role in restoring ecological balance within the region.

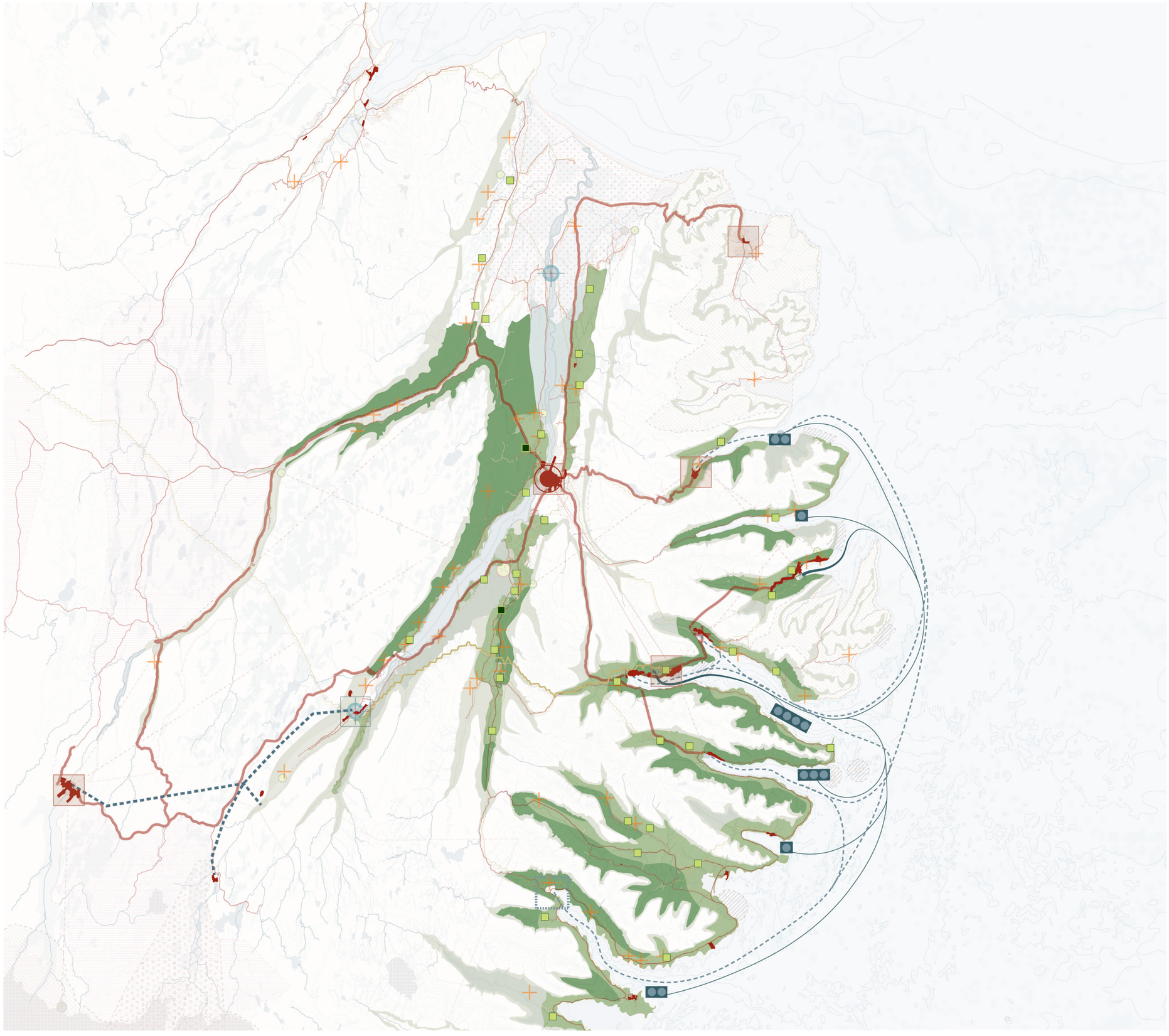


Local economies

The local economy layer comprises various elements that contribute to its diversity and sustainability. One such element is the de-damming project, which will give rise to a temporary economy during the restoration process. Additionally, the reforestation project includes the establishment of productive forests consisting of two types: silvo pastures, where sheep can continue grazing, and timber forests for sustainable timber production.

In the fjords, the Alcoa facility undergoes a transformation into an agricultural and aquaculture center. The agricultural facility incorporates vertical farming methods to cultivate vegetables specifically for the local region. Additionally, algae farming is implemented to provide food for fish, sheep, and supplements for human consumption. This agricultural diversification aims to enhance food production and reduce dependency on external sources. Furthermore, aquaculture practices are implemented throughout the fjords, contributing to the strengthening of the fishing economy.

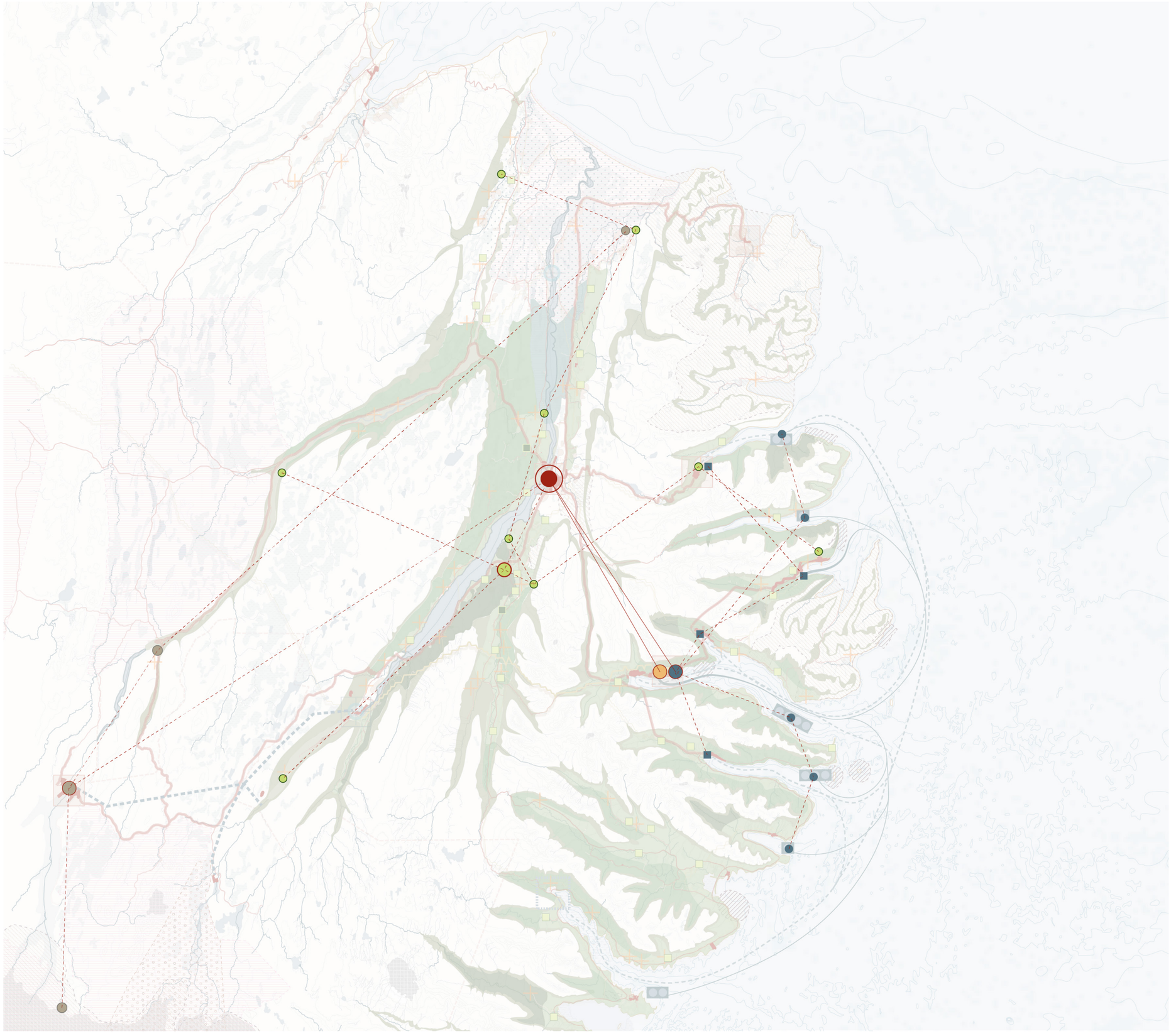
By integrating these elements, the local economy layer fosters a multi-faceted and sustainable economic system that promotes self-sufficiency, agricultural innovation, and the revitalization of traditional industries.



Knowledge sector

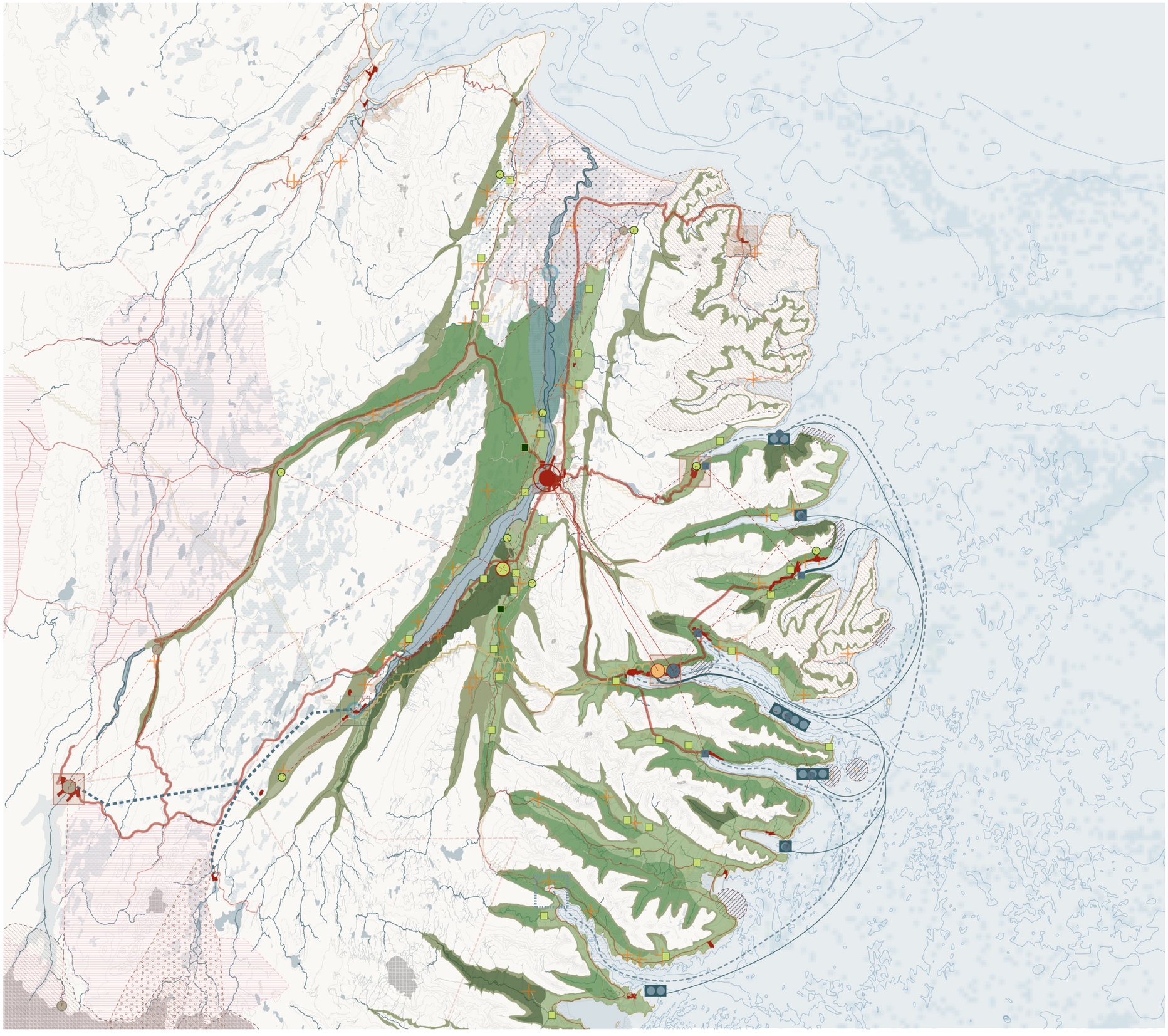
The knowledge sector plays a vital role in bridging the efforts of nature restoration and local economies. At the heart of this sector is a central research facility located in Egilsstaðir. The main research centers are strategically positioned at key locations, including the Kárahnjúkar dam, the reforestation project south of Egilsstaðir, and the Alcoa factory.

These research institutions are not only focused on the specific region but also aim to contribute to naturalization processes throughout Iceland. They serve as valuable examples for restoration and sustainability initiatives that can be implemented worldwide. The knowledge facilities have the potential to attract knowledge-based tourism, where visitors can learn from the research findings and practical applications in the field of nature restoration and local economic development.



Integrated vision

The vision encompasses the integration of ecological restoration, local economies, and the knowledge sector, offering a promising future for Iceland. This future entails not only the restoration of the ecosystem but also the establishment of a new primary economy that revolves around timber, agriculture, and fishing industries. Furthermore, the knowledge facilities play a crucial role in enhancing the sustainability and resilience of these economies, paving the way for a more sustainable and resilient future.



Timeline

Essentially the design for Northeastern Iceland is a process, therefore the timeline is of great importance. The most important process is the dam removal and the start of this process will happen in 25 years, and the whole de-damming project will take around a 100 years to finish.

The initial phase before the dam removal involves necessary preparations, such as the growth of erosion-resistant forests along the riverbanks. This reforestation process typically takes approximately 25 years to allow the trees and their roots to mature adequately.

During this period, other sectors of the economy can prepare for the transition to the new paradigm. The reforestation process will start in the meantime to create erosion resilient forest. And after 10 years when the tree planting zones for forest are defined, the trees can be planted as protected forest or planted as productive forest. The timber industry is expected to start within 30-35 years.

Within the first ten years an agricultural research facility is established around the current Alcoa factory, together with a campus terrain for employees and knowledge tourism. And after 10 years a part of the Alcoa factory will change to vertical farming and algae production. At the same time a marine research facility is established, and coastal nourishment and marine restoration is happening. After 25 years the other part of the Alcoa factory changes to a land-based aquaculture facility that is directly linked with the algae production.

After the de-damming process is started, the highlands, the river and the wetlands can slowly be restored. And overtime the reservoir of the dam is slowly dredged and the dam can be recycled.

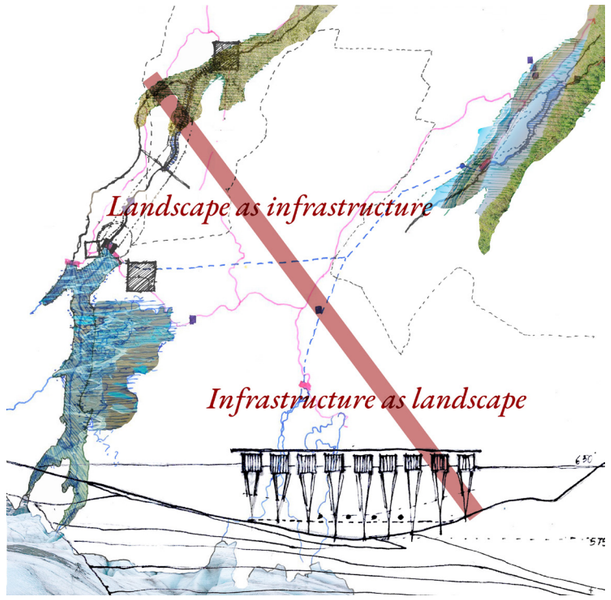


4.

Design experiment

Ecologies of Dam Removal

Kirthan Shekar



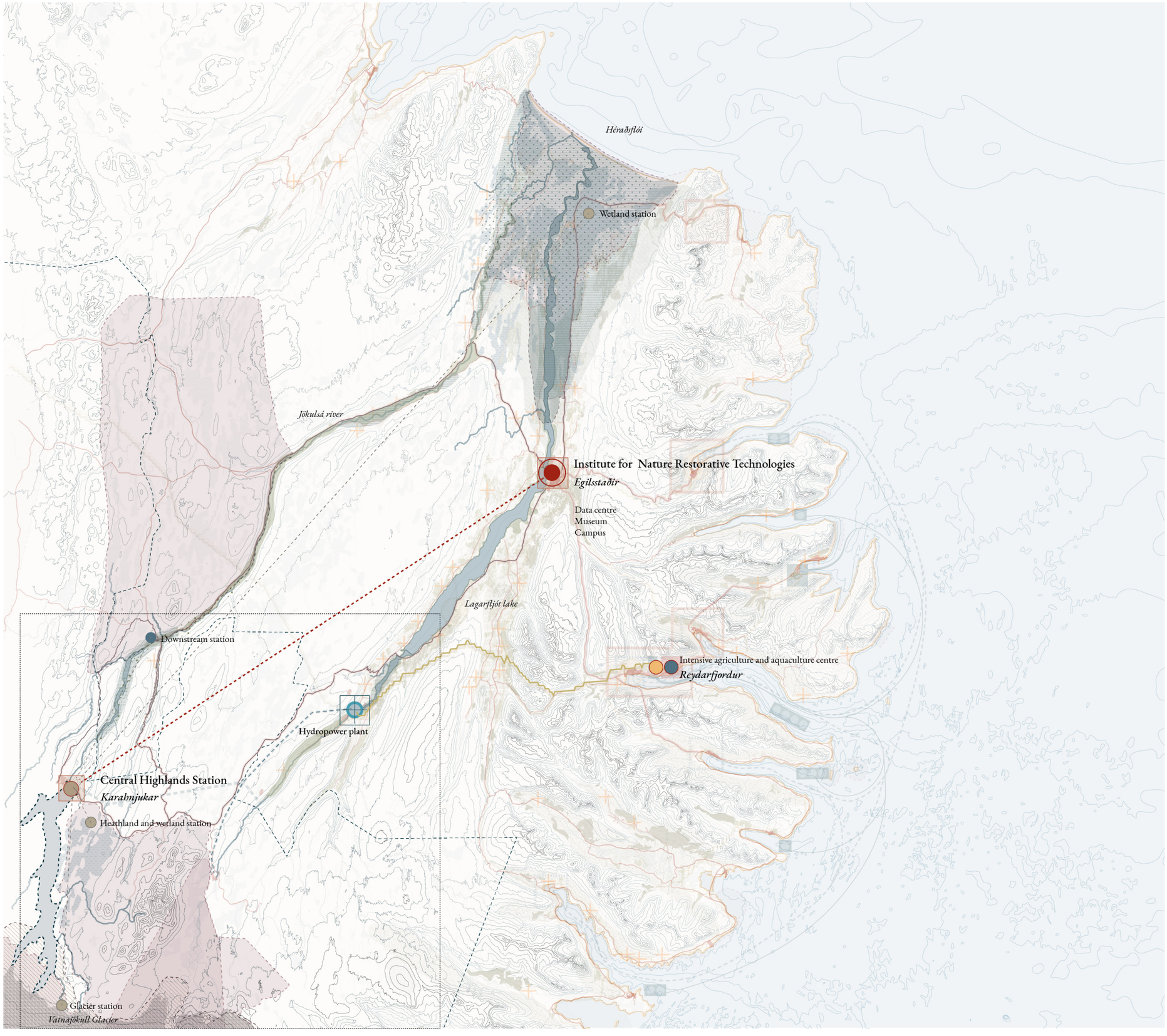
Manifesto

One of the main stands in the vision in the removal of Karahnjukar dam. This extractive infrastructure is a part of the larger system of production One one hand removing this infrastructure has regional economic impacts because the Alcoa smelting plant which the dam solely produces the energy for provides 450 jobs and planetary impacts in material resource flows. On the other hand removing infrastructure which has had a significant impact on the landscape which it is now a part of is as much a project in the long duree like building a new one. The process of removal of Karahnjukar dam is stretched across a period of 100 years where in measures of removing the mighty dam is taken sensitively with establishment of the knowledge structures to analyse the impacts of the projections. There is a common notion that the process of decay is negative, and it gives a sense of dystopic perspective to the process. This leads to wiping out brownfields and rebuilding landscapes instead of repurposing the same landscapes sensitively for a specific ecological and social function. Processes of ecological restoration through deinfrastructuralisation should include regenerative practices where two infrastructural landscape notions can be applied - ‘Infrastructure as landscape’ and ‘Landscape as infrastructure’ (Belanger, 2012). In the former notion, the structure of the dam can be adapted for a different use; in this case to house the Central Highlands Institute. The latter notion of Landscape as infrastructure is applied during restorative process in which the natural physical forces like water and sediment flow downstream can be manipulated to create conditions for ecological regeneration. Here this process is experimented through terraforming. Both these infrastructural landscapes can give design agency to participate in providing multiple conditions for instigating various ecotopes, ecosystems and ecological succession. This design experiment firstly focuses on the spatial and temporal projections. Then conditions are discussed for the dam recycling and highlands ecological restoration practices upstream. Then conditions for the dynamic natural forces in the processes of terraforming for restoration around the morphodynamics and optimising the material ecologies connecting to the other regional interventions.

Kirthan Shekar

Positioning in the regional vision

Although the process of removing the dam is place-specific, it has ecological and social implications in the region. This map situates the project in the larger vision, where the implications are seen in the form of infrastructural changes, knowledge dependencies, and human resource dependencies.



