Norwegian University
of Life Sciences

Master's Thesis 2022 30 ECTS
Facutly of Landscape and Society(LANDSAM)

Co-existing along the coast

Nesodden coastal trail case study

Elin Karoline Harstad
Landscape Architecture for Global Sustainability

Co-existing along the coast:
Nesodden coastal trail case study

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Master's Thesis Autumn 2022
Faculty of Landscape and Society
The Norwegian University of Life Science

Information

Title
Co-existing along the coast:Nesodden coastal trail case study

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Assignment
Master's thesis in Landscape Architecture

Format
A4 portrait

Pages
235
Keywords: Coastal Recreation, Intertidal habitats, Seabirds.

Figure 1. Bench along the coastal trail, Berger, Spring 2022.

‘In every walk with nature one receives far more than he seeks.’

(Muir, 1918)

Figure 2. Visible rock formations at Berger beach, Autumn 2022

Figure 7.. Trail makings along the trail, Berger beach, Autumn 2022.

Preface

This Masters thesis marks the completion of my Masters degree in Landscape Architecture for Global sustainability. The 30ECTS thesis was written for the Institute of Landscape Architecture at the Norwegian University of Life Science.

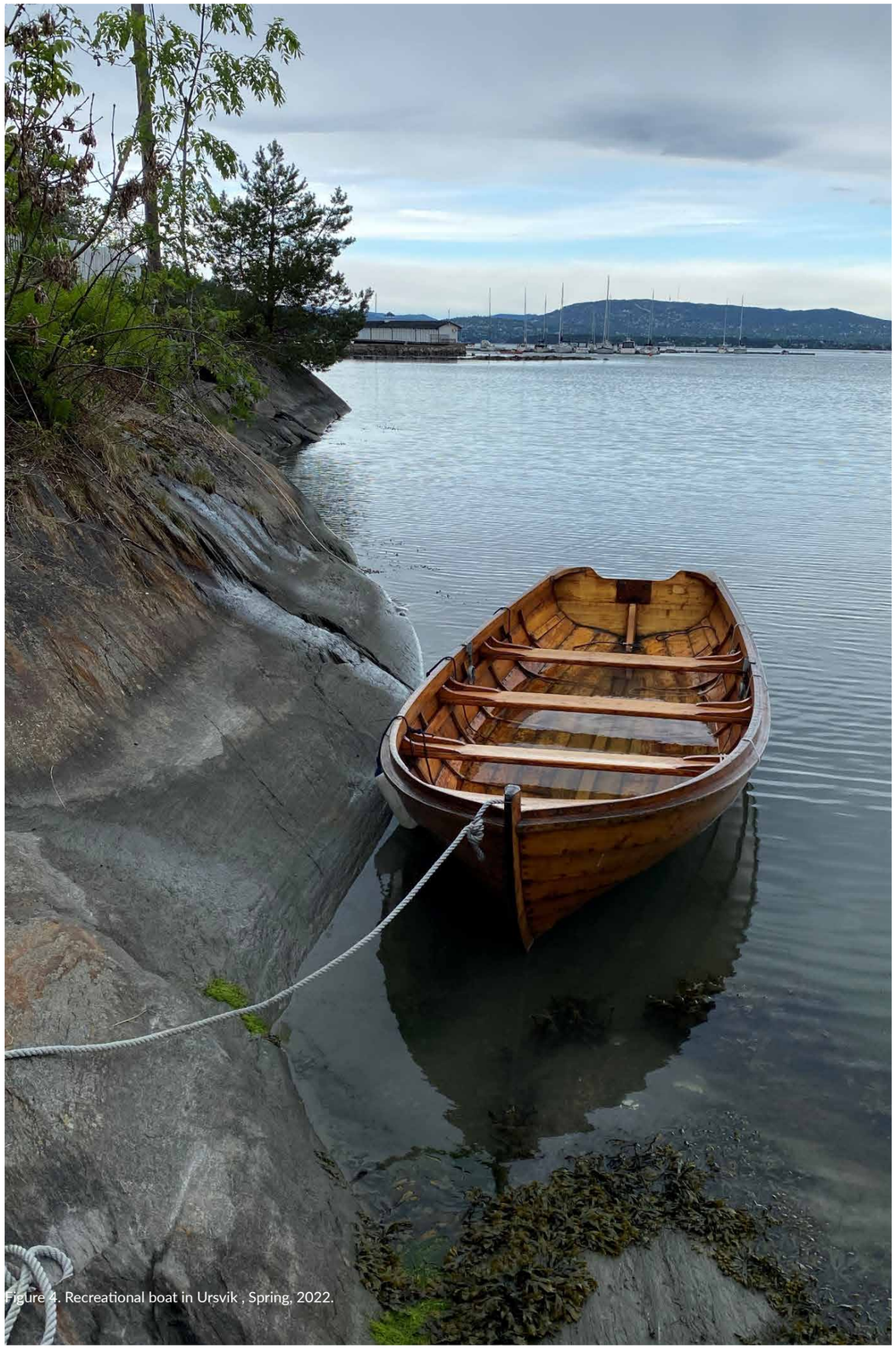

Figure 4. Recreational boat in Ursvik , Spring, 2022.

Abstract

The green movement strives to tackle the consequences of climate change, urban sprawl, ocean sprawl, sea rise, and more. The Oslo fjord is struggling to maintain and guard its current ecological state.

Using the semi-urban- case study of Nesodden, I wish to explore the local coastal land use, its current ecological state, and with a design outcome aim. The thesis aims to answer the research question to which degree can landscape architecture facilitate a multi-specie design approach along the coast of Nesodden?

The coastal trails of Nesodden are deep-rooted in culture and identity. As well as a recreational value for walking. The trails connect the many coastal recreational nodes such as beaches, cafés, marinas, piers and community saunas. Using the trail as a base for exploring these recreational areas I wish to identify key issues and possibilities to preserve and enhance the trail. How can landscape architects design for a more-than human client? Through the path of the research, the fascinating sea bird *The Common Guillemot /Murre (Uria Algae*) and their critical relationships with their environment became a focus.

The Norwegian government has developed a holistic action plan for the Oslo fjord in March 2021, considering this action plan, Nesodden, which has a close relation to Oslo and plenty of coastline both on the east and the west side is an ideal candidate for the case study..

With its proximity to the urban hub of Oslo, Nesodden can also offer proximity to forests and coastlines, a valued asset. Historically, the municipality has rich creative culture. The population has increased in the last few years, and the pressures of urbanization are relevant to investigate. I've chosen to limit my investigation to the eastern part of the Nesodden coastal trail, and focused on the intertidal zones. The research aims to include both creative knowledge productions as well as scientific based theory knowledge.

Figure 5. Small private dock at Berger beach,Autumn 2022.

Aknowledgements

Thanks for all support and encouragement from my supervisors Jorg Sieweke and Eli Rinde. To the wonderful fellow GLA comrades for moral and technical support the last few years. A special thanks to Monica Vestvik, Emelie Dahlen, Hilde Flikke, Anne Line Sund, Bente Westergaard, Gwyenth Slade and the participants at the workshop, A warm thanks to my close family and friends, 'the village' of people who supported in every way possible. Thanks to my children, supporting me to never give up and to continue to re-imagine the future...

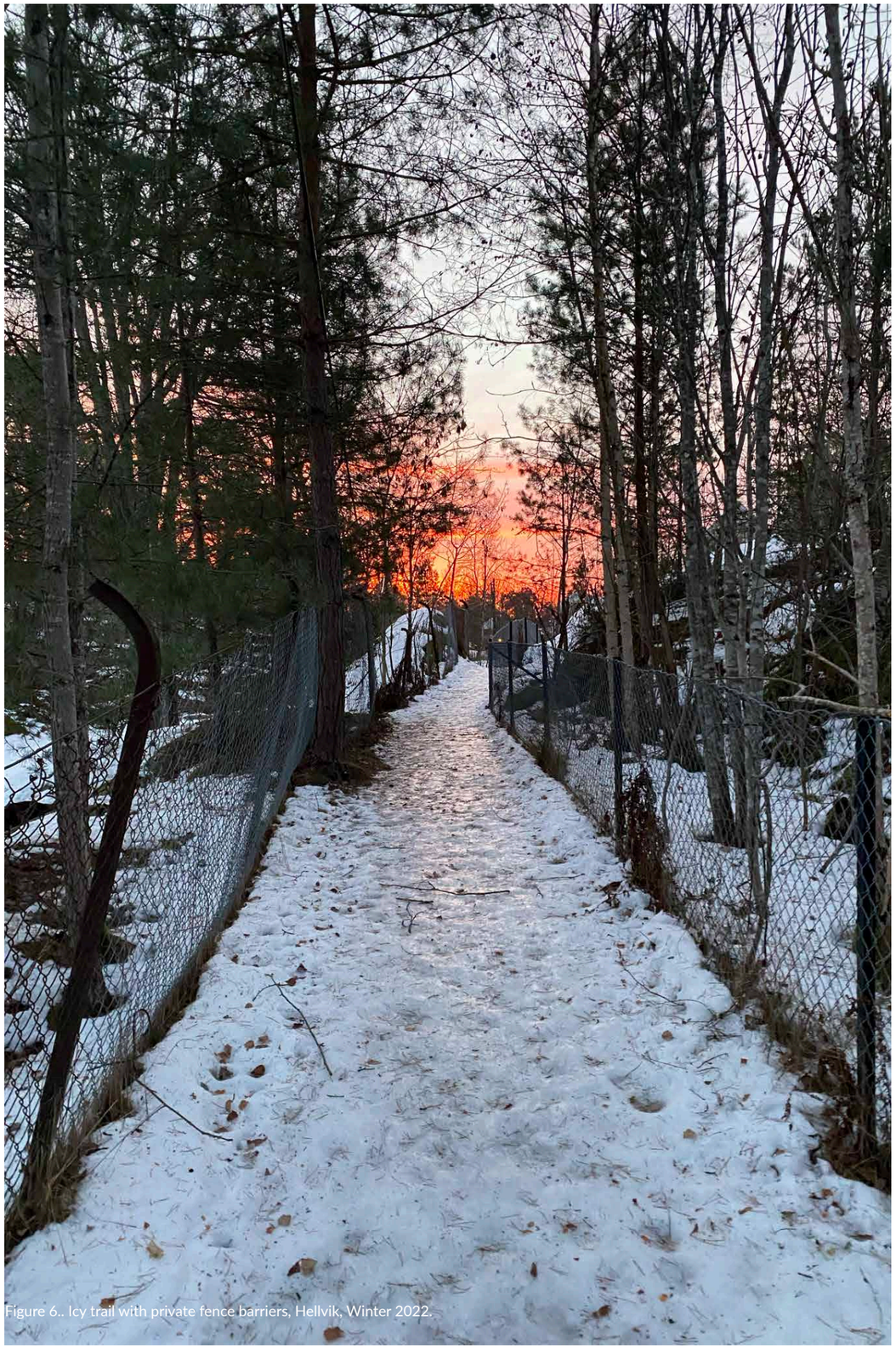

Figure 6.. Icy trail with private fence barriers, Hellvik, Winter 2022.

Figure 3. Private bathing houses, Oksval Spring 2022

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Figure 8. Example of marine fauna and flora. Summer, 2022.

Figure 9. View of Oslo by night, from Hellvik, Winter 2022.

Figure 10. Chair located after a steep elevation climb, Kirkevika, Spring 2022.

01.Introduction

This chapter presents the projects area, research question, and thesis structure.

Project area
Scope/limitations
Research Question and goals
Methodology
Case area
Thesis structure
The role of the landscape architect

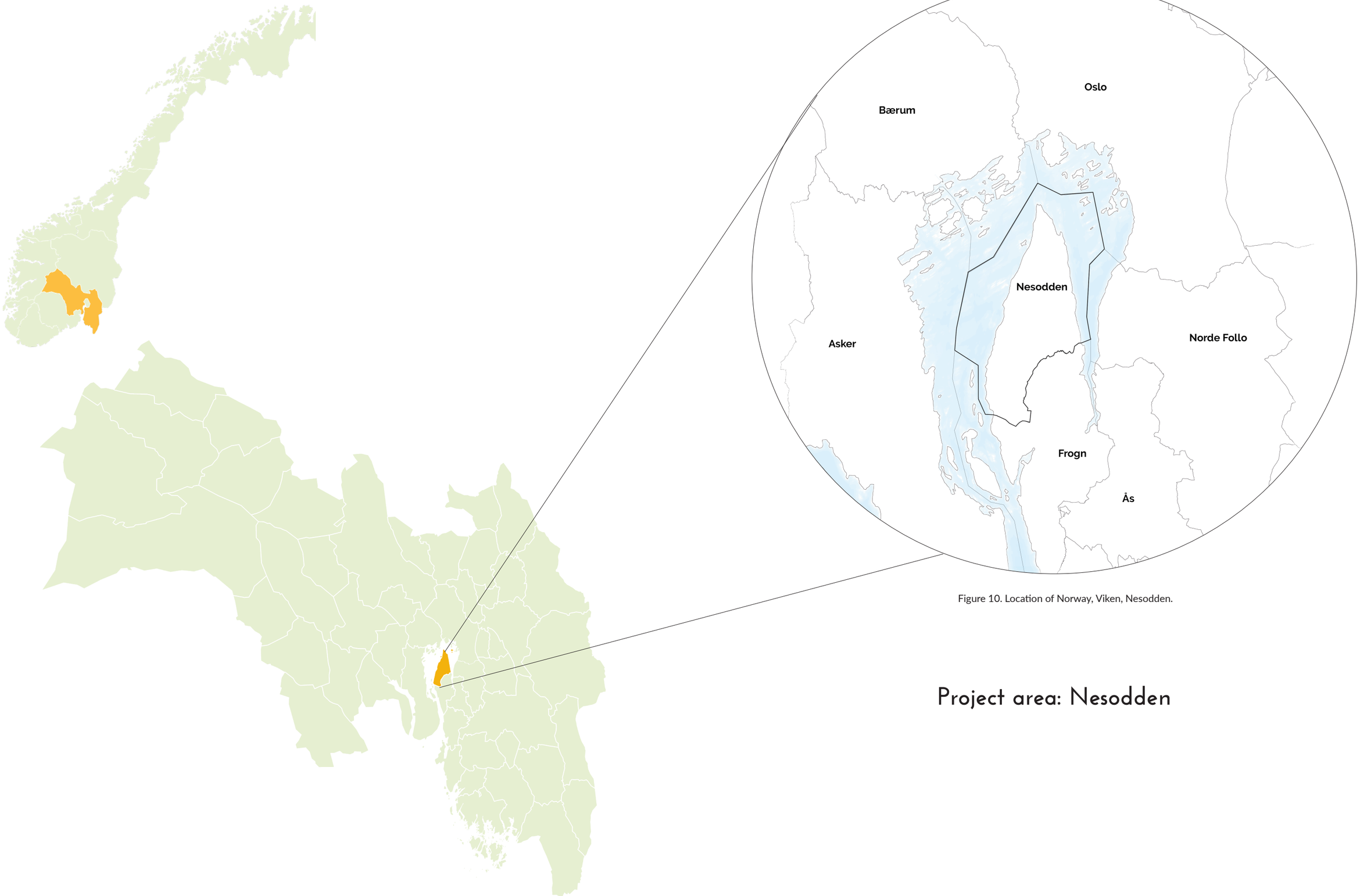


Figure 10. Location of Norway, Viken, Nesodden.

Project area: Nesodden

Scope/limitations

- **Geographical**

The case area is located in the Municipality of Nesodden, which is peninsula in the Inner Oslo fjord. The Nesodden Coastal trail follows the coastline on the west and east coast. For this thesis the coastal trail on the eastern coastline will be investigated

- **Overall**

At the overall scale the thesis places Nesoddens coastal trail in a context to the surrounding area in the Oslo fjord. It proposes access to recreational nodes along the coastal trail of Nesodden and design elements to promote co-existence with other species.

- **Detail**

The detailed design proposals consider the smaller areas investigated in Ursvik/skoklefallstranda, Hellvik Brygge/HellvikStrand and Prestekjær.The proposal is an answer to the research question and goals presented.

- **Thesis definition**

The detailed design proposals consider the smaller areas investigated in Ursvik/skoklefallstranda, Hellvik Brygge/HellvikStrand and Prestekjær. The design proposal is an answer to the research question and goals presented.

The research question

To which degree can landscape architecture facilitate a multi-specie design approach along the coast of Nesodden?

- **Goal**

The goal of this thesis is to produce a design proposal along the Coastal trail located on the eastern part of Nesodden Municipality. By using a more-than-human lens to the area the overall goal is to strengthen the overall ecosystem to promote co-existence between humans and other species.

Through research of the area, three spots have been selected for individual design proposals, however the approaches can in theory be replicated for other areas along the coastal trail
.

- **Sub-Goals**

1. -Explore non-human design
2. -Increase biodiversity
3. -Facilitate human-nature interaction
4. -Public participation.
5. -Strengthen access to the coast.
6. - Acquire knowledge about the history and how it formed the coastal landscape in Nesodden.

Methodology

The **methodology** of this thesis is based on document study, literature reviews,historical study, site survey and workshop approach. The findings are further processed and used for the design proposal for the case study.

The **document study**, **literature review** and **historical study** is the foundations to understanding the area, the ecological and cultural context.

Historical maps and **photographs** were reviewed. They contributed with important impressions of how the overall and specific areas had changed overtime. As well as providing a cultural context. Understanding the history of the area also contributes to understanding how the land developed as it is today and the local identity of its users.

A **literature review** provided theoretical information about intertidal ecosystems, sustainability, multi-specie approach, and more-than human philosophy.

A **document study** of existing guidelines and ongoing strategies for the area was done to get an overall understanding of ongoing plans.

Reviewing specie registration database: from the national specie registration data base. (www **artsdatabanken.no).** to get important understanding of which species have been registered as 'users' of the area. This information was further used to develop an understanding of specie composition in the area., and further point me to the topic of Sea birds, specifically the *Common Guillemot / Murre (Uria Algae).*

Case study

Site survey
Several site surveys were conducted in the seasons of early spring, summer, fall and winter, The surveys provided important informations about the seasonal conditions, users and access, non-human interactions, and local flora and fauna.

Analysis and mapping are based on site surveys, historical information, and document studies. Revealing human and non-human relationships. in the landscape.

Workshop
An interactive full-day workshop was arranged with local artist. The goal of the workshop was to explore creative place-making methods of environmental embodiment. Participation in community development and decision making is an important democratic right (Dahlgren & Linderud, 2021) that are stipulated in the Norwegian plan- and buildings law (PBL) since 2008 and the European landscape convention. The Norwegian government defines the main goal 'to develop a society which takes care of important common values and good living conditions for all groups, within the framework of sustainable development'

Participation in DNT organized senior coastal walk, provided insight in arranged hiking tours, popularity of the route and the work of the volunteer guides.

Digital tools
The use of digital tools, QGIS, Adobe Photoshop, Illustrator and InDesign was used to render maps and illustrations.

Image Material
Photographs were taken with my Iphone 13 on site visits, working with performance artist Emelie Dahlen and registering events of the workshop. These images are presented throughout the thesis and part of the artistic exploration as well as a tool to communicate attributes of the landscape. Past illustrations produced by the author have also been used as figures.

The **design approach** was developed throughout the research and by using Ecological areal principles for green structure planning as a reference in designing green areas which benefit biodiversity.
Through my research and analysis, I explored the need to establish multi-species arenas along the coast.

Sources of error

Thesis structure

The thesis is divided into six parts. The structure and process of this thesis was inspired by recommendations Landscape architecture research: Inquiry, Strategy, Design (Deming & Swaffield, 2011) and Research for People who (think they)would rather create (Vis, 2021).

Introduction

This chapter presents an introduction to the project area, scope& limitations, research question and methodology and structure.

Background

The background puts the thesis in a global, regional and local context. Presenting important and relevant themes. Current information on the existing international, national, regional and local guidelines are briefly presented and commented.

Theory

This chapter presents the literature study within marine ecology and tidal ecosystems, and forms my knowledge basis for the design proposal.

Case Area

This chapter presents my analysis of the case area, local conditions and historical context.

Design Proposal

This chapter presents my design approach and design proposal

Conclusion & Reflection

This chapter presents the conclusion and reflection of the proposal and thesis.

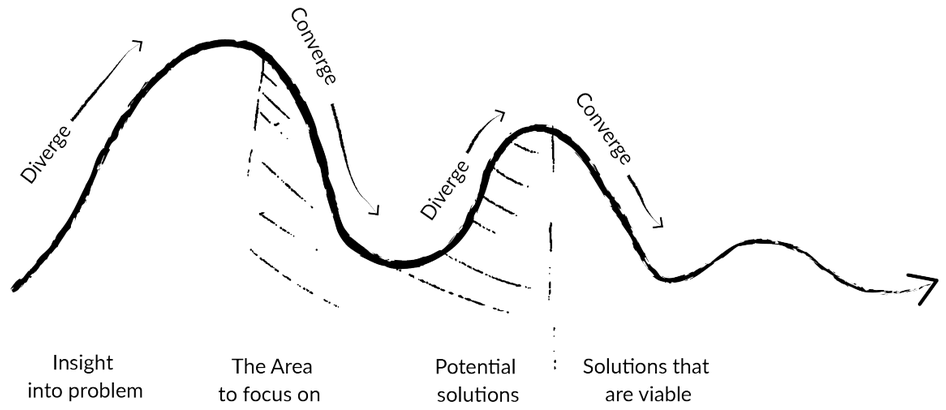


Figure12. Illustration.Conceptual sketch off design process.

Design Thinking process

The process of this thesis has been an overall non-linear process, however using the creative design thinking strategy(Figure #) the design outcome is my interpretation of a viable solution.

Insight into the problem is the basis for chapter 2 in background. The theory chapter 3 and the case study chapter 4 represents the area to focus on, whilst moving back and forth into potential solutions and finally presenting the design in chapter 5 and concluding remarks in chapter 6.

The thesis has explored several methods of landscape architecture knowledge production, and this has also been a part of the overall goal of the thesis.

The role of the landscape architect

Landscape architects should be included early in planning processes. This thesis emphasises the union between human and nature when looking for the solutions we are now urgently seeking to the global problems of biodiversity loss and ecosystem functions. It is important to explore the complex ecologies and inter-connective relationships of these phenomena's, in an interface of science and art. The natural processes, biodiversity and arenas where humans can engage with nature should be prioritized. It is vital to move beyond aesthetic interventions and to focus on everyday spaces in diverse landscapes(Jørgensen et al., 2022).

Figure13. Bench provided by the housing association along the Coastal trail, Ursvik Winter, 2022.

Figure 14. Mooring stakes attached to rock, Prestekjær, Winter, 2022.

Figure 15. Hat hanging from tree along the Coastal trail, Winter, 2022.

02. Background

The background chapter will place the thesis in a global, regional and local context. Including existing international, national, regional and local guideline. This background overview reveals the need in a perspective change for future co-existence.

Urban seascapes
Biodiversity and urbanization
Conservation
Sea birds and the anthropocene
Human Well-being in Nature
The anthropocene, art and more than human agencies
International, regional and local guidelines
Nordic approach to recreation in the Oslo fjord

Urban seascapes

Most of the world's population lives in cities which indirectly affect ecosystems from a regional to a global scale(Grimm et al., 2008) . Coastal zones are the preferred choice for human settlements(Kuenzer & Renaud, 2012). Around 40% of the world's population lives within 100km of the coast, making the population density in these areas much greater than the global average(Cohen et al., 1997). The ecosystems provide certain advantages such as flat topography, available salt and freshwater resources, access to waterways for transport, rich biodiversity, access to marine food sources and fertile soils for agriculture, in addition to offering recreational value. These advantages are often why proximity to the coast has been attractive for human settlements historically(Kuenzer & Renaud, 2012). Coasts and estuaries are also productive biological systems, with important eco-system functions.

These valuable and vulnerable ecosystems are facing challenges of climate change, environmental degradation, social conflicts in the era of the Anthropocene. In the interface between land and sea the coastal marine ecosystems provide ecosystem services such as detoxification of pollutants, food production, raw materials, important habitats, nutrient cycling, and regulatory services as well as important recreational value for humans(Costanza et al., 1997). Coastal and marine habitats provide habitats for pelagic fish, serve as protective buffer zones from floods and storms and can serve as filters of land-derived pollution. However, on a global scale anthropogenic pressures such as overfishing, run-off from agriculture, and coastal development threatens these ecosystems(Ferreira et al., 2017). These ecosystems are facing major challenges caused by human activity. Excess nutrient input largely from agricultural runoff is a major source of nitrogen pollution on a global scale(Ferreira et al., 2017). This increased nutrient load results in biological diversity loss, decreased ecosystem resilience, and a decline of ecosystem services. The accumulative effect of land-use change(such as deforestation, agricultural practices, coastal development, pollution) and climate change may accelerate eutrophication as well as nutrient flux in coastal ecosystems(Lu et al., 2018). Pollution in marine ecosystems from plastics as well as heavy metals and persistent organic pollutants (POPs) are also threats which can be transported via the food web(Lu et al., 2018).

Climate change is predicted to affect vulnerable coastal zones. One of the complexities of understanding the ecological footprint of cities is that the impact extends beyond the human made city boundaries (Daoji & Daler, 2004). Large-scale changes in the ocean temperature and circulation patterns, coastal storms, changes in precipitation patterns and sea level rise all contribute to coastal impact from climate change (Carstensen et al., 2011). Urban coastal infrastructure ranges from coastal protection structures, large ship docks, recreational small boat docks, human recreational structures, fisheries, oil and gas platforms and marine windmills.

These structures impact natural eco-systems causing habitat loss, fragmentation, modifying ecological connectivity, eco-system functions, services, and the physio-chemical state(Strain et al., 2018). Restoring natural habitats along the coast can sometimes prevent the need for protective coastal structures in the long term(Dethier et al., 2017). Coastal processes are affected by an accumulation of stressors. By understanding these stressors and their causes, and mapping vulnerable ecosystems and species we are one step closer to protecting these systems.

Figure 16. Small marine flora and fauna attached to dock structures, Hellvik, Summer 2022.

Figure 17. Oslo marine traffic, Aker brygge Summer 2022.

Biodiversity and urbanization

We are currently experiencing the fastest expansion of built infrastructure in history(Zu Ermgassen et al., 2019). Consequently, large scale urbanization is linked to radical biodiversity decline(Garrard et al., 2017; Living Planet report, 2020). The decline in habitat quality and size through fragmentation of natural habitats are directly linked to human impacts on land use, such as, for agriculture, infrastructure and urbanization (Bracke et al., 2022).

Fragmentation of natural habitats can lead to further loss of species, degraded natural cycles like water quality and increased flooding(Hellmund & Smith, 2013). From a traditional perspective, biodiversity and urbanization may be viewed to be in conflict with one another. However, urban ecosystems are also dynamic, heterogeneous and socio-ecological systems encompassing the living and non-living(Graviola et al., 2021).

It is increasingly recognized that cities have a place in biodiversity conservation and ecosystem functioning(Grimm et al., 2008; Ives et al., 2016). To envision a biodiverse and ecologically functioning urban space is the key to conscious and planned urban development. Over 50% of the human population now lives in urbanized areas, and it is predicted to increase to 68% by 2050(United Nations, 2018).If this prediction is correct urbanized areas can serve as opportunities to maintain, and promote resilient and biodiverse environments(Graviola et al., 2021).Not all species are able to adapt or survive in urbanized habitats.

The urban cities can also serve as filters for species which are less tolerant. For these tolerant species, the City can be a migratory stopover, a larger regional gene pool, a opportunity for species to adapt qualities necessary for future survival and as an opportunity to engage humans in conservation and stewardship efforts(Spotswood et al., 2021).

Tools for increasing biodiversity on land in cities include, green roofs, green walls, storm water retention, and reduction of night time light. Managing green infrastructure and greening existing built infrastructure in cities can contribute to wildlife connectivity(Friedman, 2021).

The coast in cities is often developed. Man- made coastal infrastructure is largely smooth and vertical structures, which can reduce species ability to attach or find refuge from predators(Strain et al., 2018). Measures for increasing biodiversity for marine and coastal infrastructure include eco-engineering which increases surface area and/or habitat complexity(Strain et al., 2018). Eco-engineering interventions are varied and important factors and are defined by texture, crevice(depression length), length-width ratio, ability to retain water in tidal zones, sub-tidal depressions, intertidal/sub-tidal protruding structures, large elevations in protruding structures, soft structures such as rope or twine, or habitat forming structures.

Although studies show that these interventions can have a positive effect on abundance of ecological communities, it is unclear if this mitigates the removal of natural habitats(Strain et al., 2018).

Figure 18. Wild vegetation along docks, Autumn 2022.

Figure 19. Mute swans encounter with humans, Winter 2022.

Conservation, fragmentation and wilderness

On a global scale, the red list for species published by the IUCN (The international Union for Conservation of Nature) was started in 1964 and the list is updated regularly. The IUCN uses objective criteria such as geographical prevalence, habitat, current predictions on population, lifecycles, threats and conservation measures. Although the scientific data of species on the IUCNs red-list may be deficient or outdated, it is still a resource and tool for biologists and in nature management. Of the 138,374 species which have been assessed globally, more than 35,000 species are classified as threatened (Frafjord et al., 2022).

Some species can be threatened on a local scale without qualifying as threatened on a global scale. Fragmentation and habitat loss are some of the largest threats to biodiversity loss in globally and in Norway. The size of 'wild' habitats continue to decrease (figure 20). Conservation measures have traditionally targeted areas with high ecological value, specific species, or important habitats, achieving scientifically derived targets, for example like increasing populations or restoring habitats (Annis et al., 2017). On a national scale, the Norwegian red list of species is published by Artsdatabanken in collaboration with experts and the most recent list was published in 2021 and was the fourth edition. Of the 6.1% of critically threatened species, habitat reduction and habitat destruction/ degradation is their greatest challenge.

Recently it is recognized that incorporating human values into conservation planning can contribute to the overall conservation success (Milner-Gulland et al., 2014). Including human well-being factors can contribute to achieving overall regional ecological goals, protecting the ecosystem services(such as clean water) and result in improved quality of places that humans use for nature-based recreational activities(Annis et al., 2017).

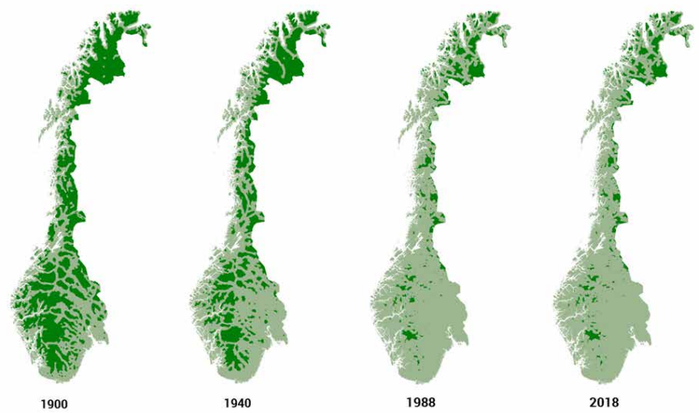


Figure 20. Illustration. Wilderness loss in Norway(Milljødirektoratet,2022)

Human Well-being in Nature

The association between human mental well-being and green spaces is well established through the Attention Restoration theory (Kaplan, 1982). The amount of time exposed to nature has been associated with positive benefits on brain regions related to stress, and as little as one hour exposure can give salutogenic benefits (Sudimac et al., 2022).

However, the ecological and physiological aspects in the relationship between humans and nature are not as clear. The microbiome re-wilding theory suggests that biodiversity can provide an ecosystem service to humans on an immuno-regulatory level(Mills et al., 2017). The prevalence of non-communal diseases has increased in societies which have undergone increased sociological and environmental changes such as urbanization (Graham & White, 2016). One of the main drivers of urbanization is industrialization (Graham & White, 2016; Steffen et al., 2015).Furthermore decreased outdoor exposure to smaller and less microbially diverse green spaces are all associated with urbanization(Graham & White, 2016). It is hypnotized that the combination of this and the increased access to medicine (such as anti-biotics), have reduced the microbial diversity within humans and affected the overall well-being(Graham & White, 2016).

Studies have shown that exposure to urban green spaces can increase microbial diversity in humans which could provide overall positive health out-comes(Roslund et al., 2020; Selway CA et al., 2020). Therefore, the diverse quality of urban nature and the amount of exposure time in nature are both important aspects to consider for human well-being and environmental restoration.

Figure 21. Conceptual illustration of human / microbiome relationship,(Mills et al, 2017)

Figure 22. Seabird

Sea birds in the Anthropocene

During the last 60 years the population of sea birds on a global basis has declined by two thirds and a third of all sea birds are under threat of extinction (Nicolson, 2017). If the current decline in general and specific specie sea bird population trend continues, by 2060, according to predictions, it will reach towards zero. However, these birds are complicated and there are many unknown factors and local variations to consider. Although these anthropogenic stressors are difficult to distinguish, the anthropogenic and environmental stressors may have an overall direct and indirect impact on the population trends(Fauchald P et al., 2015). The warmer climate may influence migratory activity, and migratory activity in sea birds is often linked to breeding(Sparks et al.1999(Barrett, 2002; Clairbaux et al., 2019).There is rising concern about the ecological impact of the ice melting in the Arctic Ocean. The Arctic is a popular seasonal environment which provides high resource productivity in the spring and summer months due to the long summer days(Dingle & Drake, 2007).

Through overfishing we directly limit food supply and alter sensitive and complicated food webs. The large amount of marine pollution like plastics, metals, and oils spill, impacts the quality of food and habitat, as well as directly endangering foraging birds which get caught in plastics debris, fishing nets and other equipment. Introducing domesticated species like rats, cats, dogs, pigs, goats, rabbits, and cattle, in the proximity of nesting birds, leaves them defenceless as prey. Whilst building and developing areas on land and sea, which is crucial for nesting or foraging also directly impacts sea-bird population.

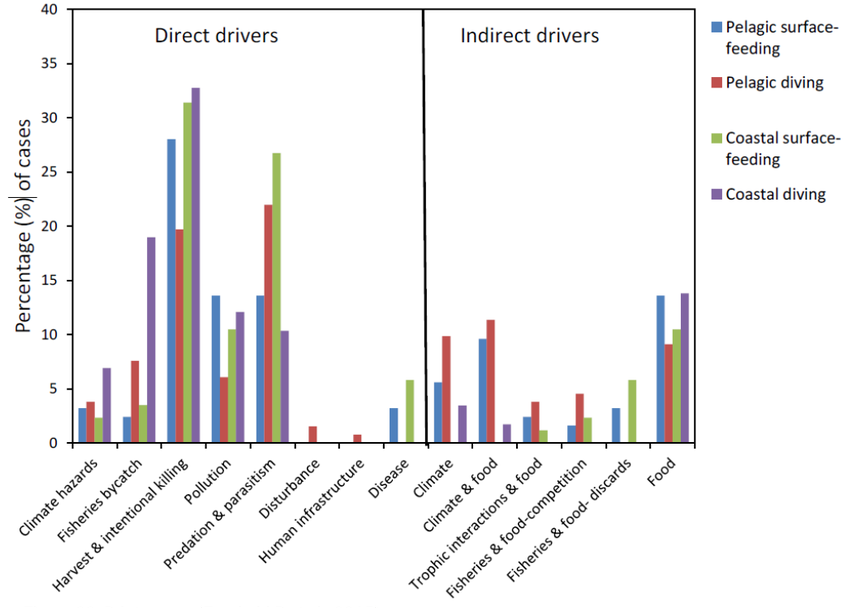


Figure 23. Print screen.(Fauchald P et al., 2015)

Sea birds in Norway

The Norwegian sea bird population is especially concerning for pelagic, colony breeding Sea Birds(Fauchald P et al., 2015). Some sea bird populations in the North East Atlantic have increase in the 20th century, and this can be associated with protection measures to limit hunting, harvesting and disturbance (Grandgeorge et al., 2008) Through fishing large fish such as cod, the ecosystem is indirectly increasing smaller pelagic fish which are an important food source for sea birds, this trend is shifting and current industrial fishing of small pelagic fish as well as climate warming has further shifted this complex ecological web and may be challenging current sea bird populations(Fauchald P et al., 2015) (Fredriksen et al., 2004).

Stricter regulations on hunting may have a positive impact on Norwegian sea birds which overwinter in exposed areas where hunting is common.

