

PILOT

Pilot study about Nordhordland as a UNESCO Biosphere Reserve

REGION
NORDHORDLAND

Nordhordland Biosphere Reserve Coastal Landscape of Western Norway



Pilot study:

"Nordhordland Biosphere Reserve - Coastal Landscape of Western Norway»

Published by: Nordhordland IKS

Knarvik, January 2015

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Front page illustration:

In a Biosphere Reserve it is important to preserve local heritage, as part of developing a sustainable local community. Photo from Keipane Kystlag, their STREIF event in Kvalvika, Sæbø, 2012. Photo: Hans Kristian Dolmen.

The project is supported by:



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Nordhordland Biosphere Reserve
Coastal Landscape of Western Norway

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Foreword

*From the farthest reefs
where the swells crashes as the planet's own heartbeats towards the cliffs
over moorland and straits, meadows and fields, knolls and ridges
in to where the landscape rises steeply towards the mountains and farm lies behind
farm
towards the horizon, Nordhordland is a slice Norway in miniature.
Even if the entire region from Fedje to Stølsheimen
was cut loose from the coast and were drifting
it would still carry along - most of what the country has to offer.*

Gunnar Staalesen

Nordhordland represents Norway in a nutshell. From the coast to the mountains; building on a culture reaching back in history; and with a livelihood covering everything from traditional agriculture and fishing to modern industry, oil, energy and aquaculture.

But, like the rest of Norway, the region is facing substantial challenges: Cultural change, pressure from the big city of Bergen coming nearer all the time, big changes in the industry and, on an administrative level, with increased demands for efficiency and plans for extensive changes in the municipal structure. And then there is the concern many feel; that environmental changes eventually may lead to reduced quality of life for our descendants.

No central strategy can address all these challenges. But to declare Nordhordland Norway's first Biosphere Reserve could help unite the region, encourage communal culture and take care of important common tasks, such as management of environmental projects in the region and regional branding.

The term 'sustainable development' has been used so often that it has almost lost its original meaning. But in this context we need to use it. A biosphere reserve represents sustainable development in practice. This means trying out new ways to use the resources; take the best from the past and from the present and use this as the basis for a regional development in a modern and sustainable way - for the benefit of the population today and for generations to come. Knowledge-based development is central to UNESCO's Biosphere program, and with this project Nordhordland could becoming an attractive and interesting area for research and development in many fields.

It is the municipalities working together in the Regional council of Nordhordland who, in cooperation with the University of Bergen, has initiated the formal process of applying for status as a Biosphere Reserve. The first step is to be approved as a biosphere candidate. If we manage that, we have three years of work before we may submit the final application.

Future-oriented companion to the World heritage program

The biosphere is in a technical sense that part of the globe where living organisms exist. Other similar terms are "biotope" or "ecosystem", but in this context, the biosphere is more than nature. The Biosphere Program is based on the interplay between nature and culture, business and economics. The environmental perspective is important, but the goal is to develop the environment in a holistic manner.

UNESCO's biosphere program was established in the early 70s, about the same time as the world heritage program. But while the world heritage program concentrates on taking care of unique cultural and natural heritage, the goal for the biosphere program is to get a positive, sustainable development of an area based on the region's own natural, cultural and economic background. When an area is given a biosphere status, it does not mean new conservation measures or formal restrictions on the use of resources. It is the local inhabitants - and then partners in education and research - who determine what qualities they want to imbed in their biosphere area. The biosphere program is therefore as much a model for sustainable social development as an environmental program.

There are today 631 biosphere reserves in 119 countries - 231 areas in Europe and 7 in Scandinavia. Nordhordland could become the first biosphere reserve in Norway.

Geographically, the proposed reserve encompasses the area from the Troll field in the North Sea to the top of Stølsheimen landscape reserve. The area includes the municipalities Austrheim, Fedje Gulen, Lindås, Masfjorden, Meland, Modalen, Osterøy, Radøy and Øygarden. In addition, parts of Vik, Voss, Høyanger, Vaksdal and perhaps Askøy may be included.