Overview of the dam

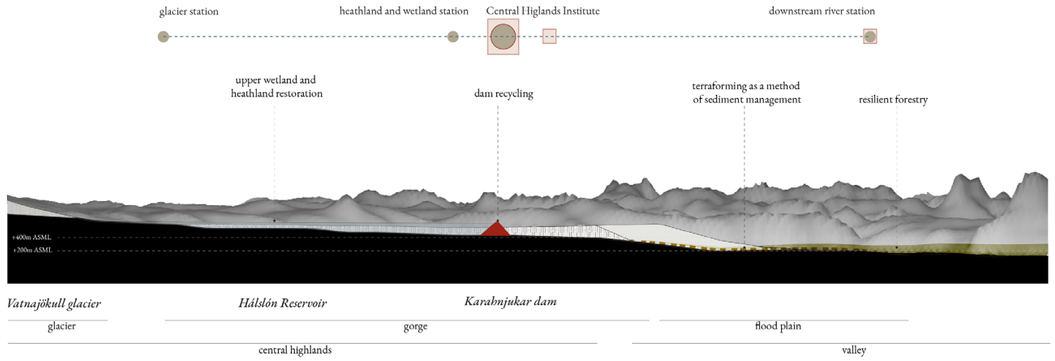
The 180-metre-tall Karahnjukar dam is constructed across the Jokulsa gorge to create the Halslon reservoir, which covers 63 sq. km and has a capacity of 2210 gigaliters. This reserve extends up to the Vatnkjokull glacier in the Central Highlands. This reservoir was previously the breeding hotspot for reindeer and the birding hotspot for pink-footed geese. The landscape consisted of a mixture of grasslands, heathlands, and wetlands that supported multiple ecotypes but collapsed with the filling of the reservoir. The dam diverted the water from the Jokulsa river to Lagarfljot lake, which caused an ecological imbalance that led to ecosystem collapses in both water bodies. Halslon reservoir and Ufsarlon reservoir together powers the Fljótdal hydro-power station to generate power of 4600GWh which powers the Alcoa aluminium smelting plant in Reydarfjordur.

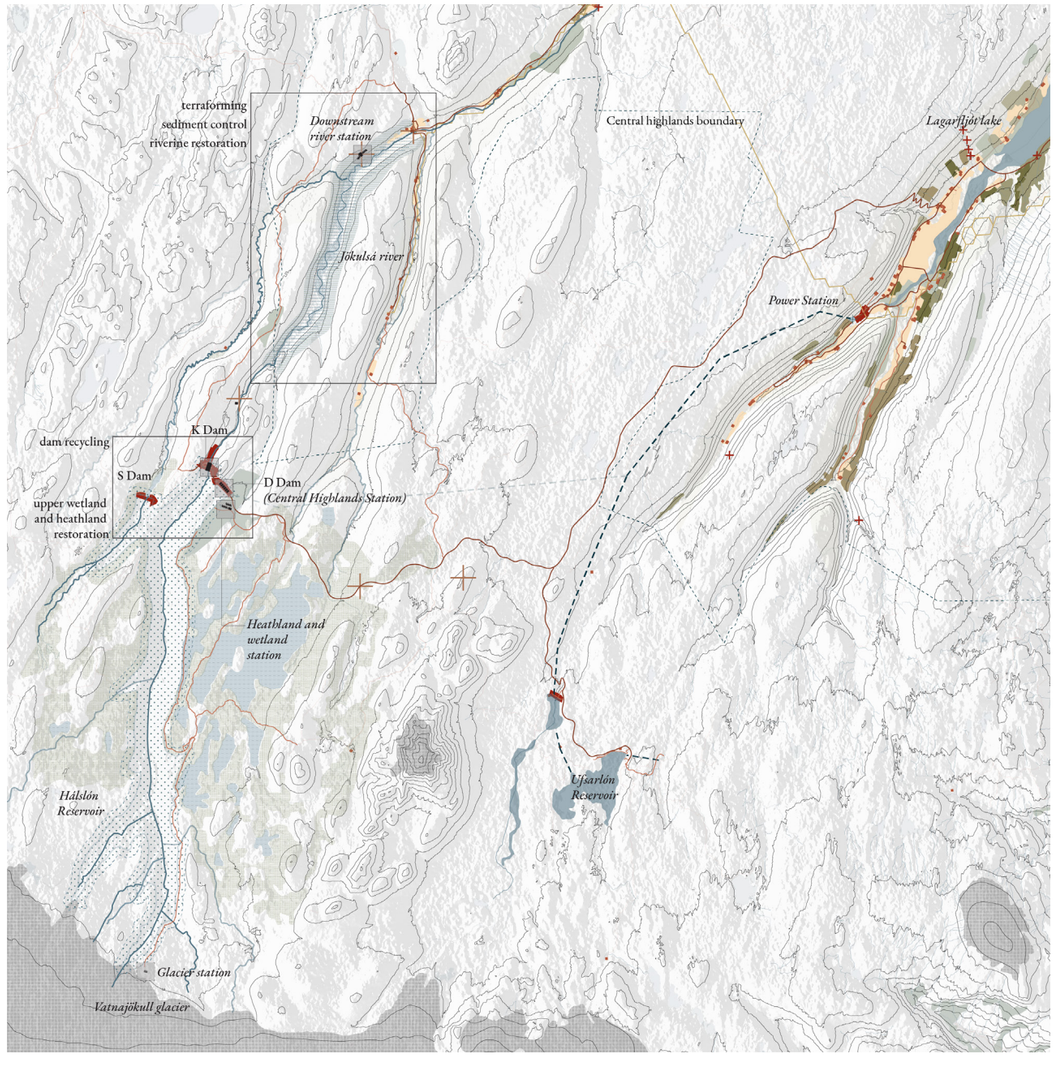


Construction of Karahnjukar dam
Örlygur Hnefill

Operations

The restorative project consists of three sets of operations that are primarily required for the removal of the dam. The upstream landscape with the reservoir and the dam structure is the focal point where the function of the dam is changed from stopping the flow of water to other functions. Secondly, as the reservoir empties, the restoration of the submerged landscapes, which are currently turned into bare rock, is necessary for the better ecological functioning of the highlands. Thirdly, in the downstream, which will be impacted by increased water and sediment flow, erosion and sedimentation processes need to be protected because these natural processes can be used to form land contours for restoration using human-made structures. The sensitivities of these operations require different knowledge structures along the water course, as described in the section.





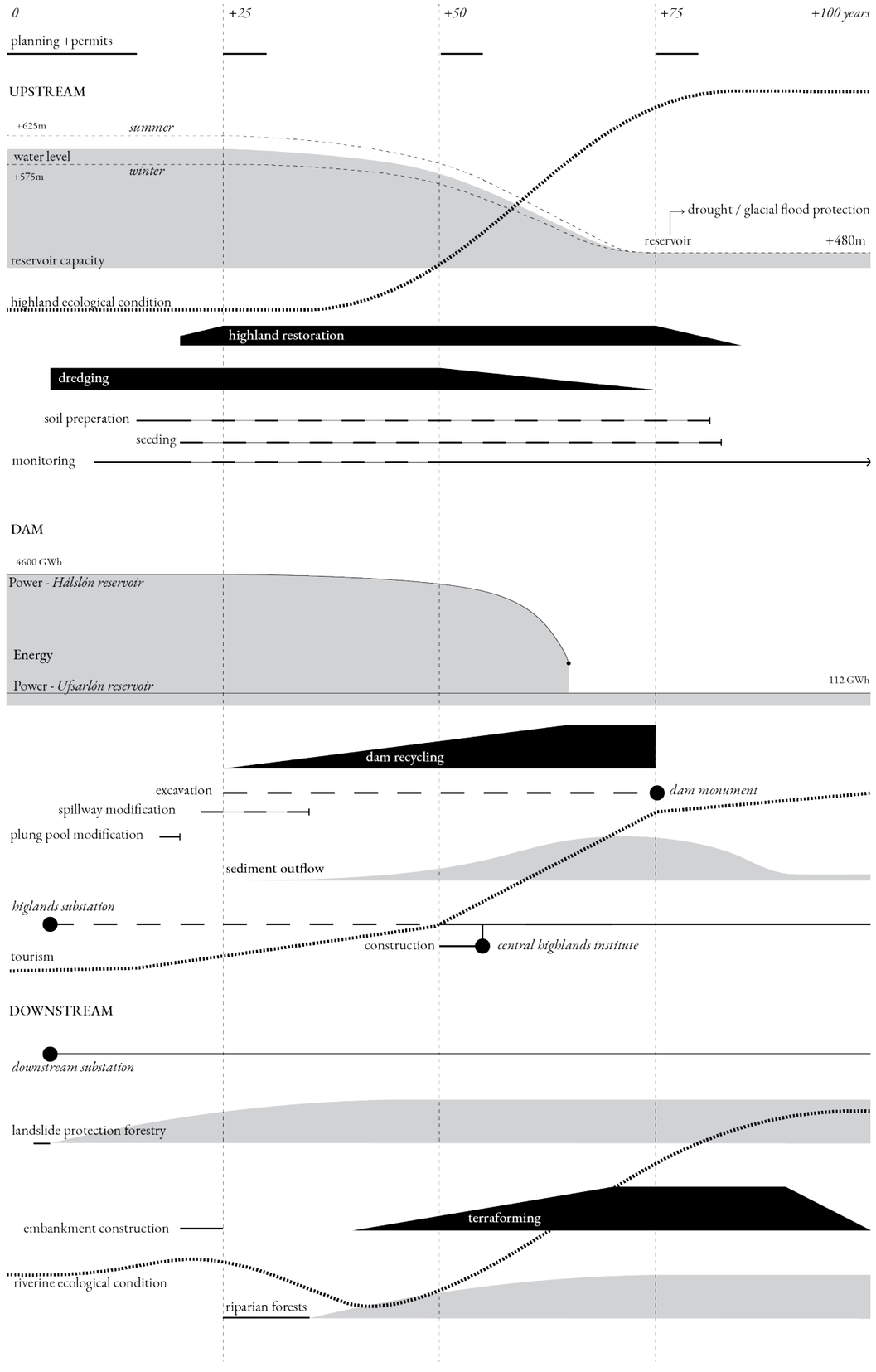
- Reservoir for restoration
- Heathlands
- Wetlands
- Dam structures
- Floodplain
- Water bodies
- Erosion restorative forests
- Knowledge structures
- Tourism hotspots
- Riparian forests
- Present pastures
- Buildings
- Glacier
- Rivers and streams
- Terrain
- Hydropower plant
- Underground water tunnel
- Electrical line
- Primary road
- Secondary road
- Highlands boundary

N

0 | 10 km

Timeline

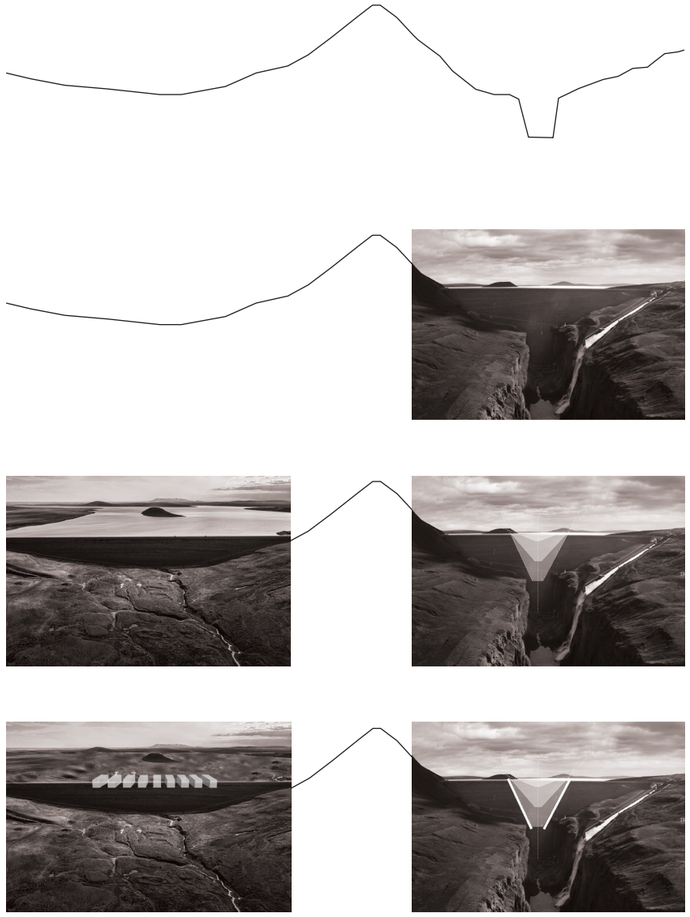
Although the three operations have different zones of impacts, the sequence and processes of restoration are simultaneous, and in some cases, like downstream, the river banks have to be conditioned for erosion and sedimentation. Before the main process of recycling the dam, these banks have to be protected with erosion-resistant and riparian forestry to make these landscapes resilient to flooding. The sequence of operations has significant natural processes and impacts on energy, tourism, and ecological trends, which are mapped in the timeline.

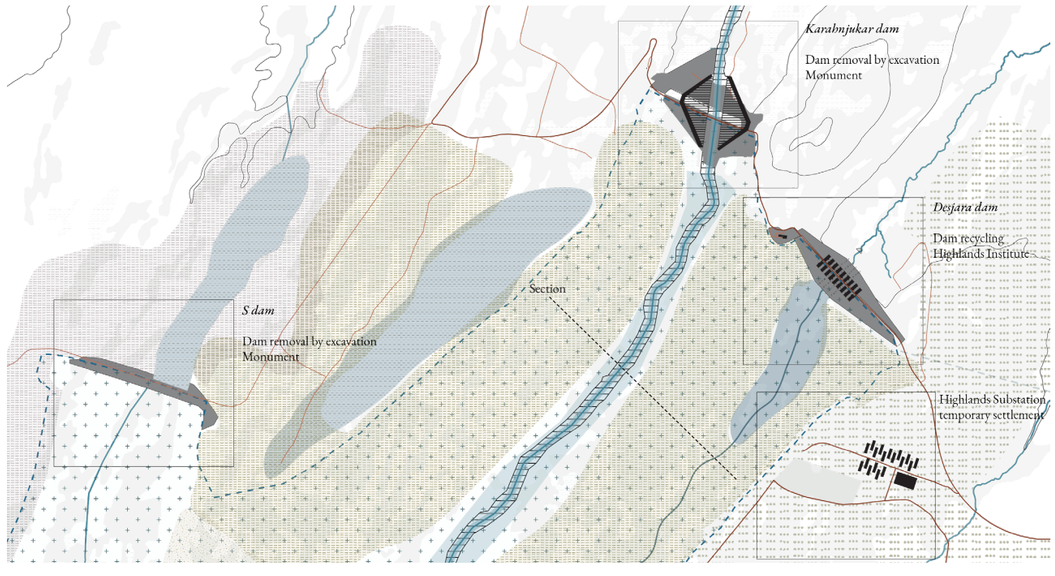


- Processes
- Interventions
- Institutions / stations / buildings
- Seasonal operations
- Perineal operations
- Resultant trends

Dam recycling

The campsite that was used to house the dam construction workers will be used to set up the temporary station for highland ecological restoration and sensitive remodification of the dam as illustrated in the plan. There are three dams that support the reservoir, with Karahjukar Dam (right image) serving as the main one. Since the dams are rock-core embankment dams, this infrastructure needs to be considered a landscape and excavated. For controlled slow release of the reservoir, the excavation process of Karahnjukar Dam is seasonal and is stretched across 50 years, so the excavation could be scheduled in the winters when the water level is low. After excavation, the remains of the structure can be protected as a monument so that nature can reclaim them. The Desarja dam (left image) can, however, be used as a structure to construct the Central Highlands Institute, which can house research, tourism, and recreational centre.





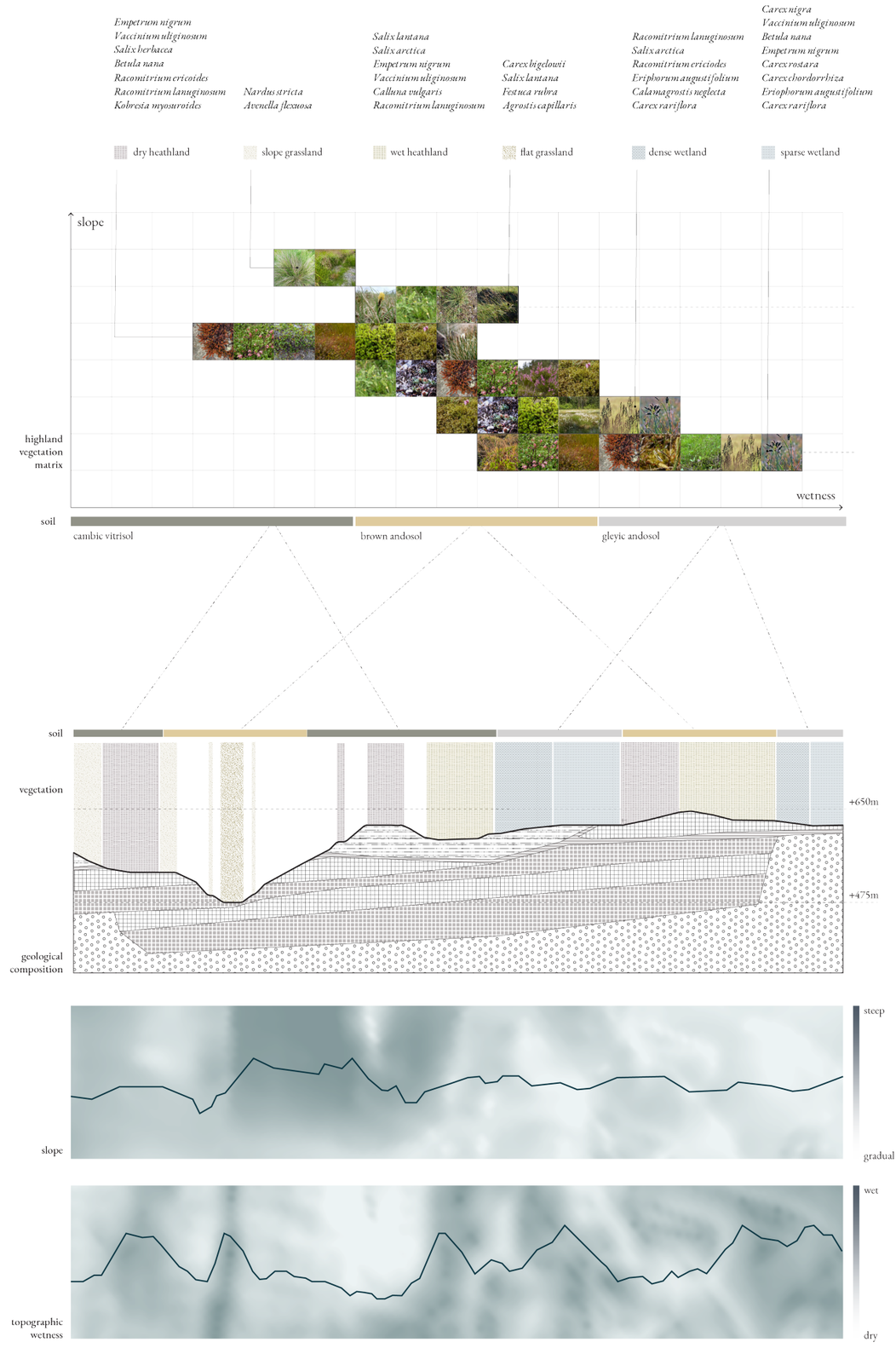
Reservoir for restoration
Heathlands
Wetlands
Grasslands
Gorge
Dam structure
Excavation
Buildings
Rivers and streams
Terrain
Roads
Tracks

N

0 1 km

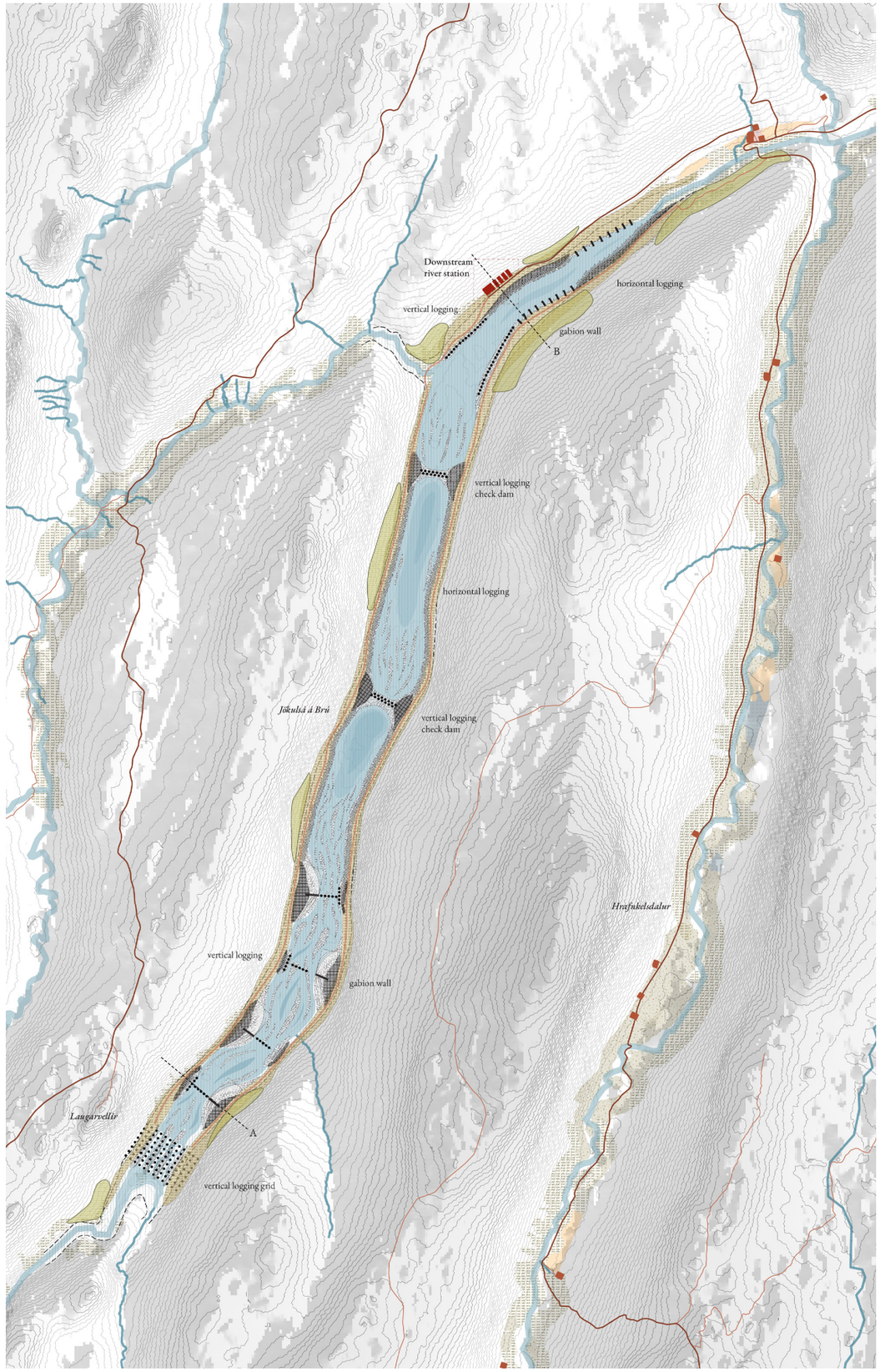
Highland ecosystem restoration

As the water in the reservoir empties, the bare rocks, which held the fertile soil housing grassland, heathland, and wetland ecosystems, are exposed. These surfaces are to be studied for their soil structures and subsequent restorative practises. Based on the slope and topographic wetness of the landscape, different ecotypes are possible to renature. The matrix provides an overview of these ecotypes, which can be applied to site conditions based on the extent of slope wetness and soil type. These different ecosystems interact with each other and provide conditions for ecological succession. The section below is an experimental scenario where these parameters can give the bands of the ecotypes in the transect.