Pollution such as (POPs- persistent organic pollutants), mercury and accidental oil spills are often linked as threats to sea bird populations. International and national regulations have managed to reduce POPs and accidental oil spills have also decreased. Pollution alone cannot be linked directly with population decline, however biomagnification through food webs might have an impact. In the 1980's, it was reported that 20,000-100,000 Common Murre drowned in salmon and cod drift-net fisheries.

In 1989, there was a ban on salmon drift nets, and fishery by-catch of Sea birds has decreased since 1980. According to the NINA rapport on Sea bird populations the most likely threats to sea bird population is increased predation from avian and mammalian predators and ecosystem changes affecting availability of food source, however data on these factors are also more difficult to collect.

The Anthropocene, art, and more-than-human agencies

The notion that humans have shaped landscape structure to an extent comparable with major geological events in the past was initially under disputed when Crutsen introduced the concept in 2002(Crutzen 2002; Zalasiewicz* et al., 2010). This is now however a concept frequently used by scientists to describe the complexity of this ecological crisis. The Anthropocene calls for a transdisciplinary and new approach to understanding and connecting the relationship between the landscape, ecology, capital, the human and more than human(Tsing et al., 2019).

It is no longer sufficient to look at singular phenomena in site specific locations without looking at the critical relationships and the holistic picture of issues. New analytical tools where the fields of art, science and humanities overlap to understanding landscapes in the Anthropocene are developing. European colonialism, global capitalism and the post-World War II great acceleration have intensified global processes leading to the Anthropocene. According to (Tsing et al., 2019), the development of 'Patchy Anthropocene analytical tools' include:

- -The act of observing and noticing landscapes reveals anthropogenic patches
- -understanding the more-than human social structures and histories reveal anthropocentric landscape structures
- -making sense of the structures with systems
- -imagining possibilities whilst acknowledging the crisis (radical hope)
- - acknowledging and exploring inequalities among humans

The 'more-than-human' perspective is becoming more relevant in placemaking and landscape architectural processes(Bracke et al., 2022).This concept allows landscape architects to reconstruct human-nature relations and act as mediators of non-human actors. Ian McHarg was a pioneer of ecological planning and design in his book 'Design with nature'(McHarg, 1969), and the landscape urbanism movement followed. However, the' landscape urbanism' movement has been criticized for its lack of potential wilderness in urban settings. Human- animal relationships and more than human concepts are already present in urban geography, urban political ecology and in planning theory(Houston et al., 2018). Multi specie perspectives in design theory and practice is still underdeveloped. Establishing 'who' the client is, revealing human-animal relations in the landscape, and representing these and developing ideas are core tools in this methodology. This perspective can provide an important opportunity for landscape architecture in knowledge production and strengthen their role in planning processes.

'For the purpose of this thesis, and the foundation of the design approach, non-human agencies Actor Network Theory (ANT) recognizes that the non-human agency is an important part of how the social and natural flow into another(Jones & Cloke, 2008).Non-human agencies can represent living material presence with their own concept of time, connecting and bridging between eras they can be meaningful and creative and they serve as a reminder that in 'the world' today they have authority(Jones & Cloke, 2008).

'Terra nullius was the term for colonial land on empty land. A land that was ready to be invaded. But no area was or is empty, regardless of human presence: we share the earth without fellow creatures. Most of the colonial empire was formed by brutal warfare. The war against nature is just as brutal. While the decolonization of nations-states has been important development in the post-war world, a decolonization of nature has hardly begun. Maybe it's time?'

(Naturtro, 2021)

The Norwegian coast

The Norwegian coast measures around 500,000 km including all bays, fjords, and small islands- thus Norway qualifies as having the longest coastal strip in the world compared with the country's overall size (Bjerkely, 2018). The variation is large and dependent on geological history and local climates, allowing for a richness in the biodiversity of flora and fauna.

Since the first human settlements along the Norwegian coast, humans have benefited from the rich biodiverse production generated by the nutrient-abundant and cold water. The first settlements were highly dependent on these coastal ecosystems to survive, and these ecosystems have provided nourishment as well as deep-rooted cultural heritage. However, life in the ocean is salt-water conditional- and the ocean's composition has changed over time since the organisms evolved the revolutionary ability of photosynthesis.

To understand part of the composition of the Norwegian coastal conditions it is necessary to understand environmental processes as far back as 30,000 years. During this ice age, the oceans of the world were around 120 meters lower than today. Much of the water quantities were bound up in ice on the land. The ice weighed down the crust of the earth. As the climate increased in temperature the water started to rise and influence coastal geology. As the ice melted the weight of the ice no longer pressed the crust of the earth down and land uplift proceeded. This slow process of land uplift is around 8mm a year in the Oslo area(Bjerkely, 2018).

Figure 24.Typical coast rock formation in the Oslo fjord, Prestekjær, Winter 2022.

Figure 25. Information sign about 'The right to roam the Countryside' in an agricultural field, Autumn 2022.

'For centuries we have been free to roam the countryside, in woodlands and meadows, on rivers and lakes, amidst coastal islets and mountain summits – no matter who owns the land. While we are free to forage for salt water fish, berries, mushrooms, or flowers, we come away not only with the fruits of nature but with our own memories and experiences'

(The Norwegian Right to Roam the Countryside, 2020) (The Outdoor Recreation Act, 1957).

The Nordic approach

It is the underlying goal that all the residents of Norway has good access to coastal areas and the national laws to protect this is important. Regulations for building along the coast are stricter in highly populated urban areas than those in less populated areas which are under less pressures.

However, statistics show that 71% of the coast in the Inner Oslo fjord is unavailable for the general public to use(Engebakken, 2022)(figure 26). Securing recreational areas along the coastline though state regulations is an important measure for the future access to these valuable recreational areas, as these areas are under great pressure from development. To ensure the future access to recreational areas along the coast it is important to avoid dispensations of the building regulations.

The Norwegian authorities have already secured around 2200 recreational areas (80% of which are within the 100-meter zone along the coastline). The national government contributes financially to municipalities and outdoor recreational associations to support the purchase or to make agreements with landowners.

Figure 26: Private dock in Ursvik, Spring 2022.

Figure 27.Recreational activities along the coast, Autumn, 2022.

Nature near human settlements serve important functions for public health measures and is the preferred arena for everyday outdoor activities (Miljødirektoratet, 2014). Outdoor recreation is defined as being and executing physical activity in the open air during your free time with the aim of environmental change and experiencing nature (figure 27). Note that experiencing nature is an important element in outdoor life(Veileder: Friluftsliv i arealplannlegging, 2022).

Outdoor recreational act provides the legal framework of the use of the areas in Norway. The Norwegian right to roam the countryside is a free common good which is an important part of the Norwegian cultural heritage.

The legal framework includes rules for staying, tenting, bathing, resting stops, movement, harvesting wild berries and mushrooms, and fishing.

This not only include the rights but also includes certain responsibilities of careful and respectful behaviour towards nature, landowners, and other users. Important concept to understand in this regulation is the difference between the outback and the infield. Infield is defined by settlements and residential areas and within the dates 15.10-29.04 agricultural land is an exemption only when the ground is frozen or covered with snow(Allemansretten, 2022).

- Overnight stay or tenting must be at least 150meters from residence or cabin- to stay more than 2 nights in an area close to buildings permission must be granted by landowner. The ministry of climate and environment can make an exemption to this rule in coastal areas.
- People can walk or ski on paths, trails, and roads in cultivated land. Bicycling or horseback riding is allowed on paths which are paved/ managed. It is also a preconception that movement does not cross farm courtyards or residential boundaries and does not provoke a disadvantage for the landowner.
- The freedom to roam does not include movement with motorised vehicles, fishing in freshwater, hunting, or use of electrical bicycles.
- It is a duty to behave with respect and consideration to avoid disadvantages for others. Specifications towards acceptable behaviour is:
  - o Tidy up and bring garbage with you.
  - o Respect the prohibition of open fires between 15.04-15.09 or in proximity to forest or cultivated land without permission from the municipality. Open fire on bare mountain rock is not permitted as it can cause the rocks to crack.
  - o Caution on gathering berries, mushroom and flowers which are protected. The north of Norway has specific rules on the gathering of mulberries.

According to Environmental directory's research, 83% of the people questioned had a decent understanding of the concept in relation to movement by foot or skiing in the outback, and in general 70% had a middle to excellent understanding of the regulations behind the freedom to roam act(Miljødirektoratet, 2022).

The Norwegian right to roam the countryside act is challenged by development, privatization, and illegal fences. Specifically, development along the coasts have reduced access to beaches, especially around the Oslo fjord and coastal areas in the south of Norway(figure 65). Landowners can limit access to the general public in close proximity of their residential house or cabin, but it is illegal to limit the access and movement of the general public in the outback. Dispensation from the building prohibition has transformed attractive recreational areas into residential settlements or cabin areas. The right to roam the countryside can pose threats to protected nature reserves and certain recreational activities can threaten red listed species and nature types. Incompatibility and conflicts between the impact of users and protection of natural areas are not uncommon(figure 28).

In the last few years, authorities have allocated resources to secure the Norwegian right to roam the countryside, especially in coastal and beach areas. It is the municipalities´ responsibility to mark paths, routes, build bridges and to take action to facilitate the freedom to roam(figure 29, 31,32). They can stop developments that are in-congruent with the Outdoor Reaction Act and can demand that buildings be removed and remove illegal boundaries such as fences or signs that are not in accordance with the act. Another important aspect of protecting this right is to educate and inform people, and programs have been prepared specifically for school children and kindergartens.

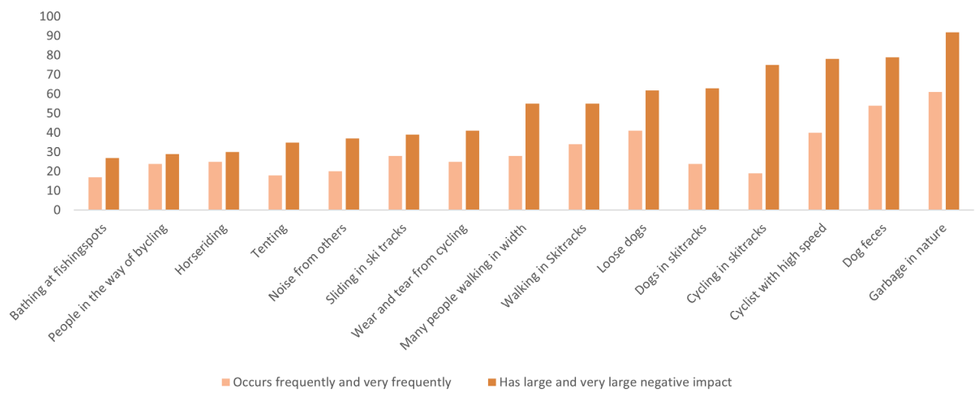
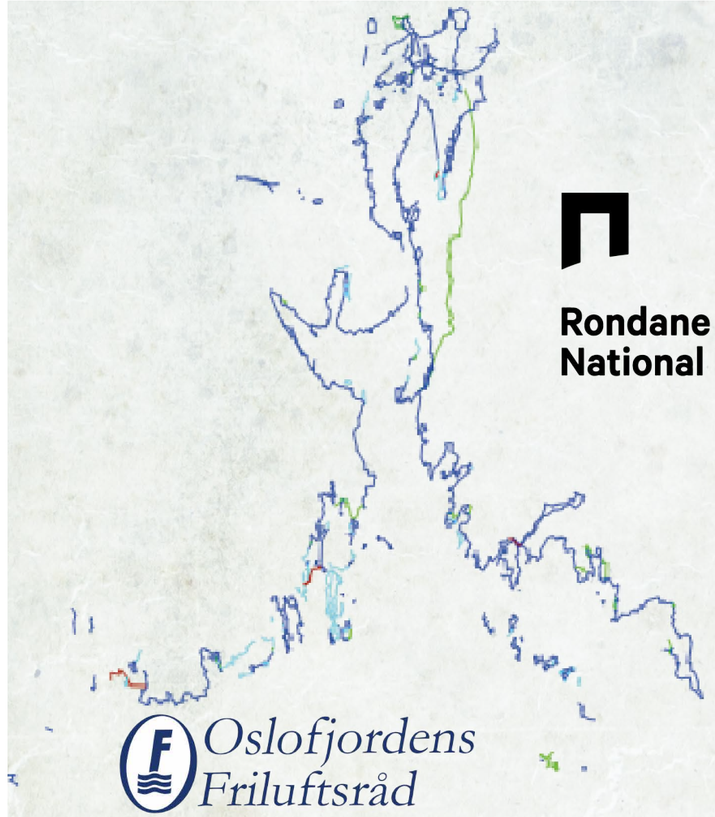


Figure 28. Table shows different conflict situations associated with ' The Norwegian right to roam the country side' data from (Miljødirektoratet, 2022)

Figure 29. Offical recreational area along the Coastal trail. Autumn, 2022.



Oslofjordens Friluftsråd

Rondane National Park

53 seabird reserves were established in important nesting locations in the oslo fjord

1962: Rondane was established as the first national park

Work towards registering small recreational boats

1998 The Oslofjord as a classroom was established as part of the educational effort

Opening of the coastal trail East Nesodden

Ytre Hvaler National Park

Ytre Hvaler National Park comprises 354 km2 of coastline and skerries, and is the first marine national park in Norway.
As much as 96% of the national park is under water.

Nov 1933 Oslofjord Friluftsråd established

Intial meeting to discuss the use of the Oslofjord

WWII and travel restrictions

Intial work towards outdoor receational legislation & auction againt pollution

Beach legistation & The building Act

Extensive investigations into the state of the Oslofjord started: the conditions were so bad that it was used as an international example for eutrofication

1972: The environmental protection autoerties established

From ideallism to professionalism work towards freedom to roam and securing more public recreational areas

Though collaboration with the coastal defense the Coastal forts and areas were re-established as nature areas for recreational use

Oslofjordproject initiated to establish national guidelines for natural resources along the coast

1930 1940 1950 1960 1970 1980 1990 2000 2010 2020

Figure 30.Conceptual time line of the work by the Oslo fjord Recreational association(Oslofjordens Friluftråd).

Recreation in the Oslo fjord

The Oslo fjord stretches inland from the Skagerrak water region towards the most populated area of Norway. The fjord provides high recreational outdoor value for people living in the area. However, it is not without its ecological challenges due to urbanization, land-use changes, and climate change. Run- off from agriculture, land-use change, and coastal development are the largest ecological threats to the ecological state of the Oslo fjord.

Landscape architects can no longer 'draw the line' where water meets land but must start looking at the whole system to find solutions. The way we build and use land affects whole systems, systems which we are dependent upon. The Oslo fjord is divided into two parts: the Outer Oslo fjord and the Inner Oslo fjord. The Inner Oslo fjord stretches north from Drøbaksundet towards the capital city of Oslo, and further wraps around the peninsula of Nesodden towards Bunnefjord.

The Oslo fjord is highly trafficked with leisure boats, private and public ferry transport, as well as large freight ships. Oslo and the surrounding area is also Norway's most populated and urbanized area and many seek recreational activities such as hiking, swimming, fishing and diving in the fjord and its surrounding coast .

Beach protective measures were supported by the Prince Olav in 1933 and November of the same year, the Oslo fjords Outdoor Council (Friluftsråd) (OF) was established- with the overall goal to establish access to recreational areas in and around the fjord. Access to the coast and its beaches was already a limited resource in 1933 and first on the agenda was to survey for potential public beaches for the general public(Brænd, 2008). The second driving force on the agenda was the 'fight against pollution.

The imminent pollution sources were many at the time. Oslo city's main sewer drain line went into the inner fjord, and the city´s street garbage, private septic tanks, landfills on the local islands in addition to unsafe sludge, all contributed to a polluted fjord.

Run-off from agricultural land as well as emissions from boats and tanks were also on the

Figure 31. Coastal trail marking on fence post, Spring2022.

Figure 32. Bridge with markings along the coastal trail, Spring 2022.

agenda in later years. Their work under the second world war was reduced somewhat due to funding and local travel restrictions, but already in 1945, when the restrictions were lifted, outdoor recreation was back to the same level as before the war. However, it was increasingly difficult to secure local coastal areas for the general public, due to an increase of land division during the 1930's for private beach properties.

The Oslofjord Friluftsråd (Oslo fjord Outdoor Association) envisions a continuous coastal trail as close to the water as possible, in the whole of the Oslo fjord. The association is Norway's oldest inter-municipality cooperative body, and was established in 1933 (Figure 30.). Its mandate is to enable active outdoor life in and around the Oslo fjord. They work continuously with children, youth, and teachers to inspire and educate as well as their political engagement to promote the coastal trail and all municipalities and regions that border the fjord are members.

The coastal trail is a continuous trail (marked in light blue) for walking and hiking in immediate proximity to the beach zone along the fjord´s coast. Some of the trail stretches are physically challenging, and there are also recreational nodes aimed at being accessible and open for all. The purpose of the trail is to incorporate the concept of 'freedom to roam' so the general public can have access to use nature close to the sea or fjord(Brænd, 2008).

The trail promotes the experience and human connection to the coastal landscape with views over the water as well as the unique coastal culture. Utilization of the trails can also contribute to local knowledge and environmental awareness. The coastal trail is part of the overall measures for public health, and in municipalities where the trail is established, it is widely used.

The trail strives to provide not just a nature experience, but also a cultural and historical experience. Along the whole Oslo fjord coast, a 600km trail is already established. However, the coast along the Oslo fjord has industry, settlements, and summer cabins estates and therefore little undeveloped land left. The coastal trail aims to channel human users so that sensitive ecosystems can be avoided as well as preclude inconvenience for landowners. The association´s work has made 20,000 acres (20,000,000 m2) of islands, beaches, and coasts accessible for the public. The organization also has simple coastal cabins which are available for the public to reserve. for overnight stays.

International guidelines

Figure 33. Sustainable development goals

- **UN sustainable development goals:**

The United Nations sustainability developments goals are a set of 17 global goals guidelines with the aim of sustainable development whilst combating inequality. These guidelines developed in 2015, recognize that ending poverty and other deprivations must go -hand in hand with strategies that improve health and education, reduce inequalities, and spur economic growth- all while tackling climate change and working to preserve our oceans and forests(United Nations, n.d). To ensure healthy lives and promote well-being at all ages.

With consideration to the UN sustainable development goals(Figure 33), this thesis aims to::

- promote well-being at all ages, make human settlements inclusive safe, resilient and sustainable,
- take urgent action to combat climate change and its impacts,
- conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forest, combat desertification and halt and reverse land degradation and halt biodiversity loss

- **European Landscape Convention**

The international treaty is ‘devoted to all dimensions of the landscape’(Council of Europe, n.d). It aims to achieve harmony between economic activity, social needs and the environment, whilst also considering cultural dimensions of the landscape.

- **New European Bauhaus:**

The initiative connects the European green deal and aims to imagine, '*build, and connect daily living spaces and lives which are sustainable, inclusive, and beautiful for our eyes, minds, and souls*'.
The movement is creative and interdisciplinary and aims to tackle both green and digital issues.

It aims to be a bridge between science and technology and art and culture.
Addressing complex societal problems through co-creation (European Union, n.d).

National guidelines

- **The Public Health Act (2011)**

The Public Health act aims for social development which promotes equal public health. The municipalities are responsible to drive public health forward, through mapping an overview of local trends and public health challenges. Acquiring an overview of potential recreational activities or lack of, and green mobility of pedestrians and cyclist. Therefore, the planning of green structures should be a part of the municipalities work in promoting public health(The Public Health Act, 2011).

- **The Nature diversity Act 2009**

The purpose of the Act is to protect biological, geological and landscape diversity and ecological processes through conservation and sustainable use, and in such a way that the environment provides a basis for human activity, culture, health, and well-being, now and in the future, including a basis for Sami culture(Nature diversity Act, 2009)

- **Plan and building Act 2008**

Section 1-8 Prohibition on projects, etc. Along the seashore and river system.
In the 100-meter belt along the seashore and river systems, special consideration shall be given to the natural and cultural environment, outdoor recreation, landscape, and other elements of public interest.

The prohibition pursuant to the second paragraph does not apply where the municipality, in the land-use element of the municipal masterplan, has permitted the erection of necessary buildings, small installations and storage facilities for use in agriculture, reindeer husbandry, fishing aquaculture or sea traffic (section 11-11, no4)(Planning and building Act, 2008).

- **Outdoor recreational act 1957**

The purpose of this Act is to protect the natural basis for outdoor recreation and to safeguard the public right of access to and passage through the country-side and the right to spend time there, etc, so that opportunities for outdoor recreation as a leisure activity that is healthy, environmentally sound and gives a sense of well-being are maintained and promoted(The Outdoor Recreation Act, 1957).

- **Coastal Landownership**

The challenge with landownership in coastal areas is that there are no official law and different rules can vary around the country due to different outcomes from legal court proceedings. The most common regulation is that you own the land as far as a horse can wade. Depending of how shallow the water this can vary(Huseierne, n.d) .

Comments

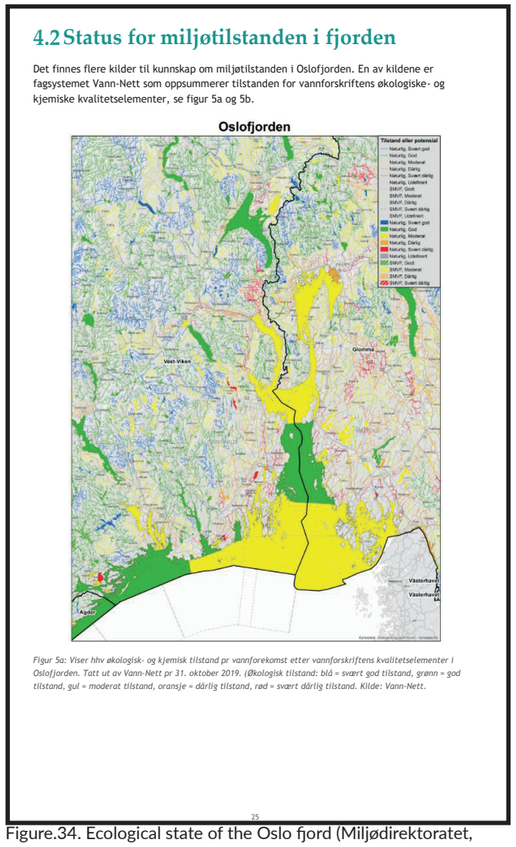
These national regulations and guidelines are the back bone in Norwegian culture. The above regulations are the most relevant to the themes of this thesis.

Facilitating public health through green mobility and encouraging recreation locally are important aspects to bring into planning processes. Overall, sustainable approaches should be taken into account for the least intrusive and destructive recreational facilities.
Dispensations for building along the coast should be further limited.

Regional Plans

- **The holistic action plan for a clean and rich Oslo fjord with active recreational (Figure 33.) overall goals:**

-To reduce emissions from municipal drainage and treatment of organic material (nitrogen) and better regulation of boat septic tanks.
-To reduce run-off from agriculture
-Reduce supply of environmental toxins into the fjord
-Increase measures against marine debris
-Conserve vulnerable species, nature types and cultural monuments and restore nature values with prohibition of fishing and establishing lobster conservation areas.
-Map nature types and cultural monuments
-Focus on national parks and maintenance of conservation areas
-Increase the public access to coast- establishing a fund to be used to buy attractive and expensive coastal properties.
-Preserve and strengthen attractive areas which are important for recreational value, like the coastal trails as well as explore suggestions to marine speed limits for transport ships and recreational small boats.
-Secure and support the use of local recreational areas for all age groups.
-Stricter administration of land use and development along the coast
-Establish information and visitor centre to educate about the value of the Oslo fjord and mobilize for action(Miljødirektoratet, 2019).


4.2 Status for miljøtilstanden i fjorden

Det finnes flere kilder til kunnskap om miljøtilstanden i Oslofjorden. En av kildene er fagsystemet Vann-Nett som oppsummerer tilstanden for vannforskriftens økologiske- og kjemiske kvalitetselementer, se figur 5a og 5b.

Oslofjorden

Tilstand eller potensial
Naturlig, Svært god
Naturlig, God
Naturlig, Moderat
Naturlig, Dårlig
Naturlig, Svært dårlig
Naturlig, Ukjent/mert
SMVF, God
SMVF, Moderat
SMVF, Dårlig
SMVF, Svært dårlig
SMVF, Ukjent/mert
Naturlig, Svært god
Naturlig, God
Naturlig, Moderat
Naturlig, Dårlig
Naturlig, Svært dårlig
Naturlig, Ukjent/mert
SMVF, God
SMVF, Moderat
SMVF, Dårlig
SMVF, Svært dårlig

Vest-Våler
Grumma
Asker
Vasterhaug
Vasterhaug

25

Figur 5a: Viser hhv økologisk- og kjemisk tilstand pr vannforekomst etter vannforskriftens kvalitetselementer i Oslofjorden. Tatt ut av Vann-Nett pr 31. oktober 2019. (Økologisk tilstand: blå = svært god tilstand, grønn = god tilstand, gul = moderat tilstand, oransje = dårlig tilstand, rød = svært dårlig tilstand. Kilde: Vann-Nett.

Figure.34. Ecological state of the Oslo fjord (Miljødirektoratet, 2019).

Comments

The *Holistic action plan for clean and rich Oslo fjord with active recreation*, was the initial inspiration for writing this thesis, and serves across mulicipalities for collaboration. Its overall strength is taking into account the larger watershed systems, run-off from agriculture and development along the coast. All of the themes in this plan touch upon the overall themes of increasing habitat resilience, whilst encouraging human nature interactions.

Local Plans

- **Municipality plan for climate and biodiversity** overall Goal:

To reduce emissions per resident to 40% in 2020 and 60% in 2030(in relation to 2006 standards).
- Increase quality of housing and efficient energy use in buildings
-Reduce the need for car-based mobility
-Increase public transport
-Reduce emissions
-Explore sustainable energy production
-To achieve eco certification in the municipality and education in schools and inform and educate about relevant environmental measures
-Conserving important habitats and measures to reduce fragmentation
-Establish maintenance and care practices to prevent overgrowth around the coast and special nature types
-Mapping of sea sediment and coast vegetation
-Removal of garbage along the coast
(Nesodden Kommune, 2017)

- **Plan for physical activity, sports and recreation** overall goal:

-Easy access to proximate nature
-Good cultural and sport activities
-Safeguarding of nature, landscape, and recreational values
-Preserve the unique recreational possibilities of the municipalities public outdoor areas
-Stimulate for activity through collaboration with local organizations, public participation, and access.
-Maintenance and establishment of necessary facilities to provide arenas for physical activity, sport, and recreation.
-Securing important areas through planning.
-Develop the western coastal trail
(Nesodden Kommune, n.d)

- **Cultural plan** overall goal

- to integrate, include, involve, and engage.
-Increase life quality in all phases
-encourage collaboration between professionals, amateurs and volunteers and stakeholders
-Inspire, challenge, and promote diverse forms of cultural expression and participants
- work actively with children and youth to provide versatile cultural activities.
-Highlights that Nesodden is Norway's largest artistic municipality. (Nesodden Kommune, 2016)

Comments

The local municipality of Nesodden have well established plans for **climate and biodiversity, Physical activity, sports and recreation**, and **culture.** These are the most relevant plans for the thesis that touch upon the themes presented in the work.

Collaborating across disciplines in the municipality and with volunteer associations can bring positive change. Nesodden is a growing semi-urban human settlement, and the assets which make it an attractive place to live (proximity to Oslo, access to forests, and coastal nature) need to be integrated into future plans.

The local plans contain aspects, such as conserving important habitats and measures to reduce fragmentation. Securing recreational areas through planning needs to be further explored to which degree it can also increase biodiversity.

The residents of Nesodden are creative, resourceful and engaged, this unique quality should be taken into account with user participation.

Figure# Breakwater docks at Hellvik beach, Winter 2022.

Figure 36. Early morning recreational fisher, Autumn 2022.

Figure 27 Dock along the coastal trail, Fjordvangen, Spring 2022

03.Theory

This chapter presents relevant marine ecological theory and research for the thesis.

The Tide

Estuaries

Marine plastic pollution

Intertidal zones

Tidal food web

Seabirds: Top predators and source of Nitrogen

The common Guillemot/Murre

Invasive Species

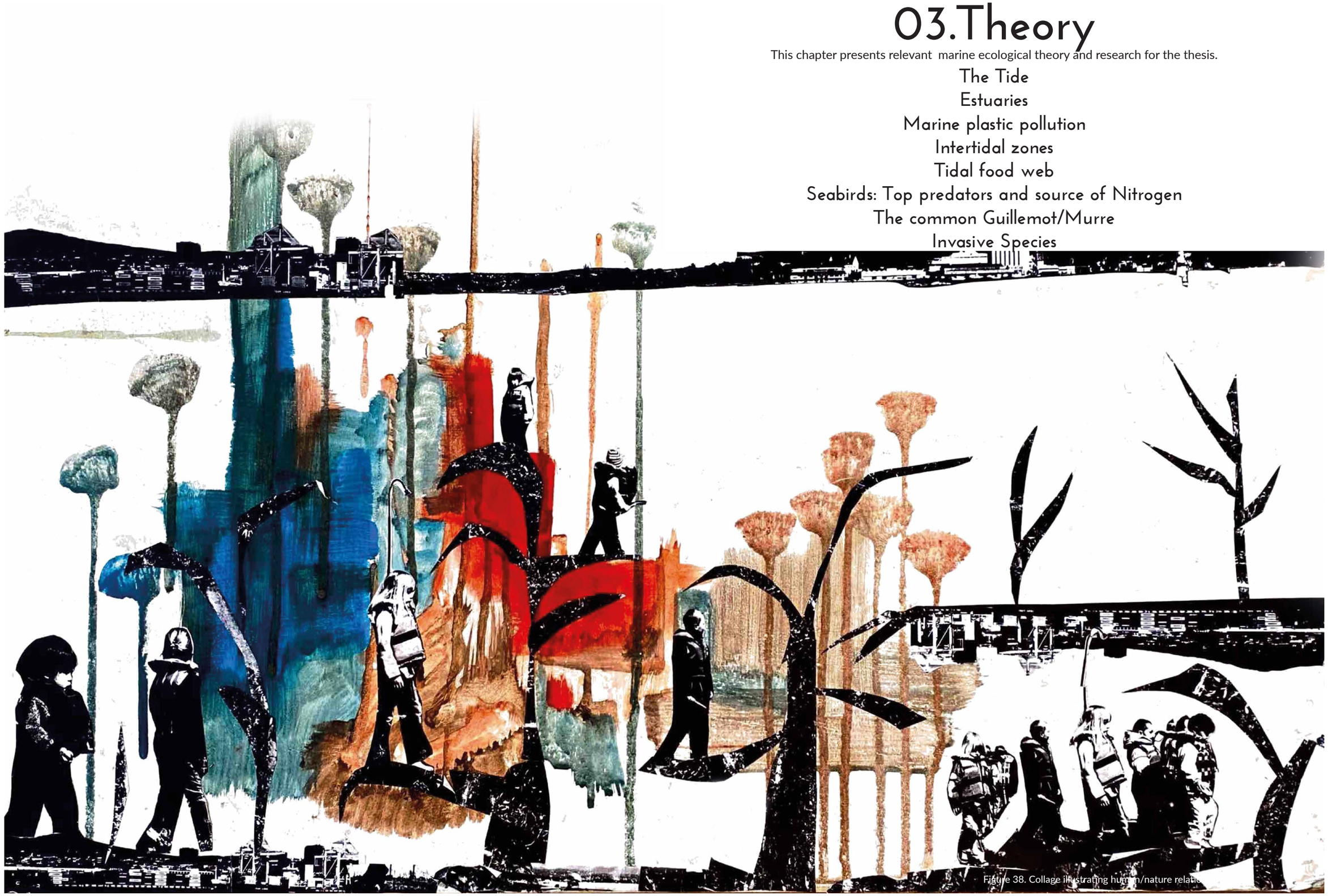


Figure 38. Collage illustrating human/nature relatio

The Tide

Tidal currents are important for the replacement of water in fjords. The largest changes in the water level is during New Moon and Full moon phase. During this phase the sun and moon amplify each other's effects whilst in other phases they more or less decrease each others effect.

During in the New moon phase the moon is between the sun and the earth, they both pull in the same direction, and we get what is called a spring tide(Figure 39). During the full moon phase, the sun and moon are on each side of earth, and we also get spring flow.

The coastal tide movement is also influenced by wind direction, wind strength and air pressure- which can especially be seen in areas with little tidal variation as in the Oslo fjord area and the Southeast coast of Norway. A threshold fjord like the Oslo fjord is classified by the underwater rock and moraine formations which can obstruct water flow(Bjerkely, 2018).

In fjords and estuaries which are unobstructed the exchange of water flow is continuous. Ocean current, tidal currents and river outlets contribute to this process. Thus, in threshold fjords like the Oslo fjord, the water exchange in the innermost part of the fjord is limited, and with the further anthropocentric pressures can result in environmental degradation.

The flow pattern can vary with seasons, less freshwater supply in the winter season and more during snow melting periods or heavy rain. There are usually three layers upper brackish, middle and lower. The water masses can usually be divided into three layers saline dependent, and the vertical mixing is restricted.

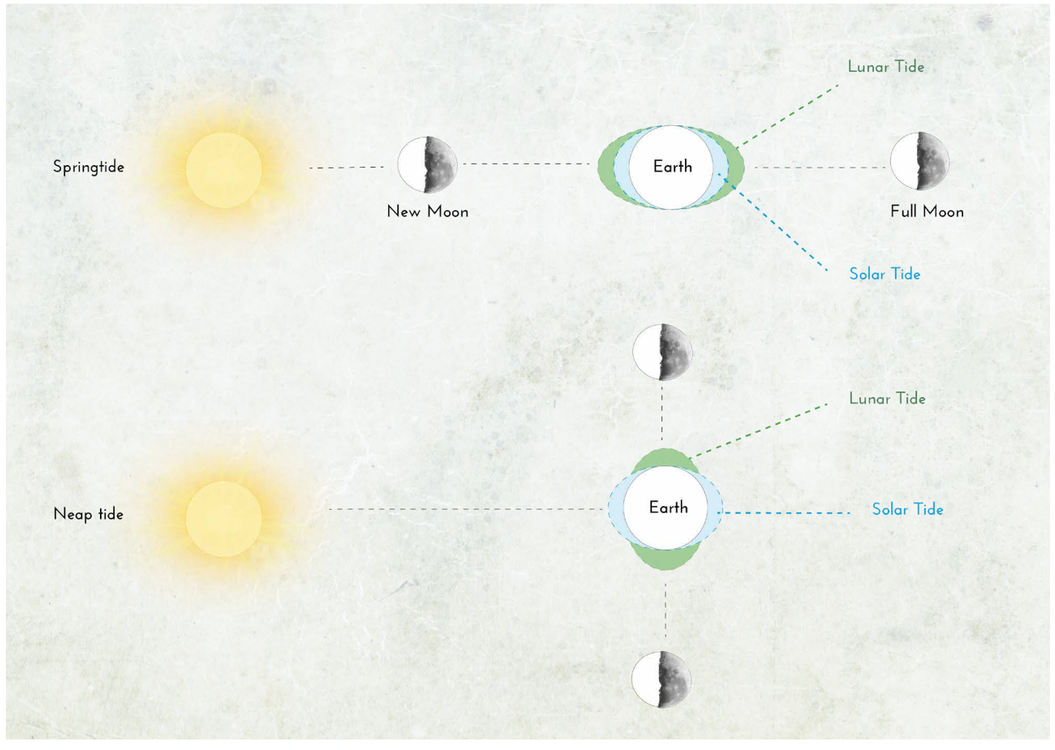


Figure 39. Conceptual illustration of the placements of the Sun, moon and Earth and tide .

Estuaries

Estuarium: Where the river meets the ocean. Estuaries represent the mixing zone between freshwater from rivers and the open ocean (Figure 40). As fresh water from rivers enter the estuary the fresh water stimulates a mixing process that renews the top layer of water in estuaries. This is referred to as estuarian circulation. This ecosystem is characterized by its chemical, physical and biological composition, and interaction. Estuaries are biologically productive with both benthic(the underwater sediment zone) and pelagic(the vertical ocean water zone) ecosystems(Cochran, 2014). The typical depths of estuaries are commonly less than 100meters.They also serve as nursing ground for marine species and human recreational zones(Dame, 2008).