Nordhordland represents Norway in a nutshell from coast to mountains. Here from Fedje, which is often called "the village in the ocean." Photo: Kjersti Isdal.

Since the establishment of a biosphere reserves requires commitment from both residents and local governments, UNESCO has decided that the process towards reaching biosphere status should start in the local community. The regional council (Regionrådet) in June 2013 initiated a pilot to explore whether Nordhordland region can fulfil the requirements for a UNESCO biosphere reserve and to provide suggestions for what a biosphere reserve in Nordhordland could mean for the development of the region. The program board and the working group have documented that Nordhordland can develop a biosphere reserves that will function well in the international context.

Significant ramifications

The biosphere project in Nordhordland will have two different components. The first are the specific responsibilities and tasks the biosphere organization will perform. Among these are projects trying to support a more sustainable environment, development of regional culture, and joint marketing, branding and tourism development. The second part is less concrete, but perhaps even more important. It's about new business development, adding new competencies and about how the region can prepare for the period after the boom in oil and gas. In this context, the support from the University of Bergen and from other research institutions is important. In addition, the biosphere project could contribute by adding an international focus to the region, by encouraging international collaboration and by finding new sources of funding for local projects.

Experience from other countries shows that most biosphere reserves acquire an extensive project portfolio - initiated both by the biosphere administration, by regional organizations and by the general population.



Trying to make Nordhordland the first Norwegian biosphere reserve means working for a more sustainable future. It is about what kind of world we want for our children. Photo: Modalen Municipality.

This application does not in detail outline how the new biosphere reserve should be and what activities it should focus on. This is basically an application to start a process. The real work does not start until UNESCO has given us clearance to proceed, based on our general suggestions.

But if we receive a positive answer to our application it commits us for years to come. Not necessarily to spend a lot of money, but to start developing the identity and the activities of the reserve with dedication and determination. You do not get any permanent status as a biosphere reserve. Being a biosphere reserve is a certificate of quality given on the basis of our strategy and on what results we achieve. If we do not live up to the requirements of UNESCO, we may lose the biosphere status.

Status as Norway's first biosphere reserve will make Nordhordland part of an international network. It will provide an opportunity to make us more visible, to develop our culture, our businesses and our identity.

Last year several UNESCO leaders visited Nordhordland. They are very supportive of our initiative. We believe that we will be able to add significantly to the international family of biospheres by building on our unique culture and our diversified resources. Because Nordhordland is a cross section of modern coastal Norway, we are well positioned and feel that we have a good chance of success - for the benefit of the people in our area and as a model for development in other parts of the country.

Modalen 09/01/2014



Knut Moe

Major, Municipality of Modalen

Leader, Nordhordland Biosphere Project

1 Introduction

This chapter provides an overview of the intended Biosphere area. There is particular emphasis on showing how the region may be said to represent the coastal area of Norway in general.

1.1 Overview of the Nordhordland Biosphere project

1.1.1 The Nordhordland Region

Nordhordland is the area between Bergen and the Sognefjord. Over the years it has contained different groups of municipalities, but today it consists of the nine municipalities, Meland, Lindås Austrheim, Fedje, Masfjorden, Radøy, Osterøy, Modalen and Gulen. The area has a population of about 45000. There is extensive cooperation between the municipalities in many areas. In the Biosphere project we have also included Øygarden and part of the municipalities, Vik, Høyanger, Voss, Vaksdal and Askøy. There are close social and cultural connections between these and the other nine, and historically they have been linked also administratively.

The variation in scenery is substantial, from the island of Fedje in the west, to Modalen at the head of Osterfjorden. Size and population vary a lot, but there are strong similarities between the municipalities, both geographically, historically and culturally. All municipalities also have close links to Bergen the nearest large town, and the municipalities have a common labor market based on the activity at the oil refinery and other related businesses at Mongstad. Since the oil adventure began in the seventies, Mongstad has been a center of growth, of migration and industrialization in a region that previously was characterized by fishing, agriculture, handicrafts and small industries.