Terraforming

With the removal of the dam, the main impact downstream is increased sediment and water flow. Since the glacial sediments are highly fertile and form the brown andosols in the region, they can be harnessed to accentuate the restorative practises and potential. Simple structures with logging can be constructed along the rivers in wide-spread areas where the water depth is low to form the land—terraforming. The process of creating these landscapes is condition-based and can be minimally planned because of uncertain natural forces. This process can be repeated along the river to make the landscape more resilient to glacial flooding and draught.



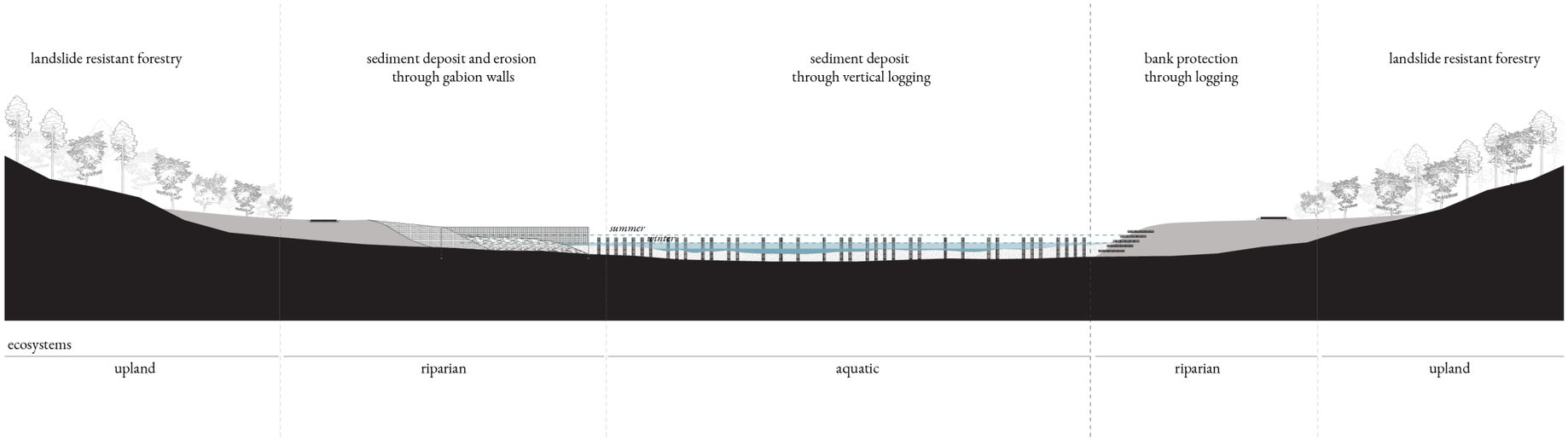
- Floodable area
- Sediment embankment
- Erosion resistant forestry
- Heathlands
- Grasslands
- Wetlands
- Agricultural patch
- Buildings
- Compacted sediment infill
- Dynamic sediment formations
- Streams
- Terrain
- Vertical logging
- Horizontal logging
- Flood extent
- Shallow river
- Stream
- Primary road
- Secondary road
- Tracks

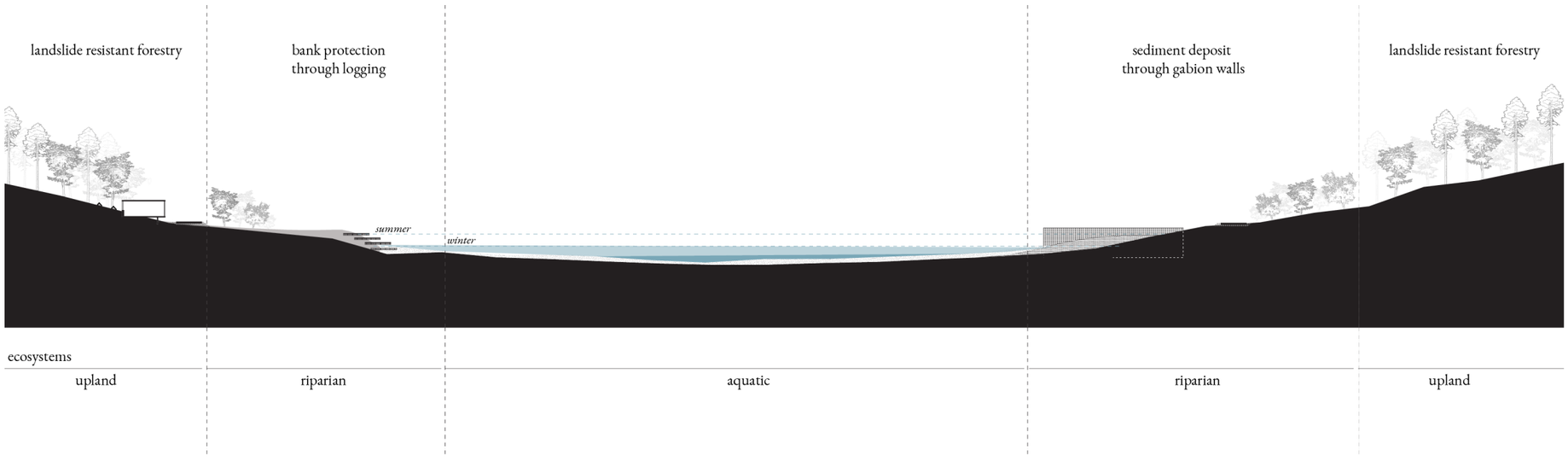
N

0 — 1 km

Technique

These sections (A and B) describe the techniques that can help in terraforming the valley. The dynamics of the summer and winter water levels with the velocities and qualities of water and sediments are used to create certain built conditions along the river. The four techniques use the materials from the dam removal and the forestry to create combinations of vertical logging, horizontal logging, and gabion walls to provide conditions for erosion of the dredging deposit during the initial process and later deposition and erosion of the natural flow of sediments from the upstream. Conditions for the growth of aquatic, riparian, and upland ecotypes are created where, initially, the restorative process is manual, but later conditions for ecological succession are left to the natural flow of time.

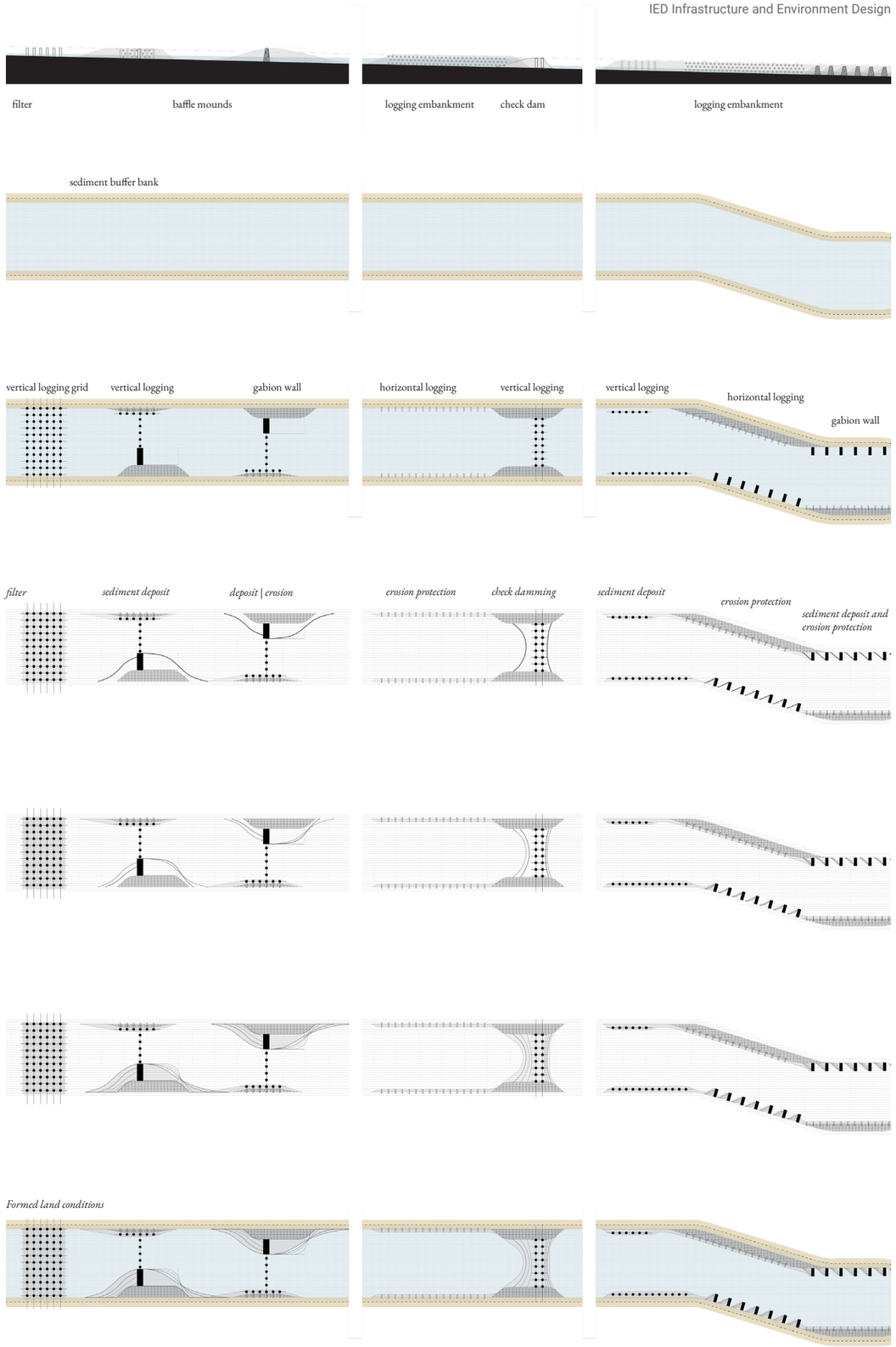




Morphodynamics

The conditions created by the combination of the structures provide opportunities for different forms of land to develop. In principle, a vertical logging grid is used to slow the water down and provide the first line of filtering and sediment deposition. Secondly, the sediment baffles with the parallel and perpendicular vertical logging along with the gabion walls, creating two conditions for sediment deposit and erosion. In the initial phases, the dredged material from the reservoir is transported by land and used to create temporary mounds on the downstream side of the gabion walls. Through the currents of water, this mound is eroded to create organic forms. The perpendicular vertical logging sets can be used to create natural check dams, which can be used for efficient water management during flooding and draught over a longer span of time.

Horizontal logging is here used for embankment protection. In addition to vertical logging that can help with sediment deposit, Horizontal logging is used for erosion control, which is highly prevalent at concave surfaces, and gabion walls are used on convex surfaces for sediment deposit. Combinations of these techniques can be used to create different conditions for land formation, which increases the resilience of the landscape to uncertainties

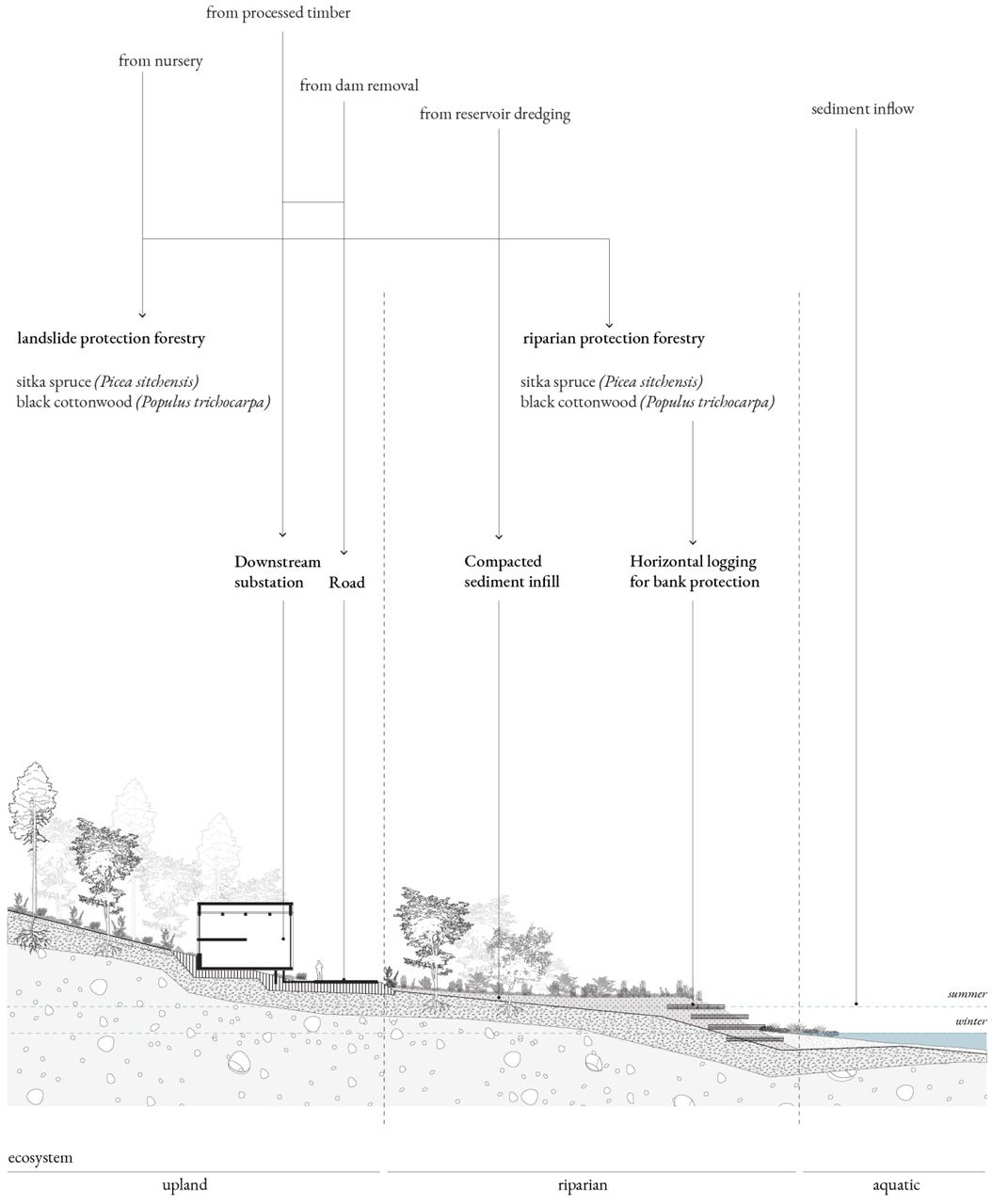


Material ecologies and tectonics

At the tectonic scale of the intervention, clear dependencies with other interventions in the vision are observed. For instance, the landslide protection forestry depends on the nurseries in the valley. The construction of the downstream substation required materials from the dam removal and timber from the processing centres located in the valley. While the natural processes of sediment deposition and erosion are a result of the natural forces from the intervention upstream, the material tectonics of the intervention are dependent on the larger regions for material resources, human resources, and capital resources. At the architectonic scale, the connection between the inside and outside can be expressed through the materiality of the substation (wood, stone, glass), its support structures, and its connection to the landscape it is situated in. But at the regional scale, although this intervention is local and in the hinterlands of the main settlements, Egillstadir and the fjords, the resource dependencies make them the hinterlands for this local intervention, integrating it into the larger vision.

Reflection

Though the ecological and environmental aspects of the project were studied, it would have been more integrative if the social ecologies were studied in detail. The removal of the dam can provide about 200 jobs in the knowledge, logistical, and operational sectors, and thus there would be a change in the social composition of the area. The deinfrastructuralisation project would be resisted by the global powers, but the project is also a response to the environmental activists who opposed the construction of the dam in the ecological hotspot in the first place. The social projections could have provided better grounds for the project to understand its implications. The second aspect that could be enhanced is the systems implications of the projects to understand the dependencies of the projects from a planetary perspective. In doing so, the project would have provided conditions for development with a systemic understanding of the economies, logistics, and extraction in the long duree.



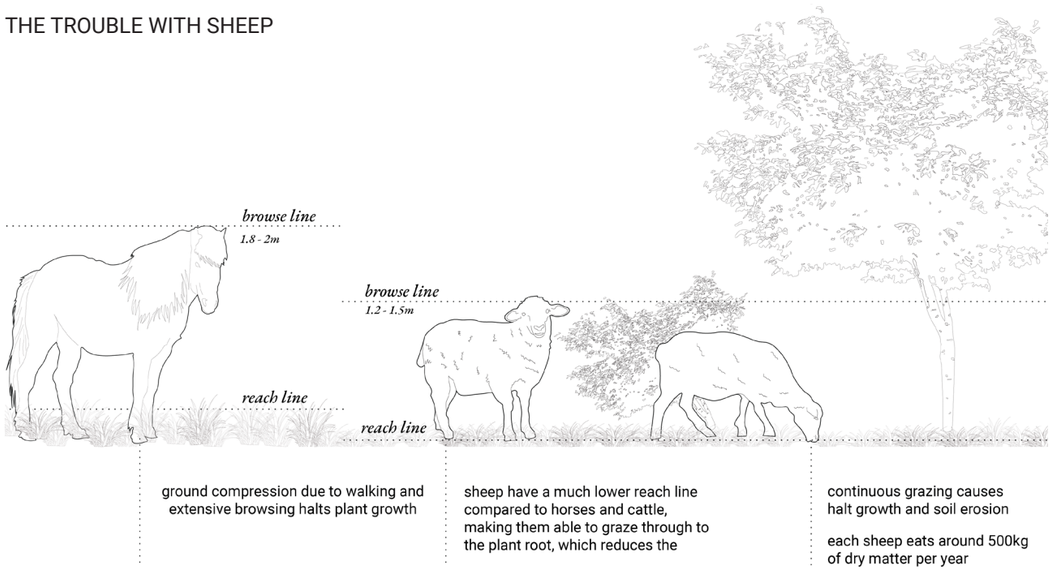
4.

Design experiment

Reforesting the Fljótsdalur valley

Vera Vince

THE TROUBLE WITH SHEEP



Manifesto

The Fljótsdalur Valley is the stuff of legends. Or more accuraetly, sagas. Accounts of its importance have been written down since the earliest ages of Icelandic history.

Today, it binds together the scattered landscape of East Iceland, existing as a connective tissue between the inhospitable Central Highlands and the dramatic East Fjords. The valley's terrain and fertile land also make it the only arable and grazable land, making it the center for agriculture. Furthermore, it is the location of the largest town in the area, Egilssstaðir as well as the largest and oldest National Forest, Hallormsstaður.

The significance of the valley is thus expressed in terms of its invaluable socio-cultural, economic and environmental role for East Iceland. However, it is endagered by the same conflicts troubling the rest of the region. The over-grazing, in particular, is contributing to further drying of the soil, leading to erosion, dust storms and landslides. These events are not solely, local as dust storms coming from this region have been recorded to reach Northern Europe, particularly The Faroe Islands and Scotland, which are already battling similar issues.

This design experiment looks to the forest for solutions. Building upon an already present innitiative to reforest the area, this project proposes a radical effort to reach a similar level of forestation which existed before the Settlement era, and in doing so not only revitalize the soil and existing habitats, but also diversify the economy by introducing silvopastures and timber industry as a new industry for the region. These efforts are to be accompanied by the network of knowledge stations, in this case a Forest Research Center, located north of the Hallormsstaður forest, which is an extension of the Egilssstaðir Central Research Institute, the main research institute for all nature restorative technologies in East Iceland. The Forest Research Center also has outpost in many of its "typical forest areas", which serve to collect real time data which can be used to determine whether the implemented changes are having the desired effect.

The goal of this design experiment is to show that an alternative path is possible in the Fljótsdalur Valley, one that will ensure a safe future for its inhabitants, both in terms of environmental and economic security, while providing valuable know-how on a global scale.

Vera Vince

Forestry strategy

Three different categories of forest are to be introduced:

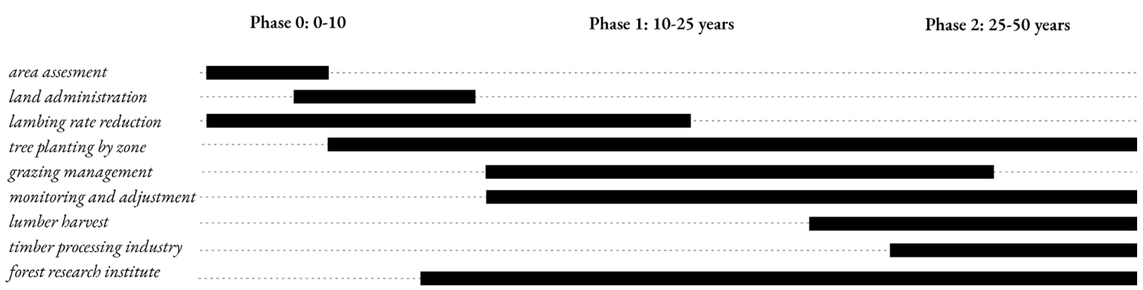
1. Protected Habitats - woodland and wetland forests with a certain level of environmental protection, such as National Forests, Nature Parks and Protected Nature Areas.