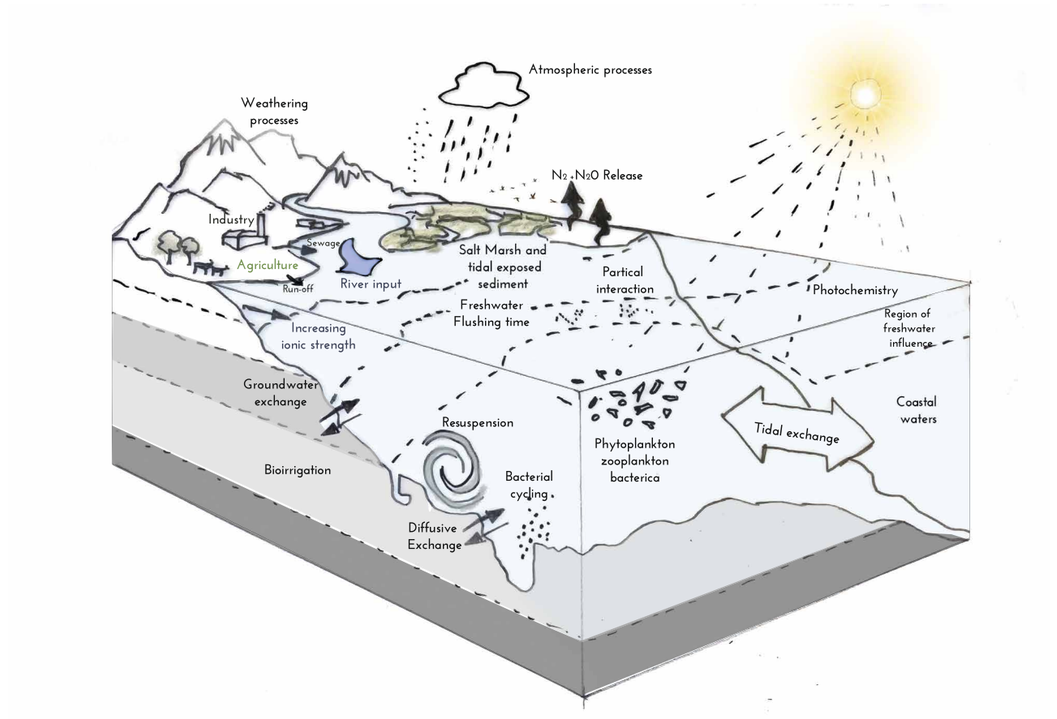


Figure 40. Conceptual illustration of the processes in Estuaries.

Marine plastic pollution

'Old habits are hard to change.... dilution as the solution to pollution...'

-Old proverb

The development of plastic products in the last 50 years is closely linked to the marine litter. 8 million tonne of plastic garbage from land based human activities and ocean based activities ends up in the ocean(Bjerkely, 2018). Around 70% of this garbage sinks to the sea floor. Whilst 15% % which does not sink, floats around the world oceans directed by ocean currents. The remaining 15% of visible garbage we find washed on the coast is only a small part of the bigger picture. The coastal debris is usually removed by volunteer organizations, private stakeholders or public authorities.

Plastic garbage in the ocean has a large impact on animals (Figure 41). Mortality can occur when animals get trapped in larger plastic items or ingest items they mistake for food. Whales, fish and sea birds have been found with plastic bags and other debris in their stomachs. The decomposition of plastic in the ocean is slower, and uncompromised plastic waste produced in 1950 is still present today. Plastic slowly breaks into smaller pieces which are called microplastic. Microplastics are small pieces of plastic less than 5mm in length (Rogers, 2022). These are found in several species and are complex to contain and remove. Accumulation of microplastics in the food chain impacts the whole eco-system. Not only do species which ingest larger plastic particles and microplastics get a false sense of fullness causing mortality due to nutrient deficiency, but these can obstruct bowel functions.

The chemicals in plastics can also have reproductive consequences for animals and humans(Talsness et al., 2009).The ingestion of plastic litter and marine organism entanglement was first registered in scientific literature in the late 1960's, and these were the first signs of trouble(Kenyon & Kridler, 1969; Ryan, 2015).Not only is there a direct plastic -animal consequence, studies also show that plastics debris can change water movement and sediment heat transferral(Carson et al., 2011). The diversity of plastic chemical composition, along with the many sources and routes into the ocean must call for a multitude of mitigations on a multi- scale level. This global problem requires immediate international collaboration for research, education, and legal framework.

The coastal authorities estimate that 34000 tonne garbage is dumped in Norwegian economic marine zone from Norwegian and foreign ships(Bjerkely, 2018). It is predicted that the dumping of garbage will continue to grow by 70% by 2030(ibid.).

Figure 41. Unaltered stomach contents of a Laysan Albatross Fledgling. Midway Island. 2010.(Jordan,2010).

Intertidal zones

Sublitorral zone
This zone is from the lowest low tide till around 10-20 meters deep Primary producing species include red algae,their red colouring can easier catch the blue green light rays from the sun for photosynthesis.

Littoral zone
This zone is the area between normal high tide and low tide (Figure 42, 44,54) . This can be observed by the highest brown algae *Fucus serratus* and the highest located barnacle *Balanidae.*

Soft bottom habitats
Soft bottom habitats consists of sediments such as mudflats, beaches, shoals, holes and sandbards. The sediments are of clay, silt, sand, and gravel with grain size less than 16mm, and can usually be exposed during periods of low tide. It is therefore an important foraging area for birds and fish. Softbottom species mainly stationary and are usually directly impacted by local variations. Many of these species live in the sediment layers (Figure 45). Threats to these habitats are development along the coast such as building of breakwaters, disturbances to river inlets, filling dredging and other infrastructural changes.

Hard bottom habitats
Hard bottom habitats are made up of rocks and hard structures and provides complex textures for other species like seaweeds and sponges to attach. These habitats can be associated with threats like dredging and damage from fishing activities.

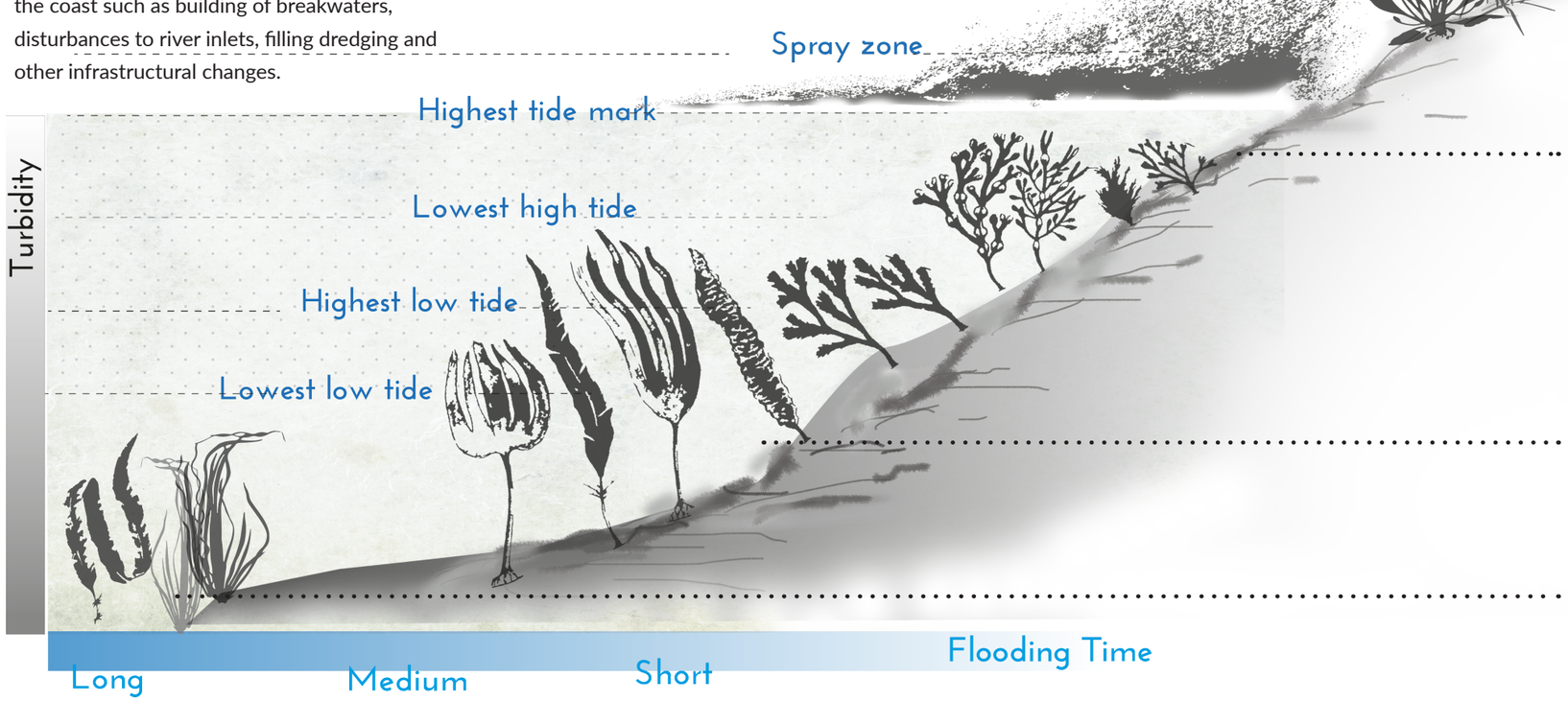


Figure 42. Conditions and typical zones in intertidal habitats. Each specie has addapted to specific zonations dependent on micro conditions,

Spray zone
The spray zone stretches as far as the waves normally reach. The force of the waves and changes in micro-climates makes this a challenging habitat and is therefore mostly colonized by lichens and blue green bacteria. This can often be observed by the blackish lichen *Hydropunctria maura.*

Brackish marsh
This zone is up to where higher plant are closely located. This area is impacted by salt water through water drops and foam. The lowest belt is usually dominated by the distinct orange coloured lichen *Xanthoria parietina*(Figure 53). This specie benefits from nitrogen deposits from Sea birds. In the rock cracks salt tolerant herbs can grow (Figure 43). Species such as *Schoenoplectus tabernaemontani*, *Phragmites australis*, *Bolboschoenus maritimus*. These are especially important habitats for grazing intertidal animals, and breeding- nesting birds. Further up the dry meadows tree species include *Juniperus communis* and *Pinus sylvestris.*

Common reeds and salt tolerant plants *:*
Halophytes:
Festuca rubra

Tide pools: Blue green bacteria (see also figure 55)

Spray zone

Spray zone
Lichens:
Hydropunctria maura
Calothrix scopulorum
Verucaria maura
Xanthoria parientian
Ameria maritima

Littoral zone
Seaweeds*:*
Fucus serratus
Fucus spiralis,
Ascophyllum,
Fucus vesiculosus
Barnacles*:*
Balanus balanoides
Common Periwinkel:
Littorina littorea
Rough Periwinkel*:*
Littorina saxatilis
Brown algae:
Channelled wrack:
Perlvetia canaliculata

Sublitoral zone: *'Kelp forest'*
Laminara Hyperborfa
Laminara digiatat
Halidrus siliquosa
Fucus Serratus
Saccharina litissima

Figure 43. Lichen on rock and vegetataion growth in weathered rock crack

Figure 44. An example of different algae and seaweed in the intertidal zone.

Figure 45.Pacific Oyster attached to rock and other benthic organisms.

Figure 46.Micro-plastics amongst beach debris.

Tidal food web

Primary producers are dependant on photosynthesis and they form the basis for production further up the trophic levels in the food pyramid. Phytoplankton are the most important producers in the ocean.

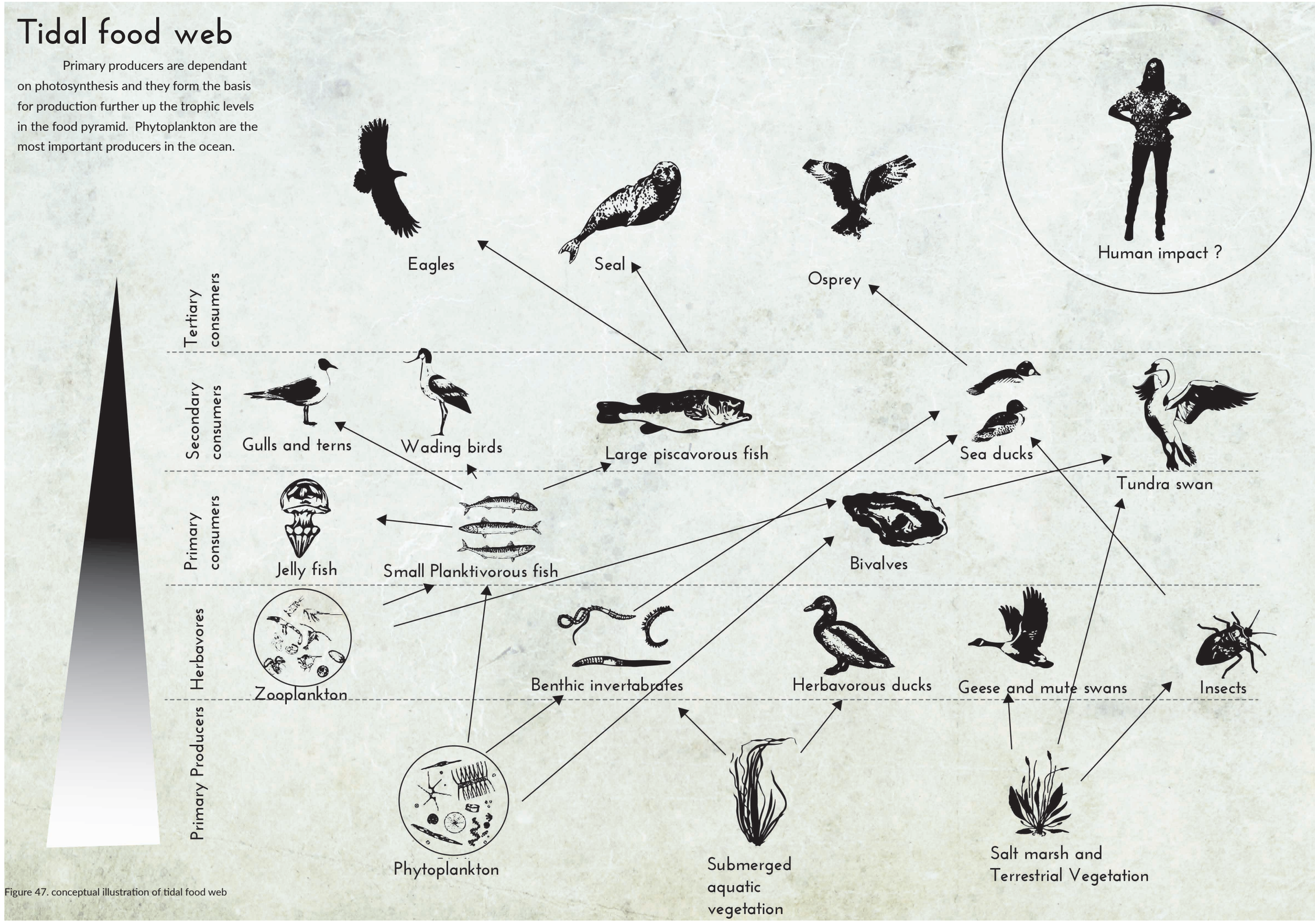


Figure 47. conceptual illustration of tidal food web

Sea birds
Top predators and source of nitrogen

N

N

N

The Common Guillemot/Common Murre
(Scientific name: Uria aalge, Pontoppidan,1763)

Overwintering in the Oslo fjord
Foraging for food

Need for small fish

Seabird excrement
as direct deposits
into sea
Inorganic N

Inorganic N

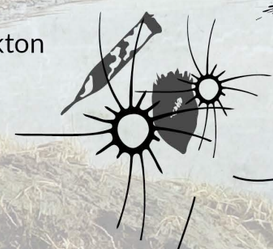
Sea bird excrements 'Guano'
is high in nitrogen and a source
of fertilizer in soil and an important
part in nutrient cycle

N

Fertilisation

Surface Run-off

Plankton



Small fish, including fish larvae
and juvelnile fish, needs
habitats for shelter and
food. Adult fish need suitable
habitats to spawn.

Percolation
NH4+
NO3-
inorganic nitrogen

Eelgrass

Macro algae

i.e Eelgrass (submerged aquatic
vegetation on sand or muddy substrate)

Small marine animals

Figure 48. Top predator and source of Nitrogen. Illustration derived from information based from:(Lorrain, et al.2017)

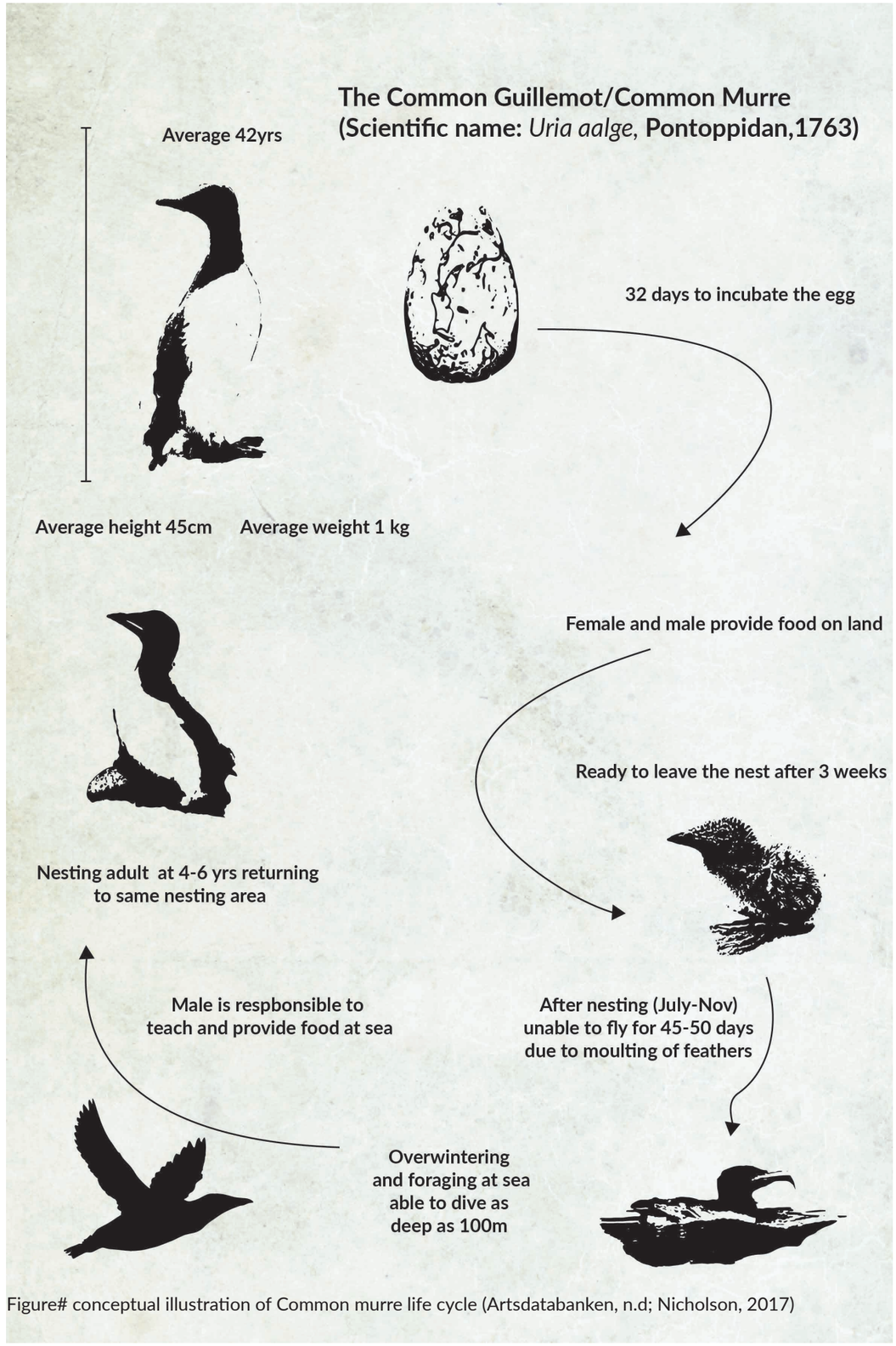
Common Guillemot/Murre
Uria aalge, Pontoppidan 1763

The specie has been classified as critically endangered in Norway and in Svalbard as vulnerable. However on a global scale it is classified as Least Concern(Ashpole et al., 2018). The elegant dark brown and white bird weighs on average around 1kg and its body is on average around 45 cm long. They live to an age of 42 years their thin pointed beak and their aerodynamic physique provides them with specific hunting abilities. Summer coat is dark head and neck whilst the winter coat has the additional white cheeks and neck (this same for both sexes). The common murre is a colony nester and places its egg directly on the open cliff edge or hidden in cracks of large rocks. The bird first nests at an age of 4-6 years and sometimes as early as age 3 years old. They only lay one egg per season, and this happens between May and June, and it takes 32 days to incubate the egg. Within one day of hatching the down covered chick can stand up, and 3 weeks after it is hatched the chick leaves the colony. Both parents will provide food and feed the chicks whilst on land but it is the male whom guides the chick out in the sea and where his duty is to guard, and teach until they can manage themselves.(Figure 47,48,49)

The Common murre forages mostly fish measuring 20cm and smaller. Important dietary species are Sprat *(Sprattus Sprattus)*, Capeliln (*mallotus villosus*), Herring (*Clupea harengus*), Saithe (*pollachius virens*), small sandeel (*ammodytes tobianus*) and other fish in the cod family. It is not uncommon that they forage on squid, octopus as well and in non-breeding season their menu expands to small marine crustaceans as krill and amphipods. It can dive 100 meters deep however majority of its nutrition is from the top layers of the ocean. They have the ability to 'fly' underwater by using their wings for propulsion and steering they catch their prey with their bills and usually consume their prey underwater unless when they are providing food for your young. After the nesting period the bird moults from July to November and is unable to fly for a period of 45-50 days whilst the wing feathers re-grow. The head and neck then moult to the summer colours until April/may. The specie inhabits the North Atlantic and northern Pacific Ocean. In Norway the nesting is on bird cliffs located from Rogaland up until Finnmark and Svalbard. The bird overwinters along the whole of the Norwegian coast and especially in southern Norway- only a small population leaves the Norwegian maritime area.

Common Murres are for the most part highly monogamous and stay with their partners for several years consecutively. These relationships begin and is maintained with rituals upon meeting where both birds spar with bills, bow, and preen whilst calling one another. During mating season, the males guard the females from rivals with bill jabs and sudden leaps. The specie is not territorial per say but will defend their immediate area where the egg or chick is present, and the couples return to the precise same location on the same cliff where they hatched. On the nesting cliffs the birds live with extremely proximity to each other. The birds are literally shoulder to shoulder-touching their neighbours on each side, and the social dynamics encompasses complex social exchanges of 'allopreening' behaviour(which is physically caring for each other through grooming ect), physical contact associated with conflicts and other 'relational' exchanges in regard to offspring care or infidelity(Nicolson, 2017).

The current estimated nesting population along the Norwegian coast is 17 000 couples- compared to the 1960 estimation of 160,000 couples. It is also estimated that the population has declined by 90 % in the coastal parts of Norway.



Figure# conceptual illustration of Common murre life cycle (Artsdatabanken, n.d; Nicholson, 2017)

Distribution of The common Murre in the World
(Uria aalge)

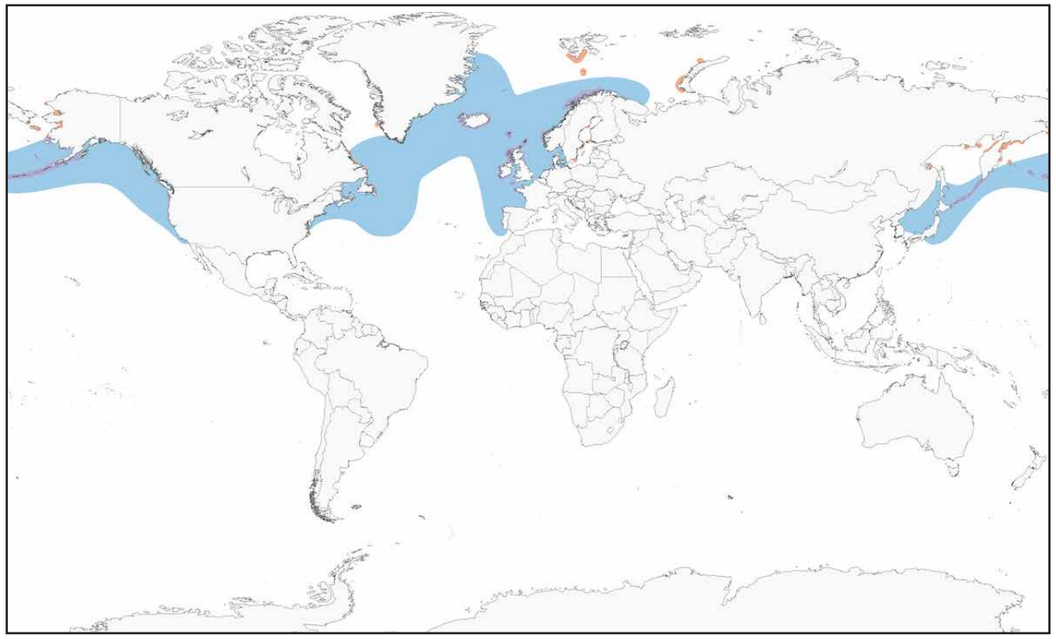


Figure 50.Map. Print screen. Distribution of the common Murre in the world.

Year-round Breeding Migration Non-Breeding

Where there is a high production of crustaceans and fish there will also be a high production of sea birds (Figure 50). Due to ocean currents and the long summer days in the northern hemisphere, the northern coast of Norway is an important habitat for nesting sea birds (Figure 51). Migration and distribution of small fish will impact the distribution of the *Common Murre*.

Distribution of The common Murre in Norway
(Uria aalge)

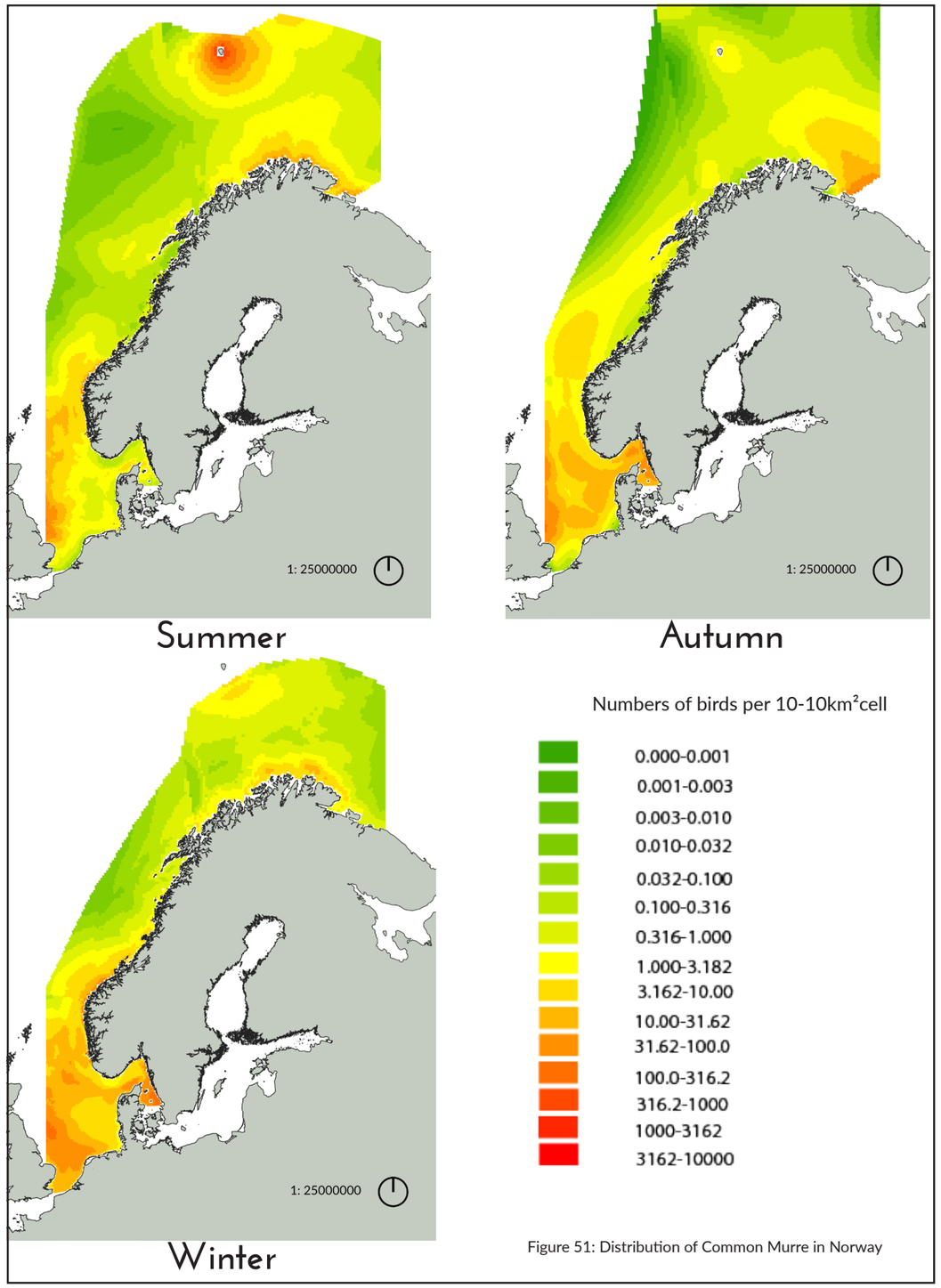


Figure 51: Distribution of Common Murre in Norway

Invasive species in the tidal landscape
The sea walnut
Mnemiopsis leidyi, A.Agassiz,1865

Species which occur outside of their natural range can be defined as alien, non-native or non-indigenous, foreign species. The non-indigenous ctenophore Sea walnut (Mnemiopsis leidyi) has recently been observed in the Oslo fjord. The abundance of gelatinous zooplankton are thought to have increased all over the world resulting in jellyfish-dominated ecosystems and food webs, however long-term data is lacking(Lies, 2015).

Marine species have been known to travel with ballast water from ships. Globalization, increased transport, trade, travel has caused an increased influx of introduced non-indigenous marine species the past few years(Katsanevakis et al., 2016). Introduced species can have negative impacts on community compositions, local food-web ecologies, cause individual specie population decline and even extinctions(Katsanevakis et al., 2016). Understanding these relations in marine systems is an important part to reduce new introduction of non-native species and finding solutions to mitigating them. It is possible to establish strategies to already present non-invasive species however the better solution is to prevent new introductions and further spreading.

When the biodiversity act of 2009 was established new regulations on how to deal with non-native species was established on a national level(Bjerkely, 2018). This particular jelly fish does not pose as direct risk to humans but may have a socio- ecological impact.

The M.leidyi(Figure 52) can contribute to both eutrophication and anoxic water conditions. It has an ecological impact on the local food web. Preying on zooplankton, and thus disturbing phytoplankton balances, whilst it excretes ammoniacal nitrogen. The combination of these can be fatal for benthic organism(Marchessaux, 2020).

The Pacific oyster (Crassostrea Gigas) is also an introduced specie worth mentioning, which is spreading along the Nesodden coast. The municipality organizes volunteer events to collect them and dispose of them. The Norwegian environmental directorate has developed its own action plan to combat them(Miljødirektoratet, 2016). Filter feeders can have a positive effect on eco-systems by filtering particles and clarifying water(Jansen et al., 2019). Although edible, there are certain health risk associated with consuming self-harvested shellfish in the Inner Oslo fjord due to algae toxins, viruses, and heavy metals due to bioaccumulation (figure 66). As indicator organisms filter feeders can serve to evaluate the presence of pathogens or heavy metal pollution in water. Although a controversial, Pacific oysters could provide certain eco-system services. However, the razor-sharp shells can prohibit access and decrease the quality of certain bathing spots along the coast. I

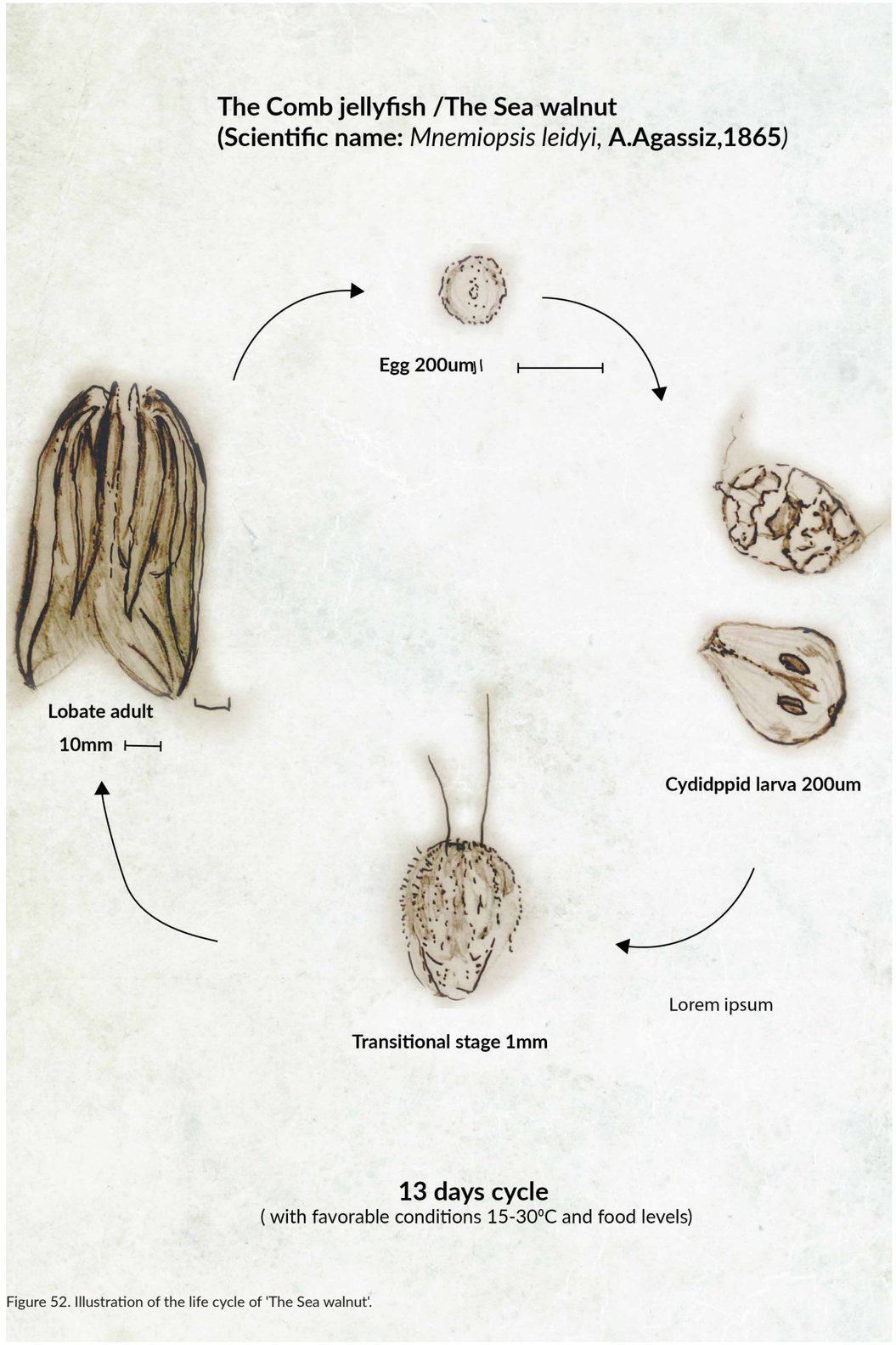


Figure 52. Illustration of the life cycle of 'The Sea walnut'.

Figure 53. River outlet, and breakwater rocks with established lichen.Winter. 2022.

Figure 54. Snails attached to rock, Prestekjær Febuary 2022.

Figure 55. Tidal pools at Prestekjær, Febuary 2022.

Figure56. Bridge structure along the coastal trail, Spring 2022.

Figure 57.Visable markings along the trail to indicate the route, Spring 2022.

Figure 58. Coastal trail marking on tree., Spring 2022.