Figur 1: The Nordhordland Region (Dotted area) is representative of the western Norwegian coastal landscape. Map: Kjersti Isdal.

1.1.2 From the ocean to the mountains

The proposed biosphere reserve extends from the oil field Troll on the Norwegian Continental Shelf, through coastal landscapes and fjords to the top of Stølsheimen (1300 meters above sea level) and then down to the Sognefjord. Based on the population of the municipalities we have the listed in 1.1.1 the will biosphere reserve has population of about 50 000. The area covers approximately 8250 km².

Nordhordland is a solid representative of the Norwegian west coast and in an international context as a demonstration area for much of modern Norway. The landscape is filled with contrasts - from the coast protected by a broad archipelago, large and small fjords and on through valleys and woodland up to high mountains



Figure 2: The planned biosphere reserve is designed as a resource profile from the oil field Troll in the west, to Stølsheimen in the east. Map: Peter Emil Kaland.

Until about 1970, Nordhordland was considered a relatively poor region. Most people had made their living from agriculture, fishing and crafts since time immemorial. Since agriculture was introduced to the area in the Neolithic people had to utilize all available resources along the ecological gradient: fishermen with smallholdings along the coast in the west; farmers with extensive dairy farming in the inner regions. The region has been important in building the Norway as a nation. The old parliamentary assembly of Gulatinget and the “Gulating-law” were part of King Magnus Lagabøte’s first national law; demonstrating the region’s major regional and national role in the Viking Age and in the Middle Ages.

Nordhordland has been selected as a pilot project because the region is a model area for both the historical and the modern coastal landscape of Norway. Development in society and in technology has made the region rich in important resources such as hydropower, petroleum and fish. The diverse landscape is a resource in itself.

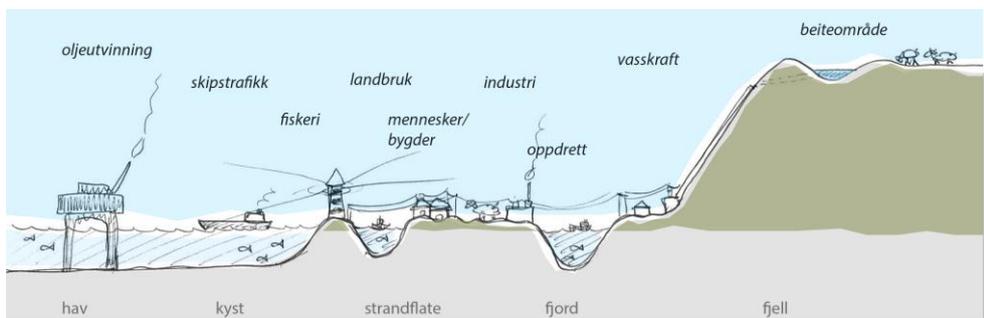


Figure 3: A cross section through the Biosphere reserve demonstrating how resources have been utilized from the sea to the mountains. Illustration: Kjersti Isdal.

Nordhordland Biosphere Reserve will focus on sustainable natural, social and economic development thus adhering to the new focus of the international Biosphere Program. Internationally there is more emphasis on safeguarding both biological and cultural diversity and to use this as a basis for an economic development that is both modern, sociocultural and ecologically sustainable.

The Norwegian West coast is a treasure trove for the nation, but this implies a great responsibility for the region in order to manage the resources so that future generations can benefit from them. In the future Biosphere Reserve it is therefore important to focus on how coastal Norway may tackle both environmental challenges and social development in a sustainable manner.