2. Restorative Forests - forested area grown for a specific restorative purpose, either erosion and sedimentation of river and lake banks, or the erosion and landslide protection in high slope areas near the 400 meter line. Special tree species are selected depending on the desired functions and area conditions

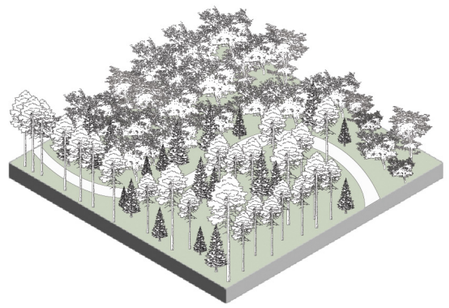
3. Productive Forests - in the areas previously dedicated to farms and grazing, the land is over time converted to silvopasture, combining area for timber harvest with area for sheep and horse pasture. The number of sheep is to be significantly reduced. In the higher areas well connected to road infrastructure, a more extensive timber industry is introduced. The productive forests shall also require a network of different facilities, such as farms for the silvopasture and processing timber facilities with a good connection to port and warehouse areas. (The locations of these can be seen on the Phase 2 map)

Phasing strategy

In the first ten years, preparations and administrative work is required in order to determine the suitability of the areas.
The lambing rate is to be slowly reduced over time, starting immediately to already have some effect by the time the first extensive planting commences. The economic activities will start only once the first trees are ready for harvest. The Forest Research will start operations after the first preparation phase is over and all facilities and infrastructure are in place. The work force for these economies will come from the area, as well as wider Iceland region and international workers, introducing a change in the social fabric of the area.

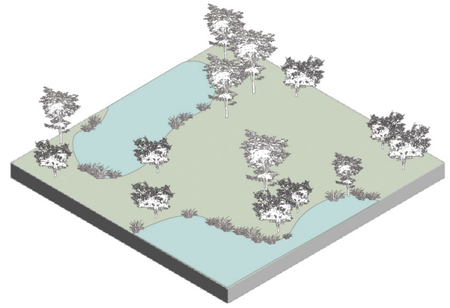


PROTECTED HABITATS



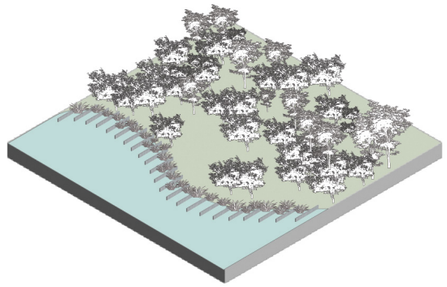
Woodlands

Combining all tree species in Iceland, areas dedicated to Betula pendula.



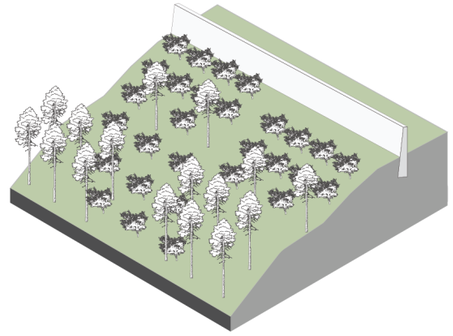
Wetlands

Betula pendula
Populus trichocarpa



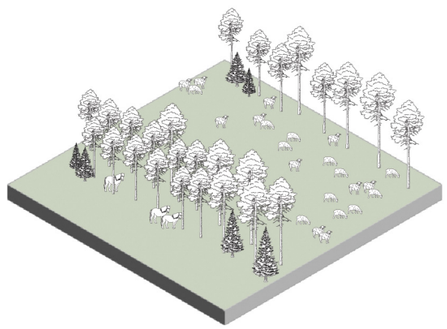
Riparian protection

Betula pendula
Populus trichocarpa



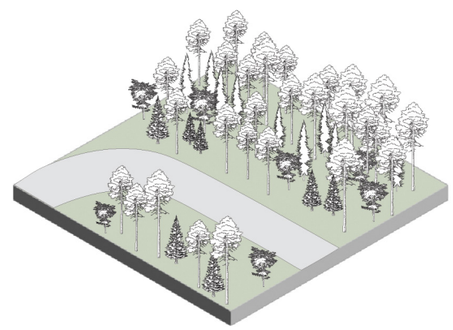
Erosion and landslide protection

Betula pendula
Picea sitchensis



Silvopasture

Picea sitchensis
Larix europea x sibirica

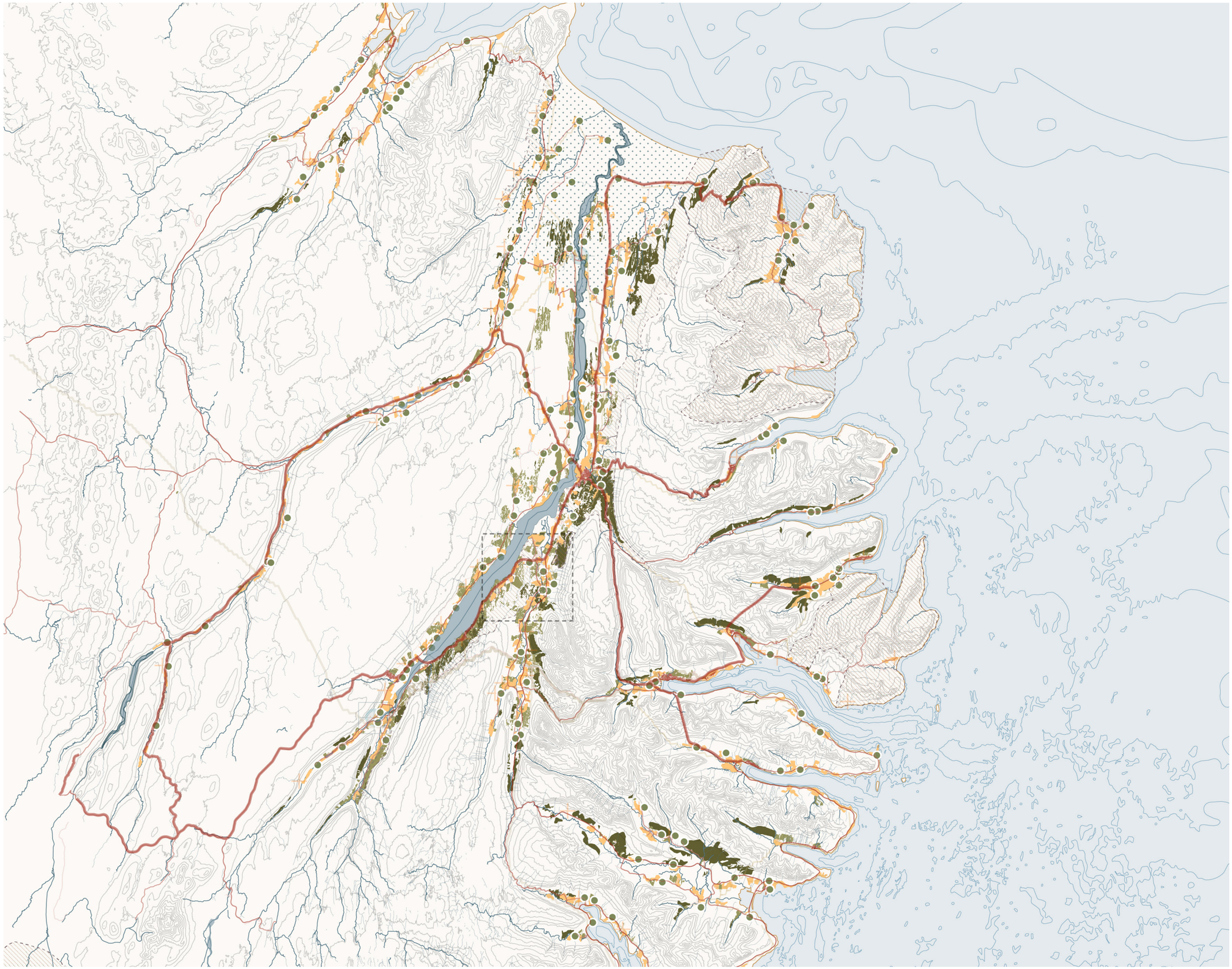


Timber production

Populus trichocarpa
Larix europea x sibirica
Picea sitchensis
Pinus contorta

Phase 0 (present state)

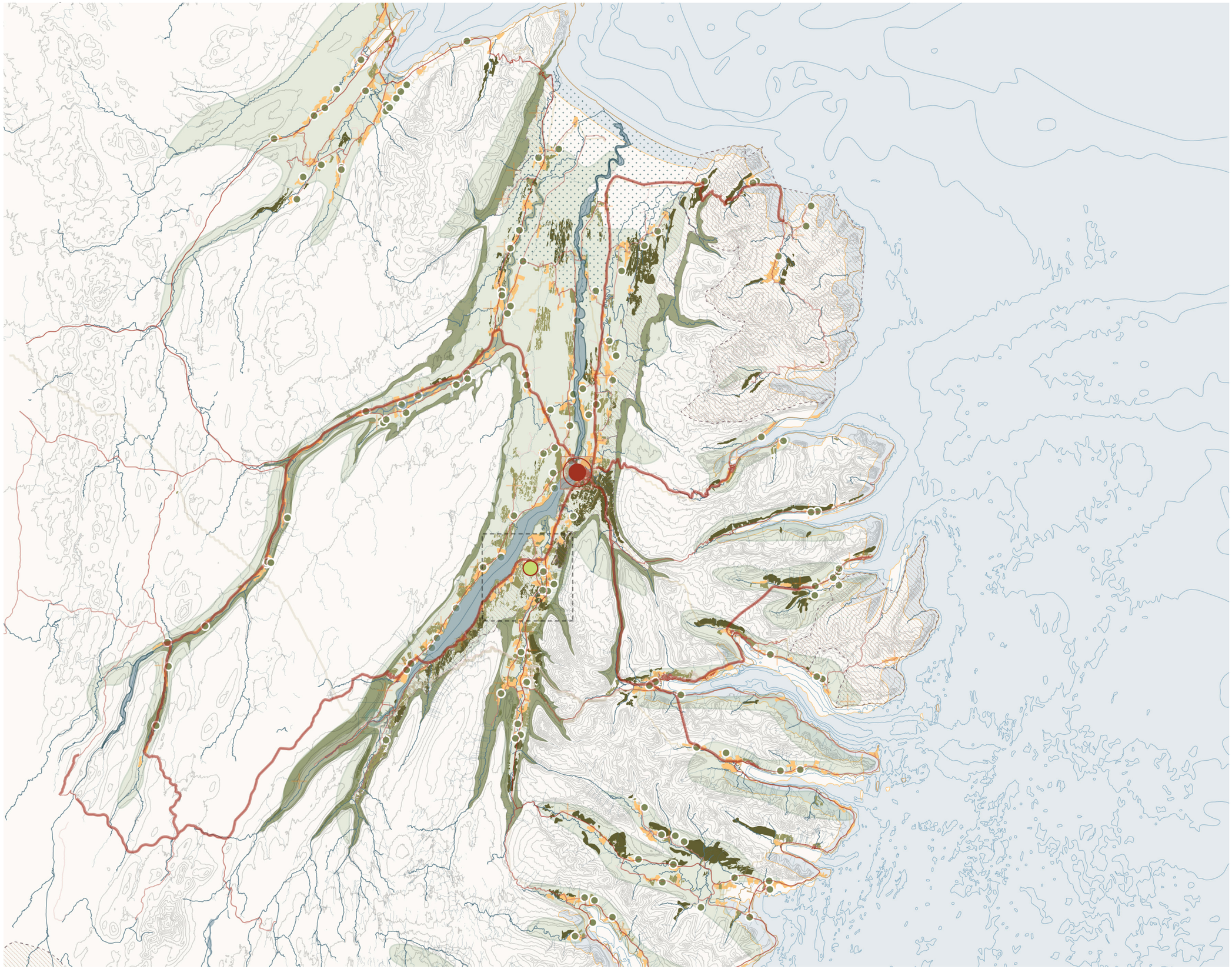
At present, the valley is one of the main locations for afforesting in Iceland, as well as the largest and oldest National Forest. However, it is still heavily grazed and the location of many farms, as shown in the map.



Phase 1

Over time, the grazed land and farm numbers decrease. Restorative forests are implemented first, in order to be able to respond to changes coming up-stream from the closing of the dam and subsequence increase in sediment.

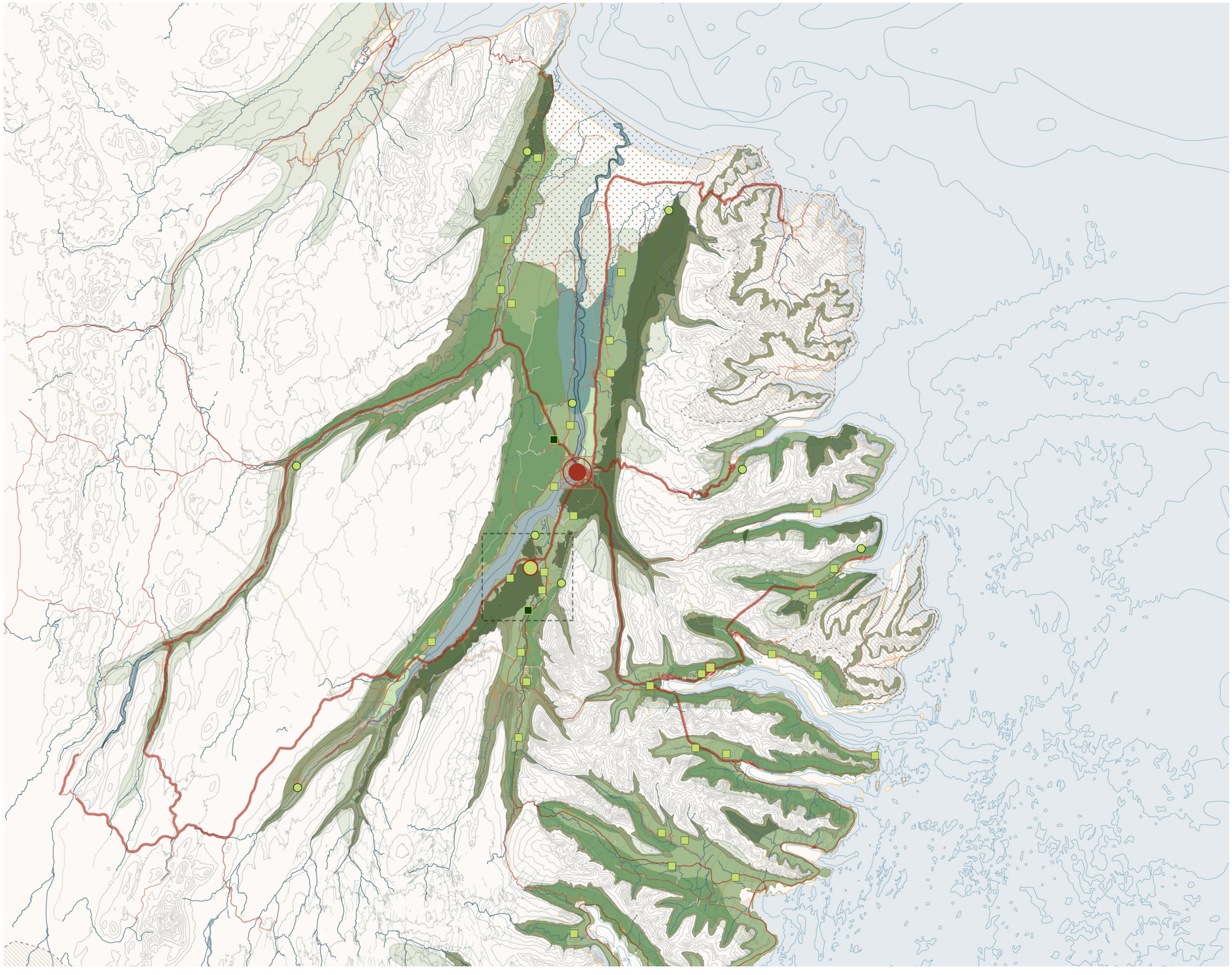
The knowledge bases are set up by the end of Phase 1.



Phase 2

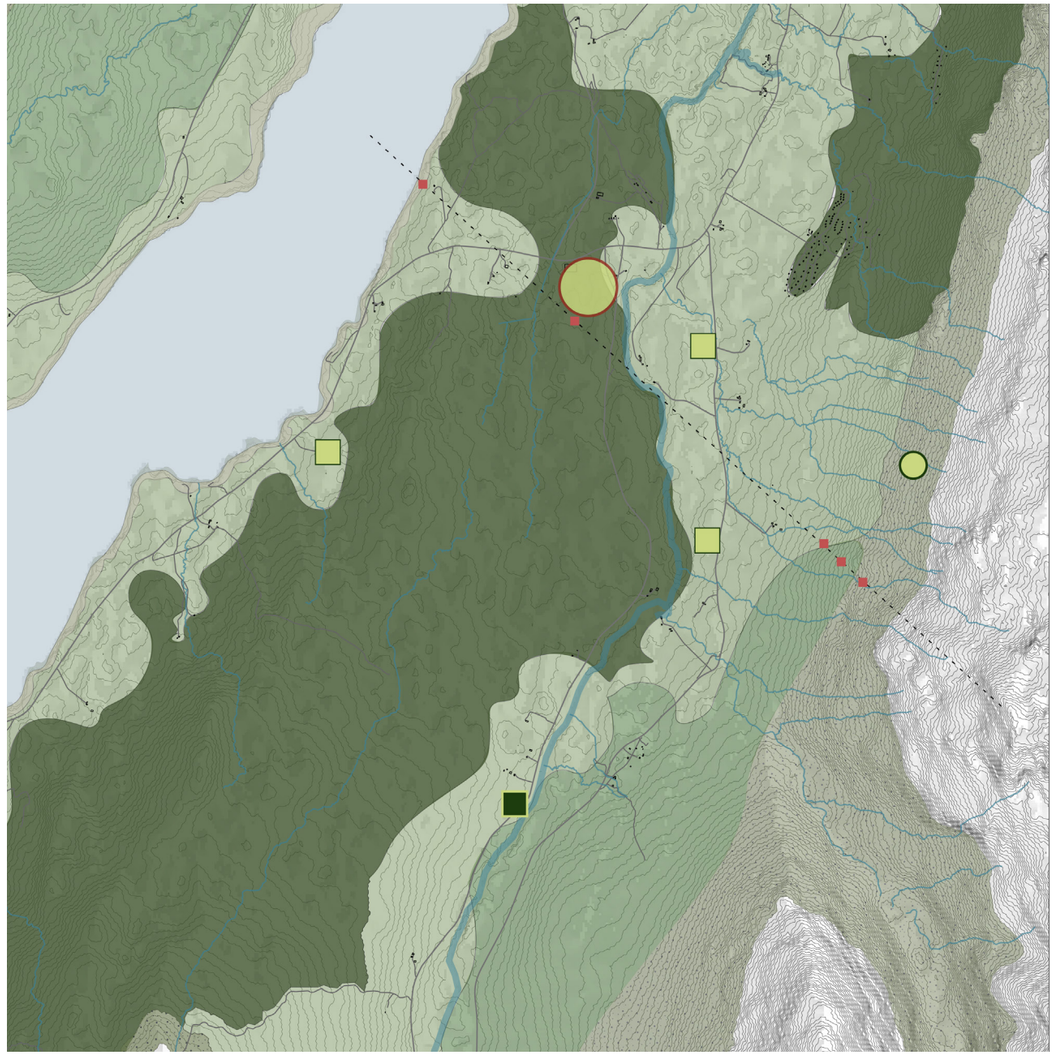
The final shape of the project would include extensive forested areas, as well as research and economic facilities. The lumber is processed into timber in two facilities set close to the productive forests, from where it is transported into nearby towns and to the ports in Seyðisfjorður and Reyðisfjorður.

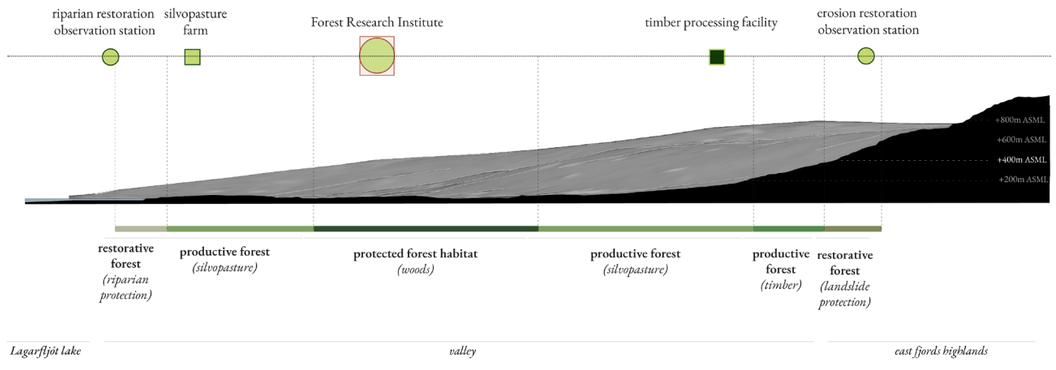
The knowledge network expands its outposts into all the different forest areas, especially in sensitive environments.



Hallormsstaður area

Zooming into the newly expanded Hallormstaður forest area shows the progression of different forest types, as well as the location of the facilities and infrastructure.





- Restorative Forests: Riparian
- Restorative Forests: Erosion and Landslide
- Protected Habitat: Woodlands
- Protected Habitat: Wetlands
- Productive Forests: Timber
- Productive Forests: Silvopasture
- Tourism
- Central Research Institute
- Forestry Research Center
- Outpost Station
- Economic Facilities (farms and timber processing)
- Knowledge economies (scientific tourism...)