04.Case Area

This chapter presents the case area of Nesodden, the analysis and research

The Oslo fjord
Soundscape
Nesodden municipality
Performing arts, environmental embodiment and landscape
Climate conditions & Tidal fluctuations
The eastern coastal trail with nodes
The workshop
DNT group tour
Historical context along the coastal trail
The ferry
Access to the coast
Historical docks along Bunnefjorden
Selected areas
Area description Ursvik
Area description Hellvik
Area description Prestekjær

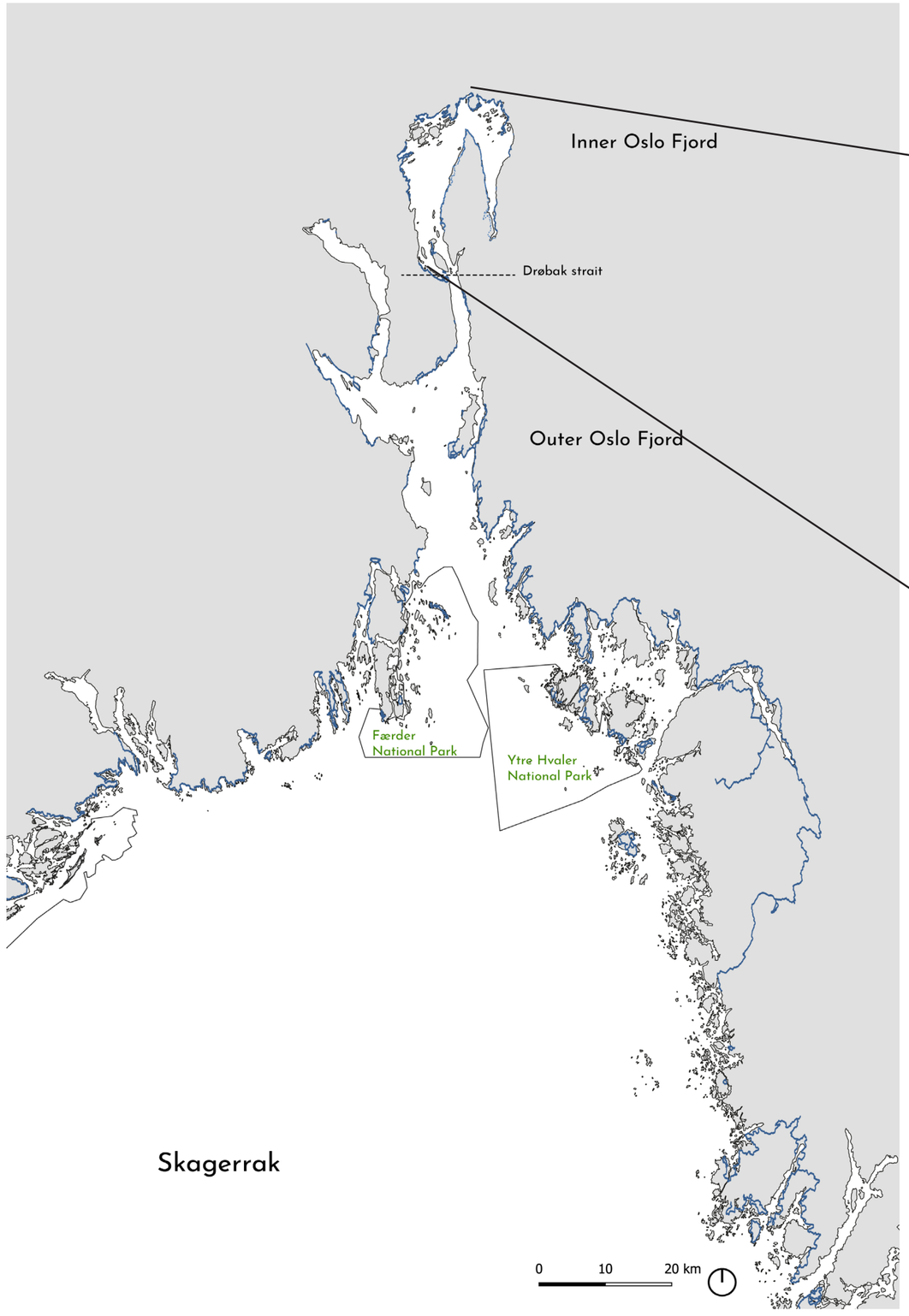


Figure 59. Map of case area.

The Oslo fjord stretches 100km inwards from the strait of Skagerrak towards Norway's most populated city- Oslo. The fjord is divided into the Outer Oslo fjord and the Inner Oslo fjord (figure 599. The fjords varied coastline serves a geological buffer of bays, islets, islands, sand and stone beaches.

The landforms is a geological result of the last ice age, when the powers of ice and melting water sculpted the land, fjords and coastline. The variation in terrain is not only on the land, but under the surface of the water the depths can be as low as 164 meters deep(Baalsrud & Magnussen, 2002).

The Oslo fjord is one of Norway's most biodiverse ecosystems and the 1.6 million human inhabitants around the fjord enjoy the great recreational value it has to offer. Bathing, swimming, boating, and hiking are amongst the activities which have an important recreational and cultural values which have a financial value estimated to 25 billion kroners a year(Chen et al., 2019)The geology of the Oslo area is world famous due to its diversity of geological processes and formation, and with the warm summer climate it is the foundation for a rich biodiverse flora and fauna(Ryvarden & Laurizen, 2006).

Figure 60.Conceptual illustration on water exchange in threshold fjords (Baalsrud & Magnussen,2002)

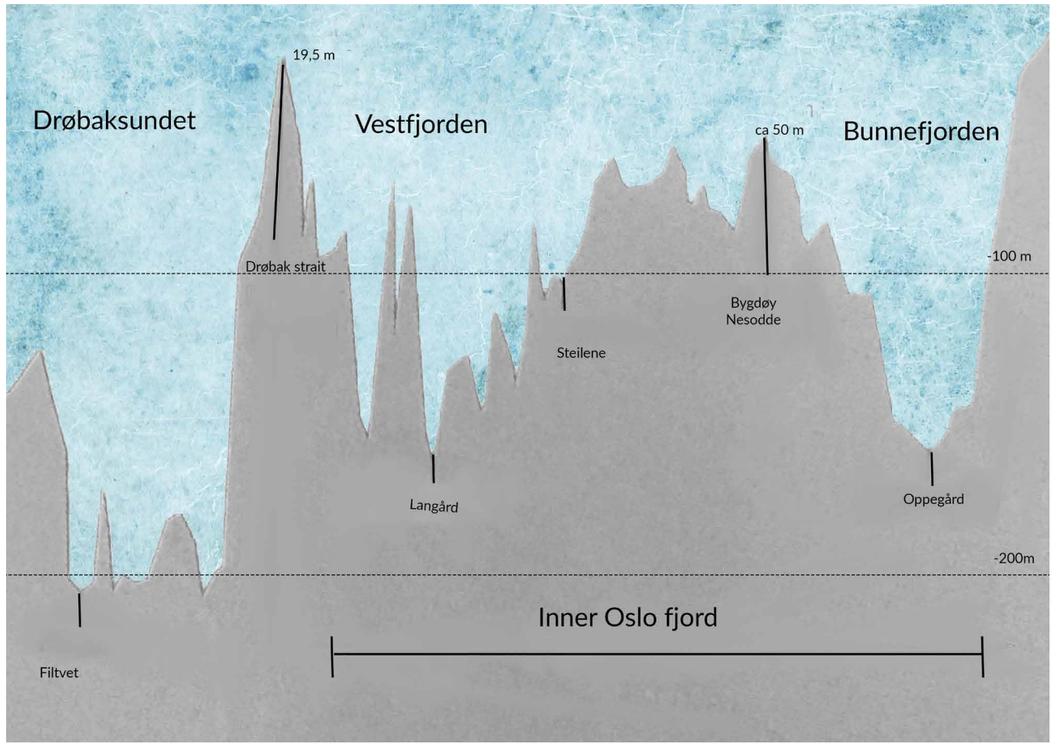


Figure 61. Illustration. (Depth section of Inner Oslo fjord exaggerated vertical proportions compared to horizontal scale (Baalsrud & Magnussen,2002)

The threshold fjord will have certain issues renewing water in the inner Oslo fjord, and therefore Bunnefjjorden is a vulnerable part of the fjord. (Figure 60,61)

The Oslo fjord and pollution issues are related to the urban development and industry around the inner Oslo fjord. It is challenging for scientist to understand the specific consequences of human emissions and the specific consequences this has on the ecological state of the fjord. Providing clean water, collecting garbage, and treating sewage for its citizens has been a driver for change in the last century.

Historically, river inlets supplied the fjord with contaminated water from industry and sewage which prohibited recreational bathing and activities along the coast. The sewage treatment commission in 1900 led way to establishing important measure for water treatment for the city. Initially the issue was addressed as a hygienic problem, and as the bathing culture and bathing houses were established along the coast around the 1920's later had to close due to harmful bacteria in the water.

In recent years the ecological condition of the fjord is understood as a more complex concern with larger consequences. Some of the environmental challenges in the fjord are associated with development and physical changes in structures along the coast.

Recreational small boat dock and facilities and the establishment of private beaches has been at the expense of natural spawning areas for fish. Previous pollution from industry has resulted in pollution in marine sediment. Marine macro and micro plastic pollution are negatively influencing flora and fauna. Micro plastics and heavy metal pollution can accumulate at the top of the food

chain. Increased instances of heavy rain transports particles and toxins into the fjord. Sewage and storm water treatment plants do not always have the capacity when heavy rains occur and this can cause untreated water to flow into the fjord.

Primary producers in the fjord water are dependent on a specific nutrient balance for growth and this balance can be disturbed by urban and agricultural run-off, sewage, and other pollutants. Artificial fertilizers in agricultural practices can cause eutrophication in fresh water and salt water ecosystems. Increase in phosphorus and nitrogen can cause algal blooms. The algae then sink to the bottom to decompose, both these processes are dependent on enough oxygen. The decomposer use oxygen in the decomposing process, and if the oxygen levels are below 0,5ml/l they then use the oxygen in nitrate instead. This process causes nitrate to become ammonium, when the oxygen and nitrate is depleted, there are a few bacteria which can use the oxygen in sulphate which creates hydrogen sulphate which is deadly for most species. Oxygen content water is therefore one of the most important environmental factors in the deep-water layers of the Oslo fjord and is used as an ecological indicator. The issue of anoxic water can be caused by both natural processes and human activities and are especially relevant for threshold fjords where the water exchange is rare(figure 62).

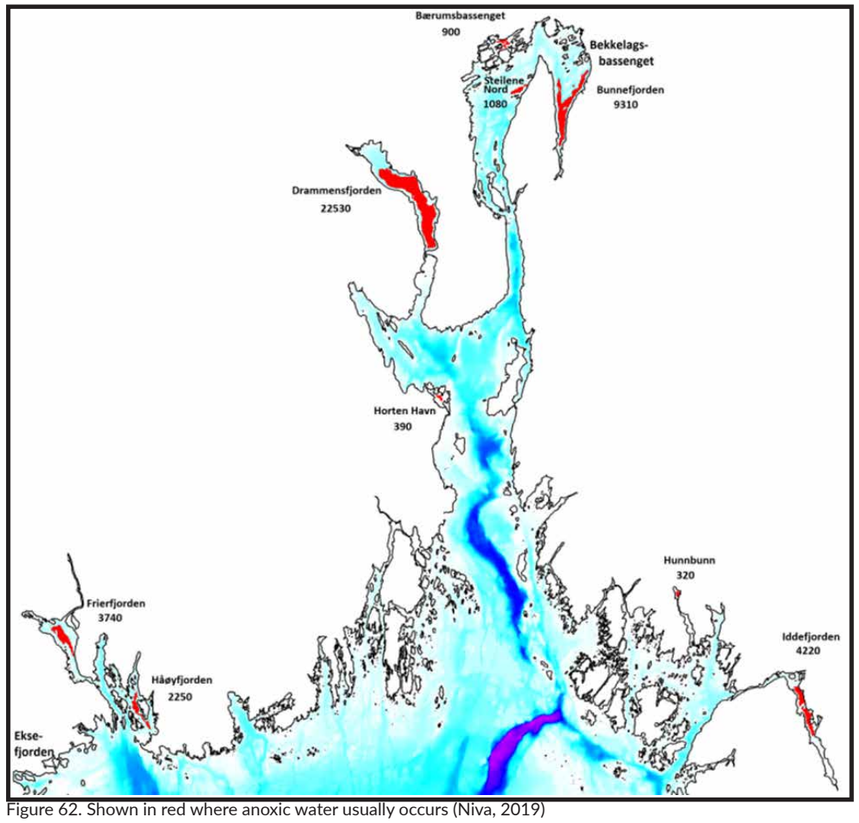


Figure 62. Shown in red where anoxic water usually occurs (Niva, 2019)

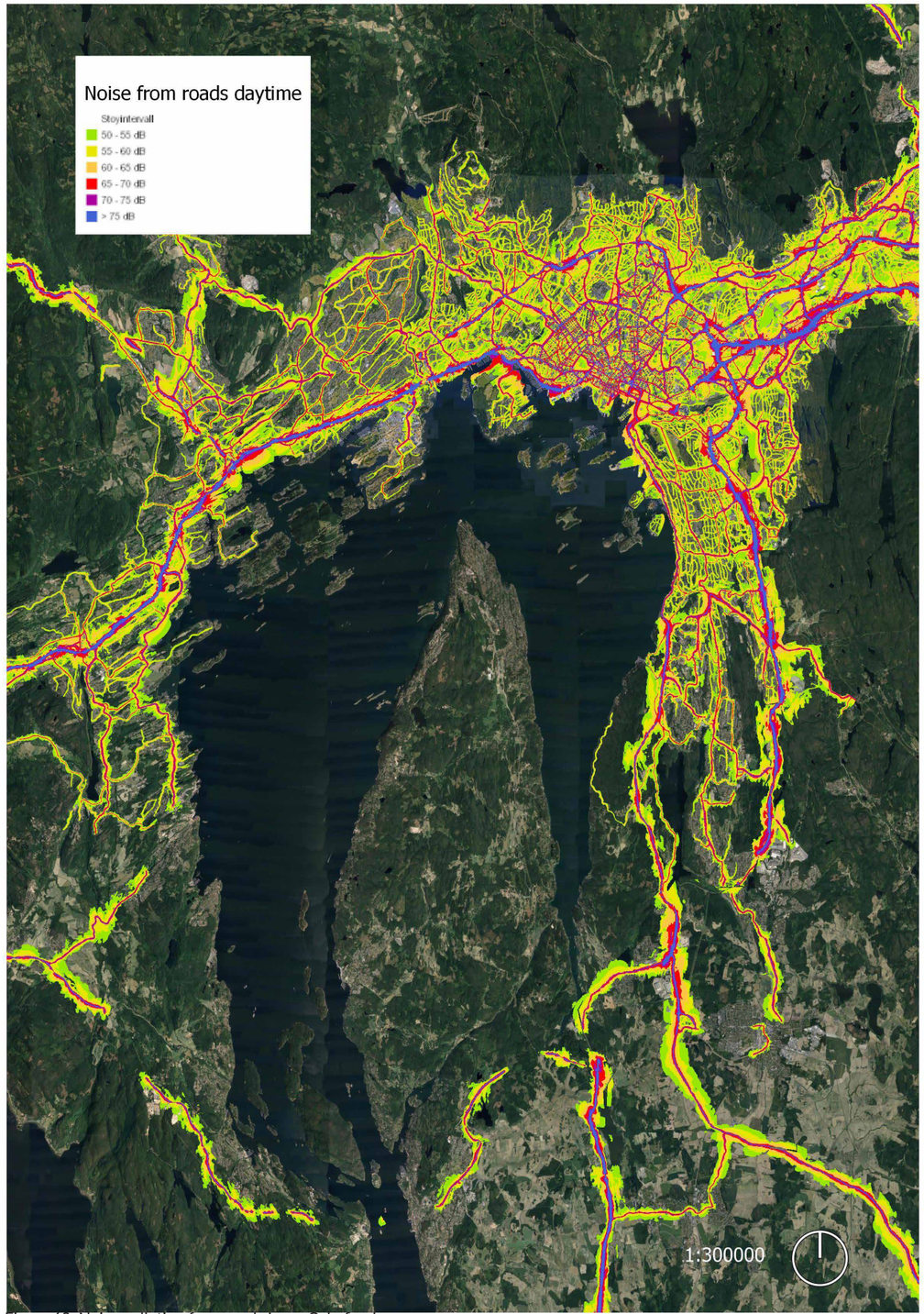


Figure 63. Noise pollution from roads Inner Oslo fjord

Soundscape

Soundscapes can be defined as ‘ ambient sound in terms of its spatial, temporal and frequency attributes, and the types of sources contributing to the sound field’(Duarte et al., 2021). The effects of the Anthropocene on terrestrial soundscapes are well recognized(figure 63), however attention to Anthropogenic marine soundscape has not been as established. Continuous and impulsive broadband sound can cause mortality in marina fauna and can also cause disturbances in specie interactions(Jepson et al., 2003; Solan et al., 2016).

Lower trophic groups, like sediment dwelling invertebrates have a key role in the food web and provide essential ecosystem services are also impacted. Impacting the lower trophic groups may have further ecological impacts higher in the trophic levels.Understanding the consequences of marine soundscape is an important part of mitigating human impact. Underwater sound can travel over greater spatial scales than light or chemicals, and a complex issue to address (Urick cited in (Duarte et al., 2021). Marine animals have evolved to detect a range of sound. They also produce and use sound for navigation, territorial defence, foraging, agnostic displays, mate attraction, and reproductive courtship(Duarte et al., 2021). The pre- anthropogenic ocean soundscapes were mostly sounds from geological and biological sources. The current soundscape situation caused by human activities are intensifying across the ocean (figure 64). Increased shipping, coastal developments, resource extractions, fishing practices and on a smaller scale coastal recreational activity, all contribute to the altered soundscape of the ocean. Along with the impacts of climate change in marine ecosystems, anthropogenic soundscape situation will increase as sound travels faster in warmer oceans(Duarte et al., 2021).

There are some efforts to mitigate the situation. The International Maritime Organization guidelines for reducing noise focus on reducing the noise from propellers, hull form, and onboard machinery. Regulating speed and managing routes to divert away from sensitive areas, as well as technological improvements such as electric motors or solar powered battery on vessels can also contribute to minimizing the sound impact. However, due to the cross-boundary nature of commercial shipping, international collaboration on restrictions and guidelines is key. The port of Oslo receives around 1 483310 tonnes of commercial goods per quarter from commercial ships(Ssb, 2022). There are 48,824 registered small recreational boats in Oslo(Redningsselskapets småbåtregister, n.d).

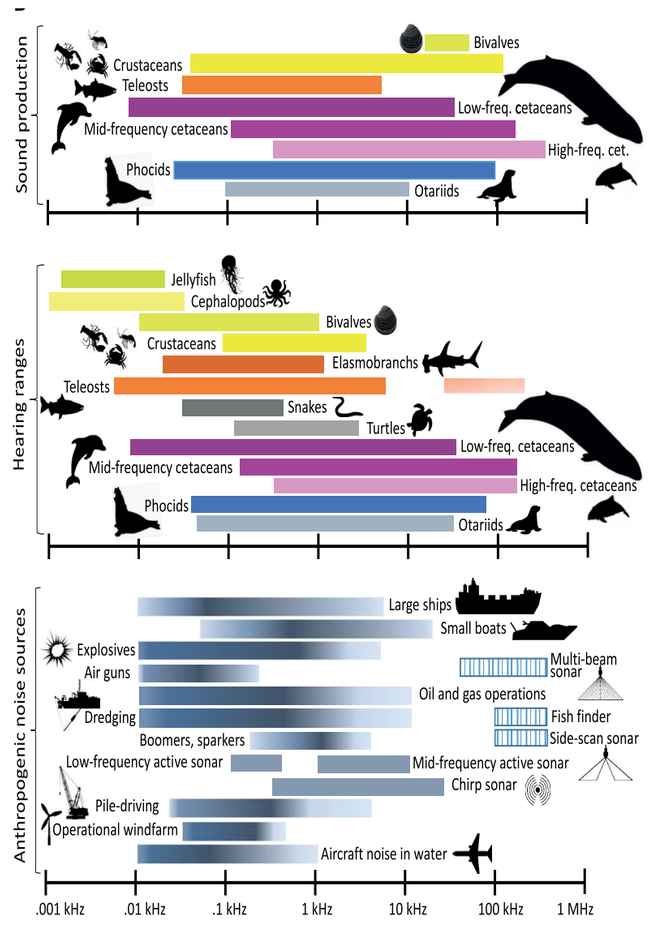


Figure. 64.Marine sound.(Duarte et al.,2021)

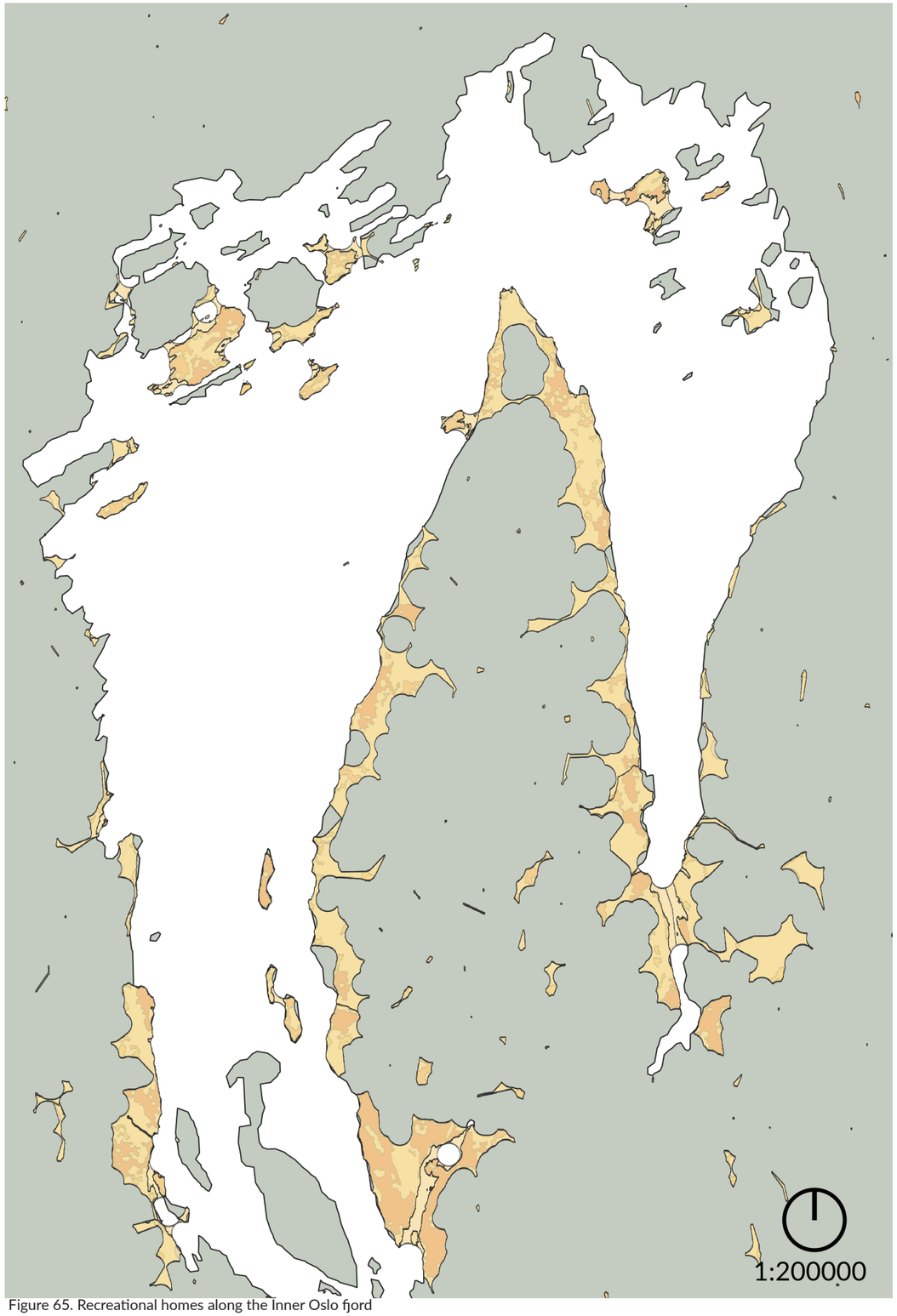


Figure 65. Recreational homes along the Inner Oslo fjord

Figure 66. Map of seafood warning

Figure 67.Location

The population of Nesodden is 20,197 in the third quarter of 2022, and the predicted population development in 2050 is 23 348.The population dominated by adults aged 35-54 years and children under the age of 18. The majority of the population consists Norwegian citizens but has a small percentage foreign citizens dominated by nationalities like Swedish, Polish and German.

Currently the two dominating industries within the municipality is merchandise trade/restaurant, and health and social services. Around 40% of the population over 16 years old has 1-4 years of higher education. 89 % of the population live in self-owned single house homes closer than 50 meters between the houses. There are currently registered 1521 recreational homes(SSB, 2021).

Climate Conditions

The climate is cold and temperate. The inner Oslo fjord is relatively protected from strong winds. Summers can be mild and warm. It has significant amount rainfall averaging 1010 mm a year. The average temperature is 5.9 degrees Celsius

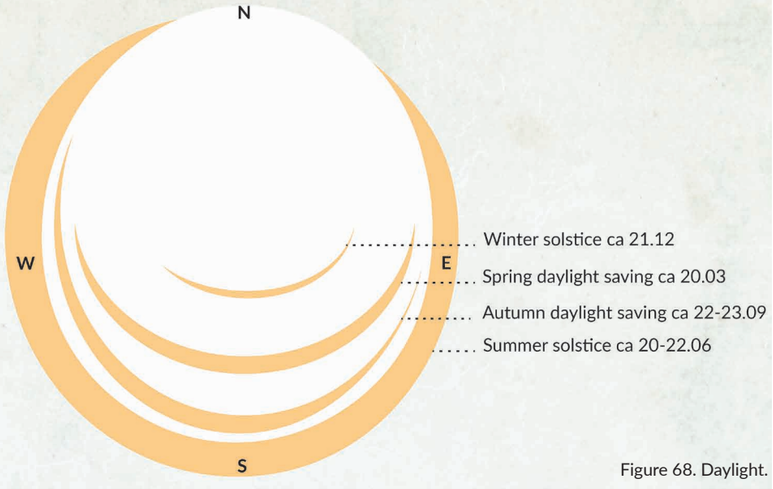
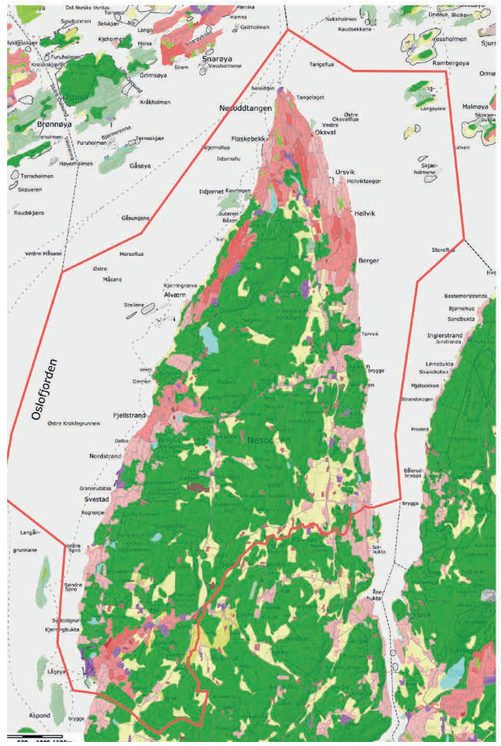


Figure 68. Daylight.



Urban atlas Land cover Land use

- Continous urban fabric
- Discontinous dense urban fabric
- Discontinious Medium density urban
- Discontinious low density urban
- Discontinious very low density urban
- Isolated structures
- Industrial,commerical,public,military and private units
- Fast transit roads and associated land
- Other roads and associated land
- Railways and associated land
- Port Areas
- Airports
- Mineral extraction and dump sites
- Construction sites
- Land without current use
- Green urban areas
- Sports and leisure facilities
- Arable land
- Permanent crops
- Pastures
- Complex and mixed cultivation patterns
- Orchards
- Forest
- Herbaceous vegetation associations
- Open spaces with little or no vegetation
- Wetlands
- Waterbodies

Figure 69. Map over the Corine urban atlas landcover land.

Around 5% of the land is used for agriculture and 42% is covered by forest(SSB, 2021). The forest provides an arena for recreational activities like hiking, skiing and cycling. It also provides possibilities foraging for wild berries, mushroom, and game. The forest provides habitats for moose and deer, and the species of leafy trees provide habitats for insects and birds. The natural wild oak forest in the northern part of Nesodden is recognized as one of the world's most northern populations. There are 39 registered ponds and lakes.

Tidal fluctuations

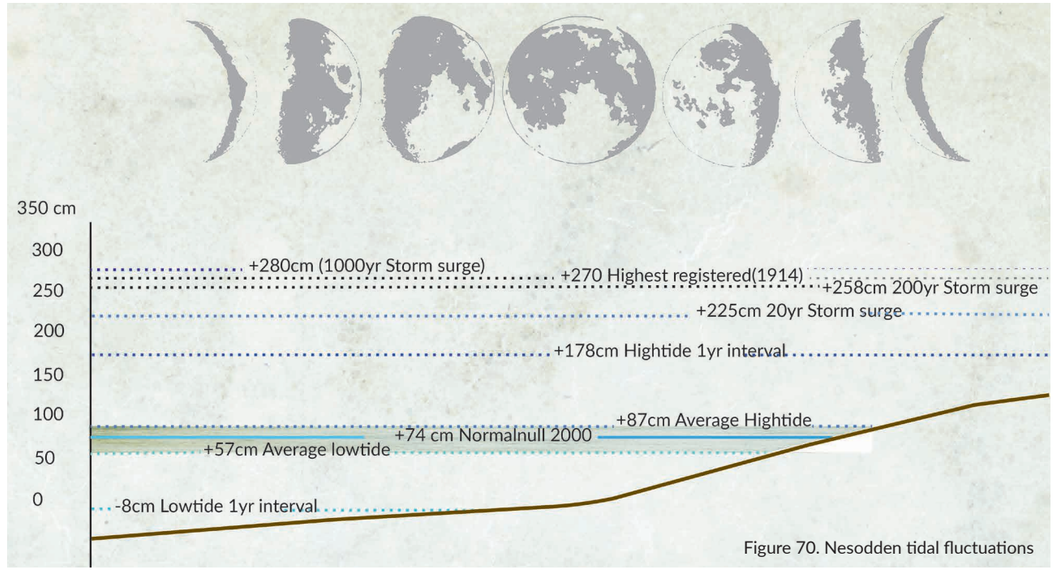


Figure 70. Nesodden tidal fluctuations

Performing arts, environmental embodiment and landscape

The marriage between cultural geography and the practice of performance arts has in recent years increased. It is viewed as a useful method to examine spaces practically and using our bodies as the tool(Rogers, 2012).

Performing arts can animate experiential and spatial qualities, but can also be a political tool. Performances can highlight a place, identity, material(built) environments, and socio-ecological relationships. According to Rogers (2012) it can be a resource of change and a method for re-imagining the world we live. Landscape is not just a scenic backdrop but integrated into the characters and the whole performance. A landscape can be a performative concept that includes embodied acts of storytelling, drama and scene setting(Ingold, 2000). Landscape can then be seen as an 'affective tie between people and place'(Rogers, 2012).

The sessions which were conducted with professional performance dancer Emelie Dahlen in the Prestekjær and Kirkevika area along the coastal trail (figure 71). The movements were improvisational, with the focus of engaging with the vegetation, water, tides and local climatic conditions(figure#).

Figure71. Visualization of the performance collaboration with performance dancer Emelie Dahlen.

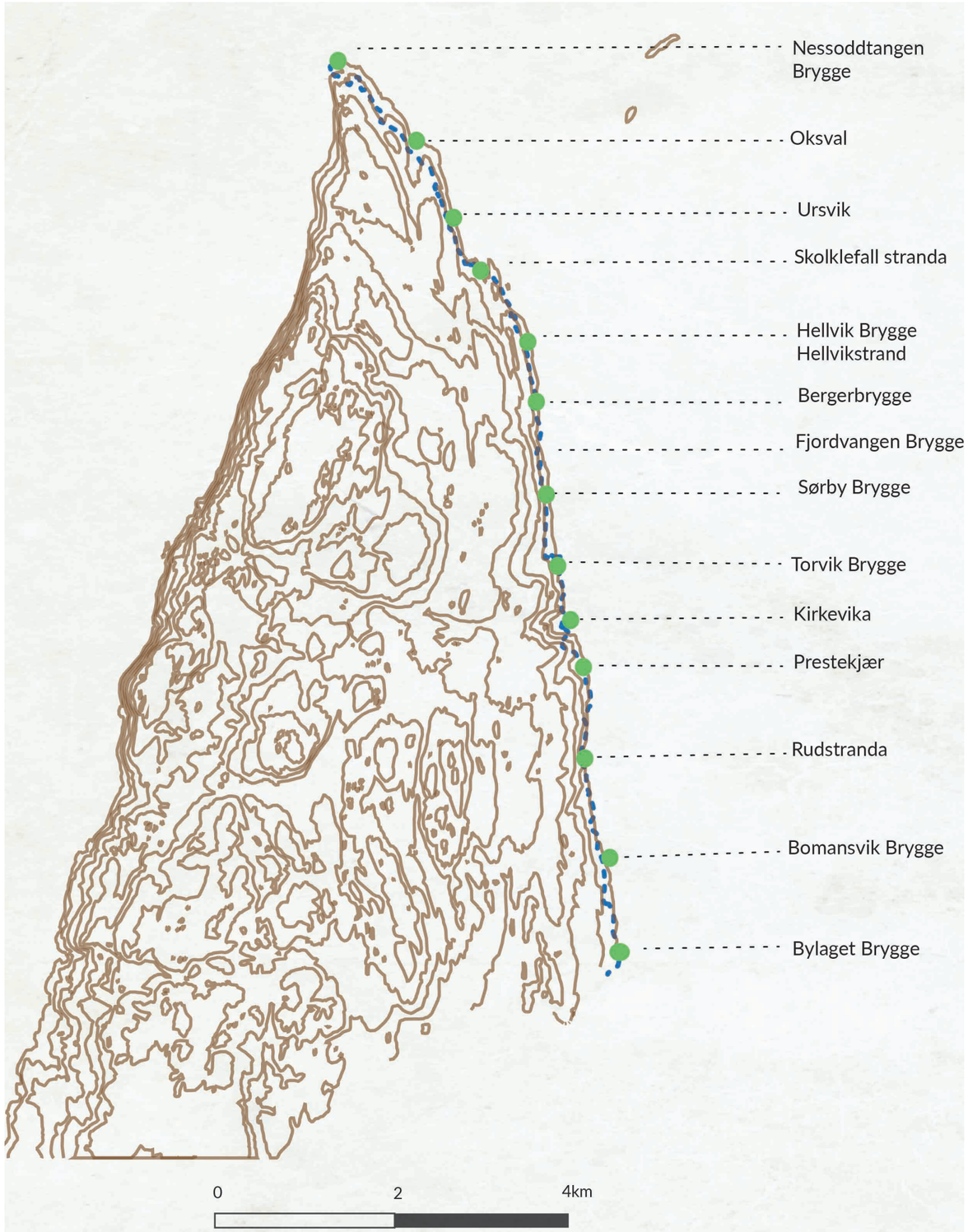


Figure 72. Illustration of the coastal trail and its nodes

The eastern coastal trail with nodes

The municipality of Nesodden coastal trail stretches from the south-eastern part of Blylaget all the way to the northern tip of Nesoddtangen ferry terminal wrapping around the coastline and continuing southwest.

The trail on the western side is still in parts underdeveloped due to difficult terrain around the coast. I have chosen to focus on the eastern part of the trail, although it is an established route for humans it has potential for improvement for other-than human stakeholders.

The coastal trail on the eastern side of Bunnefjorden, Nesodden is collaboration initiated by the municipality of Nesodden with the local historical team (Historie lag), local housing associations, and landowners (Figure 72). The trail opened in June 2001, the initial 12 km stretch passes through varied terrain, forests, asphalt roads, wooden board walks, dirt trails, intertidal zones, historical piers, historical landmarks, and houses(Turtumøygard, 2004). The 13 private housing associations which it passes, each have their responsibilities of maintenance for local piers, beaches and in some cases association houses.