Nordhordland represents the Norwegian western coast with great natural and cultural assets

1.2 How can a Biosphere reserve contribute?

A Biosphere status **does not** lead to more conservation, restrictions or prohibitions in Nordhordland. On the contrary, the region acquires a set of tools which may be used to enhance internal collaboration, develop a greener environment and lead to a positive economic development. It is expected that the biosphere reserve will achieve results in the following areas:

- **Increased research on sustainable development.** The University of Bergen will actively follow up the biosphere reserve with a focus on environmental, health and social research in Nordhordland. Other research groups have indicated that they will follow suit.
- **New business development.** The region has a leading position in the development of technology and expertise in carbon capture and storage. It is a goal that this position shall be

maintained and strengthened. Research projects such as production of fish food from tunicates in Øygarden and utilization of waste heat and CO2 from the Mongstad refinery and TCM (test center for carbon capture) to algae production has the potential new products. Through the Biosphere Project, the region can take a position in green manufacturing. Getting the region a status as Biosphere Reserve, may give tourism a boost.

- **EU projects.** The close cooperation between the European Biosphere Reserves has led to many collaborative projects funded by EU. Nordhordland could take part in such cooperation.
- **Focus on common culture, nature and values.** It is crucial for the biosphere project to support local produce and the local farmer/fisherman culture, to preserve the cultural landscape and the traditions related to the use of this landscape.
- **Marketing and branding.** That Nordhordland will become the first Norwegian biosphere reserves, will in itself generate interest in the region. In addition, the biosphere project will provide an excellent foundation to develop a common profile for the whole region and to make it easier to build a brand based on the region's unique qualities.
- **Better quality of life - and proud citizens.** Experience from other countries shows that involvement in the Biosphere Program builds identity, strengthens local initiatives and supports cooperation.



Focus on common culture strengthens identity and pride. Photo from Håkonarspelet at Seim in 2011. Photo: Region Nordhordland.

1.3 About the pilot

1.3.1 The idea

The idea of a biosphere reserve in Nordhordland originates from 1996, when the Norwegian Research Council searched for candidates to a biosphere project in Norway. The national initiative was shelved, but the thoughts of a biosphere reserve in Nordhordland continued to flourish. Through an initiative from the University of Bergen in 2010, all the mayors affiliated with the Regional Council in Nordhordland + Øygarden were positive to start a project trying to develop a biosphere reserve in Nordhordland.

In 2013 the municipalities in Nordhordland decided to prepare an application to UNESCO in order to be the first biosphere reserve in Norway. The work is based on cooperation with the University of Bergen both on developing the application and on future research collaboration within the biosphere reserve. A steering committee for the project was appointed and a small working group took on the task of developing the application. The work is funded by the municipalities in the region, by grants from the University of Bergen and by support from local industry.

1.4 Goals

The objective of this pilot study is to make clear how a Biosphere Reserve may contribute to further development of the region, and what it takes for Nordhordland to meet the requirements to become a biosphere reserve based on UNESCO's guidelines.

The pilot project aims to create a basis for a following application for permanent status as biosphere reserve. If the Norwegian UNESCO Commission approves the pilot project, Nordhordland will be appointed a Biosphere Candidate. We will then proceed to develop the main application, which, through the Norwegian UNESCO Commission will be sent to the Norwegian Government. If the Government approves, the application from Nordhordland will be sent to UNESCO's ICC Commission in Paris for consideration. It is the ICC Commission who makes the final decision on whether to establish a Biosphere Reserve in Nordhordland.

1.5 Organization and methodology

The Regional Council of Nordhordland is project owner for the pilot project. Nordhordland Development IKS (NUI) is project manager. All the municipalities linked to the regional council of Nordhordland are participating in the project. These are the municipalities Austrheim, Fedje Gulen, Lindås, Masfjorden, Meland, Modalen, Osterøy and Radøy. Øygarden has joined the project, and from a scientific point of view parts of the municipalities Voss, Vik, Høyanger, Vaksdal and Askøy should also be part of the Biosphere Reserve.