N

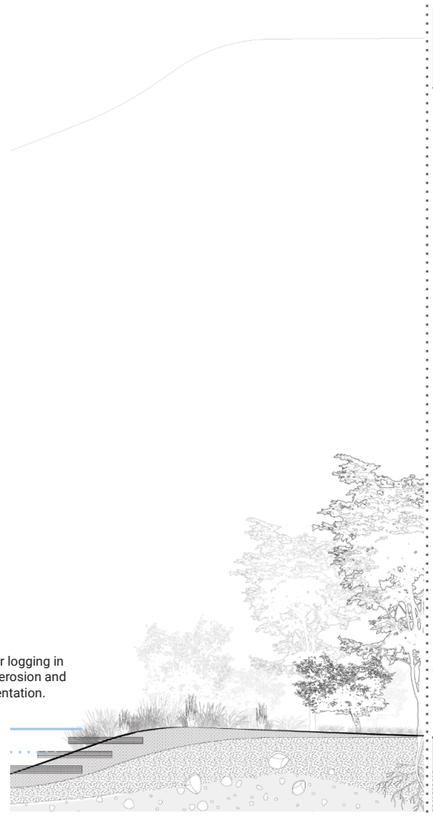
0 | 1 km | 2 km

Sequence of forest areas in Hallormsstaður

The five characteristic forest areas shown here are a result of different conditions set by their elevation, soil condition and function they are set to perform.

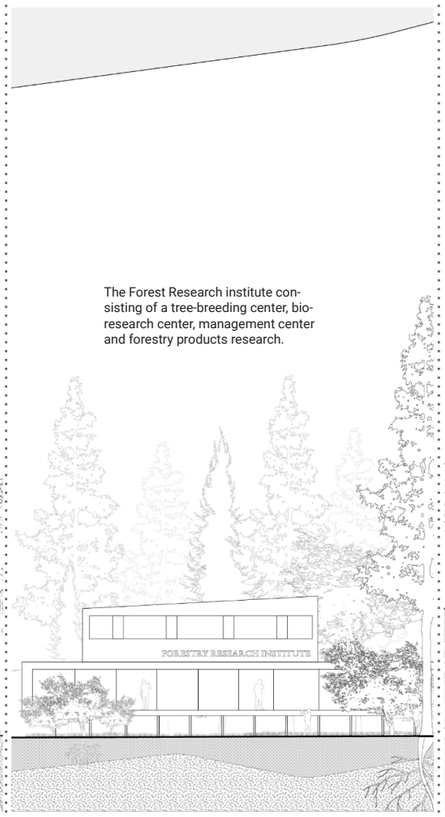
Restorative riparian

Horizontal timber logging in order to prevent erosion and help with sedimentation.



Protected woods habitat

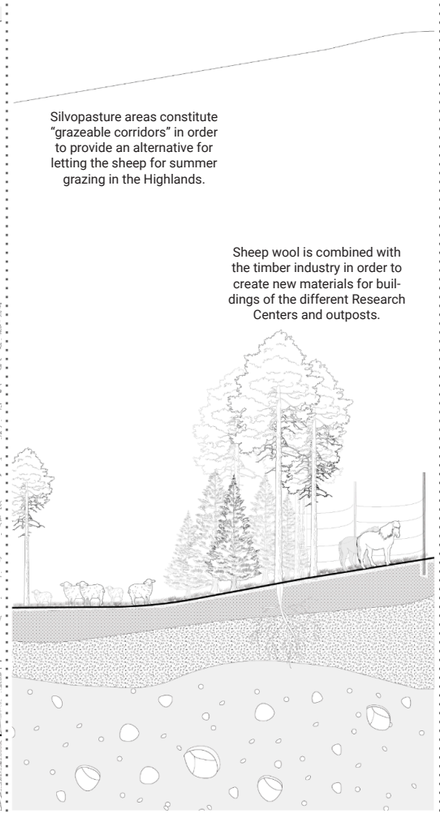
The Forest Research institute consisting of a tree-breeding center, bio-research center, management center and forestry products research.



Productive silvopasture

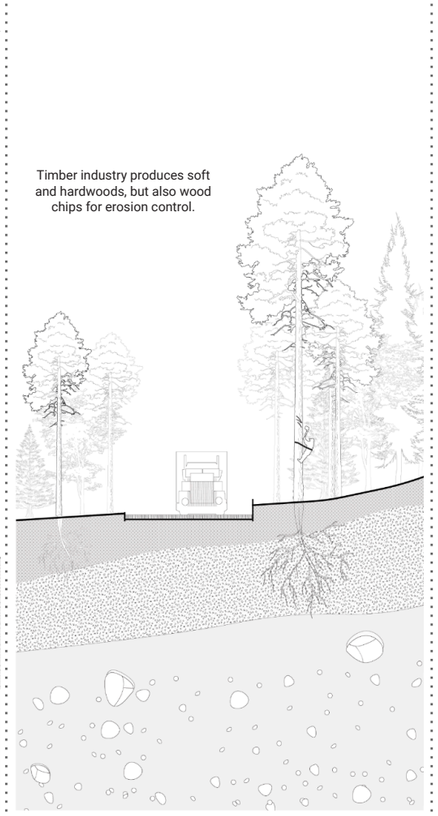
Silvopasture areas constitute "grazeable corridors" in order to provide an alternative for letting the sheep for summer grazing in the Highlands.

Sheep wool is combined with the timber industry in order to create new materials for buildings of the different Research Centers and outposts.



Productive timber

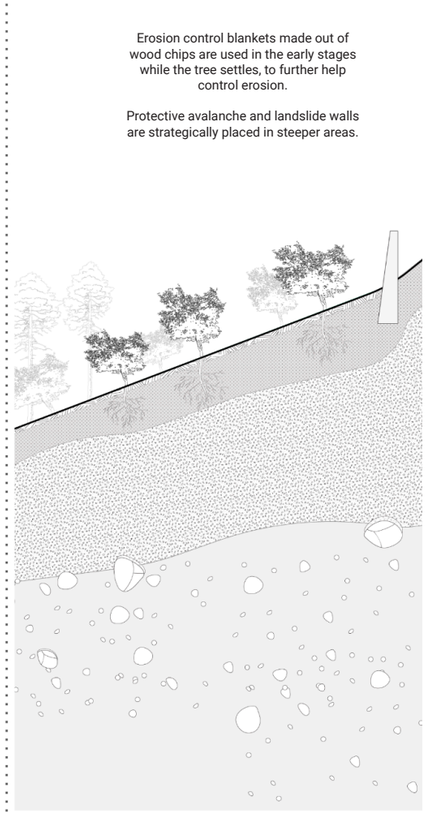
Timber industry produces soft and hardwoods, but also wood chips for erosion control.



Restorative erosion

Erosion control blankets made out of wood chips are used in the early stages while the tree settles, to further help control erosion.

Protective avalanche and landslide walls are strategically placed in steeper areas.



Impressions of new landscapes

The two AI-generated collages illustrate how the new forested landscape might appear.

First shows a silvopasture landscape, while the second one shows the view from the lake towards the fjord uplands.

Reflection

Working on this project presented a new set of challenges, somewhat different to the ones I've experienced in the other quarters. From exploring the island to find our site, through then diving into the different scales and layers of understandning the area to finally finding and developing our project.
Iceland and its radical conditions forced us to examine our pre-conceived notions of both urbanity and nature, and to develop a new approach to jumping through scales while examining the causal relationships found on site. We chose to take the route of posing a hypothetical design scenario which takes a radical stance in the nature v.s. extraction debate, by attempting to show that nature restoration can go hand in hand with scientific and technological processes. In my own design experiment, the aforementioned causal relationships started feeling more tangible, but also more consequential, as they leave behind not only a transformed landscape, but also greatly impact daily routines, material flows and the role that the region plays on a larger scale.
Finishing this project, there are many questions and implications which remain in terms of examining the consequences of our interventions. On a small scale - how do our transformations affect the local social fabric? On a global scale - what are the far reaching consequences of removing an energy source and a green metal industry from our area? I hope to be able to deal with some such hypotheticals in other upcoming projects.





4.

Design experiment

Transforming the Icelandic agricultural landscape

Rik Ebbers

Manifesto

The personal design experiment is focused on vertical farming, reforestation, and research facilities, replacing the Alcoa aluminum smelter as the primary economy in north-east of Iceland. The agricultural facility explores new forms of agriculture that balance the WEFM nexus and resource availability. Iceland is ranked number 1 on the WEFM nexus (IHE Delft Institute for Water Education, n.d.-a), but the cold climate and extreme weather conditions makes agricultural practices very challenging and therefore Iceland is mainly relying on cattle breeding or the import of food. (Jóhannesson, 2010)

By shifting towards new forms of agriculture such as vertical farming, Iceland can diversify their production of food and improve their self-sufficiency, by creating a more circular economy. The shift from cattle breeding towards vertical farming provides another opportunity, mitigating erosion caused by overgrazing and the reforestation of the lower parts of the island. The reforestation of the island also provides the opportunity for a new economy, the timber industry.

The Alcoa building will transform in a huge vertical faming facility where the need for vegetables in the northeast of Iceland can be provided as well as a new economy of producing spirulina algae. The algae can be used as food for animals, fish and supplements for humans making it very versatile. The algae are a protein rich resource that could be an alternative to meat or could replace soybeans for sheep feed. The study done by Tzachor et al. (2022) shows that Iceland could be self-sufficient in protein need with only 10% of the current annual energy production, but in a more extreme scenario Iceland could provide food for multiple countries in North-West Europe. However, for this scenario the production is focused on the Icelandic market and connecting it mainly with the fishing industry.

The scenario shows a future where agriculture is more sustainable and where the local landscape can be restored and where humans and nature live together.

Transforming the Icelandic agricultural landscape

Rik Ebbers

Eastern Fjords

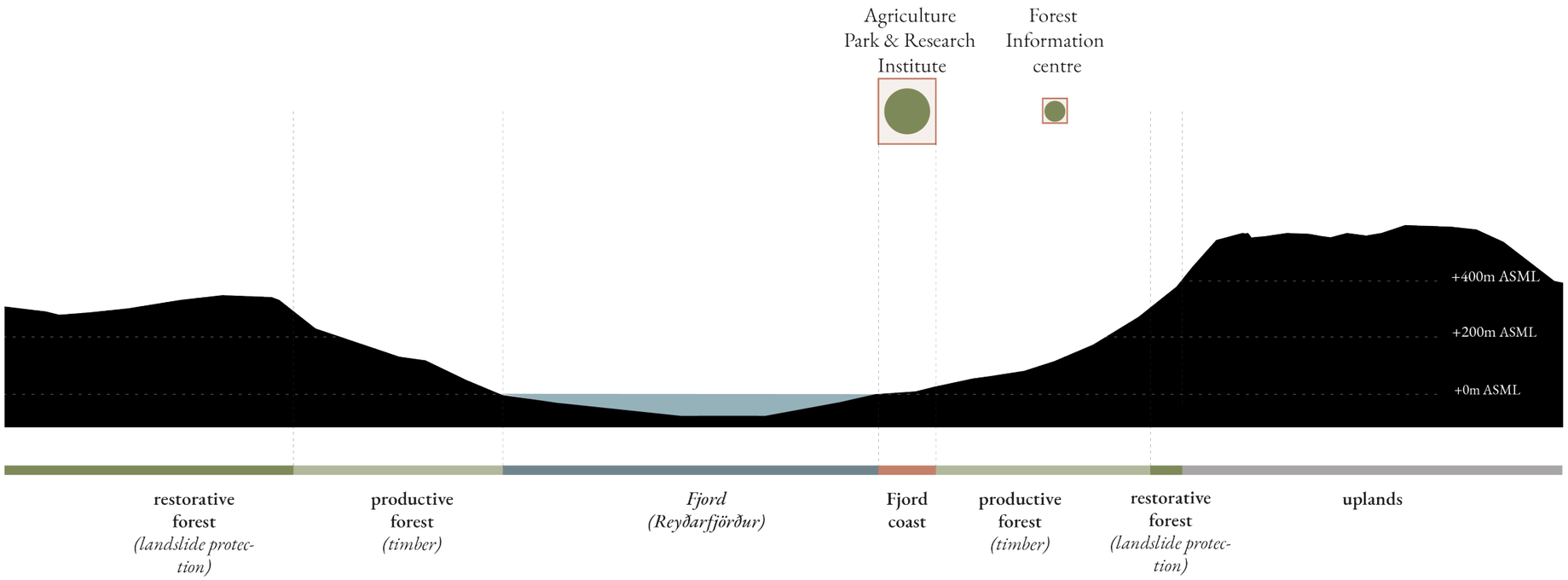
The lowlands of the fjords will be reforested to battle erosion and to create a timber industry. The result is that grazable lands within the fjords is reduced significantly. The agricultural sector in Iceland need to shift towards more sustainable agriculture to avoid overgrazing.

Within this design experiment the Alcoa factory is repurposed as an agricultural campus as a knowledge hub and a production center of food. Multiple forms of vertical farming are practices within this building such as making vegetables for eastern Iceland and Algae production that can be used as food for fish and sheep and as a healthy supplement for humans.



Section of the fjord

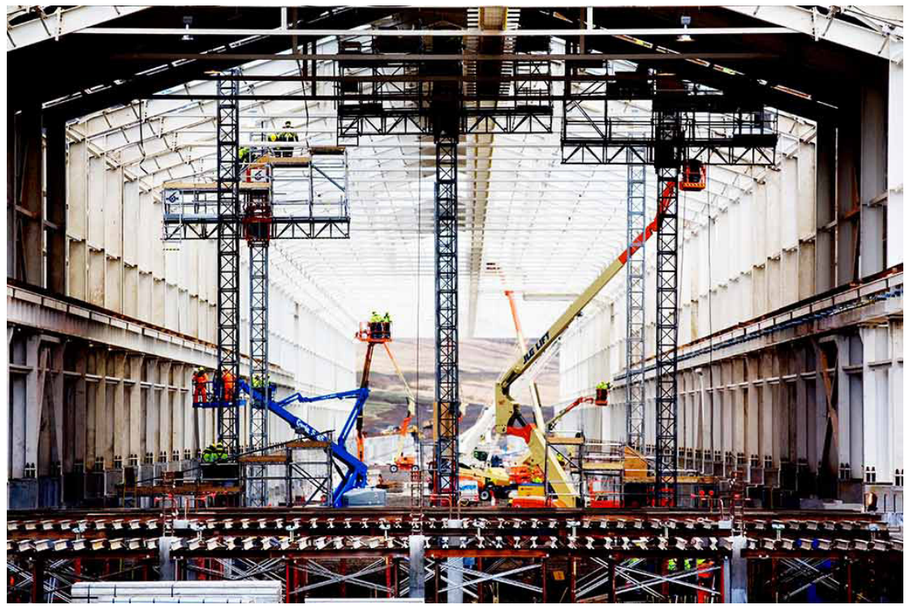
The Alcoa factory is located on a relatively flat part of the fjord northern side of the Reyðarfjörður fjord.



What is the human scale?

The building feels relatively small within the context of the fjord, but when the building is compared with humans, we start to understand the massive scale of this megaproject.





Present situation

the Alcoa factory is the biggest aluminum smelter in Iceland. The main building with the long tubes is over one kilometer long and all the buildings in total dedicated to melting aluminum have a surface of 14 hectares. The harbor is used to ship the aluminum in and out of the harbor. On the west side of the terrain are supporting facilities for the melting process such as, a fire station and a repair shop.

phase 1 (0-10 years)

Within the first 10 years of the project the Alcoa factory is still producing on full power. In these 10 years the infrastructure and the necessary facilities for the agricultural campus are developed. The campus park will have two main functions, firstly serve as a agricultural research facility and secondly as a place for knowledge tourism. Besides this the reforestation is started in around the campus and is connected with a touristic route connecting the campus and the reforestation area.





- River restoration
- Restorative Forersts: Riparian
- Restorative Forests: Erosion
- Protected Habitat Forests: Woods
- Protected Habitat Forersts: Wetland
- Productive Forests: Timber
- Productive Forests: Silvopasture
- Tourism only (no other economy)
- Central research centre
- Forestry Research Institute
- Outpost station
- Economic facilities (farms and timber processing)
- ① Forest information center
- ② Touristic agriculture
- ③ Cantine and office
- ④ Agricultural research facility
- ⑤ Tourism centre

N

0 | 500 m

Phase 2 (10 - 25 years)

After the first 10 years a part of the aluminum smelter will be reproposed for vertical farming and algae production. On the agricultural campus are two new facilities for growing seeds and growing seedlings. Besides this there is a dry and process facility for the spirulina algae. The vegetables and algae can be stored in a part of the storage facility that is shared with the aqua culture.

The tourism route remains the same for the agricultural part, but some tours can now be given through the factory. Besides, this the tourism route is connected with the aqua culture facilities that are designed by Anmol in the next personal design experiment.

Within 25 years the whole fjord will be forestated. The part where forest was planted in phase one has now grown bigger.

Phase 3 (25+ years)

In the last phase the agricultural campus is already fully developed, the development of new facilities and repurposing of new buildings is happening on the aqua culture. The productive forest has grown even bigger in this stage and the first grown parts can be harvested partially for timber.

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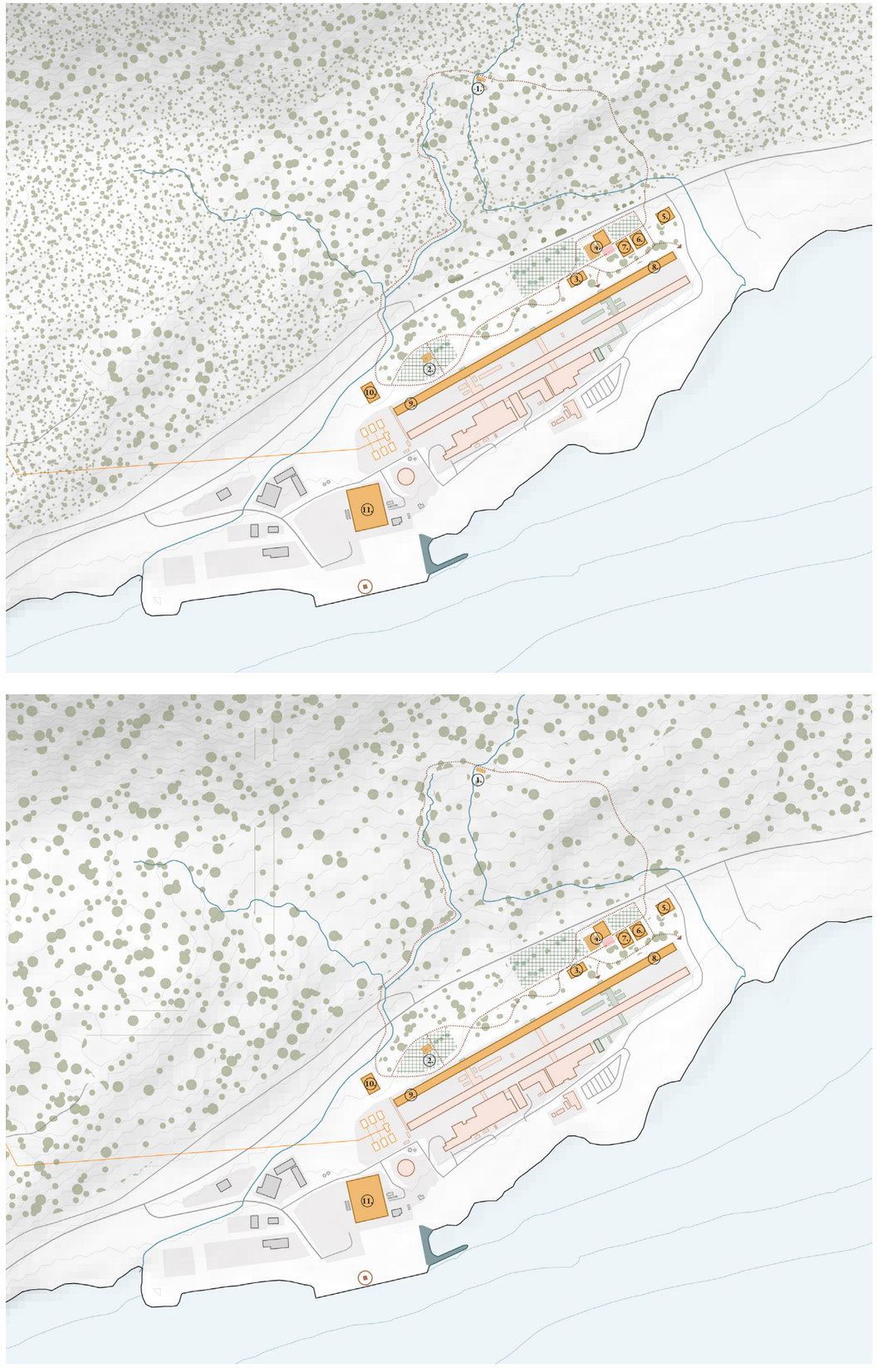
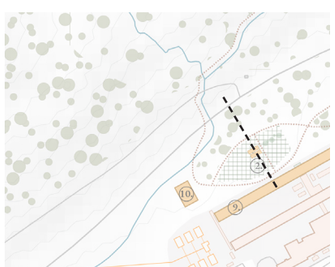
- ③ Cantine and office
- ④ Agricultural research facility
- ⑤ Tourism centre
- ⑥ Seed Lab
- ⑦ cutting nursery
- ⑧ Vertical farming for vegetables
- ⑨ Vertical farming for Algae
- ⑩ Spirulina dry facility
- ⑪ Storage facilty

N

0 | 500 m





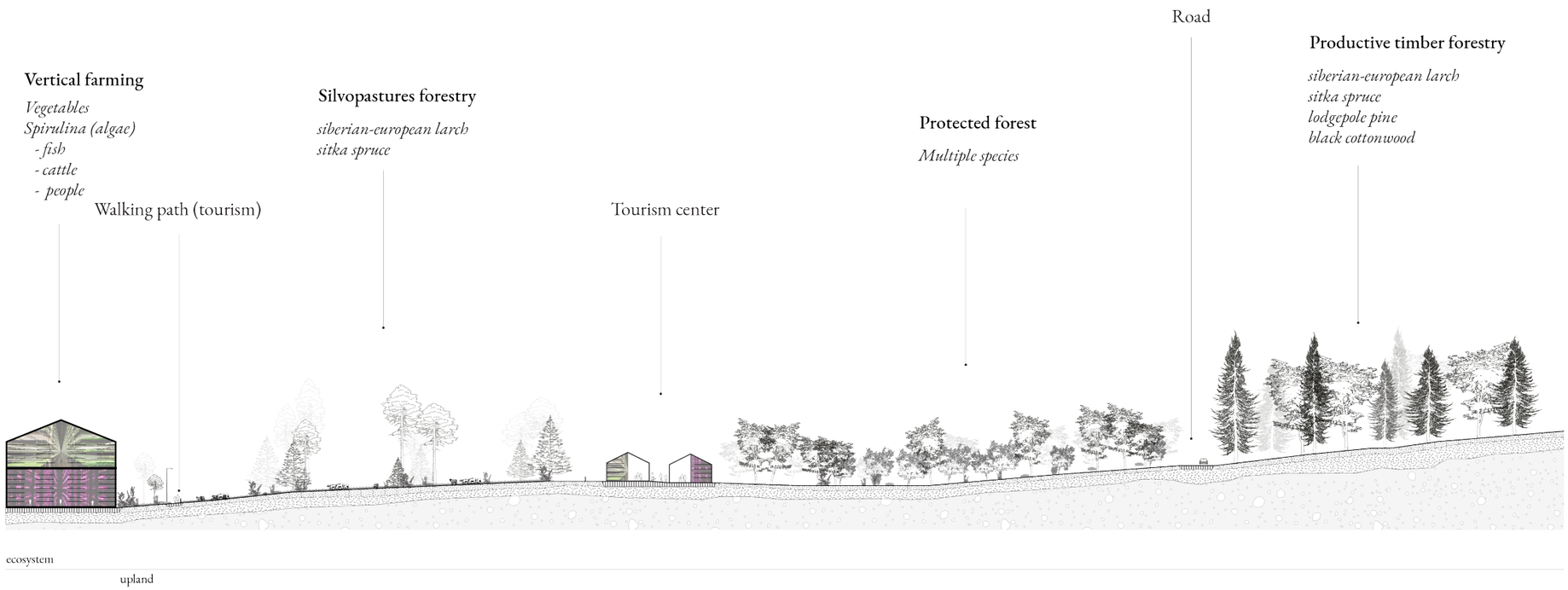
Section of agricultural campus terrain

The agricultural campus terrain has two functions, create a touristic route with that connects different facilities that explain the process of vertical farming, reforestation, and aquaculture. On the other hand, is this campus used as an experimental zone for new forms of agriculture and a healthy work environment for the employees of all the facilities.