Todays current extended 15 km trail passes beaches, alternative detours, old steamboat harbours as well as other cultural monuments of interest. It offers historical and cultural experience as well as unique nature experience.(figure#)

Nesoddtangen ferry terminal is also popular amongst bird enthusiast to witness annual spring migration from March to May. The majority of migrating birds fly from the south to the surrounding areas of the Oslo fjord.

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With som expections of fishing spots up until the 1800's the coast of Nesodden did not have much settlements (Turtumøygard, 2004).

Strengths

- Well-marked paths
- Accessible with public transport
- Ability to observe natural processes

Weaknesses

- Development along the coastline
- Access to coast limited in private properties

Opportunities

- To preserve already existing nature
- Facilitate access to coasts and human/nature connections

Threats

- Invasive species
- Property development along the coast
- Pollution from marine garbage
- Noise and disturbances

Figure 73. Information signs along the coastal trail. Spring 2022.

Figure 74.Coastal trail marks on tree. Spring 2022.

The Workshop
09.03.2022 (9am-16pm)

'Creativity does not begin here, with an idea in mind, and end there, with a completed artefact. Rather, it carries on through, without beginning or end'
(Ingold, 2015)

The intention of the workshop was to explore the knowledge production in landscape architecture through art and public participation. Initially, I contacted a local artist who had recently exhibited products from work with school children mapping their paths to and from their homes and school. The ideas for the one-day workshop were formed through discussions and conversations with an artistic partner, Hilde G. Flikke, around the theme of 'How can artists use their tools to connect to the environment and be apart of the early stages of planning work?' Part of the framework of the workshop was to invite professional artists with a variety of artistic expressions(see appendix for invitation and itinerary for the day). The leader of the local professional artist association, Anne Line Sund, facilitated the invitation of the artists. I was the facilitator and a participant, and including myself and Hilde, we were 6 participants. These questions were presented in the introduction in a power point presentation:

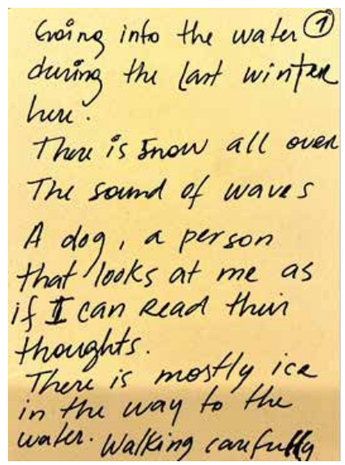
1. How can we develop the coastal trail in a sustainable manner?
2. What does sustainability mean for the coastal path?
3. How to create areas that include other species by expanding from a human centric approach to a multi specie approach?

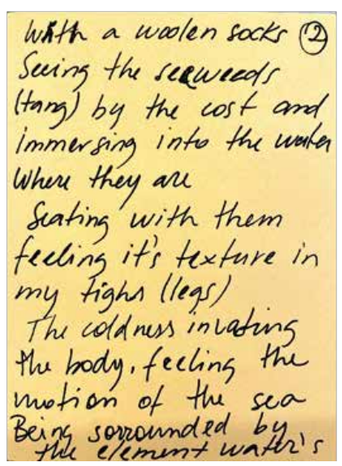
For general information, a summary of the ecological state of the Oslo fjord was provided and the Nesodden municipality plans and future strategies were summarized. The overall intention of the workshop was to practice how to connect to a place or a phenomenon using one´s own methods and tools, and to facilitate a dialogue on the subject.

Creative placemaking as a term can be interpreted as the use of art and culture for strategic shaping of physical and social places and is often associated with economic development, social change and improving the environment(Markusen & Gadwa, 2010). Artistic knowledge production in landscape architecture has been repeatedly addressed(Lenzholzer et al., 2013). The arguments that landscape architecture is somewhere between art and science, and criticism that landscape architecture focuses on an aesthetic output, which does not encourage public use. In research through design (RTD) methods form art and science are important parts of the design process. Art not only has an intrinsic value but has important value in society as an agent for change, inspiration, social criticism and social justice(Webb, 2014).

Public participation strengthens local democratic

Figure74. Participants of the workshop





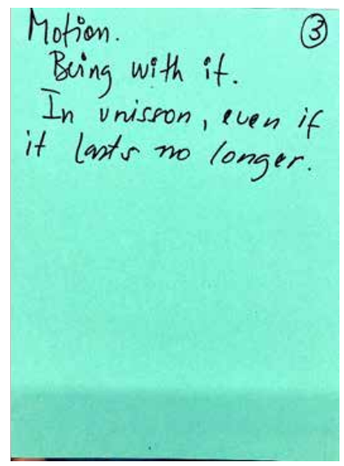


Figure 75. Scans of the workshop outcome

planning processes.

The Plan and Building law emphasises public participation in planning processes(Plan & Bygningsloven, 2008). The municipalities are responsible to inform the public about plans and invite the public for feedback. Especially vulnerable groups of people, like children and youth and people who are unable to directly participate, should be able to voice their opinion.
On a global level, drivers of landscape change directly and indirectly have major consequences (Egoz, 2011). The European landscape convention takes into account landscape democracy and according to Egoz, (2011) this framework has the potential to become the driver for landscape protection on a global level, the discourse about justice and power(Egoz, 2011).

After the introduction the participants executed three practical exercises within the group and one individual exercise..

1. To walk a pre-described path in silence using all senses to observe, and to gather items of interest. (Participants received a paper box in which to place items of interest). Once we returned, we discussed our experiences and placed the items on sheets of paper for everyone to see.(see figure 76,77,68))
2. This exercise was to answer a few questions about how you relate to art and what your artistic language is. Then the participants were asked to remember an early childhood memory related to interactions in the intertidal zone and express these to the group either with a drawing or words (or other forms of expression). The third part of this exercise was to discuss how and what is possible for future development and what are possible future scenarios.
3. The third exercise focused on the questions of how to use the concept of care in place making and to discuss this in the group.
4. For the individual exercise the participants were invited to explore the landscape using their own artistic expressions and return to the group to either share or discuss the outcome of these.

Summary and comments

The outcome of the workshop gave insight into how artists can connect with places and use their tool kits to open a dialogue about landscape democracy, landscape embodiment and sustainable development. Ideally, I would have liked to follow up this workshop with the next step in the process, which could include brainstorming ideas, further research into species and exploring specific species. Time and resources did not allow for this. I did however learn about the framework of facilitating a workshop and networking with the professional art community on Nesodden. The focus was on the process and not on a particular design outcome. One of the ideas for future work is the practical question of how to connect the municipality and artists in the actual place making processes. The participants discussed the possibilities for the coast as a social arena for all generations and the importance of general access and landscape democracy.

Figure 76. Photograph. Walk and box exercise

Figure 77. Scan.Box content.

Figure 78. Scan. Box content.

Figure 79. Hilde Flikke and Fernada Branco practicing environmental embodiment at Hellviktangen.

Figure 80. Performance dancer Emelie Dahlen.

"Let's make it easy and cheap, so that many people can come and see what is great and beautiful in our country"

(Heftye,T n.d)

DNT group tour

DNT- The Norwegian tourist association was founded 21. January 1868 based on the philosophy that easy access and affordable framework will allow for more of the general public to enjoy, experience and appreciate 'the outdoors'. It is Norway's largest outdoor association based on the 300,000 individual members,57 group members, 1 million T markers and 22,000 kilometres of marked trails.

Since its establishment the association has been a strong advocate for the simple outdoor experience urging all groups of people to use nature with consideration. The association organizes guided hikes, has simple cabins for rent, organized activities along the coast, in the mountains, in the forest and even in cities. Today the DNT has over 200 children's sub-groups.

The resources in the Norwegian landscape have been well used since people first settled. However, after the independence from Denmark, a new national romantic interest to explore and understand the Norwegian landscape was driven forth by a few elites, whom had the financial affordance for outdoor recreation. More and more of the public started showing interest to hiking, thus the association was established by a little group of people in 1868.

DNT's work advocating for national park started in 1904, and it would take some time until Norway's first national park Rondane was established in 1962, and later by Jotunheimen in 1980.

The DNT hiking guidelines

1. Bring all garbage home with you
2. Practice hygienic toilet etiquette- pick up your toilet paper in a bag.
3. Show consideration to the local population.
4. Remember fire restrictions and practice appropriate fire etiquette.
5. Show consideration and respect for animal and bird life
6. Show consideration to each other
7. Book and reserve your bed space at the cabins.

Amongst other activities the local Nesodden DNT arranges group walks along the coastal trail. The trail has been classified to a medium degree of difficulty, and information can be found on the DNT website. The 12.5 km hike takes around 4,5 hours with stops and accompanied by a historical insight. I to participated in this group hike especially for seniors and guided by Arild Drolsum on 11. august 2022. figure 81.

Figure 81. DNT senior group walk, August 2022

Historical context along the coastal trail

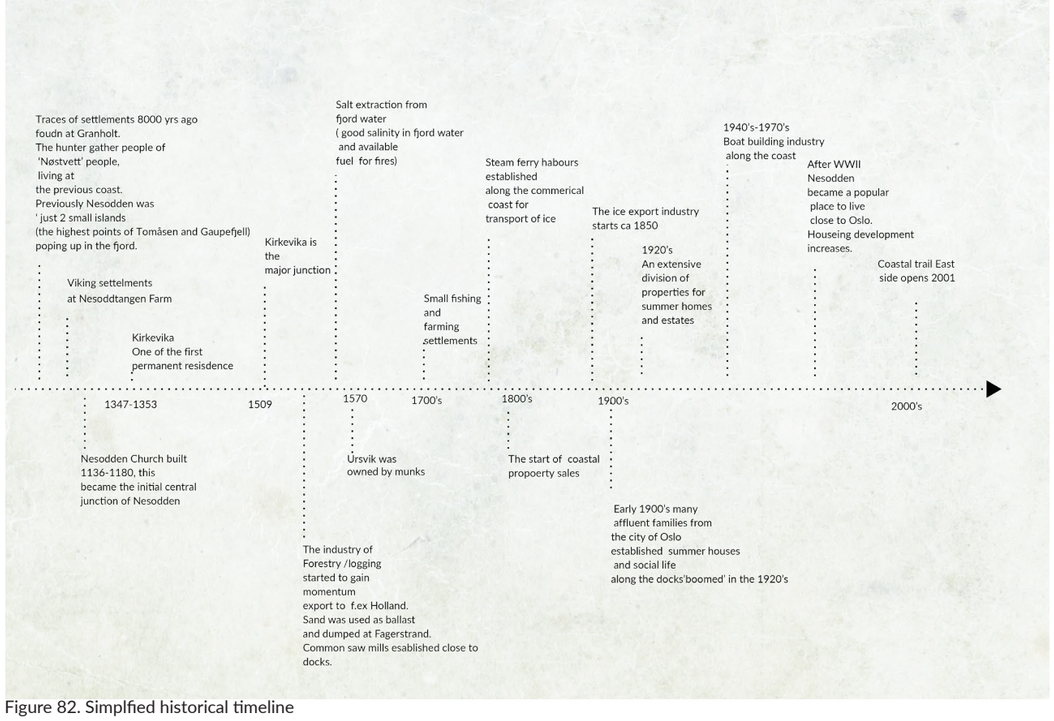


Figure 82. Simplfied historical timeline


Figure 83. Photograph. Workers transporting ice.

Historically, since the late iron ages Nesodden has mostly been a farming community(Geard, 2018)pg.8) The population was around 500 people up until the 1800's, and due to better living conditions and general public health strategies the population increased to 1168 people in 1875.With some exceptions of fishing spots up until the 1800's the coast of Nesodden did not have much settlements(Turtumøygard, 2004).

In general, farms produced oats and later potato. The early coastal settlements were usually associated with farm communities which were more inland and combined with fishing. The roads were of poor quality and the terrain challenging, but the fjord became a great means for transporting products and people. The forest and the fjord provided resources, which could be transported to Oslo and sold. The local industry included boat building, salt production, and ice production. Inland natural lakes and artificial lakes were a good source of ice up until after the WWII when freezers and refrigerators became common.

The development of summer house settlements along the coast around 1870 were dependant on public ferry transport. Nesodden then became a popular place for the elite of Oslo to establish summer houses. The increased popularity of summer guests from Oslo a triggered improved ferry facilities and routes. Hotels, local shops and restaurants were established to serve the input of people.

This first establishment of houses before the WWI, was mainly large villas close to the fjord with private bathing houses for the Oslo elite and provided work for locals. The second phase of property settlements was more moderate simple summer houses for the middle-class, further from the coast. The third major development was around 1940's -1950's,mostly due to better work conditions, allowed the working class to partake. During this last phase different workers unions and associations bought properties for their members to use. Much due to the reasonable land prices and the reliant ferry schedule, one could easily work in Oslo and live on Nesodden. During the 1920's there was an influx of artists to the eastern coast, and this established a miniature art community which continued to flourish for years(Geard, 2018). Between the World War's and The Oil tankers on the west coast of Nesodden provided needed storage as oil products became in demand. These were later discontinued in the 1980's. Nesodden's landscape has mostly been sculpted by the ice exporting, and timber industry.

The ferry

Figure 84. Ferries leaving Oslo

The ferry route

The fjord around the municipality of Nessoden, has been the natural short-cut to the capital of Oslo (figure 84). Produce and products were transported to the capital and in the winter when the fjord froze over, the horse and carriage took over the role of the boats. Due to its proximity to the capital, it has been a natural transportation artery. The terrain on the east coast made it the preferred coast to bring products for transport. Today, the ferry leaves frequently from Nesoddtangen ferry terminal with a connection to Lysaker and Oslo. The ferry transport system also provides a connection from Oslo to Asker and Bærum. Around 6200 people commute out of the municipality daily and 1200 people commute into the municipality(SSB, 2021). During the summer months the ferry also provides transport further south the west fjord to smaller recreational areas as well as small towns like Drøbak and Son(figure 85).

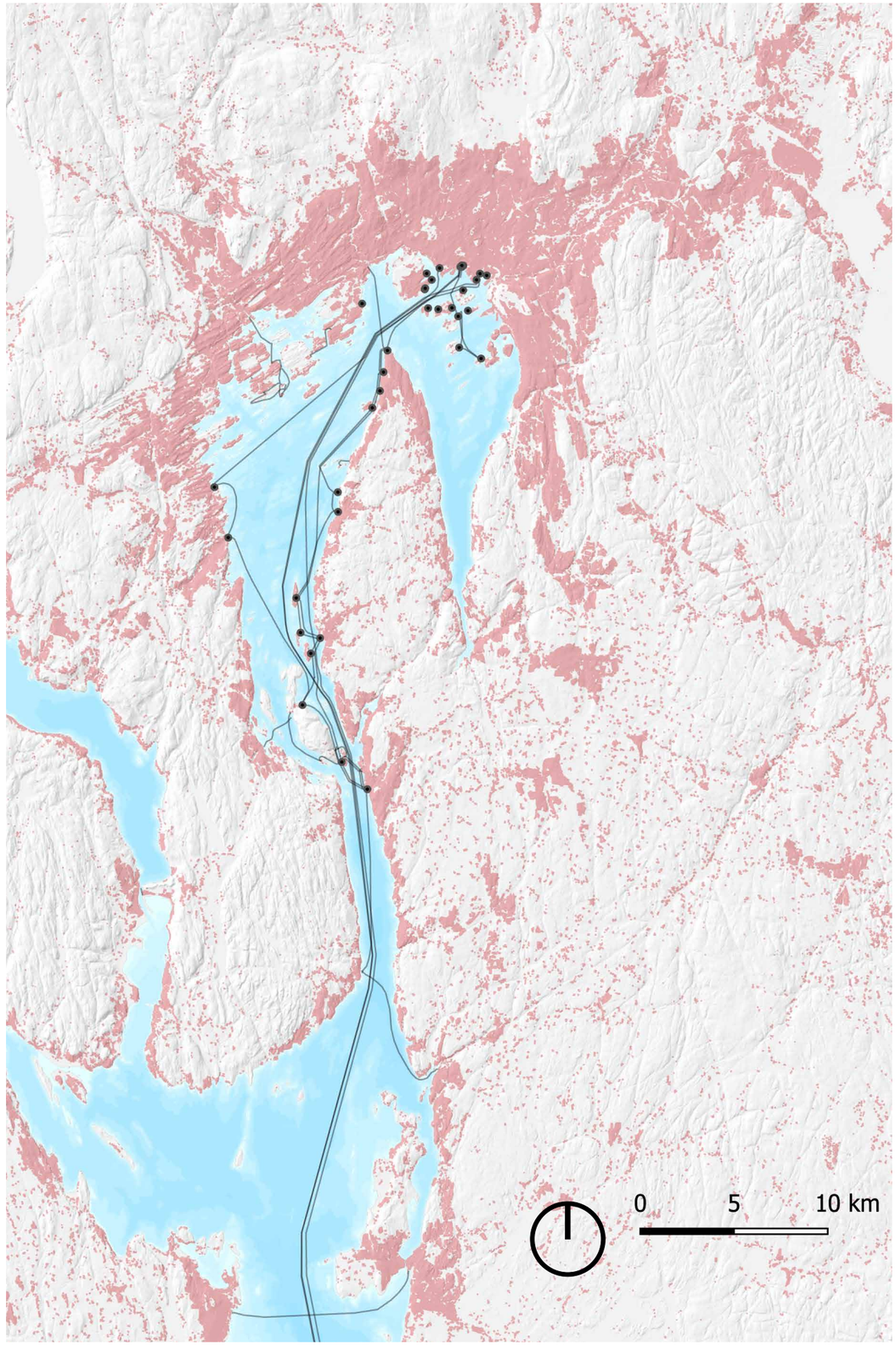


Figure 85. Map of Ferry routes Oslofjord

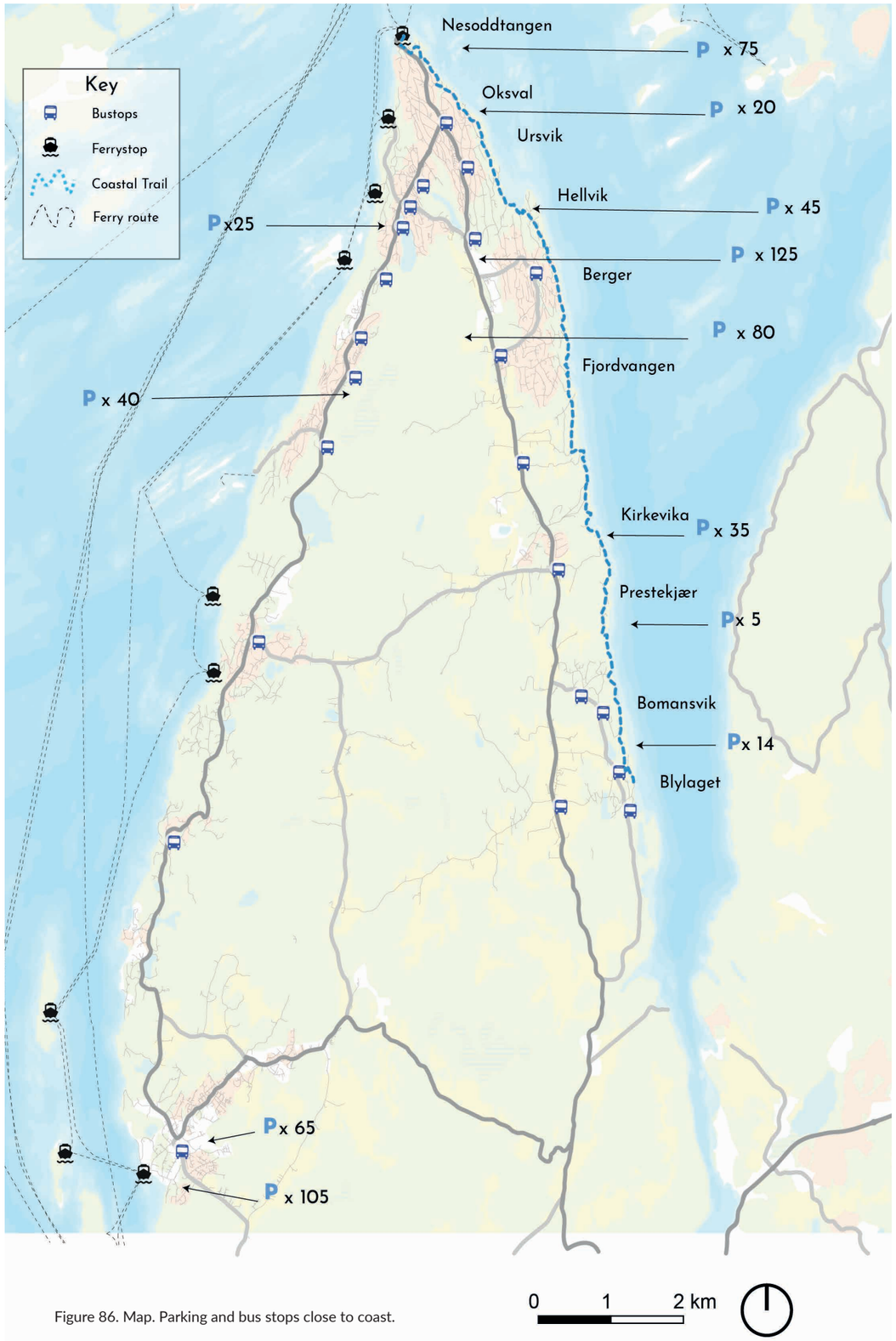


Figure 86. Map. Parking and bus stops close to coast.

Figure 87.Nesoddtangen ferry terminal, Summer 2022..

Access to the coast

With public transport like the buses and ferries many of the recreational areas along the coast is accessible. The ferry connection to Oslo and Lysaker are frequent and regular. The buses are aligned with the ferry arrival and departure, and allow for connecting buses out of the municipality to Frogn and Ås municipality. The west coast of Nesodden is connected via the additional ferry route through the summer months. Nesoddtangen (figure 87) is a main junction point for public transport by passenger ferry and bus transport within the municipality and connections to adjacent municipalities, Today there is Signalen restaurant, Kiosk, bicycling and car parking, public bathroom and either the starting or ending point of the coastal trail. The network of roads often lead to the local docks. There are some car parking possibilities(figure 86).

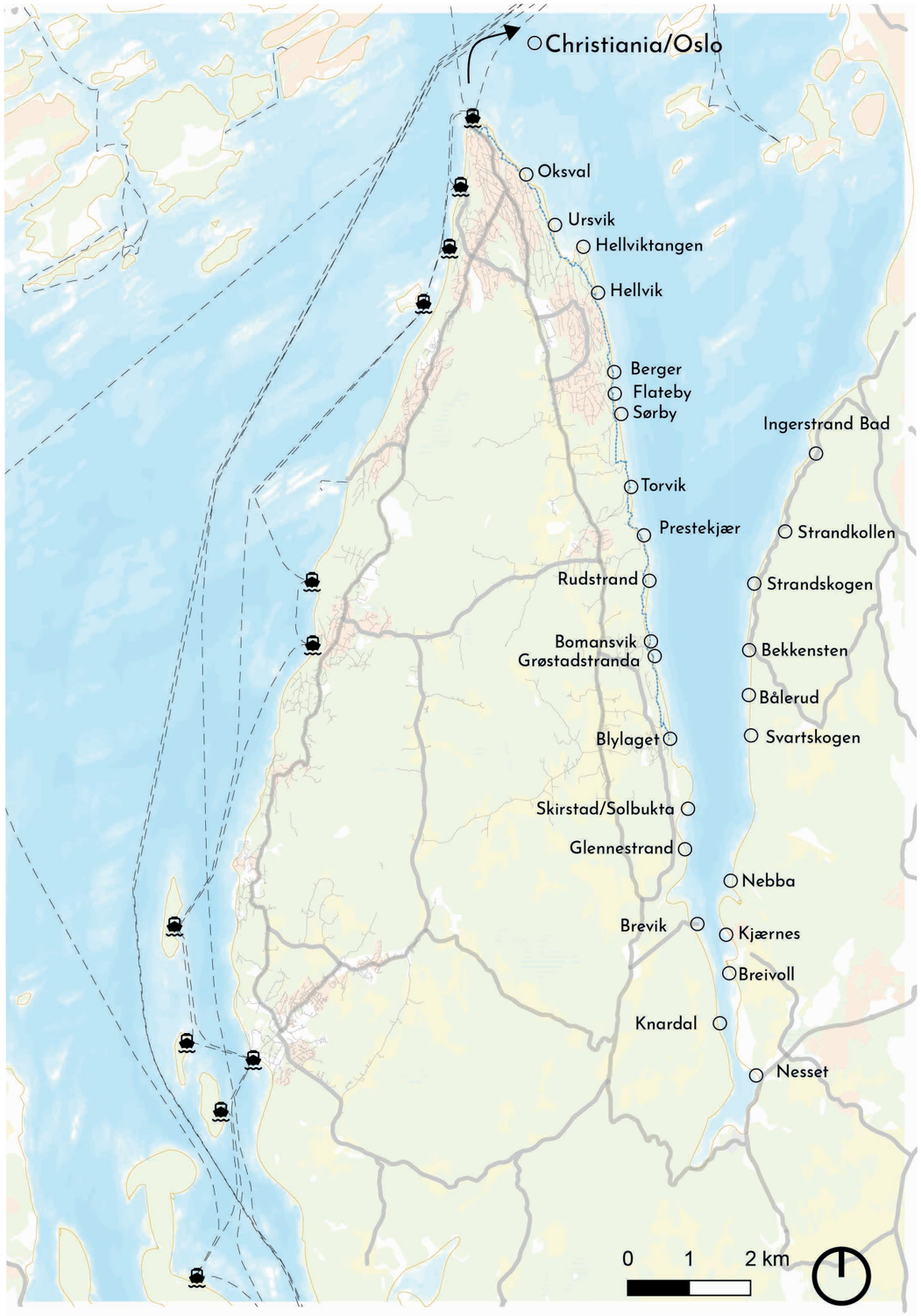


Figure 88. Map. Past docks along the eastern coast of Nesodden

Figure 89. Hellvik dock, summer 2022.

Historical docks along Bunnefjorden

The docks along the Bunnefjord side of Nesodden are no longer in use for public transport (figure 89). However there are several small boat marinas. Oksval marina has recent upgrades the last few years which include public bathrooms, sauna, outdoor BBQ facilities and parking. Users can access the beach and use the grass plain to rest.

Hellvik dock is an easily accessed by recreational small boats, bathers, and recreational fishers. It is surrounded by historical buildings with the city of Oslo as a view. At the adjacent beach there are public bathrooms, showers and a limited small boat marine.

Berger dock is today used by recreational small boats,location for the mobile sauna, or as a destination for recreational bathers and hikers along the coastal trail.

Although these were used in the past, the docks are mostly used by recreational boats today.

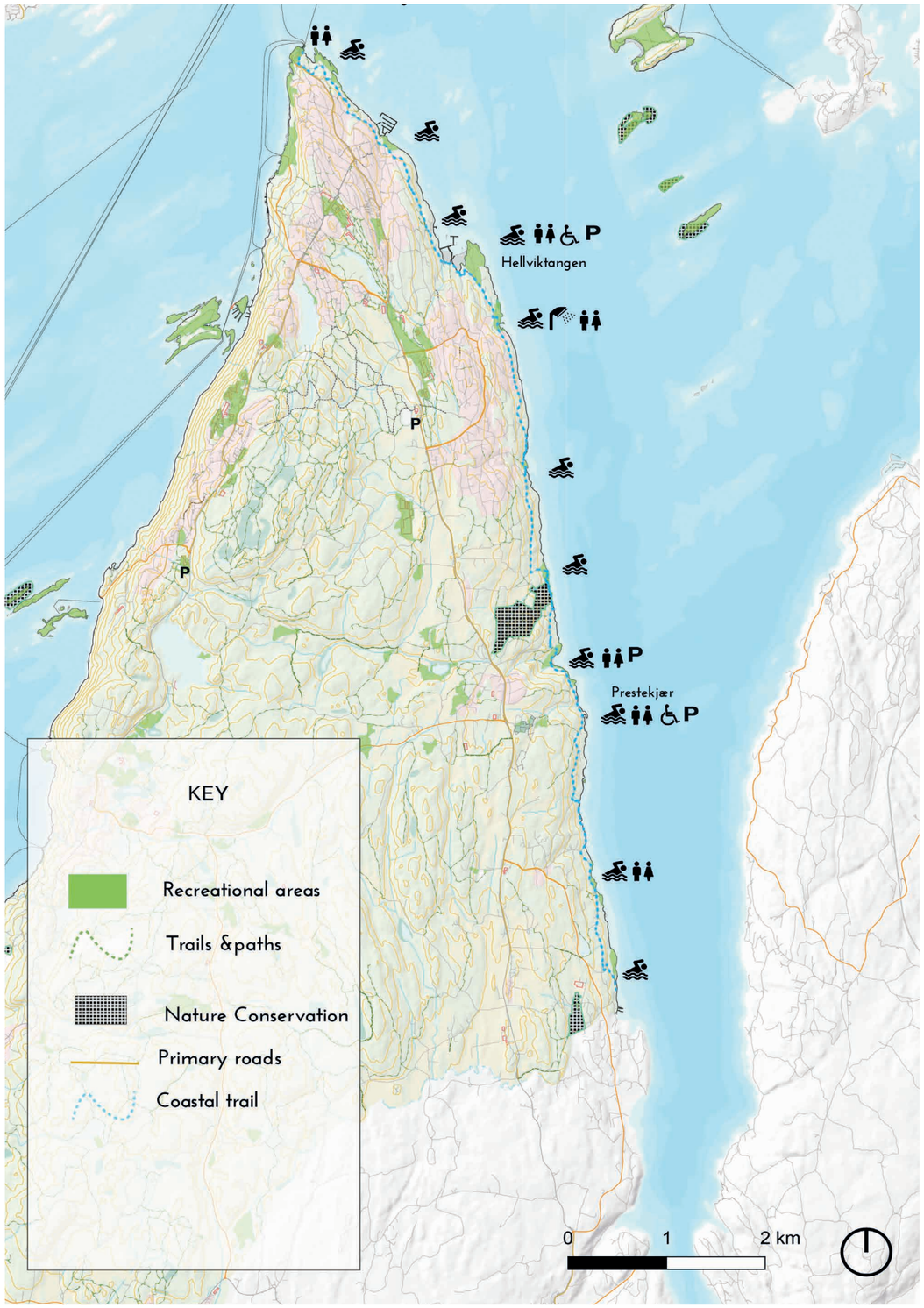


Figure 90. Map of Recreational activities

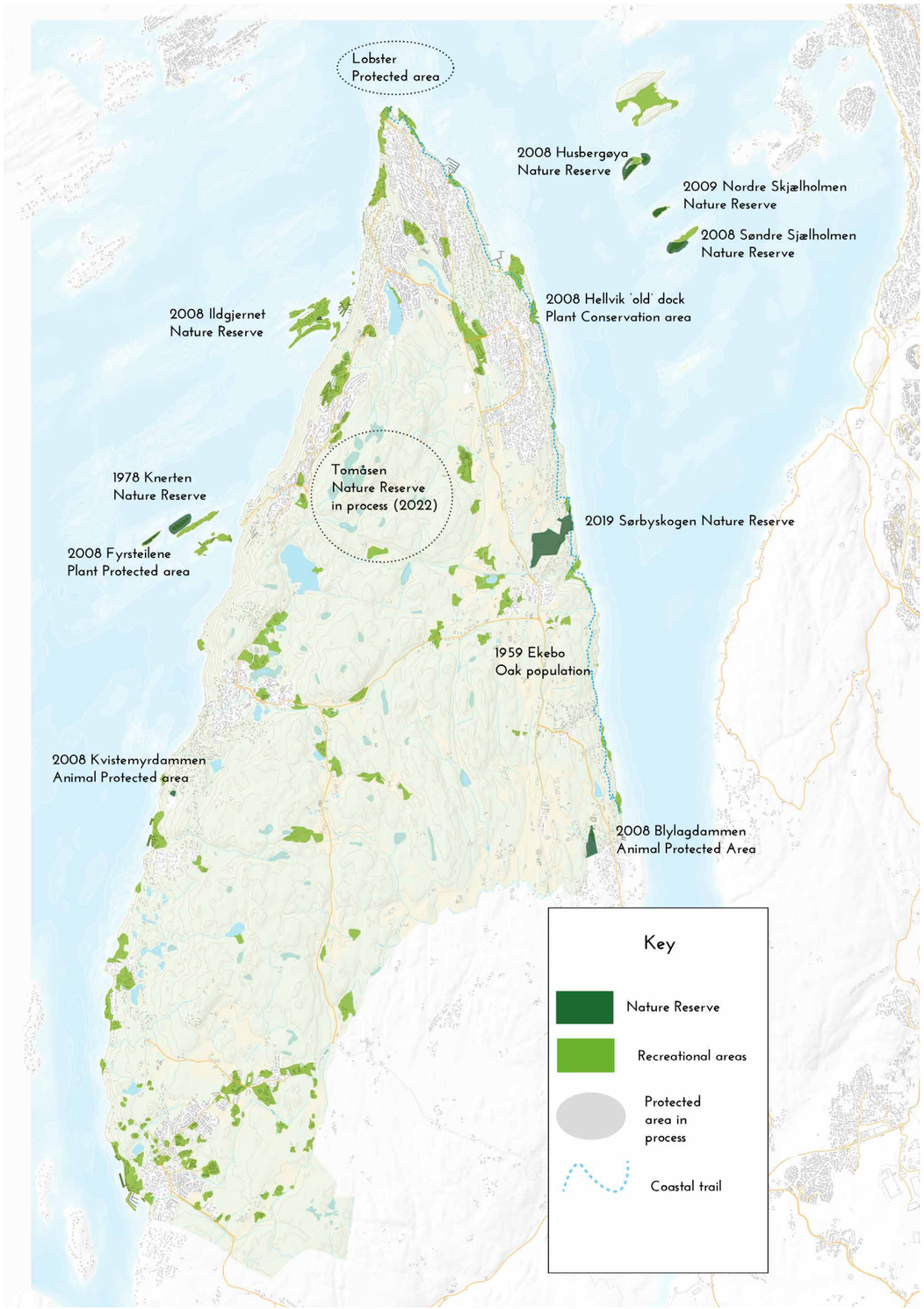


Figure 91. Map of Recreational areas, Nature reserves,

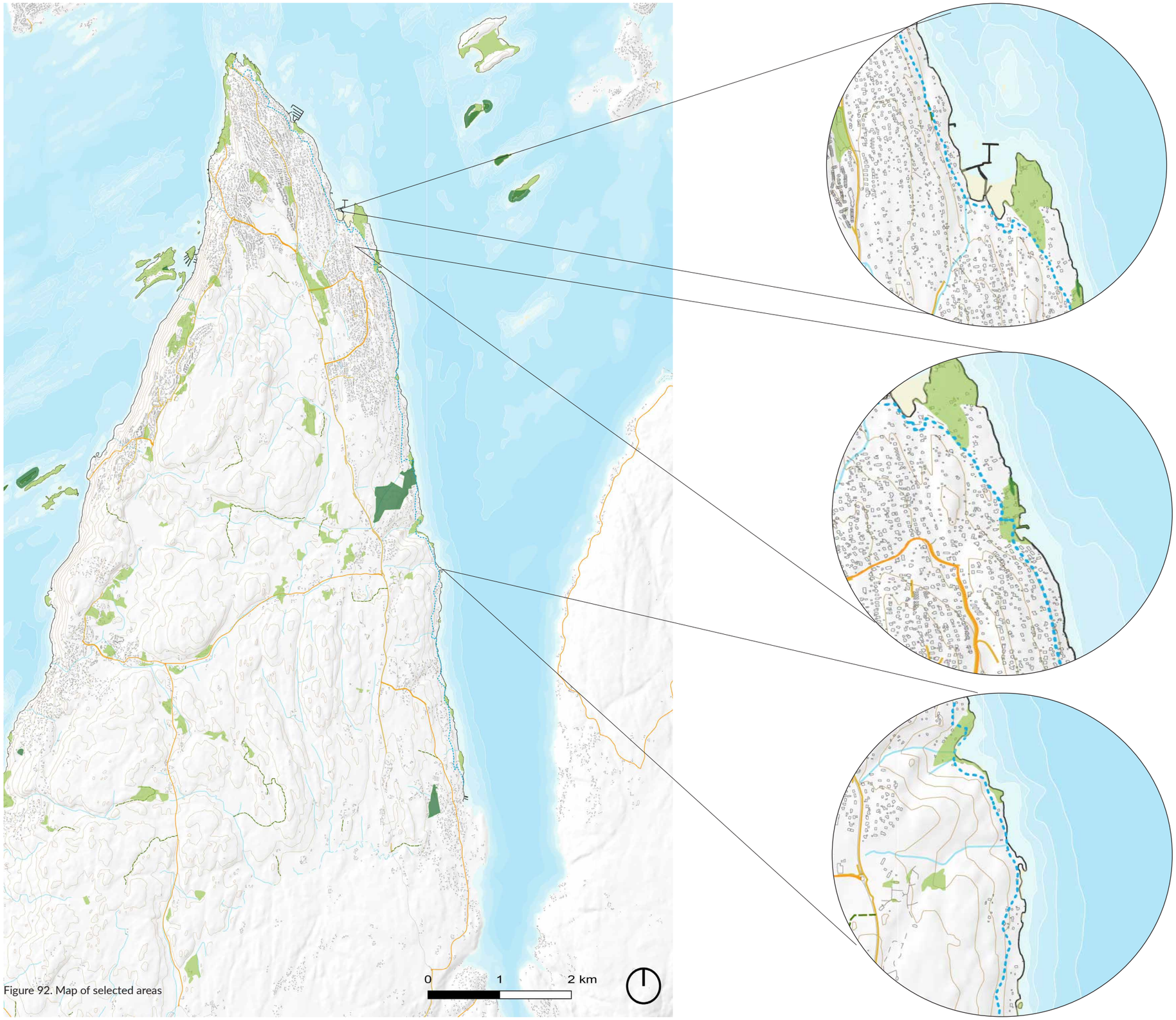


Figure 92. Map of selected areas

Selected Areas of interest

Ursvik & Skoklefall stranda

This area was chosen for its unique nature type, the iconic bathing houses and proximity to residential areas.