The UNESCO Biosphere Program

UNESCO's *Man and the Biosphere* (MAB) program was established in 1971 to promote a multidisciplinary approach to management, research and teaching about a sustainable use of ecosystems and natural resources. The Biosphere Program differs from the World Heritage Program in that its purpose is to ensure a future positive, sustainable development of a region based on the region's own natural, cultural and economic conditions, whereas the World Heritage Program concentrates on taking care of unique cultural and natural heritage. In order to reach this goal, MAB is developing Biosphere Reserves. UNESCO's Biosphere Program is as much a general program for social development as an environmental program. There are presently 631 Biosphere Reserves in 119 countries, with 231 reserves in 34 countries in Europe alone. Nordhordland could become the first Norwegian Biosphere Reserve.



We need to manage the resources for the benefit of future generations. Photo: Kjersti Isdal.

We will keep working on integrating these municipalities. The University of Bergen is an active partner and supports the project academically and financially. Bergen University College is informed about the project and we aim to include the college in the project. The project is supported by Hordaland County Council which has allocated funds for the pilot phase of the project and by The County Governor who has allocated funds for this prequalification application.

The steering committee is responsible for strategy. This is a group of 8 people from politics, university and regional authorities representing the municipalities Modalen and Masfjorden, The County Governor, Hordaland County Council, The University of Bergen, an environmental organization and industry (BKK).

A 4 person working group is responsible for the day to day project work:

Kari Evensen Natland (project leader) Nordhordland Utviklingsselskap IKS
Kjersti Isdal (adviser), Nordhordland Utviklingsselskap IKS
Peter Emil Kaland (academic coordinator), University of Bergen
Arne Abrahamsen (communications adviser), Nor.PR

This group will be supplemented based on need for expertise and manpower.

Through the pilot project we will develop a comprehensible documentation of Nordhordland, the region's natural and cultural values, resources, population structure and businesses. We will make it clear in what way Nordhordland may fulfill the three main criteria of the Biosphere Concept: *protect, support, and develop*.

Merknad [AA1]: PEK: Riktige ord?

2 Biosphere Reserves – implementing sustainable development

Most people know of UNESCO's World Heritage program, and Norway has several World Heritage sites. But the Biosphere program is not well known in Norway. UNESCO's «Man and the Biosphere» (MAB) program is well developed in our neighboring countries, and is highly appreciated especially because of the environmental challenges the world is facing.

2.1 What is a Biosphere Reserve?

2.1.1 Biosphere Reserves

A Biosphere reserve is a well-defined geographical area where one facilitates a sustainable development. The aim is to achieve a sustainable balance between conserving biodiversity and natural resources, promote economic development and ensure a positive development through cooperation between the local communities, local and regional authorities, private industry and research institutions.

A Biosphere Reserve should have **significant natural and cultural values** and contain some protected areas. The area should be **representative of a larger type of landscape and / or marine area** so that the results from the biosphere project can be used in other parts country. For this purpose the Biosphere Reserves shall develop innovative methods for sustainable development, test them and share the results nationally and internationally. The work requires close cooperation between stakeholders in the local community and commitment from the participating research institutions and from regional authorities.

The word **biosphere** refers to everything on land, in the water and in the atmosphere that sustains life on Earth. In a Biosphere Reserve one aims to developed practical methods in order to find a sustainable use of the resources. The reserves are centers for community-based initiatives that protects our natural environment while ensuring a healthy economic growth.

Local initiative

It is normally the local community that nominates a Biosphere Reserve. The application is then ratified by a national UNESCO committee, nominated by the government and finally accepted by UNESCO's Executive Board for the MAB-program. A Biosphere Reserve attempts to develop innovative solutions for living and working in harmony with nature. One of the primary goals for the MAB program is to work for a sustainable balance between maintaining biodiversity, promoting economic development and preserving the region's cultural heritage.

The most important tool for the biosphere reserves are an active **dialogue** between different players in the local community. Worldwide, this has proved to work extremely well. Many biosphere reserves have focused on local identity and developed local products, making everybody **proud** of their local community.