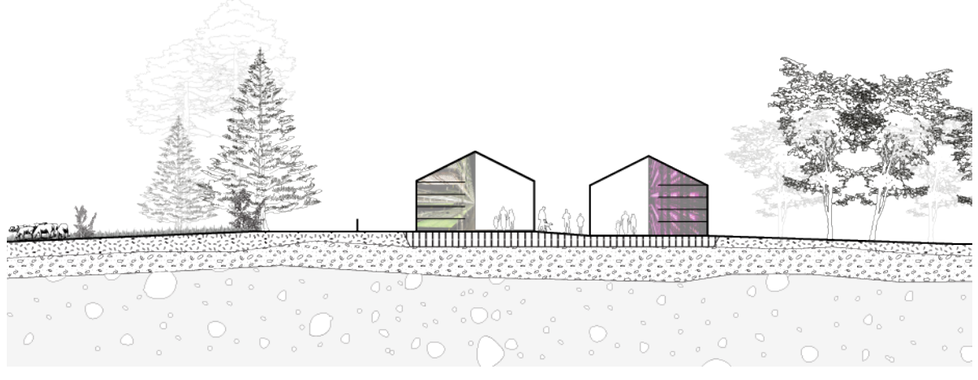
In the section one of the big tubes of the Alcoa aluminum smelter is on the left, this part will be repurposed for vertical farming. The silvopastures on the agricultural terrain are used as an experimental zone for the research facility and a showcase for knowledge tourism. Within this zone new types of trees for silvopastures and the balance between overgrazing and normal grazing can be tested.

The tourism center is partially a museum on how to grow food in Iceland and shows the new experimental growing processes of vegetables and algae that are done within the main vertical farm. The permanent forest serves as a small park around Alcoa, the productive timber forestry on the other side of the road is used for the timber production.

at the bottom of this page, the vertical agricultural facility and tourism center are shown in more detail.







Relational diagram of the Alcoa terrain

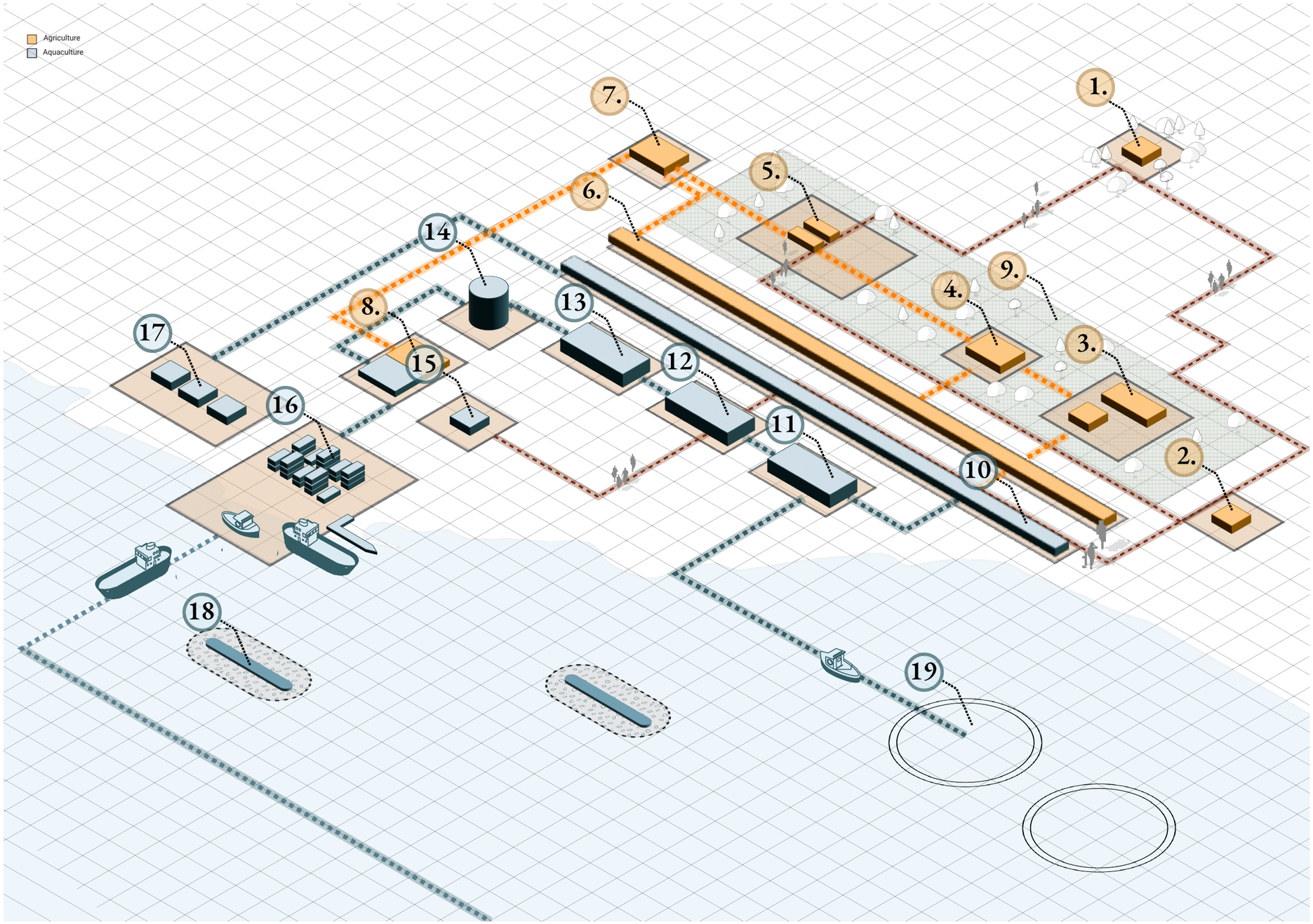
This relational diagram shows to agricultural park and the aquaculture facilities and how they are connected. The main relation is the algae production that functions as fish feed and is directly transferred from algae production (6) to the land-based aquaculture (10). Besides these facilities as the park and the storage are shared. The touristic route is connected with aquaculture, agriculture and the reforestation facilities.

Reflection

Looking back on the IED course, I learned a lot about resource management and how it is related to spatial phenomena. The project goes through many different scales to understand the intricate flows and relationships between resources.
The context of Iceland also made the project unique, Iceland has a unique landscape and many resources at its disposal. On the one hand, the country therefore also has a huge potential on a global scale to contribute to the food security of the future or other industries such as aluminum smelting. on the other hand, you can see that these practices can also lead to the overuse of the landscape.

The project on a possible scenario where a dam and Alcoa's aluminum smelter would disappear, and Iceland would return to primary economies in world of globalization. In my opinion is the globalized context and the economy feasibility of the project a bit neglected. The dam and aluminum plant were built recently, these mega-structures have been a significant investment and have a high residual value. Especially the de-damming process comes with additional costs and without any profit, removing what is considered green energy. furthermore, it is unclear whether the new economies will be able to be profitable, especially the research facilities will rely heavily on investments, further increasing the cost of the entire project.

Therefore, the project should be seen as a scenario involving a return to primary economies in a globalized world, where Resource management and sustainability are of paramount importance.



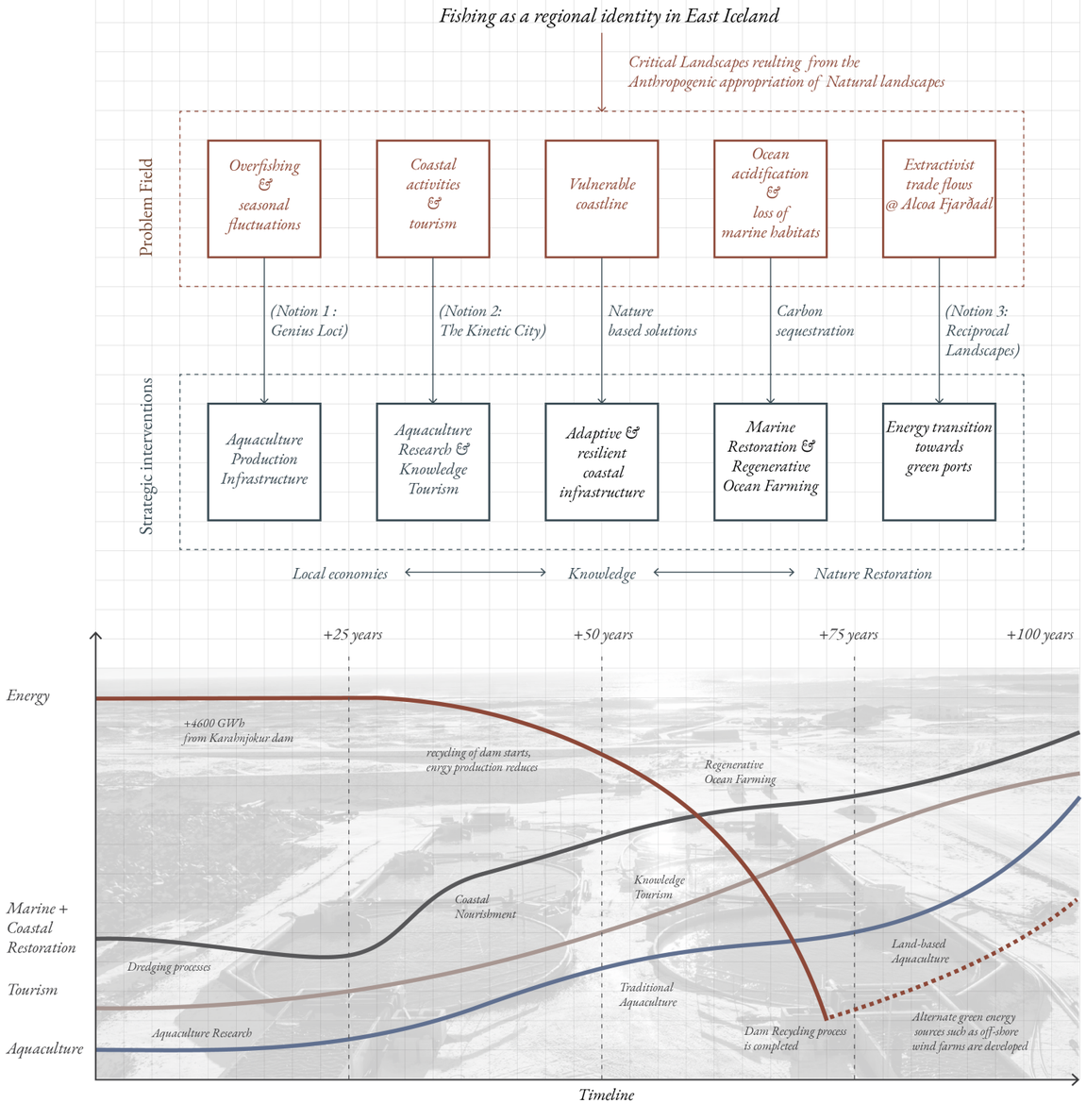
4.4

Design experiment

Aquaculture & Marine Restoration in the Fjords

Anmol Bhargava





Manifesto

The sea has played a pivotal role in shaping the cultural landscape as well as the socio-ecological identities in the Eastern Fjords of Iceland over centuries (Barnes, 2014). Fishing has been a regional identity as well one of the primary economies within the region. However, seasonal anthropogenic activities such as overfishing and the booming tourism industry has resulted in ocean acidification and loss of marine habitats as well as imparted vulnerability to the coastline which is further compounded by extreme climate change (Mehrotra, 2021). Moreover, massive infrastructural developments such as the the Alcoa Fjarðaál Aluminium smelting plant which the Karahnjukar dam solely produces electricty for currently employs 450 people within East Iceland. Such extractive projects not only result in a loss of regional soocio- ecological identities but also have an adverse impact on their surrounding ecosystem.

The goal of repurposing of the Alcoa Aluminium smelting plant and the dam will have major planetary impacts in the flow of materials and resources (Hutton, 2019). This calls for a transition from the existing extractivist landscape towards emerging knowledge landscapes which integrate regional economies with state of the art ecological restorative practices. Thus, the Alcoa smelting plant is gradually de-infrastructuralised as long as the dam produces electrcity. Thereafter, it is repuposed into an aquaculture, food production and research facility which also facilitates regenerative ocean farming and restorative practices in the adjoining marine ecosystems. The vulnerable coastline is transformed into an adaptive nature based system which accomodates ecological processes, temporal touristic influx as well develops a layer of resilience over the transformed industrial ecology. The surrounding fjords and ports steadily transition from carbon based fishing economies towards a synergised and integrated network operating on clean energy in the long duree.

Intervention: Aquaculture & Marine Restoration in the Fjords

Notions: Genius locii, Reciprocal Landscapes, Adaptive Cycle, Ecological rationality, Long Duree, Territorial Resilience, WEF Nexus strategy

Anmol Bhargava

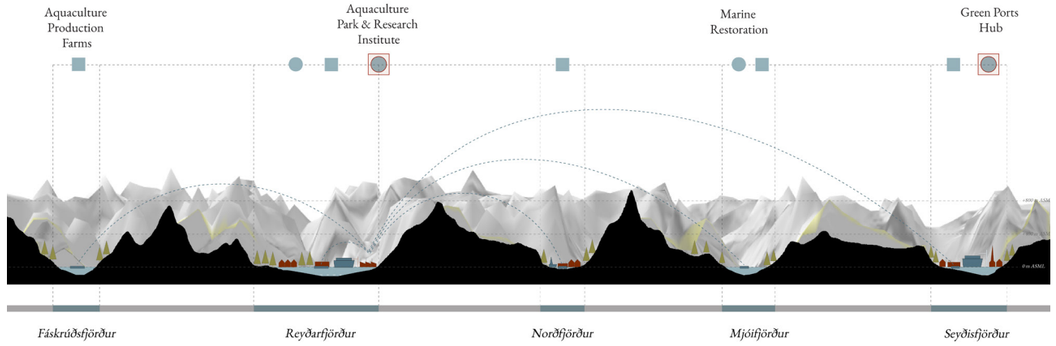
Aquaculture Process & Spatial Structures

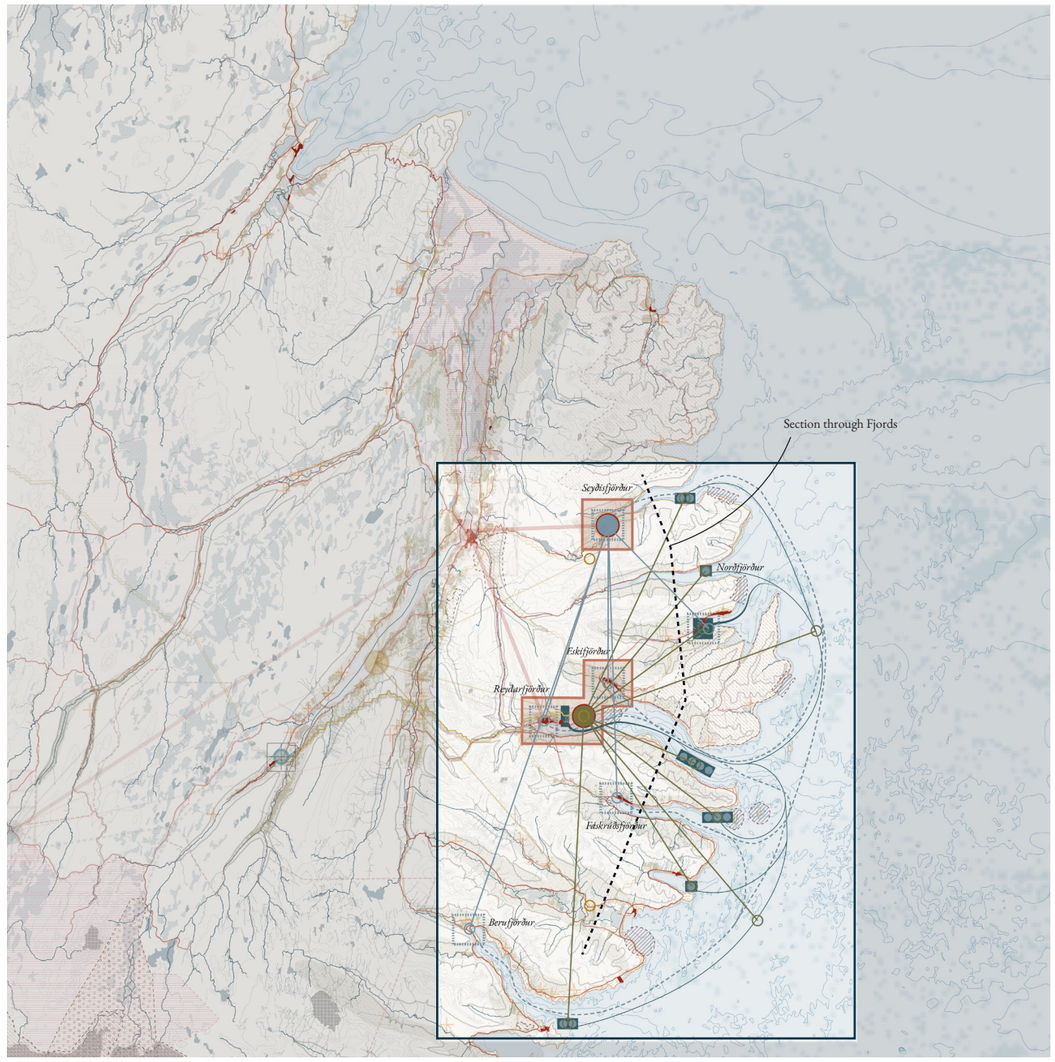
Aquaculture is an exponentially growing industry where fish and marine life is farmed. In the existing scenario, production farms are located in the Eastern Fjords as they provide the ideal environment for practising Traditional Aquaculture but there is a room for increasing the production capacities of these farms as well as expanding these to other fjords as well. However, in order to localise the aquaculture process within East Iceland and create employment oppoutunities within this sector, production facilities such as hatcheries, feed mills, smolt facilities, etc need to be established in the region. These infrastructures will complement the already existing processing facilities within the fjords, thus making the entire aquaculture process indeendent and circular within East Iceland itself, thereby making the region independent and boosting the local economy. At the same time, the aquaculture process is more sutainable than traditional fishing practices and less damaging to the marine ecosystems.

	Aquaculture Process	Description	Resources / Spatial structures	Potential sites / Hybrid systems	Prioritization
Phase I : 10-16 months	Hatchery & Broodstock	Eggs from Broodstock fish are stripped off when they become larval fish. These leave the hatchery as juveniles	- freshwater - electricty - logistics	- large industrial facility in the fjords with abundant supply of electricity	**Needs to be setup.** East Iceland currently does not have this facility and it imports eggs from South-west Iceland.
	Feed mill	Feed produced from vegetable ingredients(soy, whaet) & marine ingredients(fish oil, fish meal)	- food production - electricty - logistics	- large industrial facility - can be integrated with food production/ vertical farms	**Needs to be setup.** East Iceland currently does not have this facility and it imports feed from Norway.
	Smolt Facility	Juveniles are grown into fingerlings.	- freshwater - electricty - logistics - vicinity to sea	- large industrial facility in the fjords with abundant supply of electricity	**Needs to be setup.** East Iceland currently does not have this facility and the juveniles are currently sent to South-West Iceland
Phase II : 12-24 months	Wellboats	Serrvice vessels, wellboats and feed carriers.	- fishing port - electricty / fuel	- Fishing ports in the fjords	**Needs expansion.** This facility needs to be expanded to all habitable fjords in East Iceland.
	Production Farms	Fingerlings are moved to cages in the fjord waters to grow	- fishing port - electricty / fuel	- Fishing ports in the fjords	**Needs expansion.** This facility needs to be expanded to all fishing fjords in East Iceland.
Phase III : 3-7 days	Processing	Fresh whole fish is harvested, packed and distributed and sold to end customers.	- electricity - logistics - storage	- large industrial facility in the fjords with abundant supply of electricity	**Sufficient.** This facility is present in Neskaupstadur and Eskistadur.