Hellvik Dock & Hellvik beach

This area was chosen for its popularity and unique situation with artificial sand, rocky bottom, and the proximate location of the dock.

Prestekjær Beach

This area was chosen for its remote location, and unique history. It is a popular recreatinal area.

Figure 93. Icy trail, Ursvik, 2022.

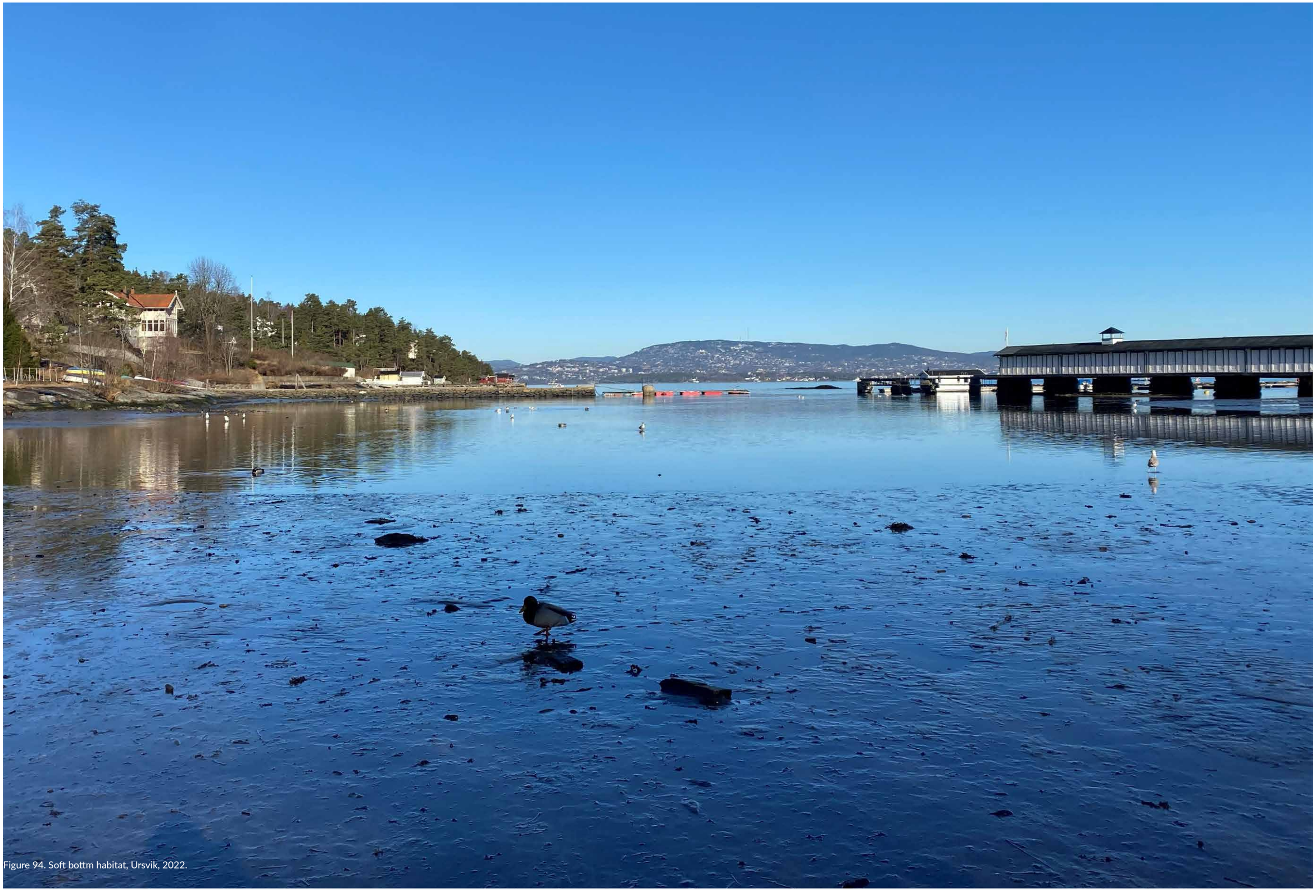


Figure 94. Soft bottm habitat, Ursvik, 2022.

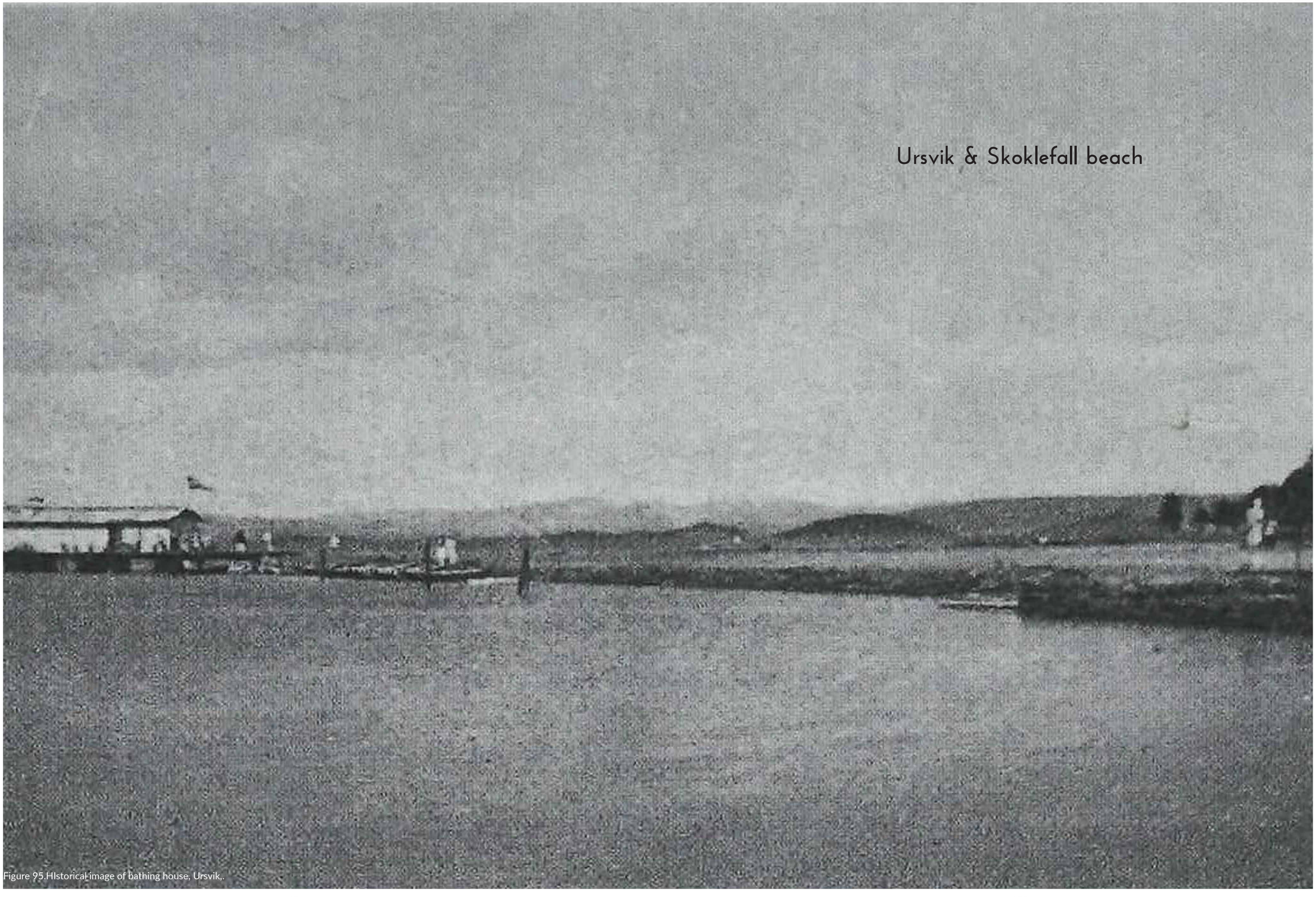
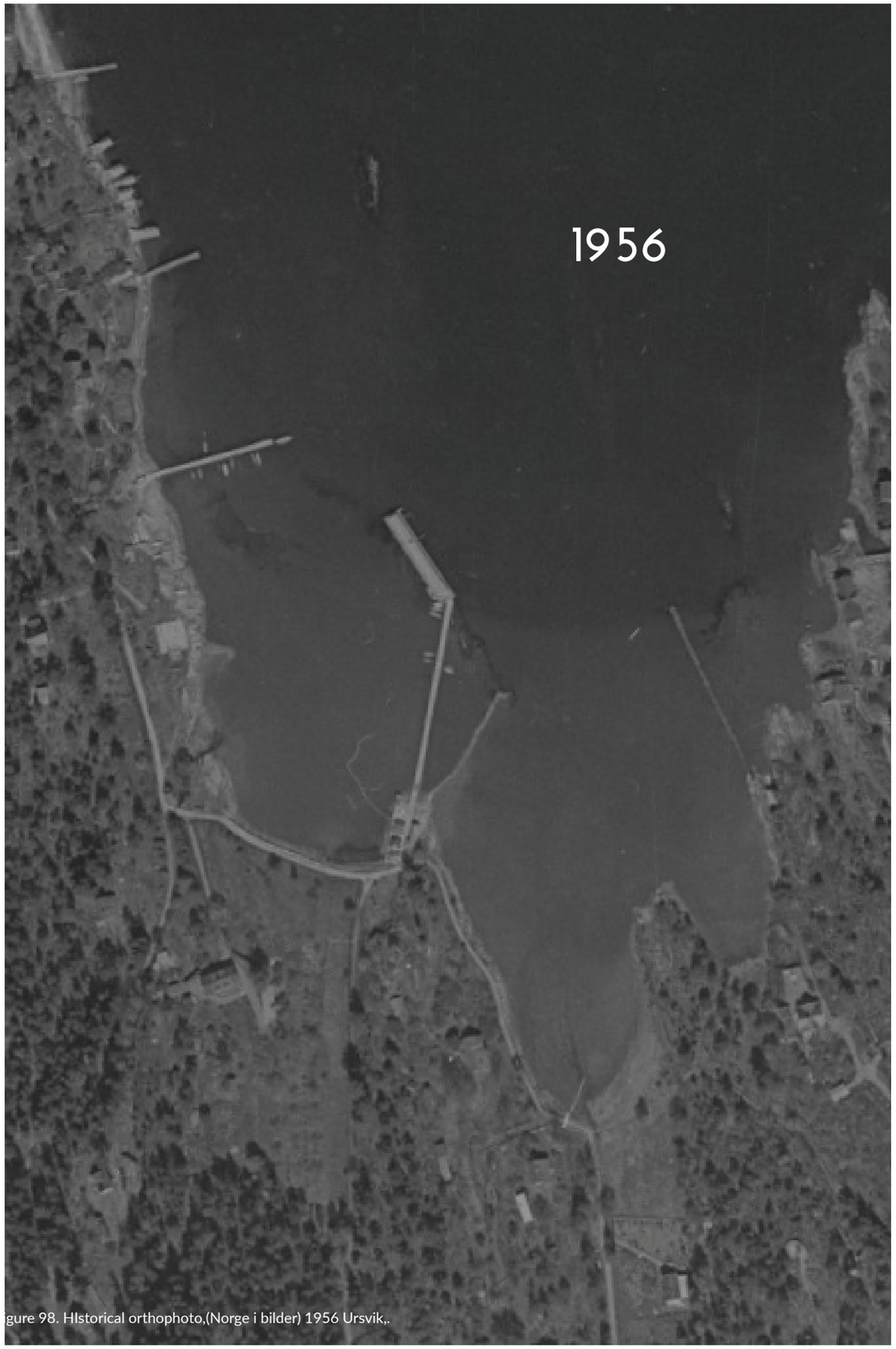


Figure 95.HIstorical image of bathing house, Ursvik,.



gure 98. HIstorical orthophoto,(Norge i bilder) 1956 Ursvik,.

Figure 99. HIstorical orthophoto, (NOrge i bilder) 2017 Ursvik,.

The coastal trail passes the Skoklefall beach, Skoklefall stream and Ursvik beach before it turn up towards in to a smaller forest. The area consists of a recreational boating association, the bathing houses and historical buildings like the decommissioned hotel and other older residential houses. The iconic 74 separate bathing houses were built in the beginning of the 1930's and since then been upgraded with shower facilities and a sauna. The bathing houses were built to promote health and access to the Oslo fjord.

City residents started spending their summers in the area at the end of the 1800's and the steamboats and docks were established in1894. It was in the 1920's when summer house properties were subdivided and sold, that the seasonal population really sky-rocketed. This area became a popular summer destination.

According to Stein Turtumøygård, a local historian, the name Ursvik descends from stories of large wolf packs (Ulve flokker in Norwegian) which roamed over the frozen fjord or from the munk Ulf from the monastery. However, detangling the Norwegian stem words- it can be translated to ' heap of stones down by the strait'(Ford & Hals, 2010).

The name of Skoklefall strand descends from early farm settlements. In 1910 there are only a few registered permanent residents in the area, and they are registered as wading fishermen. Due to the shallow water this was an ideal fishing spot.

According to personal stories from the housing associations historical book, mackerel (Scomber Scombrus Linnè 1758) and Whiting (Merlangius merlangus Linneus 1758) was the abundant species(Ford, 2020). The summer guests travelled home at the end of the season with all of their equipment and the ferry from the Ursvik dock was full of life and people saying their goodbyes., The seasonal difference of populations was noticeable. The area has a unique soft bottom nature type, as well as infrastructure like the bathing houses, breakwater, floating docks and private docks.

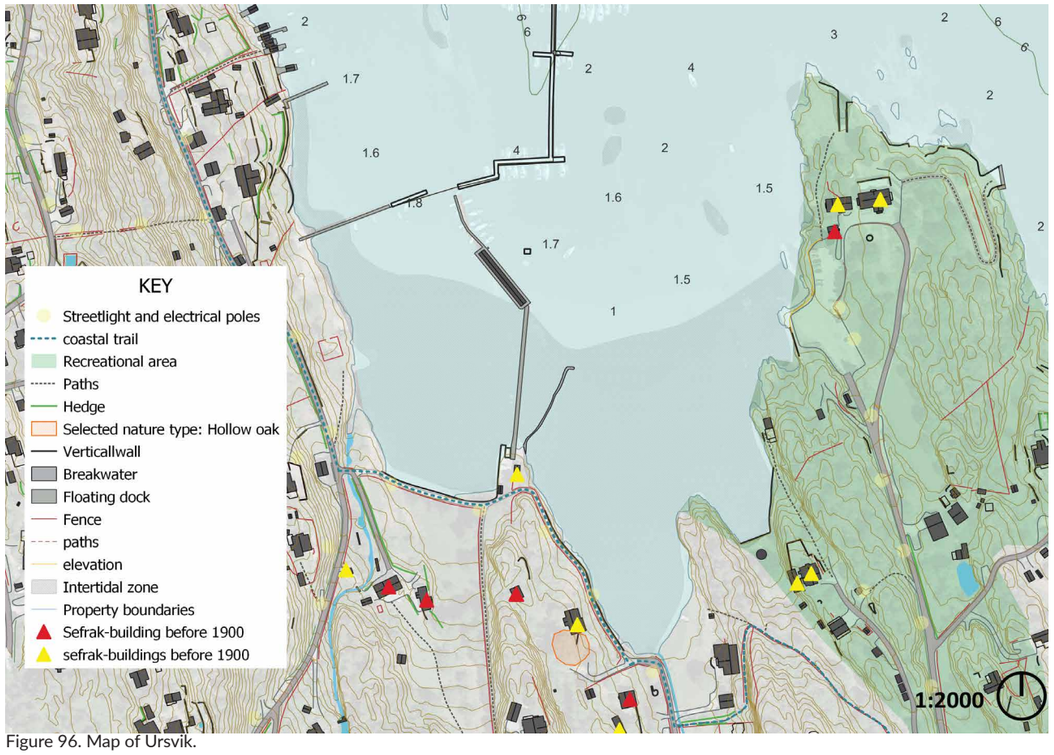
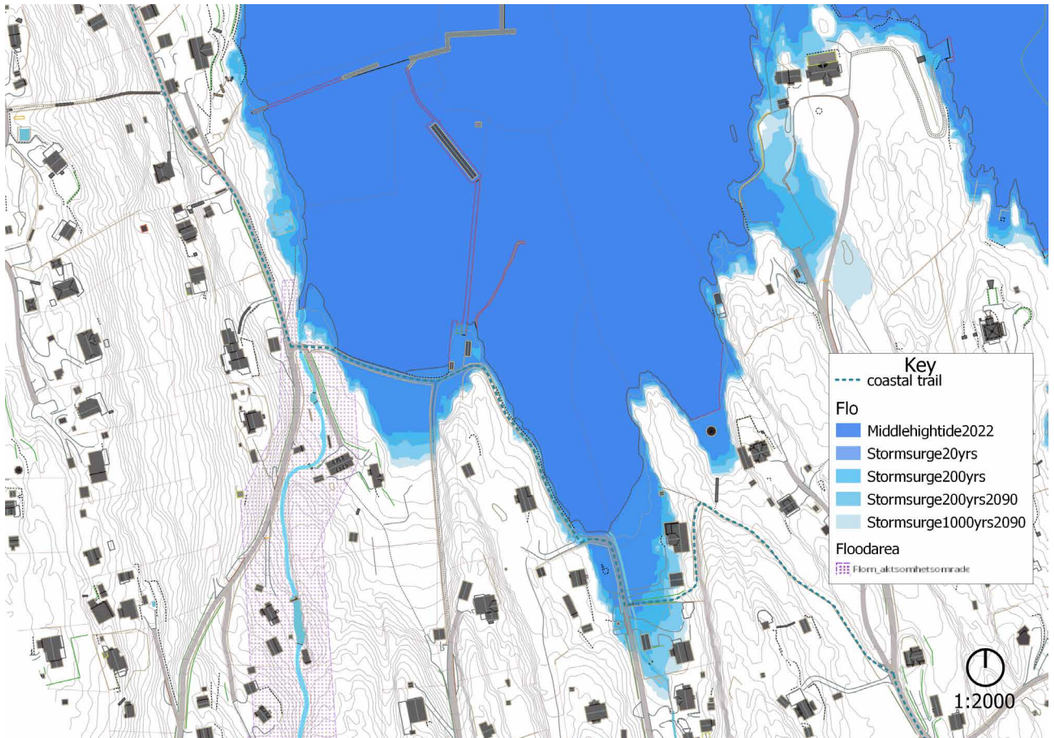


Figure 96. Map of Ursvik.



Figure# 97.Map of Ursvik Storm surge.

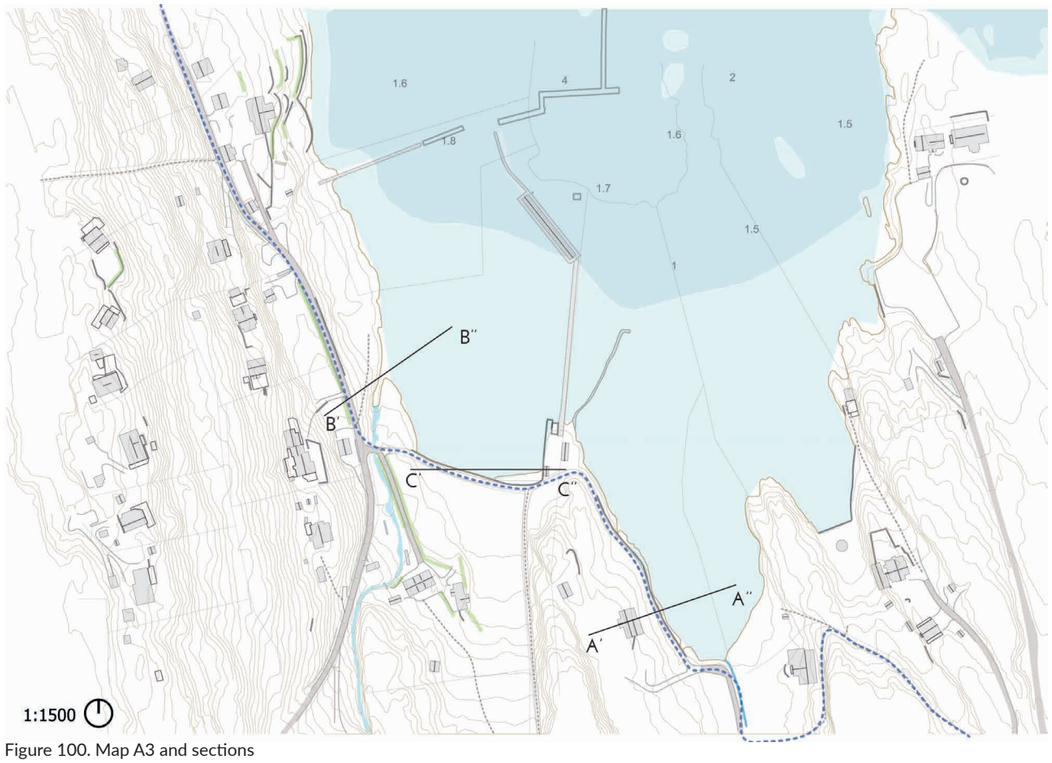
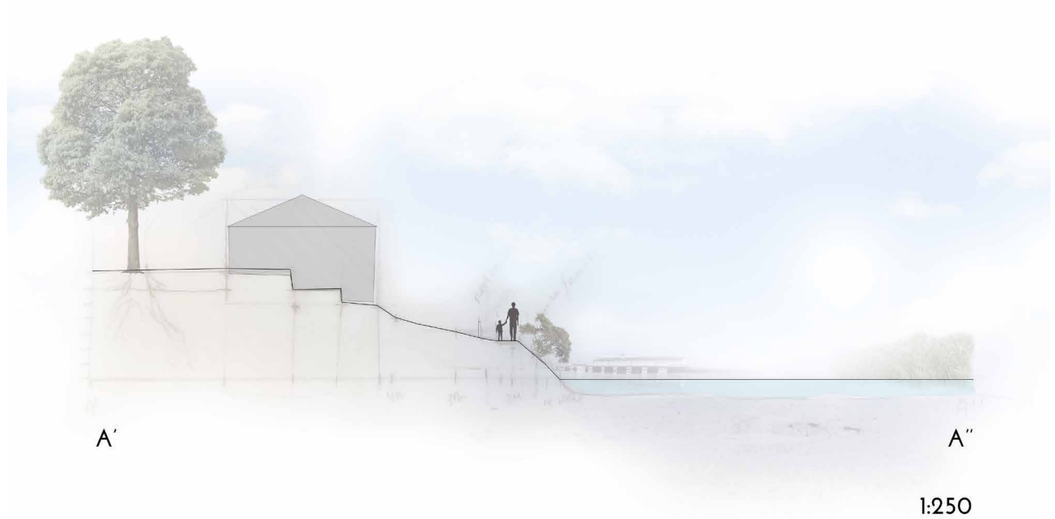


Figure 100. Map A3 and sections



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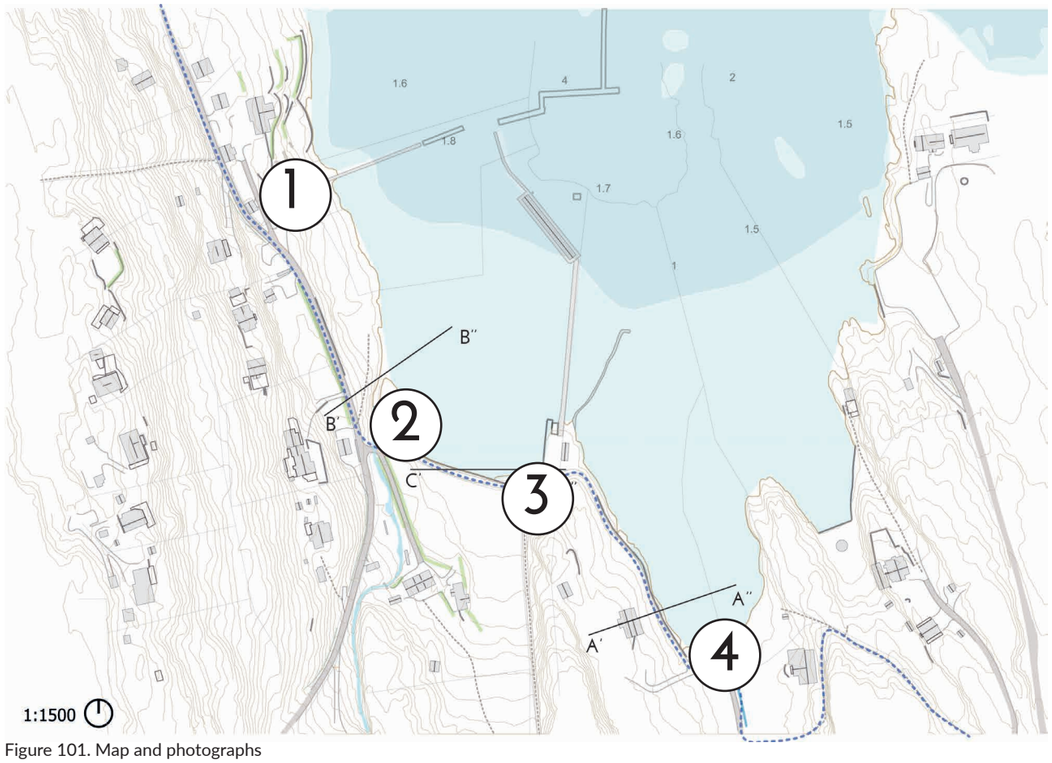


Figure 101. Map and photographs

1

Platforms previously used for communal gatherings and celebrations are located along the coast.

2

Benches are located along the coastal trail, some of these are initiated by the local housing associations

3

Local kayak associations have store their kayaks.

4

Private fences along the path.

Black-headed gull
(Chroicocephalus ridibundus)
CR

Northern Fulmar
(Fulmarus galcialis)
EN

Common Tern
(Sterna hirundo)
EN

Herring gull
(Laurus agentatus)
VU

Common Eider
(Somateria mallisima)
VU

Rasor bill
(Alka torde)
VU

Common Goldern eye
(Bucephala clangula)
LC

Grey Seal
(Halichaerus grypus)
VU

Habour seal
(Phoca vitulina)
LC

Eel
(Anguilla anguilla)
EN

Sea Plantain
(Plantago maritima)
LC

Common Reed
(Phragmites australis)
LC

Eegrass
(Zostera Marina)
LC

Crustacean
(Corophium volutator)
LC

Pacific oyster
(Crassostrea/Magallana gigas)
SE

Red-list catagories
RE Regionally extinct
CR Critically Threathened
EN Endangered
VUVulnerable
NT Near Threatened
DD Data Deficient
LC Viable
NA Not suitable
NE Not considered

Invasive species catagories
SE Extremely high risk
HI High risk
PH Potential high risk
LO Low risk
NK No known risk

Figure 102. Species registered from Artsdatabanken.

Soft bottom marine habitat

Vegetation

Recreational Area

Barriers

Connecting paths

River input

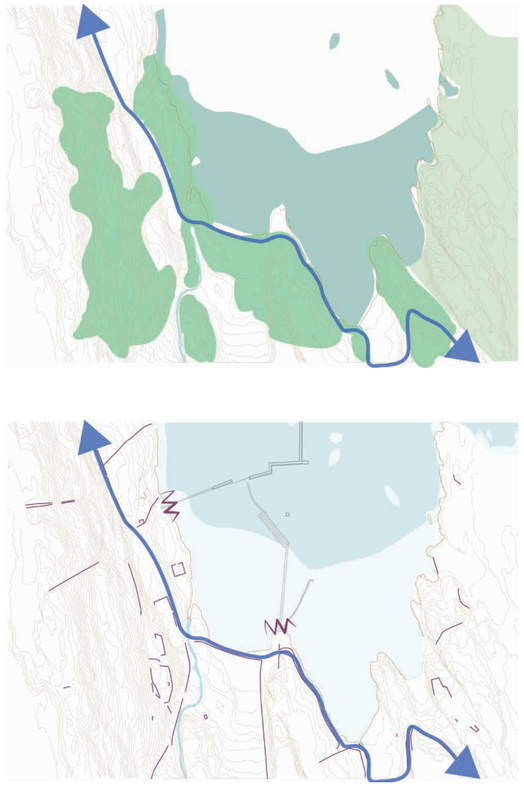


Figure 103. Illustration analysis

Strengths

- Great view across the fjord
- Historical buildings and public bathing house
- Unique nature type: soft bottom marine habitat.
- Sauna
- Small boat marina

Weaknesses

- Limited access to the structures on the waterfront.
- Icy conditions on the coastal trail in the winter

Opportunities

- Opportunity for co-existence and connecting with nature.
- Many sea bird registrations

Threats

- Great opportunity for co-existence and connecting with nature.
- Pollution from small boat
- Sensitive habitat
- Noise and disturbance from humans and boat activity

Hellvik dock and Hellvik beach

Figure 104.: Photograph. (Lorentzen, 1998)

Figure 105.Orthophoto (Norge i bilder)

Figure 106. Orthophoto (Norge i bilder)

Along the area of Hellvik there are old summer house and properties alongside modern buildings. The road's natural ending point is the dock. Historically this was connected to the old farms of Berger. The fjord is deep enough for large boats to dock and was usfull for transport of goods. The oldest building is dated back to ca 1570 and several buildings were associated with local farms. Historically there was a lot of activity around the old doc and logs were shipped out form this area as well as old ship building areas. Traces of old bolts in the rocks can be found in the area today, and many of the houses are buildt before 1900's and are classified under SEFRAK catargoies. SEFRAK is short for ' Sekretarietet for registrering av faste kulturminne I Norge' (The secretariat for registering of cultural building in Norway. The area was well used by summer guests and seasonal summer residents. Up until 1937 there was a bus route ending here as well as the summer ferry route. The old Hellvik dock was first established in 1875 and was the last stop before Oslo on the Bunnefjord ferry route(Lorentzen, 1999). The public beach is now registered as a recreational area and has recreational small boats, public bathroom, outdoor shower facility and in the last few years a kiosk food truck. The area is very popular in the summer months especially for families and youth. There are annual swimming competitions, and smaller arrangements such as weekly meetings of 'ice 'bathers.

There are limited parking possibilities but in the proximity of the bus stop which links with the ferry system to Oslo. The southern beach is artificial, this was arranged by the local housing association, and although this is controversial it has allowed for visitors to be able to sit on the sand more comfortably than the natural rocky hardbottom which was there previously

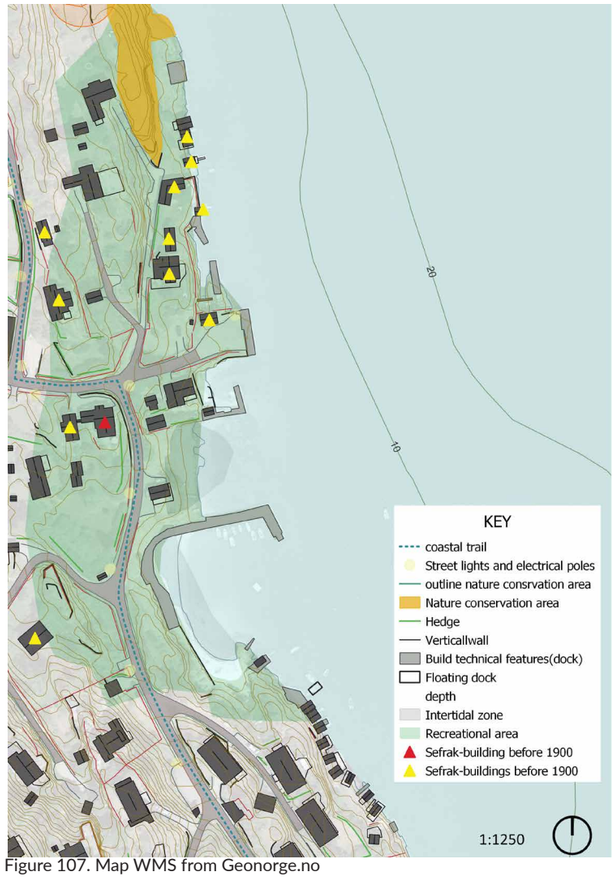


Figure 107. Map WMS from Geonorge.no

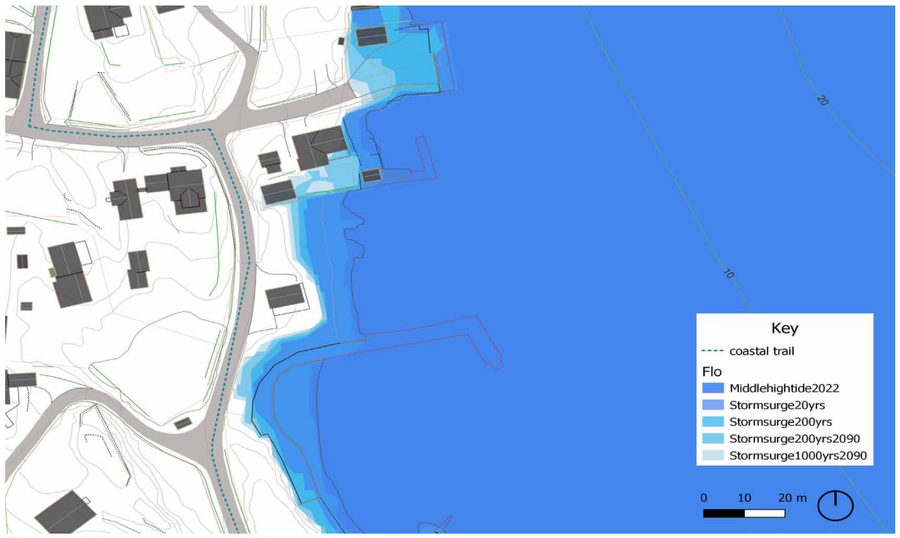


Figure 108. Map Storm surge WMS from Geonorge.no

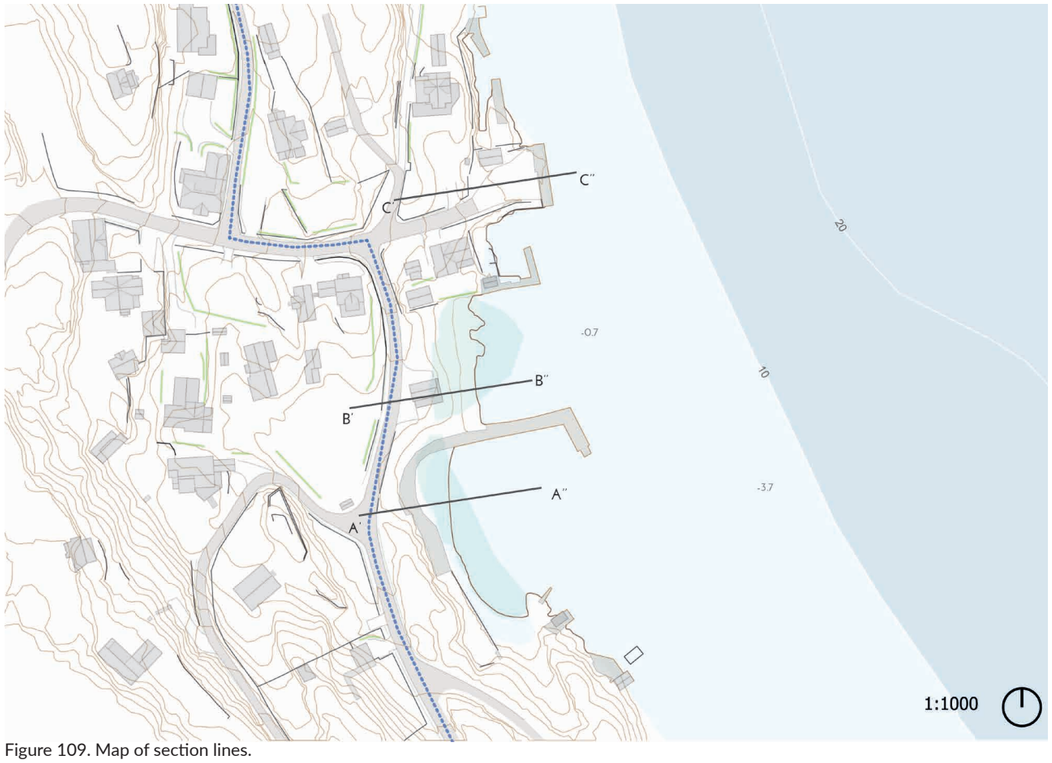
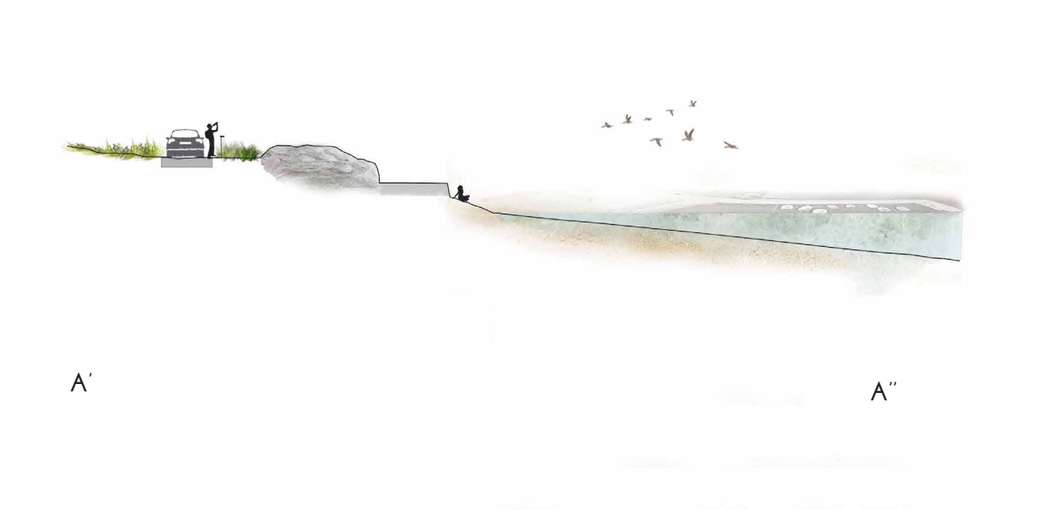


Figure 109. Map of section lines.