Since a Biosphere Reserve need two keep up with changes in social and environmental conditions, the focus of the project may change over time. But work at all Biosphere Reserves is based on these fundamental principles; **develop** the sustainability of the local community, **preserve** biodiversity, natural resources and cultural heritage, and **support** knowledge development and local practice. All Biosphere Reserves need to have a protected core areas (A natural- or cultural protected area) and what is called «buffer zones» (Areas where protection is voluntary and less strict). Everything else is designated «development areas».

Control over land and water are **not** changed when a biosphere reserve is created. The status does **not** mean creation of new protected areas nor restrictions of the rights of the citizens to their properties.

No new protection

UNESCO requires that a Biosphere Reserve shall contain some protected areas. In practice this means that you use the protected areas that already exist in the area when developing a new reserve. Developing a new Biosphere Reserve does not mean new conservation and does not change the rights of the citizens to their properties.



The beech wood in Seim is the northernmost in Europe. Photo: John Y. Larsson.

2.1.2 How the MAB-program has developed

The start of the MAB program was the international research program IBP (International Biological Program 1964-1974) with a wide range of major environmental research projects focusing on "*The biological basis for productivity and human welfare.*" The research revealed how important human resource utilization was for the development of ecosystems. UNESCO accepted this as a major global challenge, and established the MAB program in 1971.

Initially the MAB program focused on research issues relating to protection of the environment. As a result, there are numerous national parks and wilderness areas included in the program. In the seventies the Scandinavian countries created biosphere reserves based on these premises. Norway created one area in the Northeastern part of Svalbard, Sweden one in Lapland and Denmark one in Northeast Greenland.

In 1987 the Brundtland Commission argued strongly for sustainable development where people's use of natural resources are put into an economic and social context. The Commission pointed out that "*resource utilization, investments, technological development and institutional changes must be in harmony with each other and take into account human needs and expectations, both present and future.*"

The MAB World Congress in Seville in 1995 built on the recommendations of the Brundtland Commission and established a new set of objectives which were adopted for new biosphere reserves ("*The Seville Strategy and The Statutory Framework of the World Network*"). New criteria were established in order to ensure that the guidelines of the program were followed. Regular evaluation of biosphere reserves are now mandatory. Consequently, many of those who were established in the 1970s and 1980s, later pulled out of the world network or they were redefined so that they would follow the new guidelines. Both the Norwegian and the Swedish biosphere reserves were withdrawn.

The World Congress in Madrid in 2008, focused on the accelerating climatic changes, the rapid urbanization as a driver of environmental change and on the accelerating loss of biological and cultural diversity. These challenges are included in the "*Madrid Action Plan for Biosphere Reserves (2008-2013).*"

All important decisions in the MAB program is taken by an international committee: "*MAB International Coordinating Council (ICC).*" The 38 members of the ICC are governmental representatives who are elected for a four-year period of UNESCO's General Conference. The secretariat for the MAB program is located in UNESCO's headquarters in Paris.

Concern for man-made environmental hazards, especially after the turn of the millennium has led to an increased interest in the MAB program. The world-wide network of biosphere reserves (WBRN) now consists of: 631 biosphere reserves in 119 countries, including 12 cross-border areas. In Europe, there are 231 biosphere reserves in 34 countries. In the Nordic countries (Sweden and Finland) 7 biosphere reserves are established. In Norway, there are several local initiatives working to establish biosphere reserves, and the Norwegian National UNESCO Commission has taken an initiative to create a Norwegian MAB Committee.

2.1.3 Biosphere Reserves in Norway

Inspired by UNESCO the Norwegian Research Council in 1989 established a committee for prioritization of research for new biosphere reserves in Norway. The Committee stopped its work in 1998 without having established any new biosphere reserves. But The Heathland Center on Lygra in Nordhordland was already involved in the committee's work in 1996 as possible core area of what could be a new biosphere reserve in Nordhordland. After the committee was terminated, the management group of the Heathland Center continued working on how to realize a biosphere project.