Positioning in the regional vision

This map situates the project in the larger group vision where the implications are seen in the form of infrastructural transformations, nature restoration strategies, emerging knowledge networks and their direct and indirect implications on human resources.





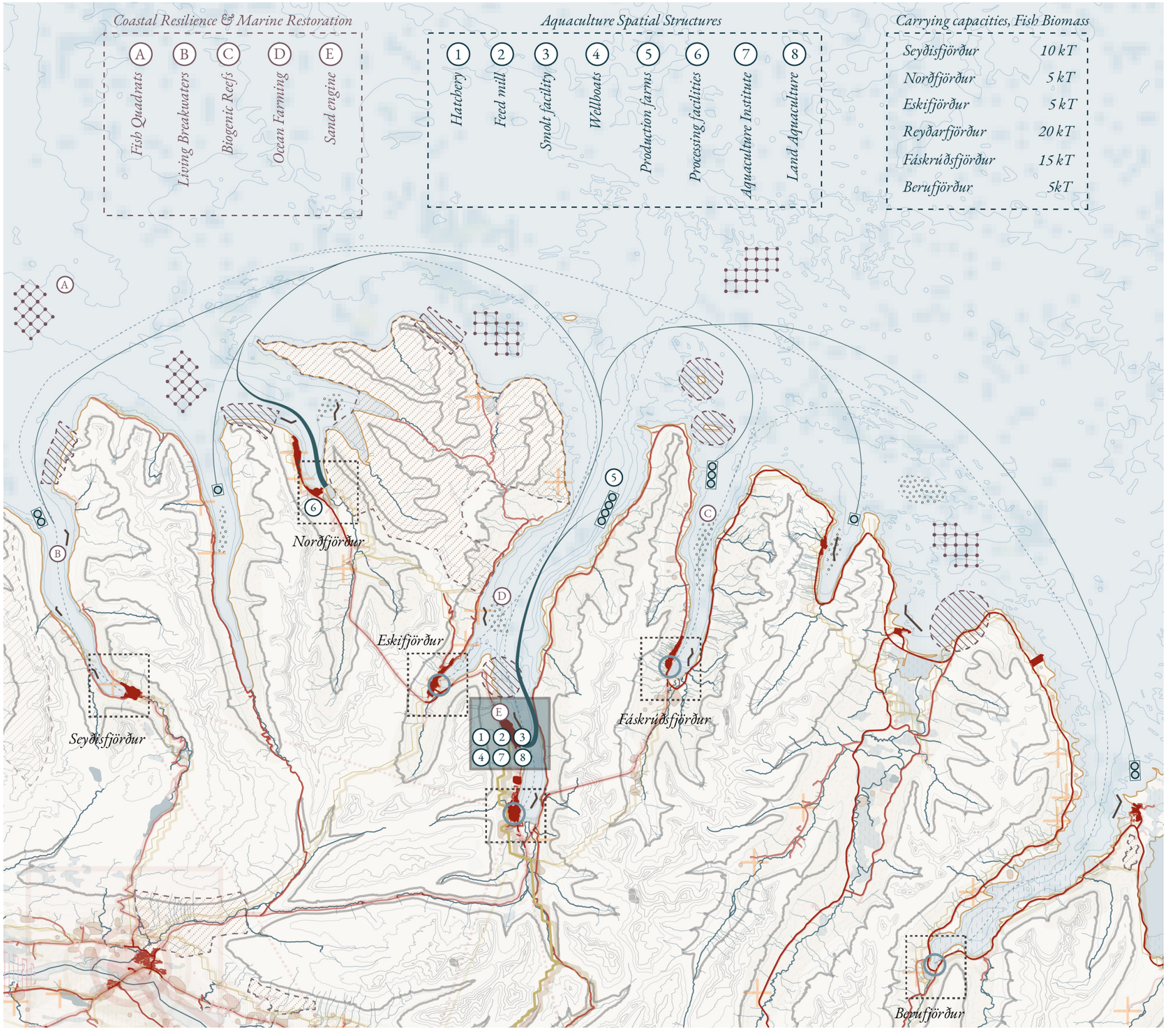
- Tourism Hubs
- Education/ Research
- Forests
- Ports
- Food production in Alcoa
- Aquaculture
- Ramsar sites
- Nature conservation
- Protected sea bird colonies
- Protected intertidal zones
- Protected bird wetlands
- Logistics via land
- Logistics via sea

N

0 — 25 km

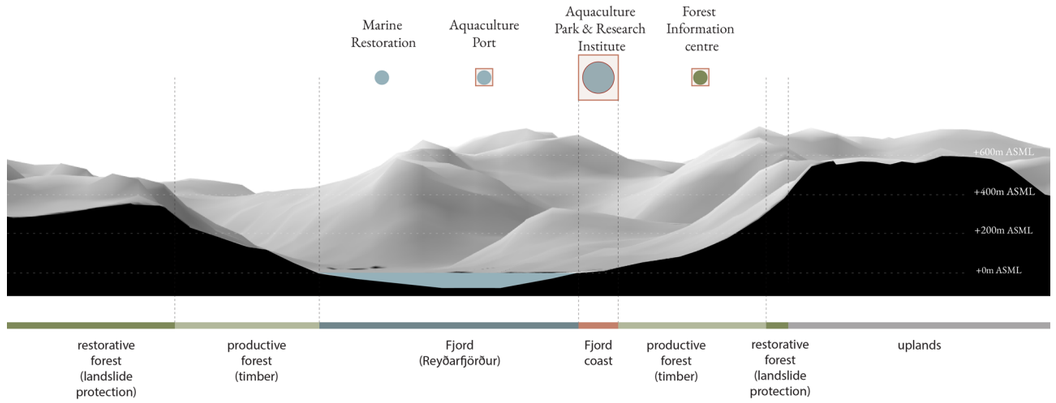
Spatial Processes & Structures

The spatial processes and structures of Aquaculture Production and Research, Marine Restoration and Coastal Resilience are interspersed within the Eastern Fjords. The new aquaculture production and research facilities can be accomodated within the existing Alcoa Fjardaal smelting plant as it requires a large industrial facility with availability of energy and fresh water. The aquaculture production farms are expanded to other fjords on the basis of their carrying capacities. For marine habitats restoration and to mitigate the impact of aquaculture Regenerative Ocean farming is initiated. In order to develop resilience against storm surges and land erosion, nature based adaptive strategies such as sand engine and libing breakwaters are also put into process.



Alcoa Smelter, Reyðarfjörður

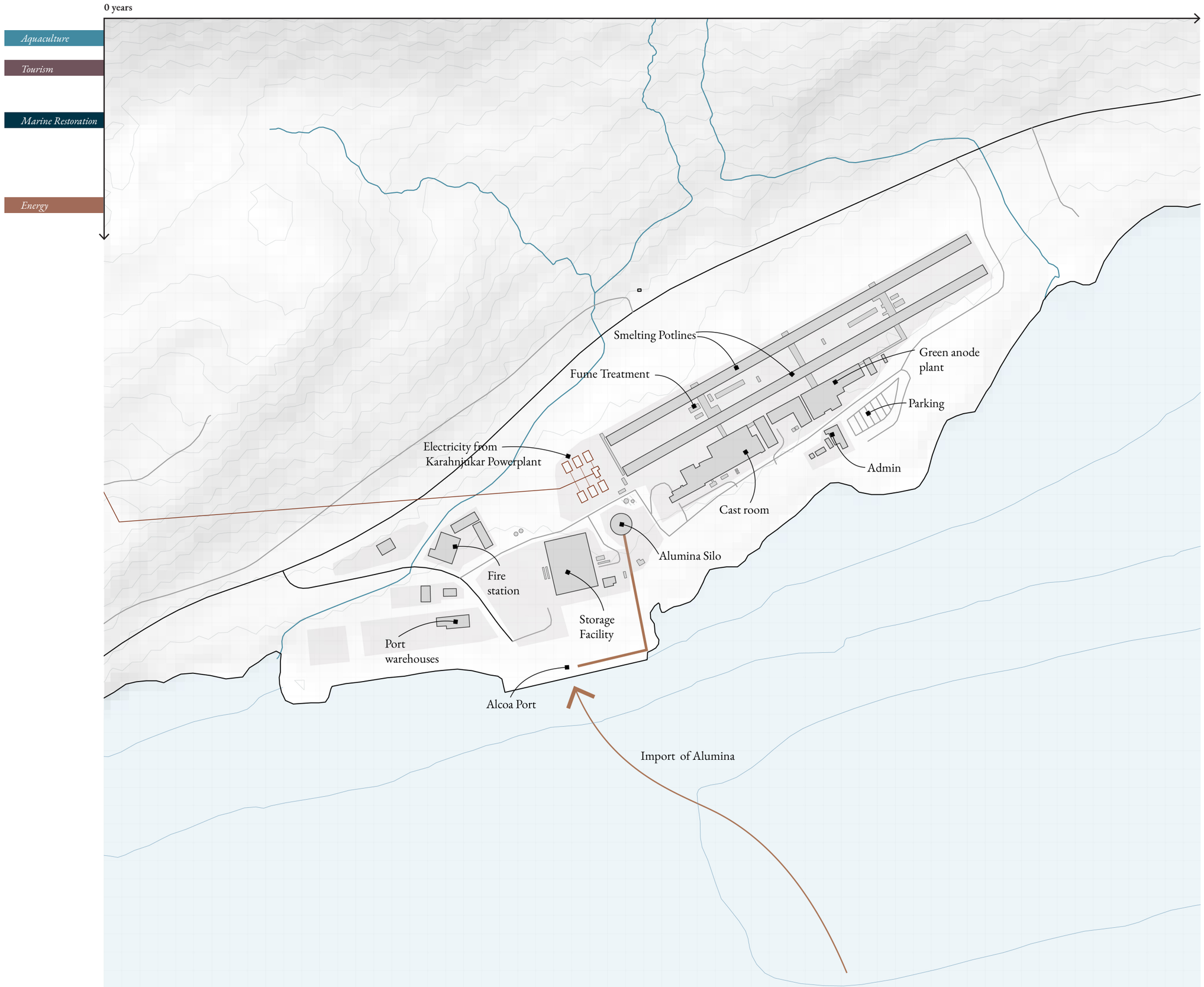
The Alcoa Fjardaal Alumium smelter was completed in 2008 and it smelts 350,000 tonnes of aluminium per annum at full capacity. The smelting plant draws 4600 GWh of energy from the Karahnjukar dam which was primarily built to supply electricity to the Alcoa smelter at way lower than the market prices. However, the smelted aluminium is exported outside iceland straight after processing and the industry does not benefit the Icelandic economy. Even the workers working at the plant were made to leave their original means of livelihood: fishing and agriculture and are overworked, underpaid and devoid of basic human rights. Moreover, the smelting plant and the supporting dam which supplies electricity to the plant damage the ecological processes and the native ecosystems of the region. Therefore, the Alcoa power plant needs to shut down and the existing built infrastructure would be repurposed to revitalise the primary economies and the regional identities of East Iceland: fishing and agriculture , along with state of the art knowledge and research institutes, thereby transitioning from an extractive infrastructure to knowledge-centric industrial ecologies.





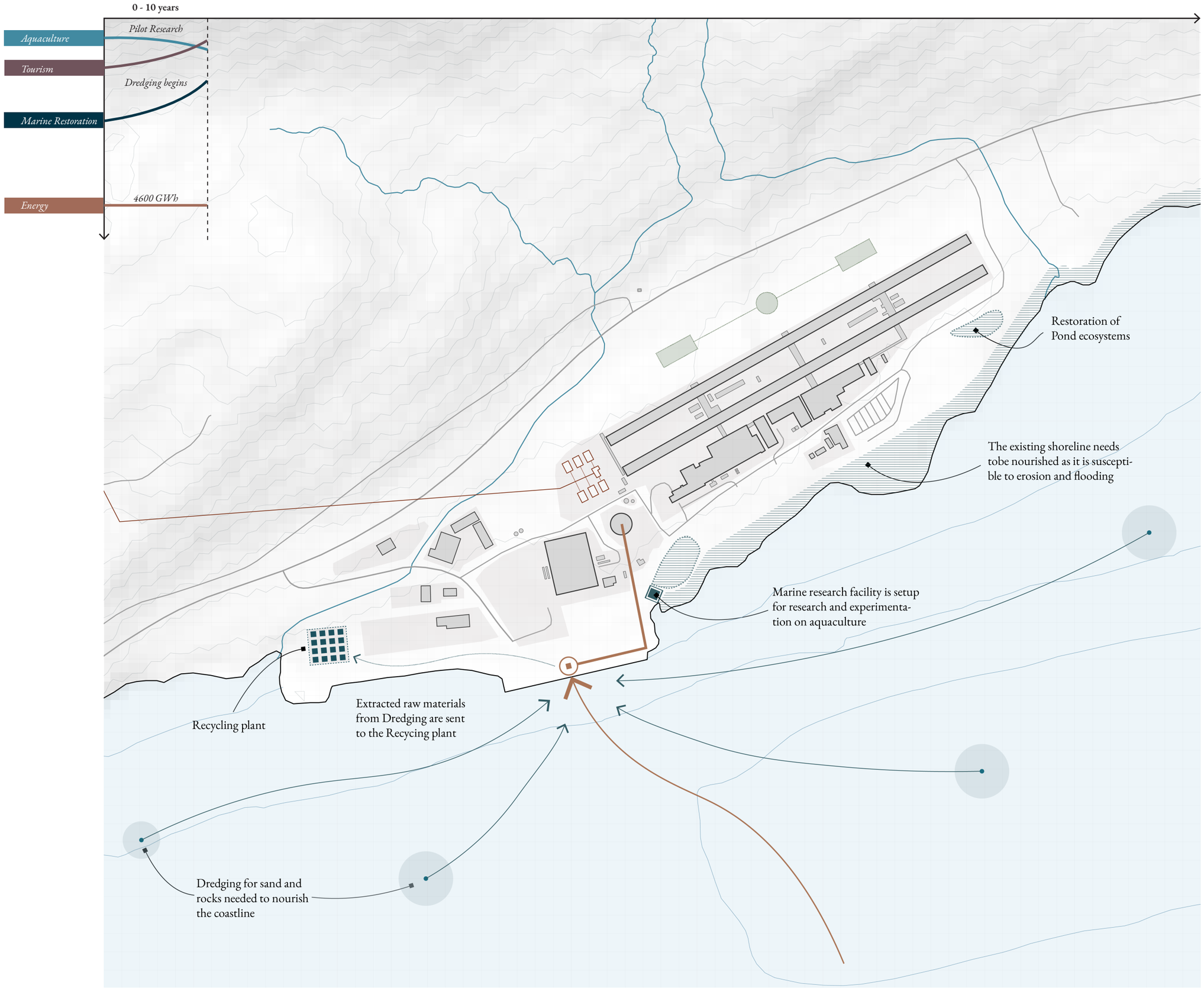
Phase 0

In the present situation, the infrastructural facility operates as an Alumium smelter. The Karahnjukar powerplant supplies 4600 GWh of energy to the smelting plant..Alumina is imported via the port facility and is stored in the alumina silo. Thereafter, it is sent to the Potroom where it is smelted into a molten state and is casted into various shapes and forms in the castroom. The finished product is then exported outside Iceland. During the manufacturing process, fluorides are produced as a by product which are hazardous to the surrounding marine flora and fauna. Storm surges and increased land erosion from the sea currents make the coastal edge vulnerable to climatic extremities



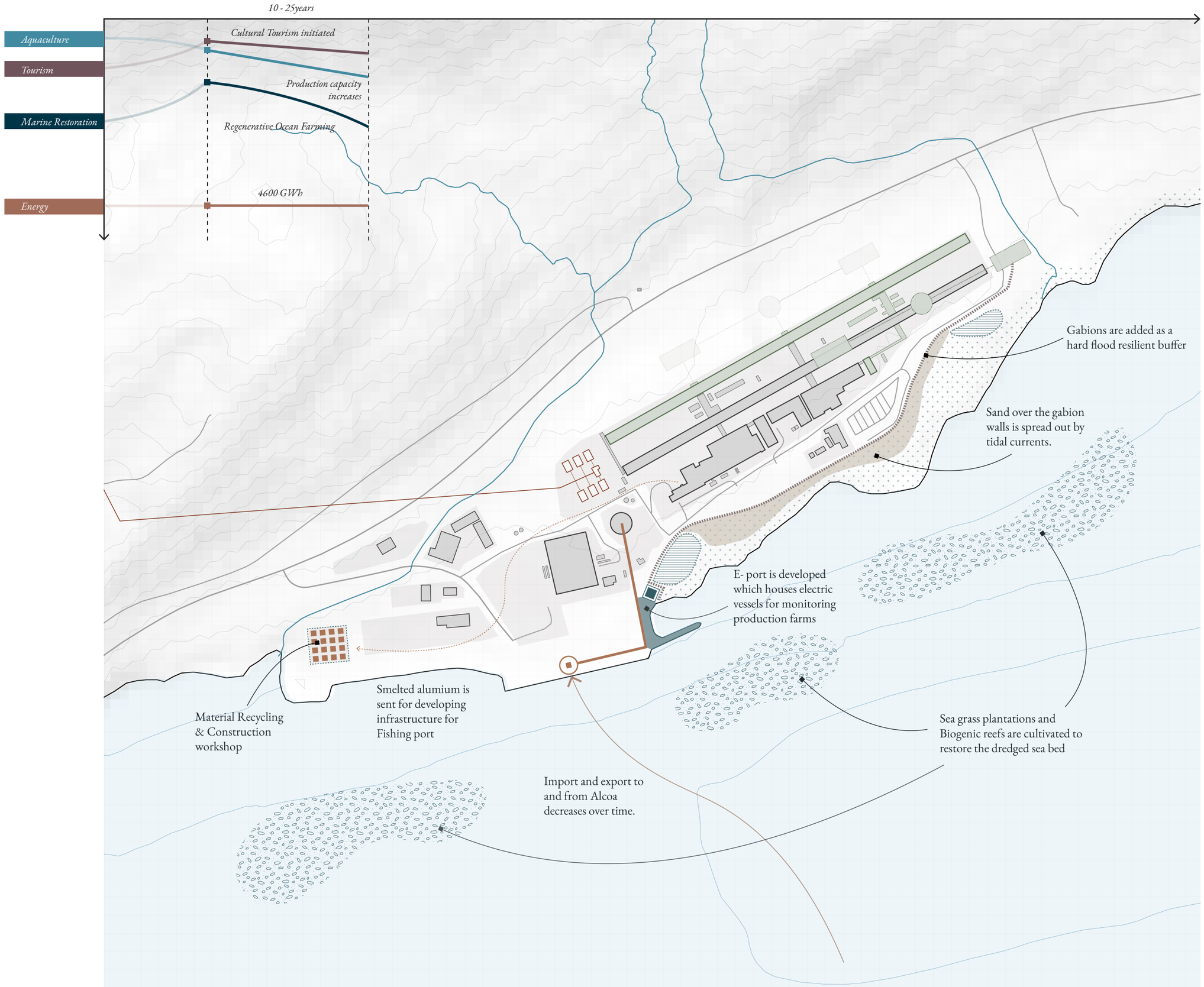
Phase I

In the first phase uptil 10 years, the Alcoa smelter continues to function since the Karahnjukar dam is still supplying electricity. A marine research facility is setup for research and experimentation on aquaculture and nature restoration processes. Dredging activities are also initiated to collect raw materials such as sand and rocks which are then sent to the temporary recycling plant. The processed materials are used to secure amd nourish the vulnerable shoreline.