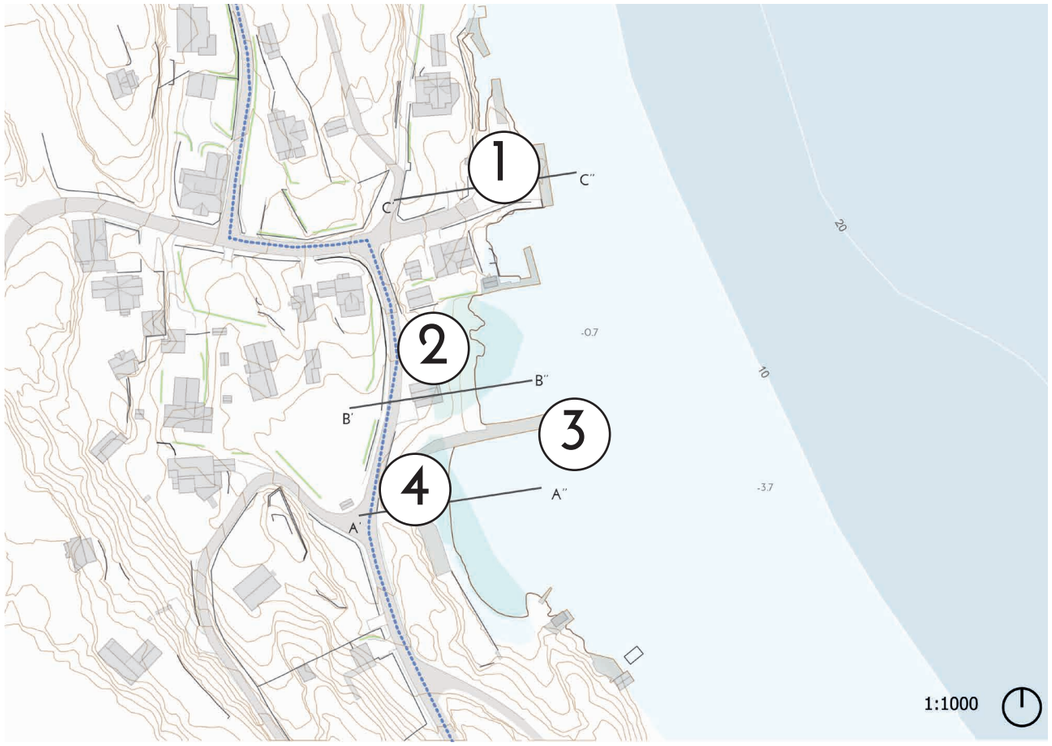


Figure 110. Map with photographs

1

Hellvik dock with Oslo in the background.

2

Rocky shore beach with recreatonal boat and washed up algae.

3

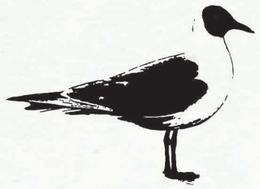
Breakwater dock (molo). This is a popular bathing spot for families as well as a spot for small recreational boats.

4

Artificial sandy beach, private bathing houses and residential houses in the proximity.

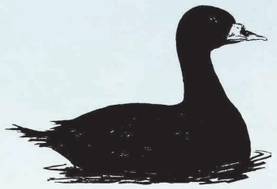
Species

Common Murre
(Uria aalge)
CR

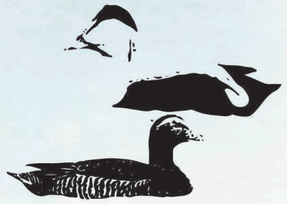


Black-headed gull
(Chroicocephalus ridibundus)
CR

Yellow Hammer
(Emberiza citrinella)
VU

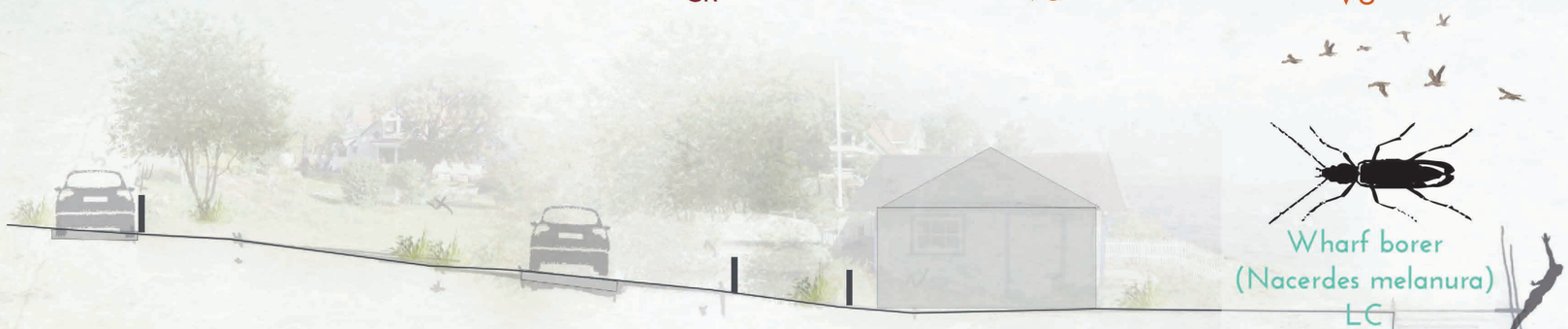


Common scoter
(Melanitta nigra)
VU



Common Eider
(Somateria mallisima)
VU

Herring gull
(Laurus agentatus)
VU



Wharf borer
(Nacerdes melanura)
LC

Red-listed catagories
RE Regionally extinct
CR Critically Threathened
EN Endangered
VU Vulnerable
NT Near Threatened
DD Data Deficient
LC Viable
NA Not suitable
NE Not considered

Invasive species catagories
SE Extremely high risk
HI High risk
PH Potential high risk
LO Low risk
NK No known risk

Bluebell
(Campanula rotundifolia)
LC

Rock cinquefoil
(Drymocallis rupestris)
EN

Fumewort
(Corydalis solida)
HI

Turkish wartycabbage
(Bunias orientalis)
SE

Makrel
Scomber scombrus
LC

Bladderwrack
(Fucus vesiculosus)
LC

Pacific oyster
(Crassotrea gigas)
SE

Sea walnut
Mnemiopsis leidyi
SE

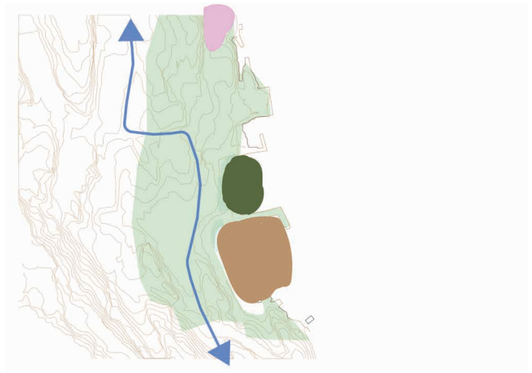
Figure 111. Illustration.Specie registered from (Artsdatabanken,2022)

Protected plant habitat

'Natural' habitat

Artificial sand deposited

Recreational area



Sefrak registred buildings

Public bathroom

Connecting path

Barriers

Access to fjord

Vertical walls

Man made coastline

Figure 112. Illustration. Analysis.

Strengths

- Great view across the fjord
- Historically rich
- High recreational value
- Access from fjord to harbour
- Easily accessed from public transport

Weaknesses

- Artificial sand beach affecting the adjacent ecosystem
- Man-made structures along the coastline

Opportunities

- Better access to the beach
- Access via Hellvik dock
- Improved recreational quality with small adjustments.

Threats

- Wear and tear from human users
- Conflicts between landowners and visitors
- Invasive species

Figure 113. Photograph. Bathing picture from 1930's from Gullis family album(Ford,2014).

Figure 114. Orthophoto.1956.Prestekjær (Norge i Bilder,n.d)

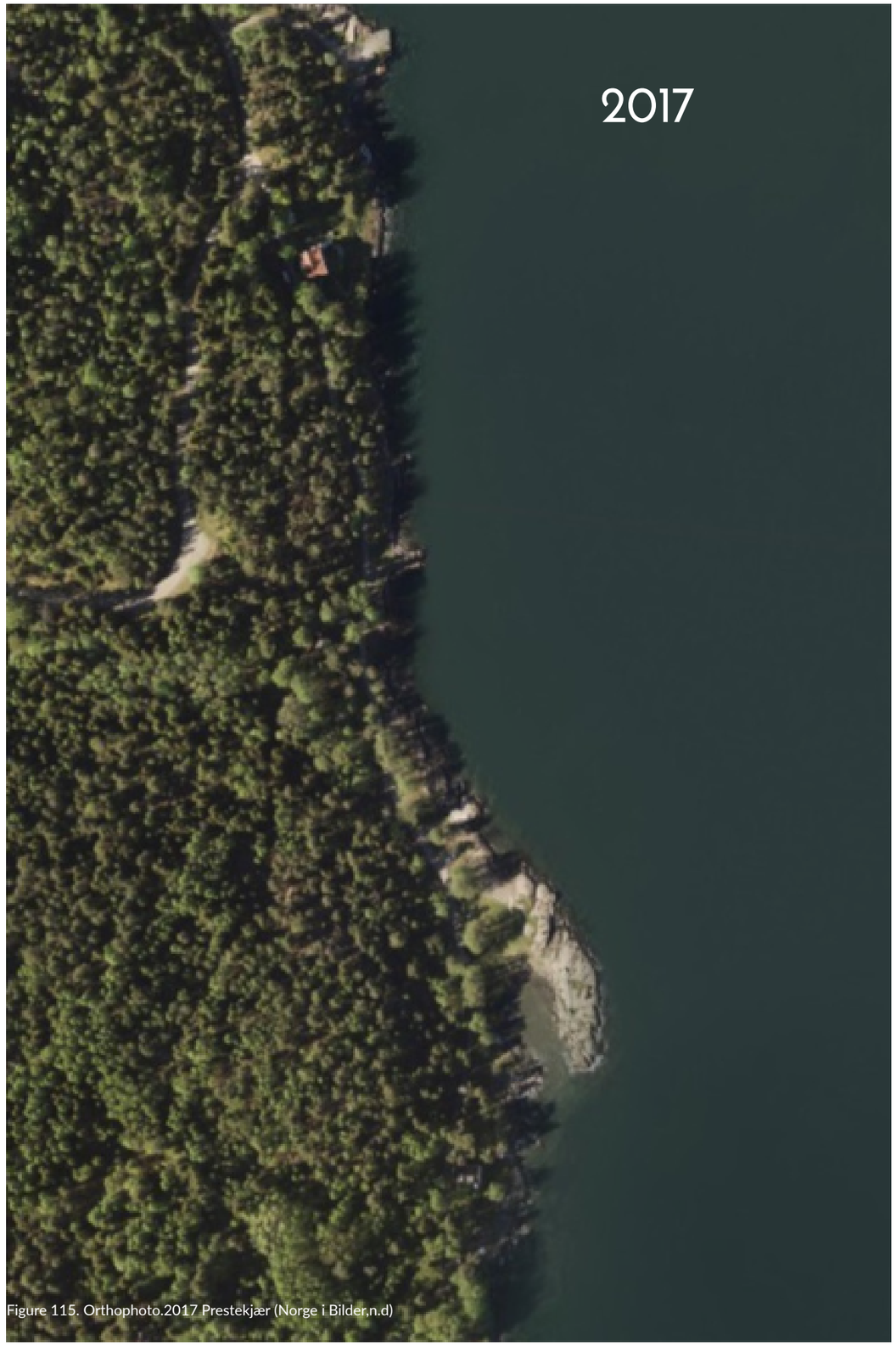


Figure 115. Orthophoto.2017 Prestekjær (Norge i Bilder,n.d)

Presteskjær is considered one of Nesoddens finest swimming and bathing spots. Its name is directly translated into 'Priest reef'. Historically this was were the local Nesodden priests had their bathing houses. The reminiscence of its foundation can still be seen on the rocks, but was destroyed by autumn storms around 1850's. Since then, due to land rise, the reefs are now land.

It has parking, public bathroom,and a handicap ramp for access to the water. Located further South in the Bunnefjord it has less coastal developments and a beautiful view across the fjord and is especially popular recreational spot in the summer months. Originally the patronage was owned the whole area from the fjord and up towards the church which was buildt in the middle ages.

Historically the church was the central part of the community and this is where post was delivered and the first steamboat dock was built in 1874. With the built dock Prestekjær became the main mobility connection in and out of Nesodden. The popular community holiday homes in Kirkevika provided well needed break from the urban hub of Oslo. This was a popular site for families with children and served as a social democratic holiday opportunity.

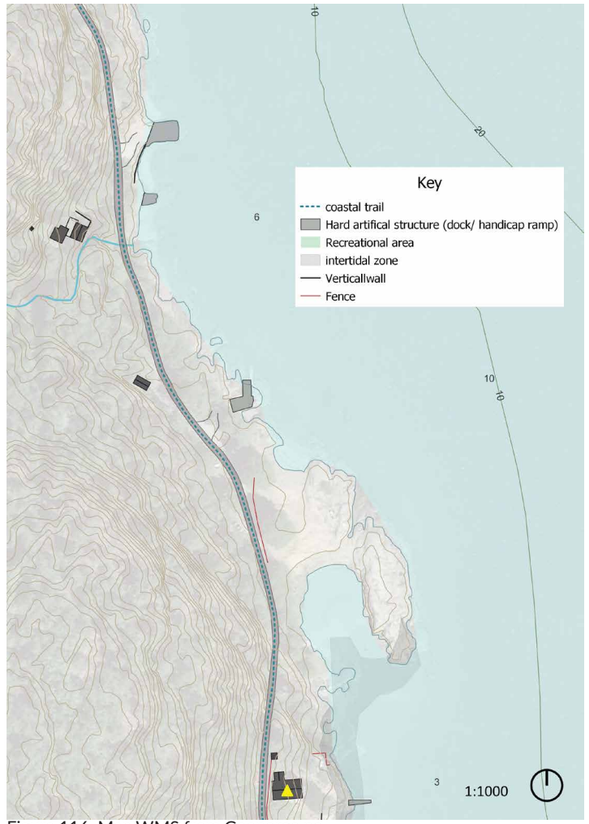


Figure 116. Map WMS from Geonorge.no

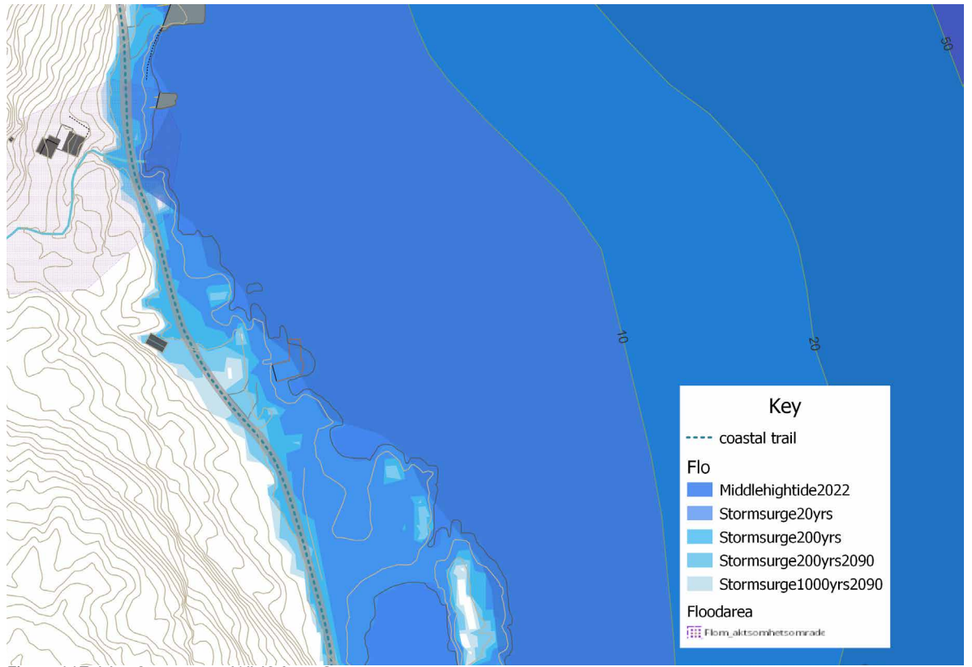


Figure 117. Map Storm surge WMS from Geonorge.no

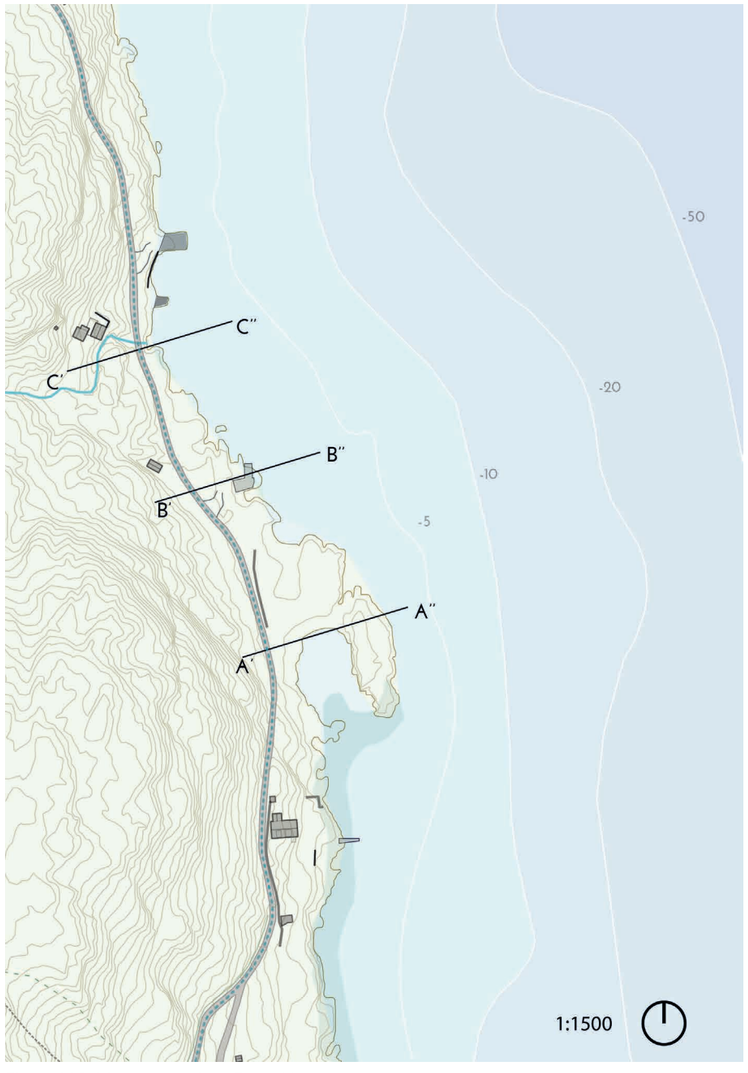
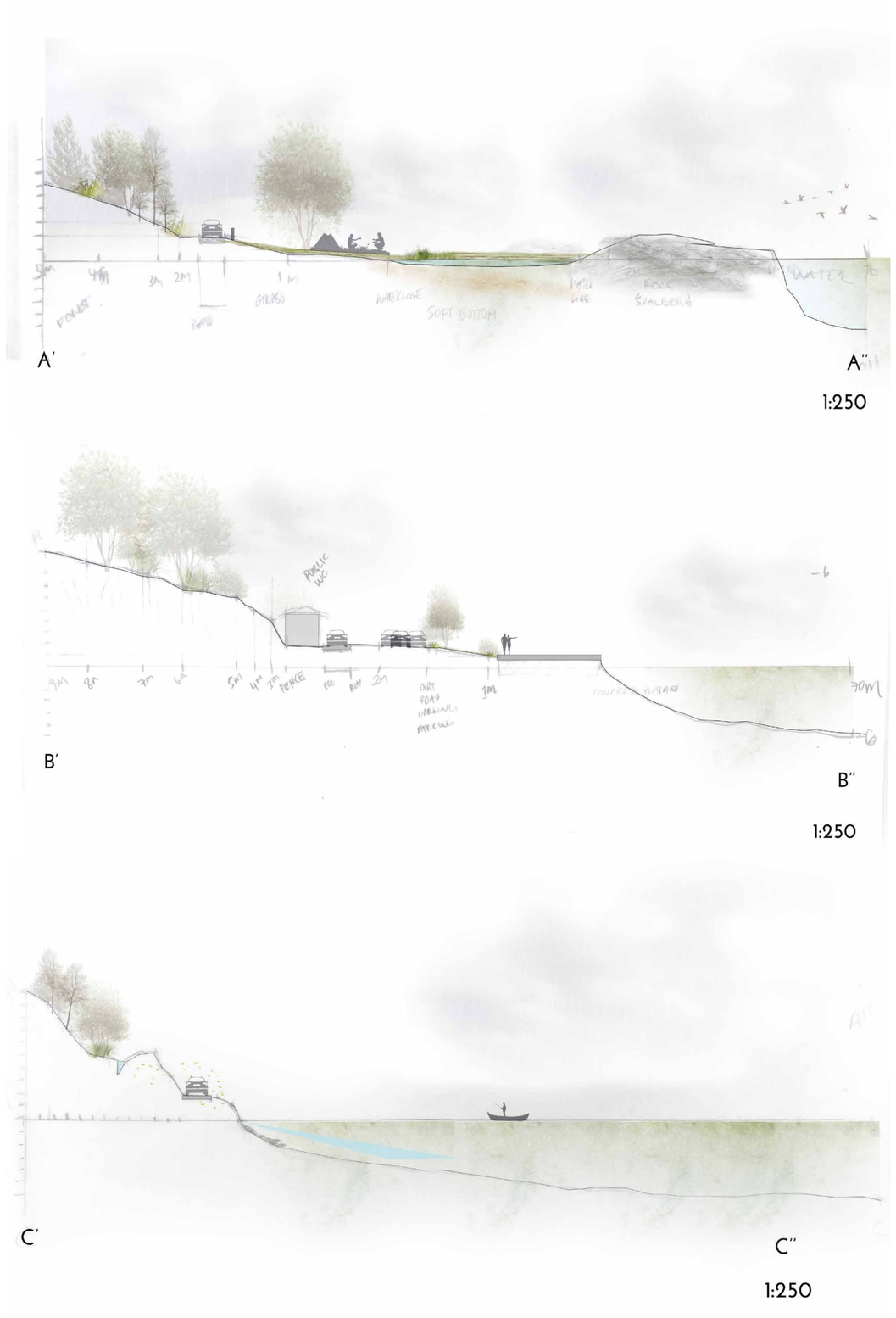


Figure 118. Map and sections Prestekjær



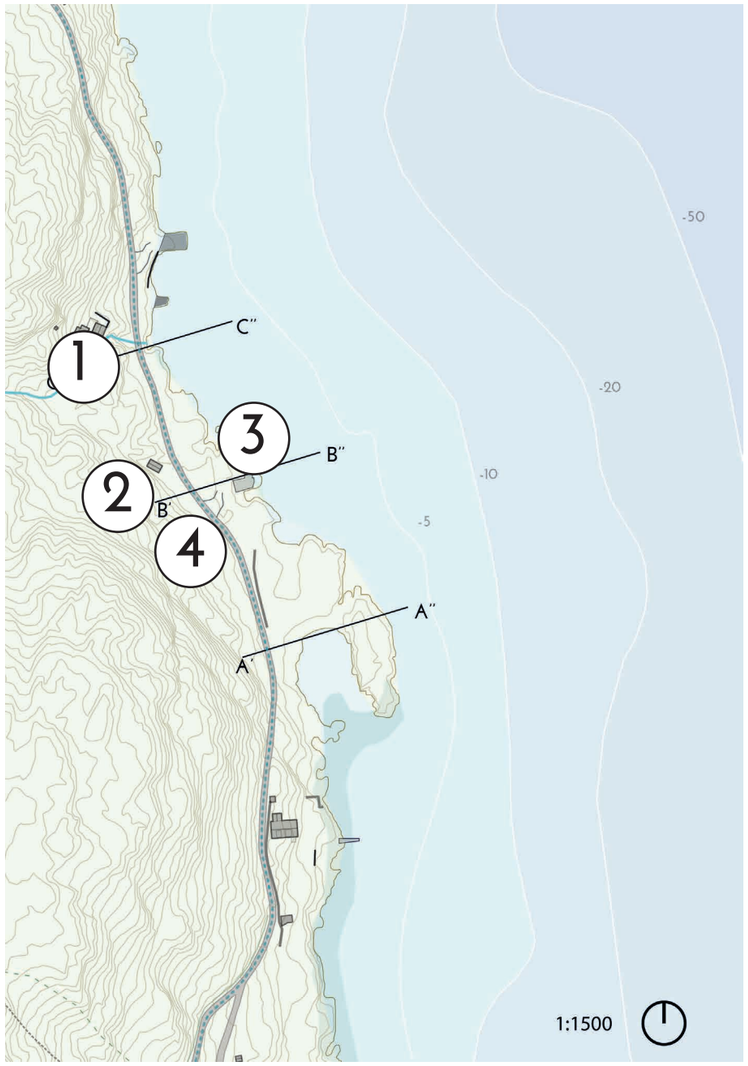


Figure 119. Map and photographs Prestekjær

1

River outlet

2

Public bathroom

3

Handicapped ramp for water access

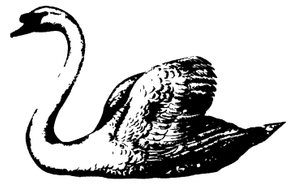
4

Parking spots available.

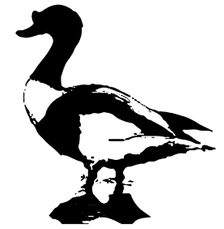
Black-headed gull
(Chroicocephalus ridibundus)
CR

Common Murre
(Uria aalge)
CR

Herring gull
(Laurus agentatus)
VU



Mute Swan
(Cygnus olor)
LC



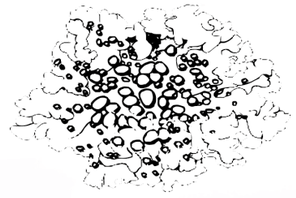
Common sheld duck
(Tadorna tadorna)
LC

Squirrel
(Sciurus vulgaris)
LC

Mink
(Neovison vison)
SE

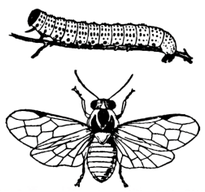
Wild chives
(Allium schoenoprasum)
NE

Bird vetch
(Vica cracca)
LC



Pin-cushion sun burst lichen
(Polycauliona polycarpa)
LC

Sawfly specie
(Nematinus luteus)
LC



Saw fly
(Athalia circularis)
LC

Pacific oyster
(Crassotrea gigas)
SE

Cod
(Gadus morhua)
LC

Red-listed catagories
RE Regionally extinct
CR Critically Threathened
EN Endangered
VU Vulnerable
NT Near Threatened
DD Data Deficient
LC Viable
NA Not suitable
NE Not considered

Invasive species catagories
SE Extremely high risk
HI High risk
PH Potential high risk
LO Low risk
NK No known risk

Figure 120. Ilustration. Specie registered from Artsdatabanken,2022)

Soft bottom habitat

Forest

Recreational area

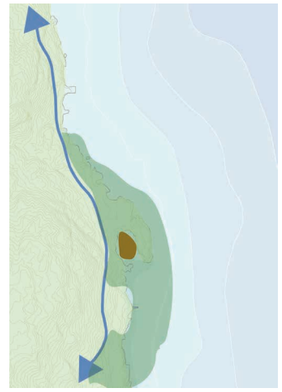
Sefrak registred buildings

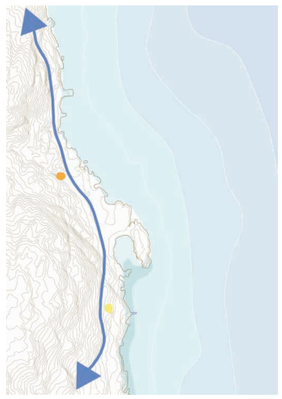
Public bathroom

Access

Barriers

River input





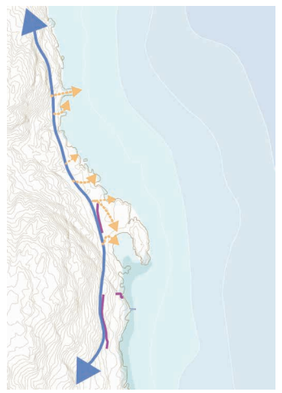


Figure 121. Illustration. Analysis

Strengths

- Public bathroom
- Handicap ramp and access to water front,
- Parking availability
- Little car traffic
- High recreational value

Weaknesses

- Further from public transport
- Noise from recreational small boats
- invasive species

Opportunities

- Unique nature
- available dock
- close to communal holiday camps

Threats

- Wear and tear from users
- Invasive species

Figure 122. Photograph. Ursvik dock, Autumn, 2022.

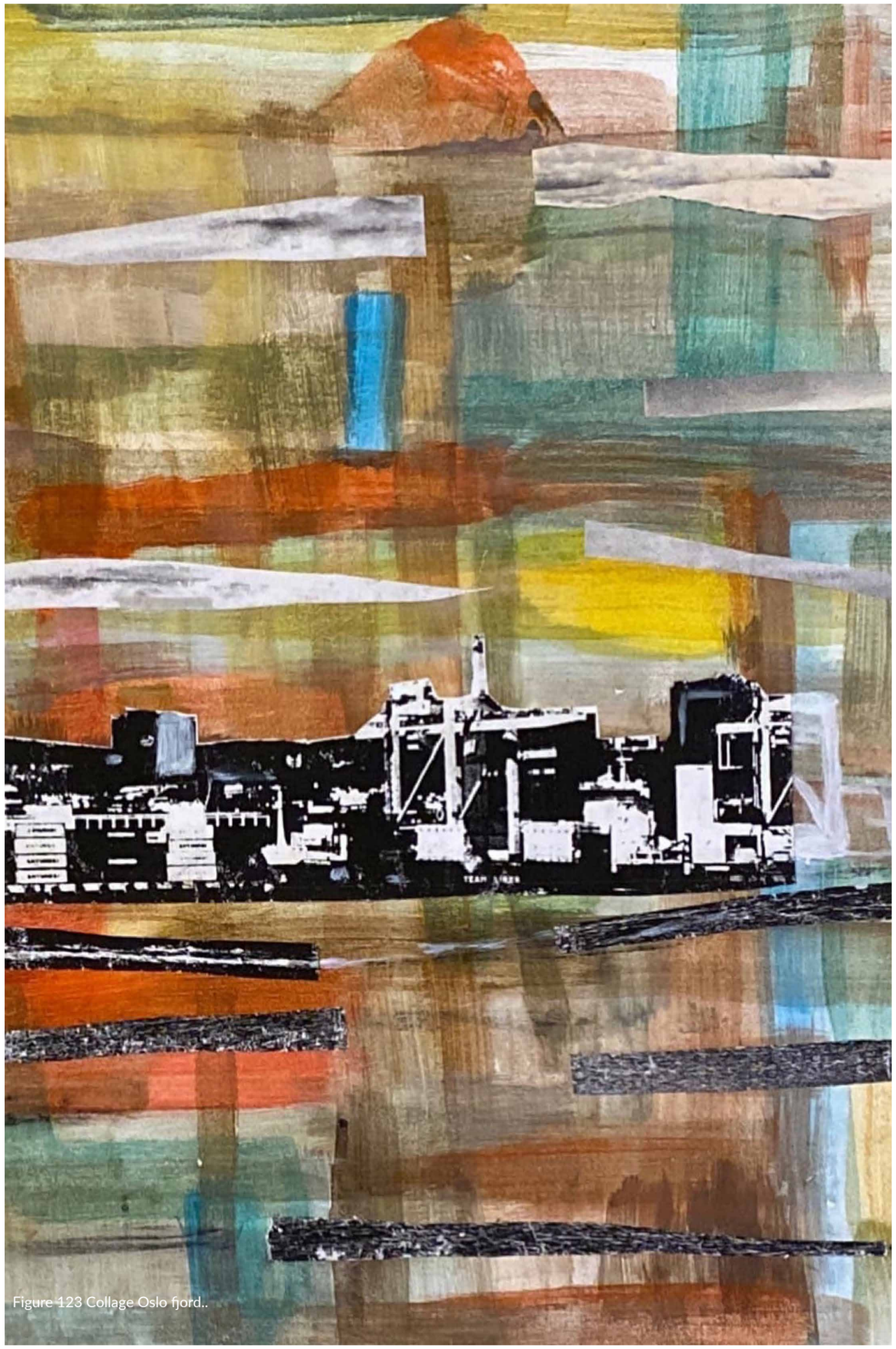


Figure 123 Collage Oslo fjord..

05.Design Proposal

This chapter presents the design outcomes which are results of the analysis from the previous chapter.