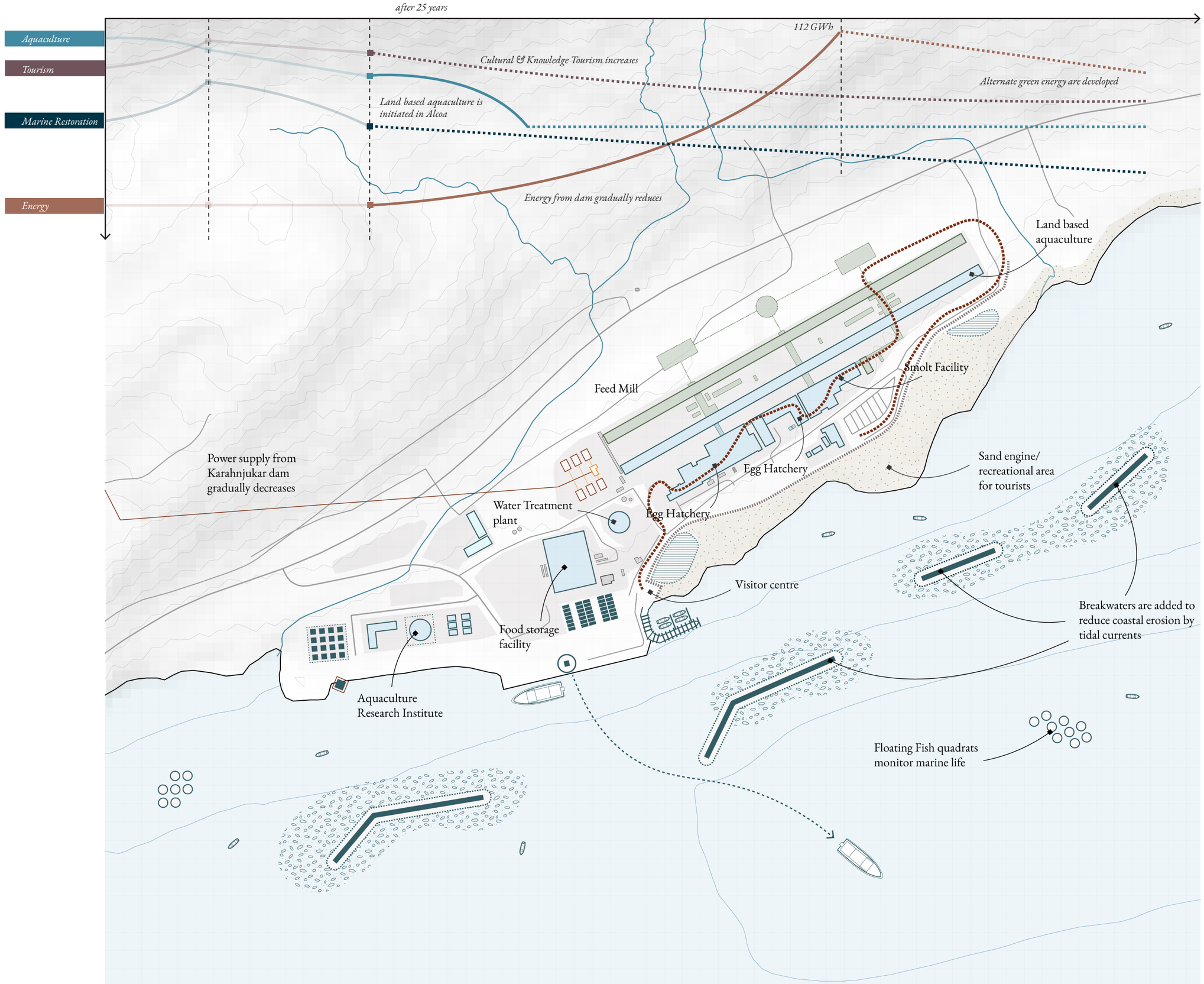
Phase II

After the first 10 years, the production capacity of the Alcoa smelter is steadily reduced and a vertical farming facility is setup in one of the smelting potlines. A part of the alumium being processed in the plant is used to build ingfrastructure for the electric port. Regenerative Ocean farming is initiated to restore marine habitats, especially near the areas which were dredged. The coastline is nourished by creating a soft and hard buffers: sand engine & gabion edge respectively.



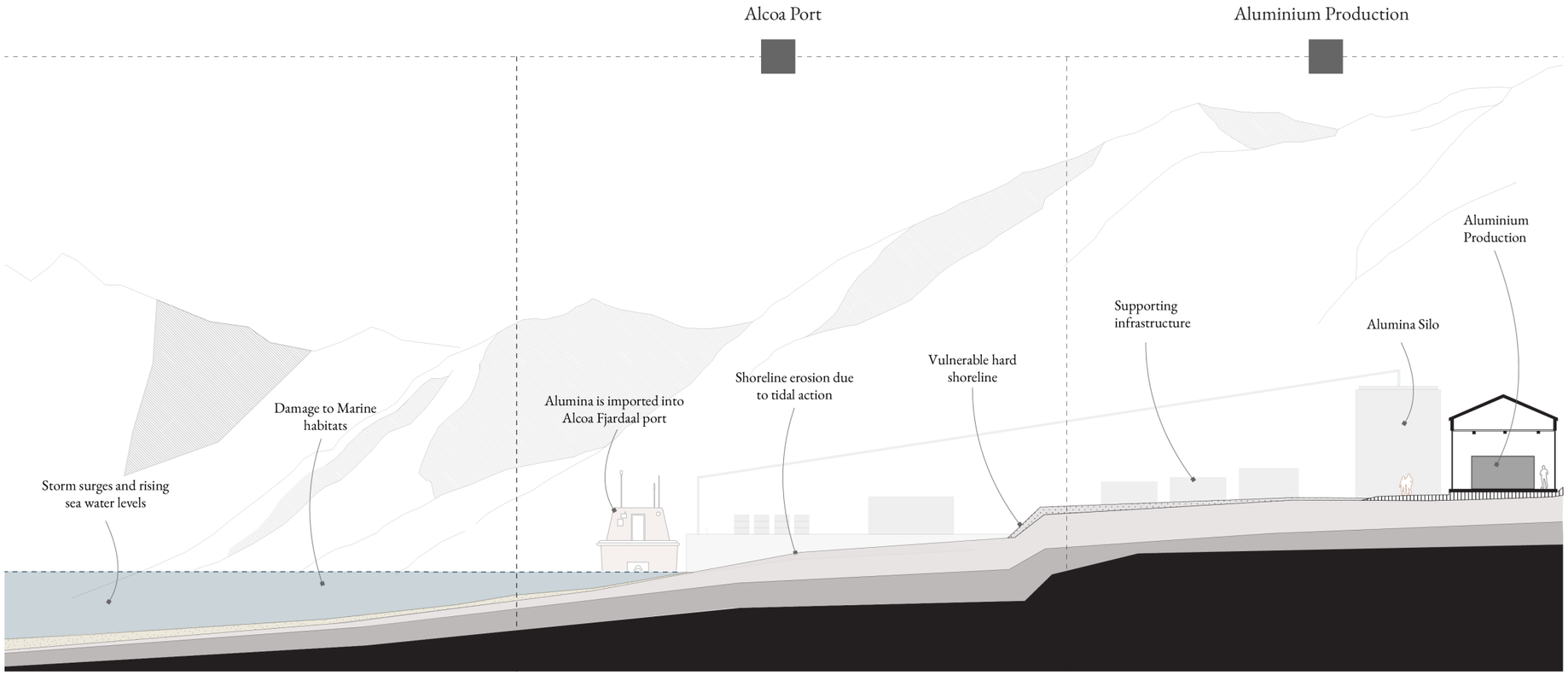
Phase III

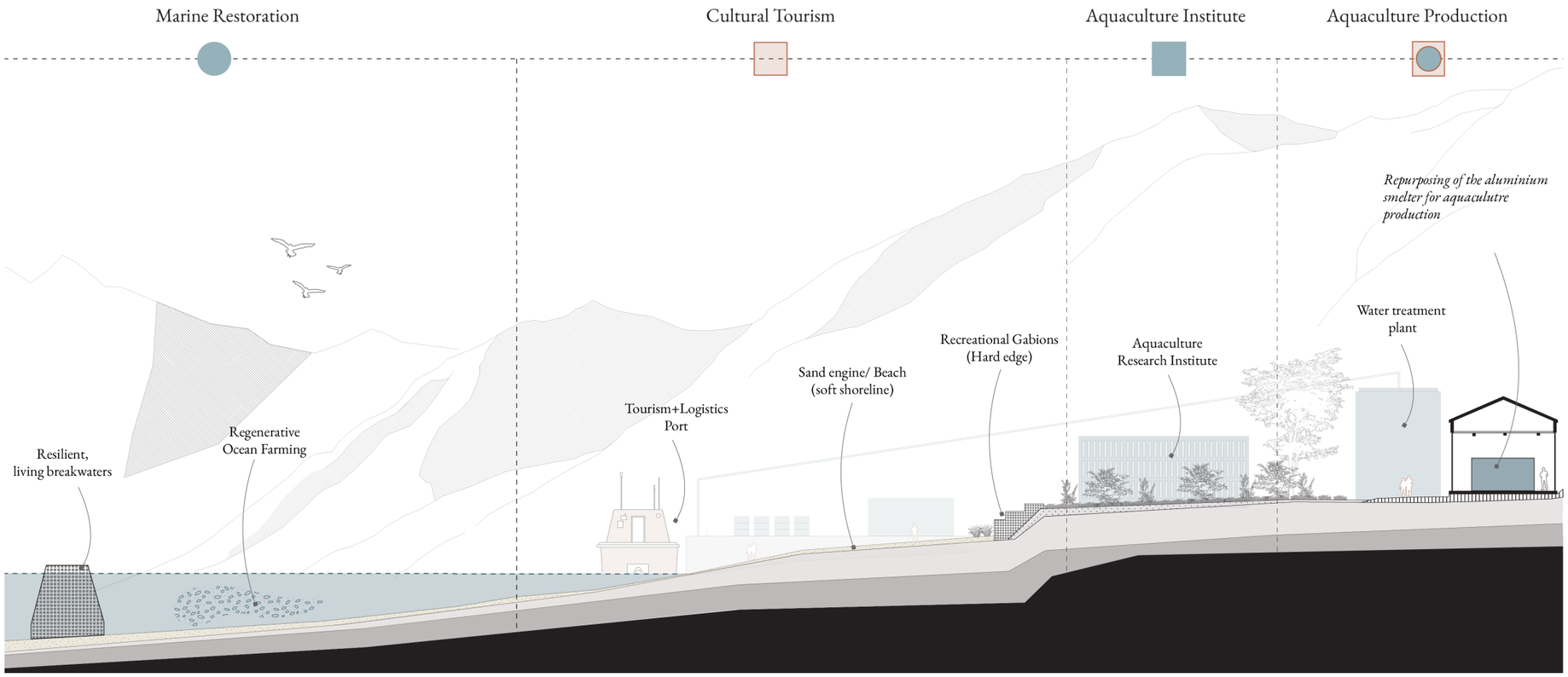
After 25 years, the energy from the dam gradually reduces over the next 50 years when it becomes steady at 112 GWh. The Alcoa smelting plant is repurposed into an Aquaculture Production and Reseach facility. Cultural and Knowledge based tourism is also initiated within its premises. Marine Restorative practices as well as Coastal resilience is developed in the long duree, along with a transition towards use green energy in the maritime industry .



Adaptive Coastal Edge

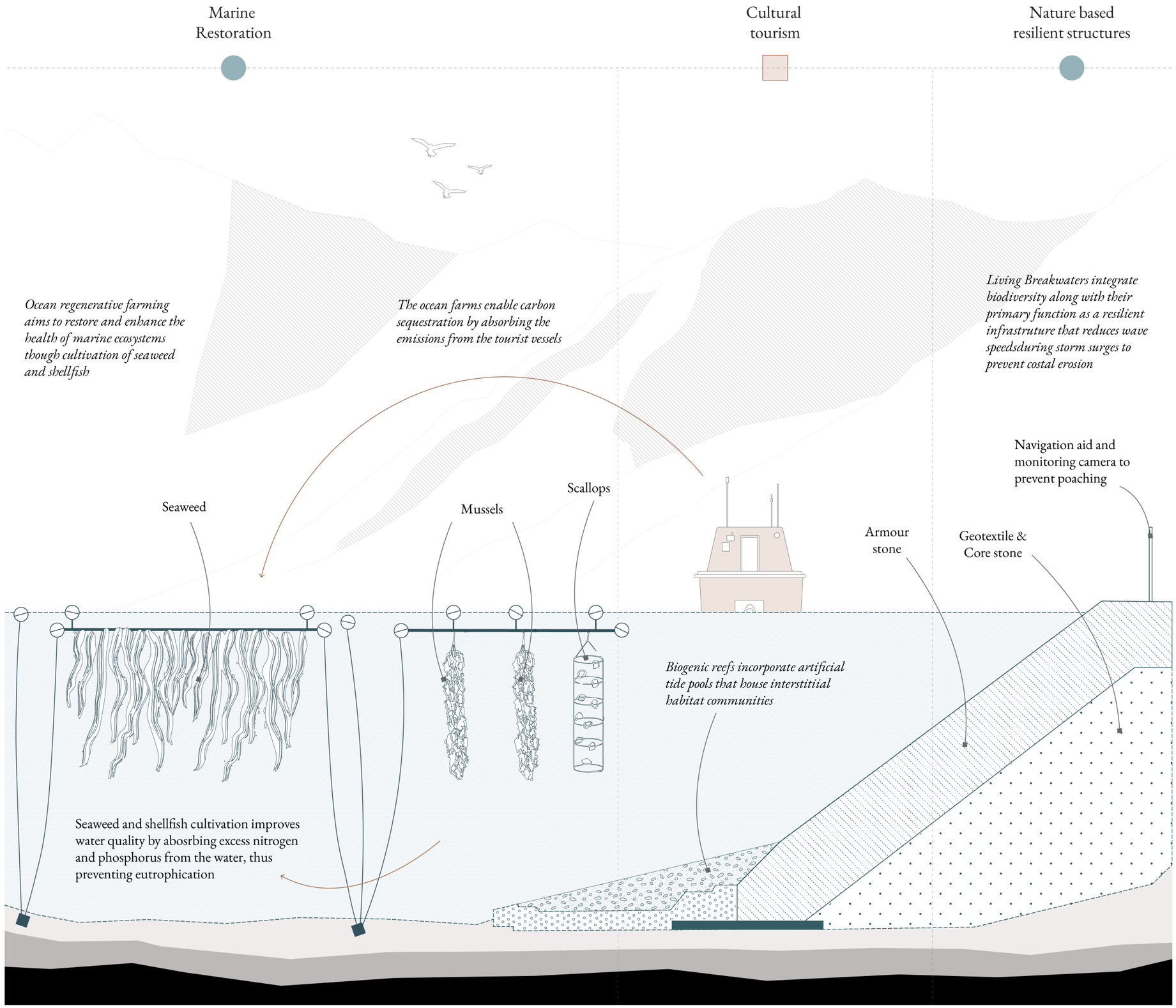
The following sections illustrate the transformation of the coastal edge along the Alcoa smelting plant. Using nature based solutions and the notion of designing for extremeties in the long duree, a multi layered resilient system comprising of a hard gabion edge and a soft sand based beach shoreline is envisioned which can also accomodate ecological processes as well as the temporal touristic activities .





Regenerative Marine Ecologies

Using the notions of Ecological rationality, the aquaculture driven economy is supported by marine restorative practices such as regenerative ocean farming as well as resilient structures such as living breakwaters which also accomodate biodiversity.

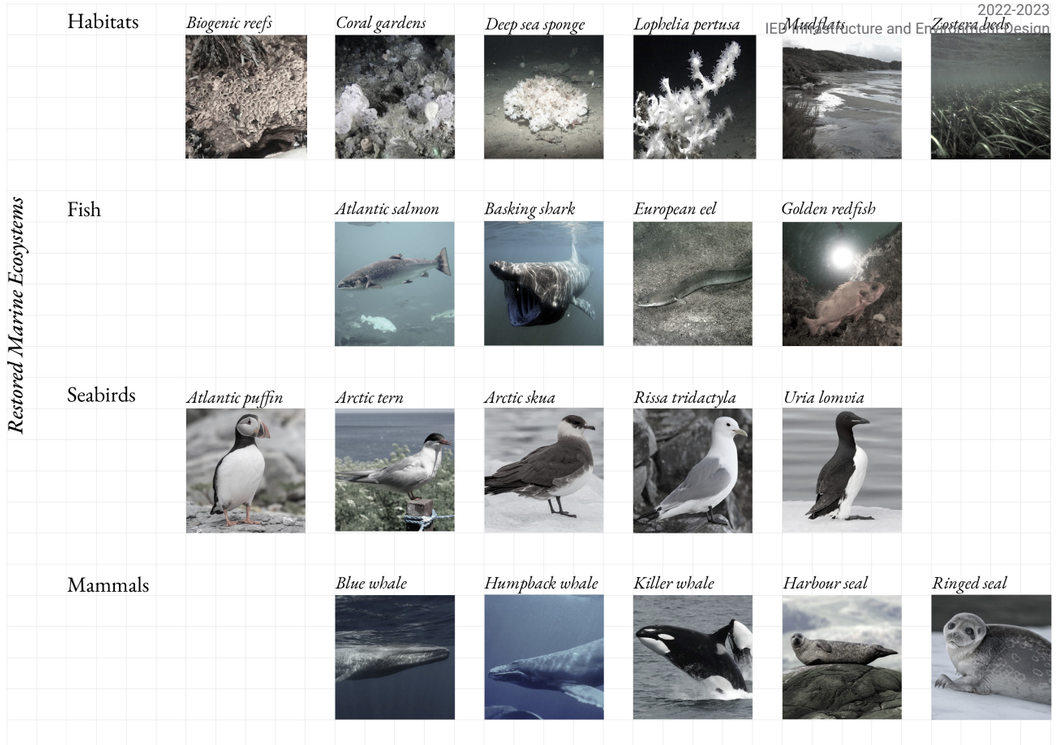


Reflection

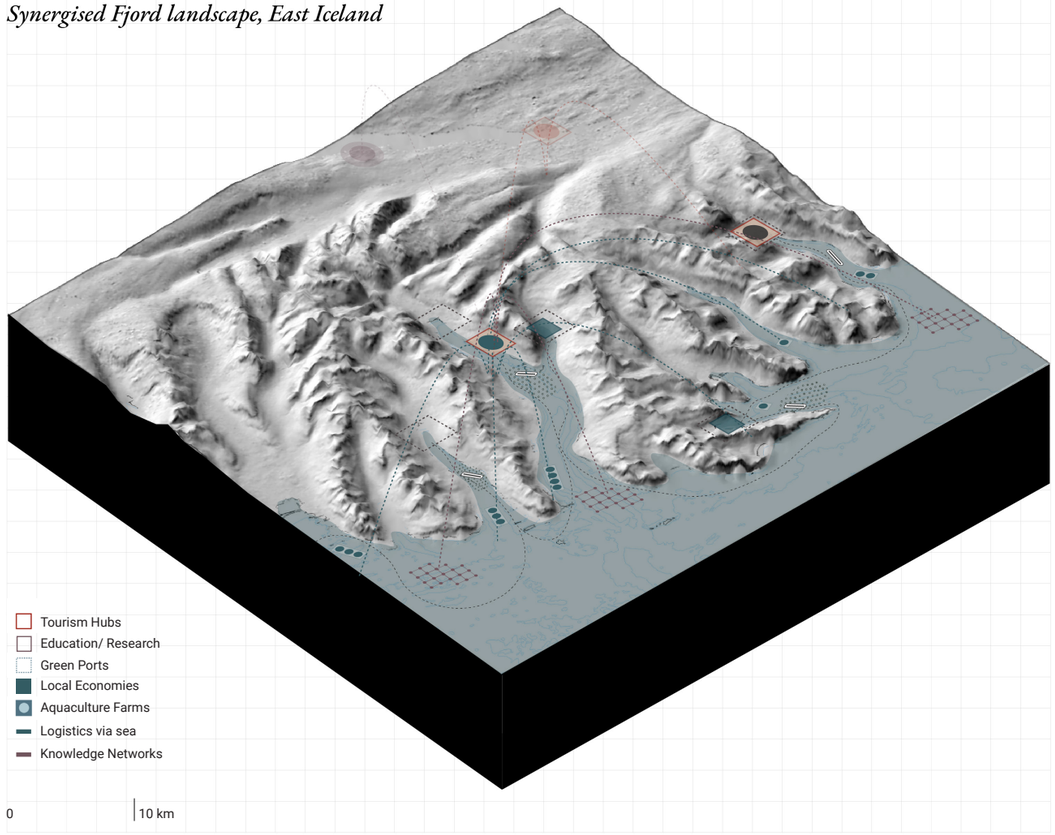
As the IED course comes to an end, I would like to reflect on the challenges, learnings and takeaways from this project as well as the excursion to Iceland. The perspectives of Critical Geographies, Critical Landscapes and Critical Tectonics helped me understand the complexities of the systems that establish the co-existence of ecological processes and the built infrastructures through multiple layers, scales and time. Through the course of exploring the island during the field trip, I was constantly questioning the preconceived notions about Iceland and the existing dichotomies between Nature and the Urban present on ground and how the productive landscapes of the resource-rich island are being transformed by global geopolitics and economics.

Our group worked on the radical what if scenario of recycling the Karahnjukar dam for nature restoration and creating alternate local economies how the two entities can be synergised through a transition from Extractive landscapes towards Knowledge landscapes that facilitate scientific and technological processes. In my personal design experiment, I delved deeper into the ecological and economic systems that have forged the symbiotic relationship between the Eastern Fjords and their Marine ecosystems and how these are being constantly challenged by anthropogenic processes.

However, the project would have been more comprehensive if the local socio-political ecologies were also integrated into research which could have helped in a deeper understanding of the implications of the repurposing of the Alcoa aluminium smelter on the local social fabric and the hundreds of livelihoods it impacts. Moreover, it would have been interesting to analyse the systemic implications of this project on a planetary scale and how the transformed knowledge centric landscape responds to global geo-politics & economics, material ecologies and resource flows in the long duree.



Synergised Fjord landscape, East Iceland



5.

Collective reflection

Working collaboratively on this critical project in East Iceland was a rewarding and eye-opening experience for our group. Throughout the course, we encountered various challenges and opportunities that pushed us to think differently about the relationship between human activities and the natural environment.

From the initial exploration of the island to the development of our design experiment, we realized the importance of teamwork in navigating the complex trade-offs and synergies required for the project's success. Traveling together on-site, alongside the other East Iceland group, allowed us to serendipitously discover Seydisfjordur, which became a significant source of inspiration for our projects.

As a group, we recognized that East Iceland stands as a testament to the delicate balance between human progress and environmental preservation. Our project aimed to address the adverse effects caused by the Karanjukar Dam and the aluminum industry, as well as the unsustainable overgrazing agricultural practices, with a vision of reconnecting with nature and revitalizing the region's fragile ecosystem. Through our collective efforts, we focused on leveraging the potential of the primary sector, including sustainable agriculture, timber industry, aquaculture, and fishing, to diversify the local economy and create a sustainable future for the community.

Working together, we realized the importance of understanding the causes and effects of our proposed interventions. These considerations reinforced our commitment to approaching the project holistically, seeking to restore ecological balance, foster economic diversification, and promote scientific progress. A question that remains and should be further studied is the potential adverse effects this project could have, especially on a global scale.

As a group, we embarked on a transformative journey to reshape the future of East Iceland, ensuring the preservation of its unspoiled wonder for generations to come. The project challenged us to think critically, imagine radical scenarios, and produce a shared vision that offers a synergetic relationship between human economies and natural landscapes, contributing to a sustainable and resilient future for this unique region.

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