Design approach
Design Measures
Ursvik proposal
Hellvik proposal
Prestekjær proposal

Design approach

This thesis' primary goal is to strengthen co-existence between humans and other species. In order to achieve this goal both human and non-human considerations must be undertaken. Through the use of multi-specie design principles the approach to the design will take into considerations:

Non-human aspects:

- Understanding the specie and the ecological dynamics
- Preserve/conserve/improve important habitats for non-human specie
- Implement strategies for habitat stewardship
- Understanding the anthropogenic impact on specie life cycle, food web, and quality of habitat

Human aspects:

- Educate users about the local nature
- Mobility
- Preserve/conserve/improve important recreational areas
- Access
- Aesthetic experience of nature itself (promote use of 'wilder' nature)
- Establishing opportunities where human and nature can connect

Some of the overarching principles for sustainable designing greenways for nature and people are(Hellmund & Smith, 2013):

- Enhance connectivity of natural features of the landscape
- Plans should preserve nature where people live (access to nearby nature) and equally distributed in socio-economic areas
- Combining cultural and natural resources in objectives
- Careful considerations when planning for grey infrastructure like roads
- Habitat dynamics and considerations of critical relationships must be considered
- Abandoned infrastructure (like railroads) and degraded land has greenway potential and can accommodate for natural processes
- Planning grey and green infrastructure simultaneously
- Community garden, farms, and forests should be included
- Inclusive processes for overcoming social conflict or aspects of environmental injustice

Design Measures

ACCESS TO NATURE-improving access to recreational areas with the establishment of electric ferry route. The already established coastal infrastructures along the coast is an opportunity and could relieve car traffic pressures as well as parking. (ferry line)

HUMAN- NATURE INTERACTION- Facilitating human and nature expreiences close to human settelements can be positive in overall conservation measures as well as human-well being.(bird watching)

PROTECT UNIQUE NATURE TYPES- Allowing for natural processes to take place along the coast can imporve habitats and their species compositions. (walkway)

INCREASE BIODIVERSITY- Increasing surface variations in new coastal structures can improve biodiverstiy locally and allow for more human/ nature connection.(Floating sauna micro-habitat)

EDUCATION-preserving natural river inlets and sounding habitats

MATERIAL- re-using infrastructure and re-use of materials for new construction

-

REGULATORY- On a regulatory level the issues touched upon in this thesis, are global, regional and local. Working for stricter regulations on all levels, regarding transportation ballast water, marine pollution, plastic production, and managing ship traffic with considerations to the soundacape.

- Stricter speed regulations on a local level should be put in place to decrease noise pollution by recreational boats.
- Stricter regulations on overfishing and destructive fishing practices(trawling).

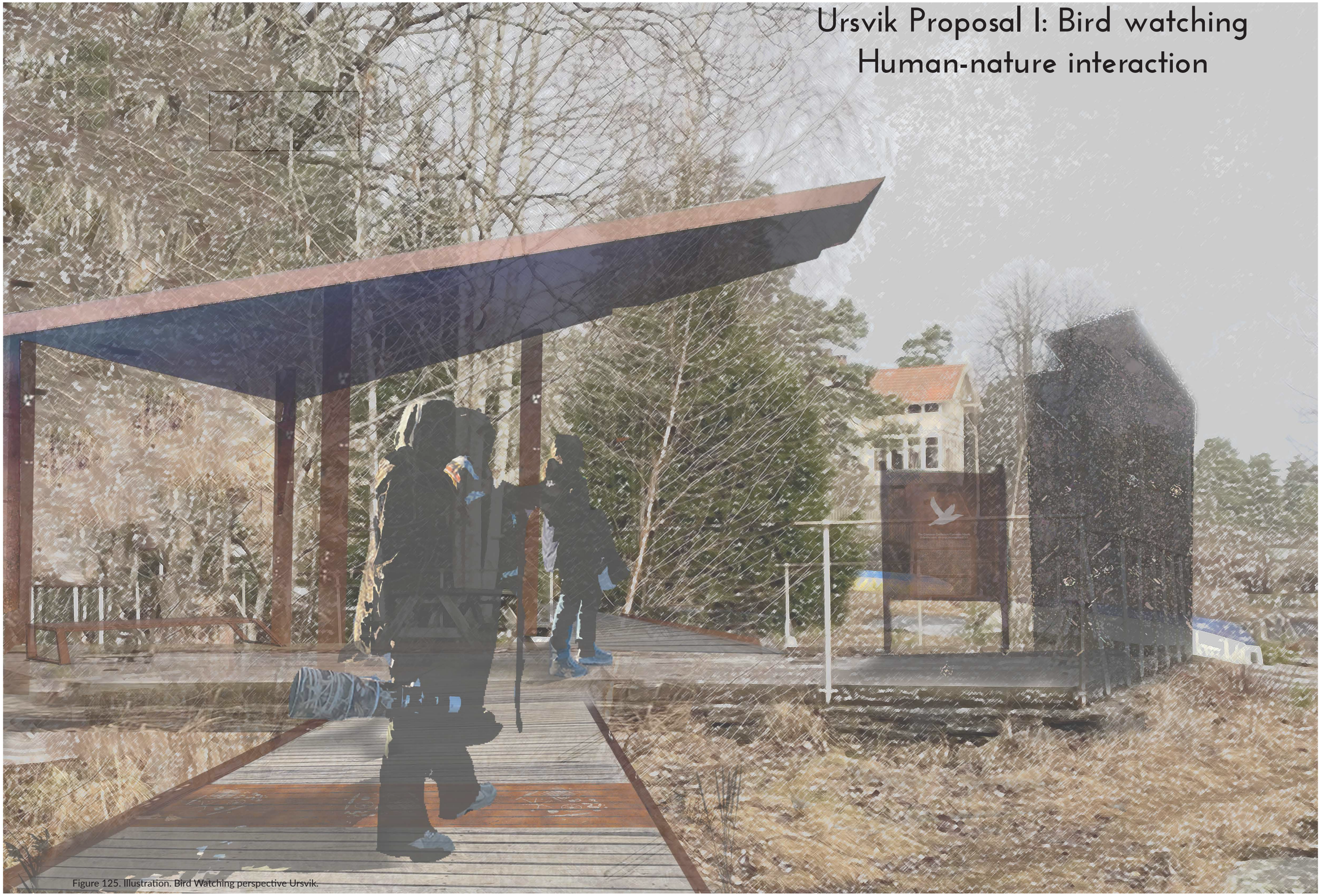


Figure 125. Illustration. Bird Watching perspective Ursvik.

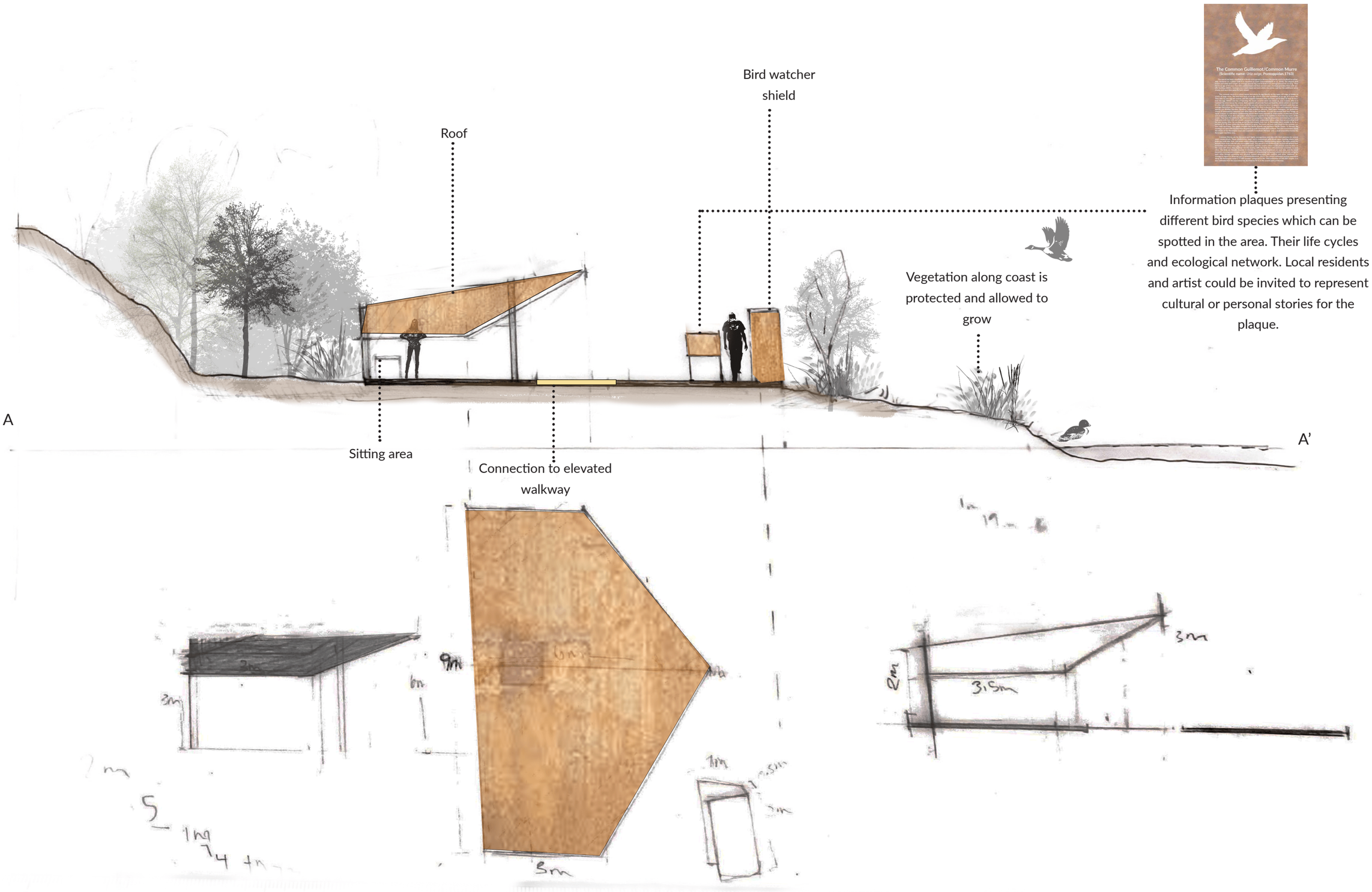


Figure 125. Section of Bird watching platform and sketches.

Ursvik Proposal II:

Strategy: Restoring the transition from land to water

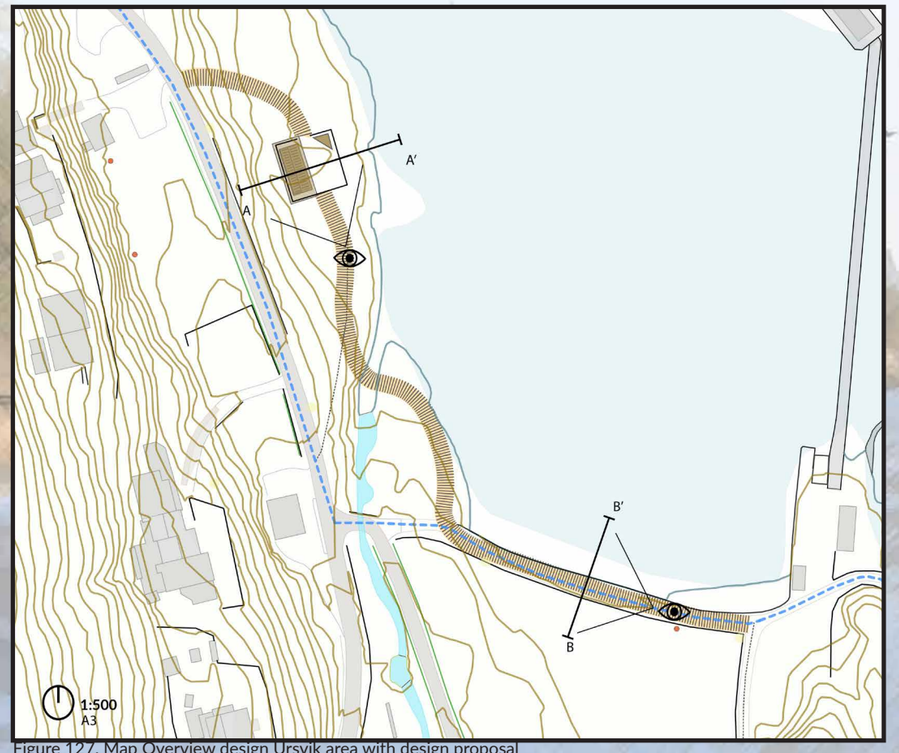


Figure 127. Map Overview design Ursvik area with design proposal

Figure 126. Illustration. Design perspective Ursvik.

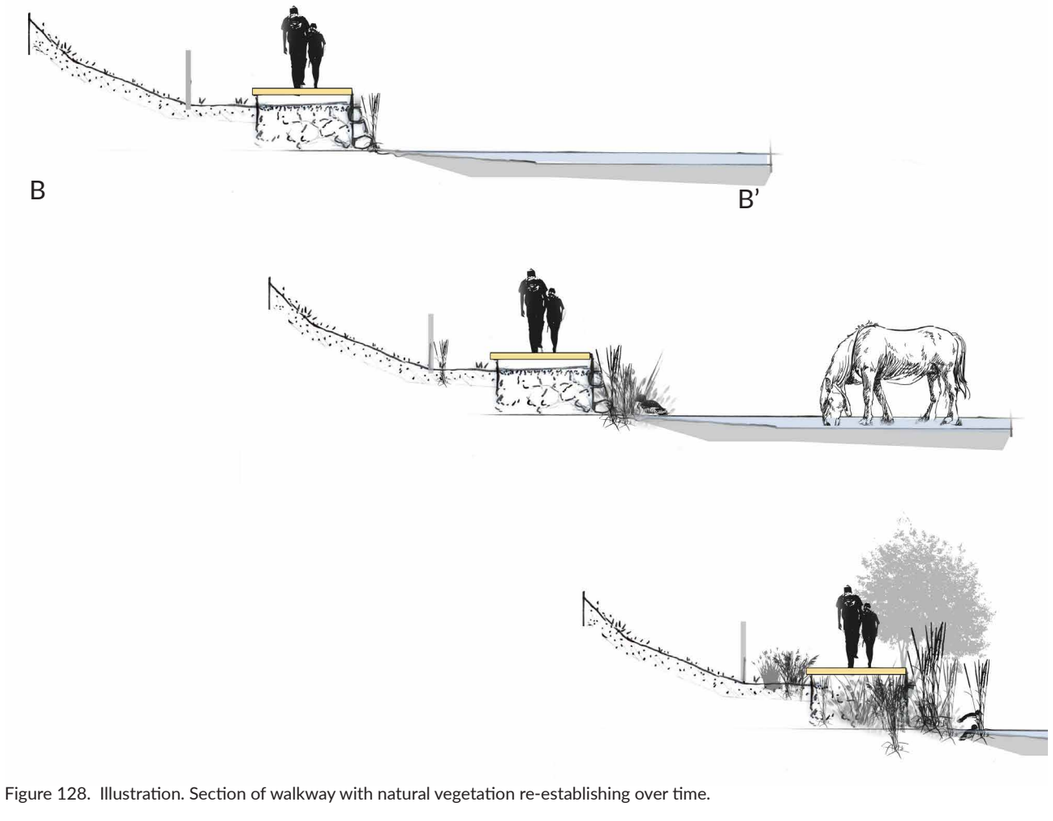
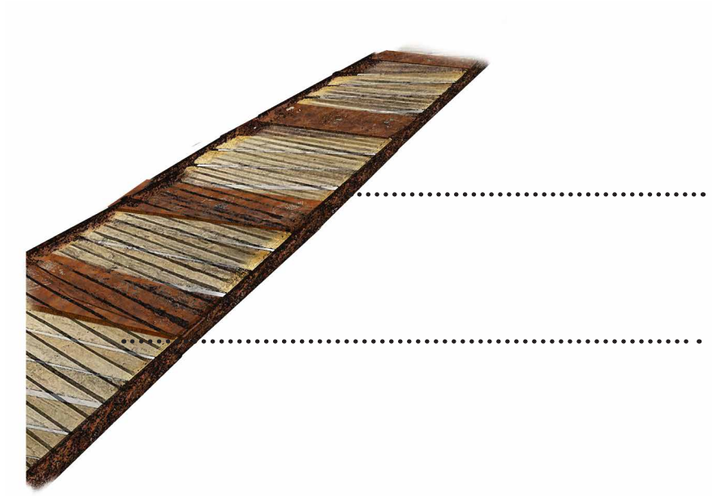


Figure 128. Illustration. Section of walkway with natural vegetation re-establishing over time.



Weathering steel or corten steel edge

Corten steel specie sections placed with 'random' intervals inter-changing between the specie patterns.
The cut out patterns will allow for water and light to penetrate ecosystem. underneath boardwalk.

Use of Material

Phytoplankton species

Benthic species

Sea bird species

Material for the elevated board walk is wooden. However for the unique touches of the design I propose the use of weathering steel or Corten steel. This has a unique natural oxidizing finish. It does not require painting and compared to other steel has increase resistance to atmospheric corrosion. As the rusty brown oxidation appears it creates a protective coating that slows the rate of future corrosion. Maintenance is low and over time the material will change appearance and this aligns with the essence of this design proposal.

Hellvik Proposa:l

Ferry transport: Access to the coast and recreational areas in Bunnefjorden

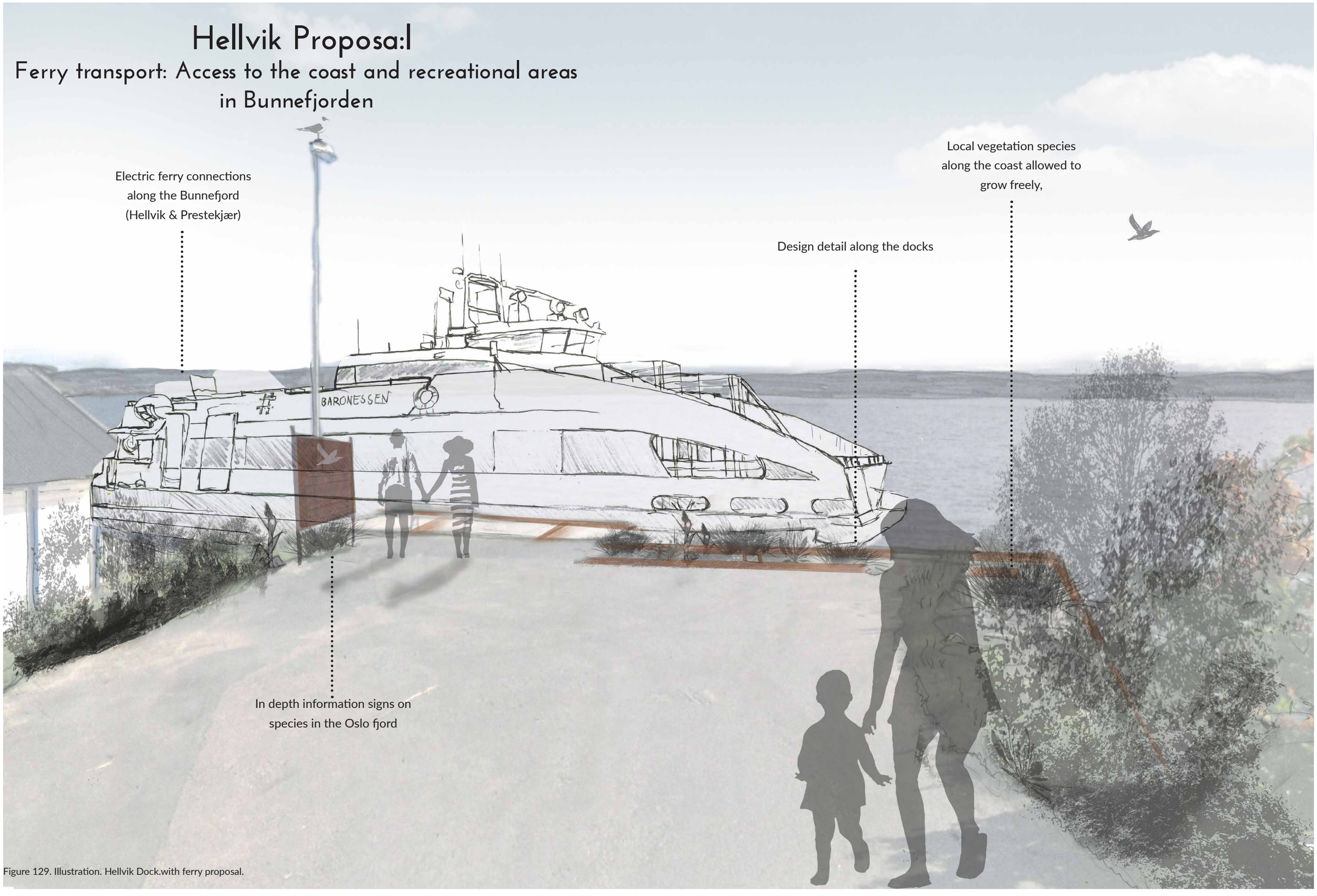
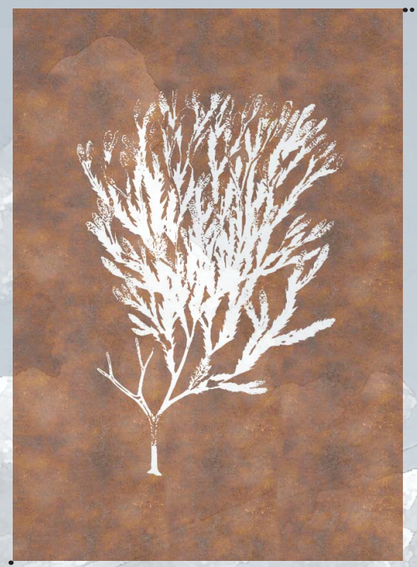


Figure 129. Illustration. Hellvik Dock.with ferry proposal.

Floating sauna:
Facilitating Micro Habitats and Human Nature interactions

The use of sauna's around the harbour in Oslo has become a popular activity amongst the city residents. This has also become quiet popular on Nesodden as well, and different private associations build and run these shared saunas. This is a traditional rooted in the Scandinavian culture.

These floating saunas can provide micro habitats for filter feeders like the invasive specie the Pacific Oyster and native species like the Blue mussels. Not only do filter feeders attach to the rope but other pioneer species will also start colonizing. The sauna can provide a micro habitat for and shelter from predation.



Information plaques on the walls of the floating sauna. Interesting facts about the species degree of vulnerability could be presented. Local artist and poets can be invited to represent stories and visualizations placed on the walls.

Figure 130. Illustration. Hellvik floating Sauna design proposal.

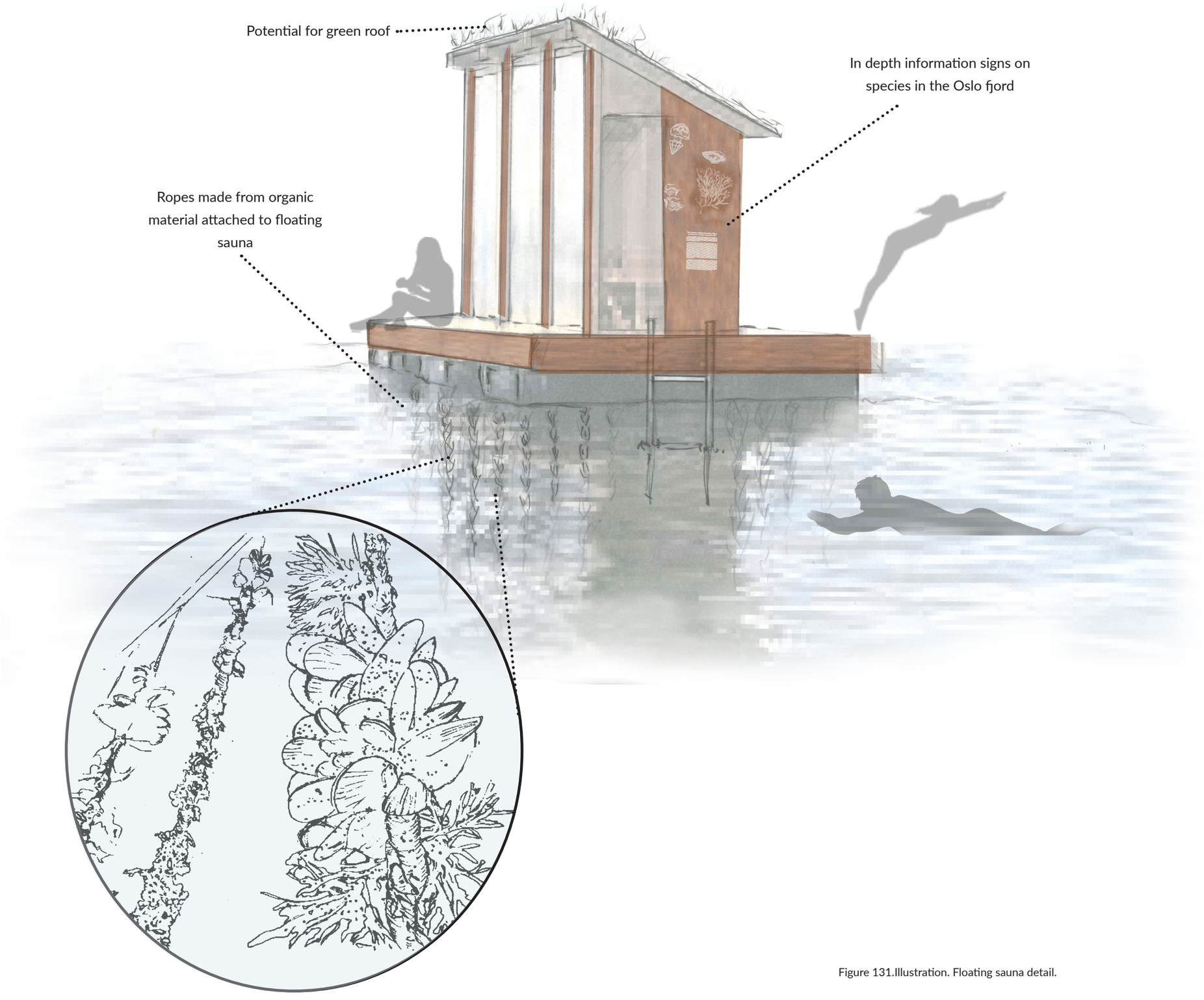


Figure 131.Illustration. Floating sauna detail.

Potential Species

Blue mussels
Mytilus edulis

Pacific Oyster
Crasostrea gigas

Common periwinkel
Littorina littorea

Rockpool shrimp
Palaemon elegans

Barnacles
Balanidae

Sugar starfish
Asterias rubens

Vase tunicate
Ciona intestinalis

Star tunicate
Botryllus schlosseri

Two-spotted goby
Gobiusculus flavescens

Prestekjær proposal: Education and stewardship

I propose to establish local educational programs within the municipality. The local coastal environment is an ideal outdoor classroom. The municipality could provide schools with an expert in the field to help the teachers to create a curriculum and a program suitable for different age groups.

Educating the general public with information plaques can provide necessary information about the ecologies of the Oslo fjord. This would provide a foundation of knowledge about the complexities of human influence on the landscape, intertidal species, ecosystem services,pollution land rights and so much more.

Proposing an environmental stewardship for Prestekjær and along the coastal trail. A resilience-based ecosystem stewardship will focus on the resilience as an important feature when interacting and responding with the environment. This initiative could be the an important joint between educational systems, and the general public. Multi-generational institutions but especially children and youth can benefit greatly in the long-term. Being in nature for more than one hour per time serves not only as an educational strategy but can increase overall well-being.

Figure illustration education and stewardship.

Figure Collage. Man and woman on the shore.

06.Conclusion & Reflection

Conclusion

The thesis primary goal was to answer respond to the research question: *To which degree can landscape architecture facilitate a multi-specie design approach along the coast of Nesodden?* Through this research process, I have encountered the complexity of this question and approached it with care. Not only is there an ethical question when understanding nature's authority, but if to provide good living conditions for the Common Murre (Uria Algae) in the relatively small location of the Bunnefjord in the Inner Oslo fjord, one has to look into the overall global drivers behind their population decline and global challenges faced as a result of human activity.

In addition the thesis listed sub-goals, to explore non-human design, increase biodiversity, facilitate human-nature interaction, public participation, strengthen access to the coast and acquire knowledge about he history and how it formed the coastal landscape of Nesodden.

I have always been drawn to the interface between art and science, and through this thesis, was able to further explore this. The background and theory chapter presented relevant information on different spatial scales, revealing complex interconnections in the Anthropocene. The case analysis presented historical and current situations on an overall local scale and smaller scale locations.

Parts of my proposal aims to use already established infrastructure along the coast, as the foundations for new design, with the aim for increasing human nature interaction and biodiversity.

There is a need for a perspective change in how we as humans interact and engage with nature that surrounds us. We need to take a more respectful approach towards recreational activities along the coast and regulations and guidelines should promote this shift. We can no longer rely on car mobility, my proposal for the public electric boat route could allow access to valuable recreational areas in the Oslo fjord. When planning and designing for the future it is vital to consider the different scales and the complexity of interconnectedness.

Governmental regulations are important to protect landscape democracy through participatory and engaging educational institutes in practical solutions to the issues we deal with today in the Anthropocene.

Reflection

The topic of this thesis reveals complex interconnections, which requires high level ecological knowledge on marine ecosystems, nature types and specie interactions. Acquired information from site surveys and literature review is limited with the time frame available, and further collaboration with professional artists and marine biologists would be beneficial.

Although the designs are on a local and small scale, the principles behind them, are transferable to large scales. Protect coastal vegetation and unique nature types, re-design infrastructure which is no longer utilized, when designing new constructions consider multi-specie design approaches to promote micro-habitats, engage the public in stewardship initiatives .

Suggested further work

The measures for further work should not only be focused on the local scale, but should be tackled on a regional and global scale. Living in a world with such complex anthropocentric conditions, it is vital to work on many levels.

Educating and engaging people about nature and consequences of human activities is vital. Looking towards ecological connections- to understand the holistic overview.

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*To determine elevations and depths a reference zero is used. There are several reference levels in Norway. Normal Null 2000(NN200) is the reference level for land and ocean zero (Sjøkart null) is the reference for marine depths.

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Appendix:

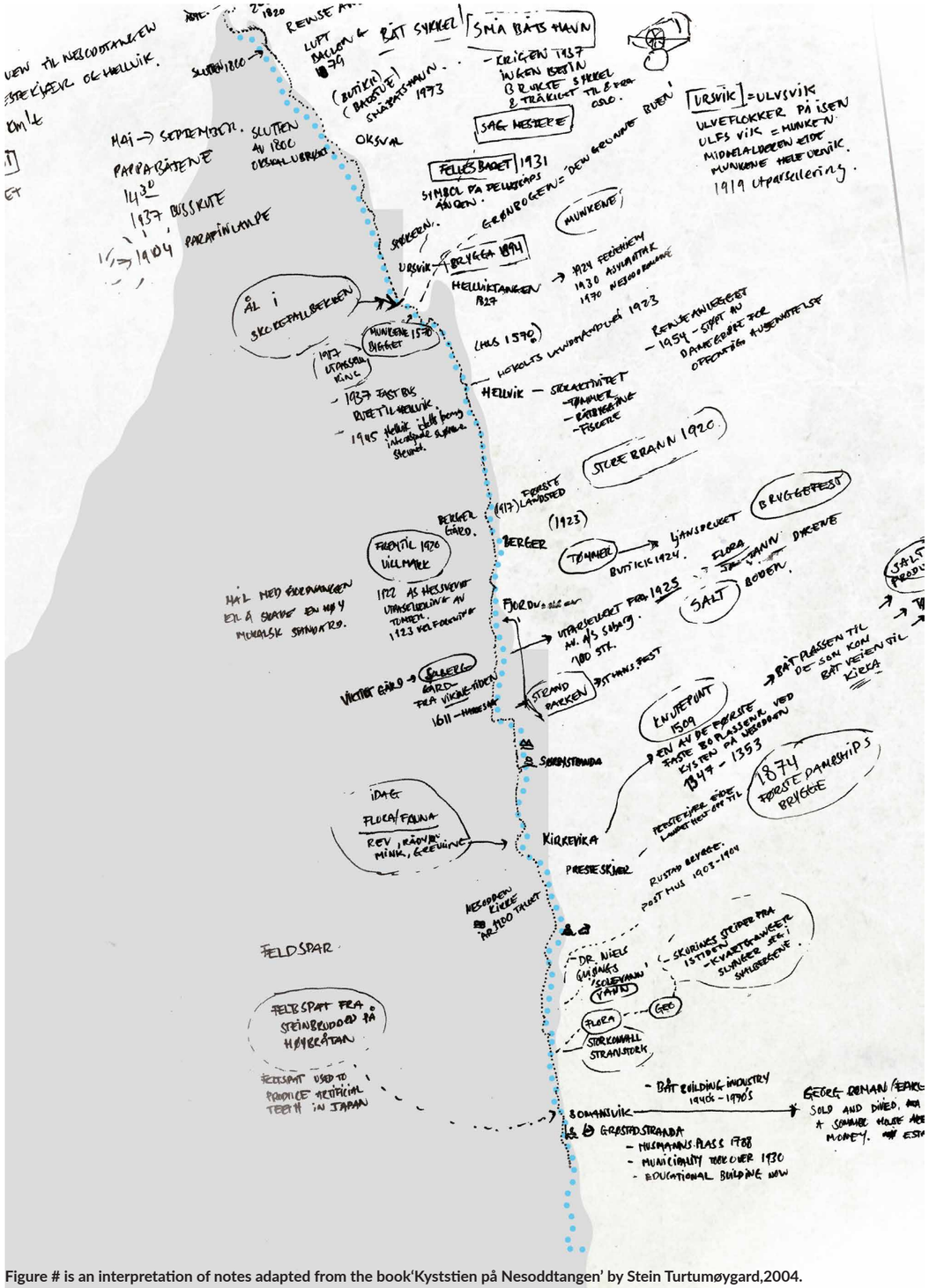


Figure # is an interpretation of notes adapted from the book'Kyststien på Nesoddtangen' by Stein Turtumøygard,2004.

Workshop Kunst i Stedsutvikling

9 Mars kl 09-15

Hvordan kan kunst og kunstnere være med på å utvikle byer og steder? Hva skjer om man slipper kunstnerne til tidlig i planleggingen? Invitasjon til lokale kunstnere til å utforske kyststien og strandsonen på Nesodden.

Oppmøte Hellviktangen kunst Kafè

Deilig lunsj og kaffe 200kr per pers

Maks 20stk

Bindende registrerings frist 2 Mars hos:

Program for Dagen

Målet med dette seminaret er en øvelse i hvordan lokale praktiserende kunstnere kan bidra tidlig i stedsutvikling. Målet er å undersøke mulighetene i kreativ stedsutvikling og så frø av inspirasjon til eget arbeid.

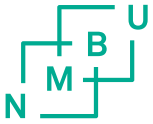
Kl 9 - *Oppmøte ved HellvikangenKunst kafè*
Kl 0915- 1000 *-Introduksjon av Elin Karoline Harstad*
-Bakgrunn for workshopen
-Hvordan kan kunstnere inkluderes i stedsutvikling?
-Kyststien Nesodden: Verdien av bærekraftig utvikling for mennesker og natur.
Kl 10-1130 *Øvelser*
Kl 1130-1230 *Deilig Lunsj*
Kl 1230-14 *Eget arbeid/Utforskning*
Kl 14-15 *Samtaler og Refleksjon fra dagen og oppsummering.*

Prosessen vil bli dokumentert og brukt som en del av Elin K Harstad sin Master Oppgave ved NMBU i Landskaps arkitektur for Global Bærekraft. Oppgaven vil fokusere på møte mellom mennesker og natur ved kystsonen og strandsonen på Nesodden. Kunstfaglig samarbeidspartner er Hilde Grønne Flikke. Det arrangeres en invitasjon til 'Sharing' av etterarbeid for deltakere (dato og kl kommer).

HUSK! *Ta med det du trenger av eget verktøy og utstyr for å kunne jobbe selvstendig med eget arbeid. A4/A3 papir og enkle skrive redskaper vil være tilgjengelig. Kle deg for været som presenteres seg for dagen.*

Workshopen koster 200kr -det dekker en deilig lunsj og kaffe fra Hellviktangen KunstKafè. Arrangørene (Elin og Hilde) stiller uten honorarer da dette i utgangspunktet er en øvelse og del av videre eget arbeid.

Bindende påmelding frist 02.03.22 til Elin K Harstad. Ved spørsmål ta gjerne kontakt med:



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