The actual work on the application did not begin until October 2009. At that point the UNESCO Commission set up a meeting at the Ministry for Education in order to establish a new MAB project in Norway. At the meeting the representative from the University of Bergen presented a rough plan for developing a biosphere reserve in Nordhordland. This was accepted. In September 2010, the UNESCO Commission organized a Nordic symposium at the University of Bergen focusing on the historical development of the MAB program and the establishment of biosphere reserves in the region. Following this the Regional Council in Nordhordland saw the possibility of establishing a biosphere reserve in the region.

In October 2010, the plan was submitted to the Swedish MAB group, who later has provided valuable support in the planning process. In 2011 the project was presented for the MAB-organization in Paris, and in 2012 and 2014 the head of EuroMAB visited Nordhordland. The plan has also been presented in several relevant scientific fora internationally, including the EuroMAB Conference in 2013. The project is supported by all the municipalities in the region, by Hordaland County Council and by the County Governor of Hordaland.



13. June 2013 the Regional Council signs a cooperation agreement with the University of Bergen, from left in front: Regional Council Chairman Jon Askeland, County Governor Lars Sponheim, and Rector Sigmund Grønmo. Photo: Region Nordhordland.

In 2013 The Nordhordland Regional Council signed a cooperation agreement with the University of Bergen on the development of an application for Nordhordland Biosphere Reserve and on future research on sustainable development in Nordhordland. The Regional Council has established a working group and a steering committee for the project. The municipalities in Nordhordland, Hordaland County Council, the University of Bergen and Grieg Foundation has funded the development of this application.

3 Regional development through 100 years

The biosphere project will contribute to a sustainable development in Nordhordland. The goal is to build on build on the region's natural, economic and cultural foundations. We will therefore briefly describe the development of the region through the last 100 years.

3.1 Part of modern Norway

The last hundred years Nordhordland has evolved from being a marginal region with smallholders and fishermen to where it today is an important part of modern Norway. The technological development has made it possible to utilize natural resources that were previously inaccessible. The hydropower resources in Nordhordland has provided some municipalities with substantial revenue, and the discovery of oil and gas on the Norwegian Continental Shelf has produced an industrial adventure with enormous impact for the region. But success has also brought challenges especially for traditional agriculture which has to compete with good salaries in the industry.

3.1.1 Traditional use of the resources at the coast and in the fjords

In the early 1900s the primary industries were still the main source of income for the population, although additional industry gradually became more important. Most people lived on farms, but it was the resource base which decided whether agriculture or fishing was most important. In the western heath land region fishing was the main occupation, but while the men were at sea, the women and children ran the farm. The combination of fishing and a small farm with a few cows and sheep supplied a secure base for the family and a sufficiently varied diet. You did not need a large farm in order to survive, and the sum of the resources on shore and in the sea provided the basis for a relatively high population density.

In the fjords fishing was part of the household economy, but the topography and climatic conditions with slightly higher summer temperatures allowed for better conditions for farming. While the outer districts could have the sheep grazing year round, colder winters and snow in the fjords meant that all livestock had to be kept inside. On the other hand, the peasants in the fjord regions had forestry and well producing pastures in the valleys and in the mountains. The forest provided timber and twigs that could be used for fodder as well as wood both to heat their own houses and for sale. Farms both west and east of Stølsheimen had out farms in various distances so that they could both use the mountain pastures in summer and harvest grass from small fields in the valleys. In autumn there was hunting for deer and reindeer which provided an important supply of meat.

There was extensive cooperation between the population in the outer coastal areas and in the fjords. On the coast there was a surplus of fish which were traded for timber from the villages in the fjords. The vast summer pastures in the mountains made it possible for the population in Modalen and Masfjorden to accept cattle from the outer coastal landscape that did not

have such plentiful summer grazing. In winter it was the opposite. Then the heathlands of the outer coast was used for grazing. This allowed more animals from the fjord villages to survive the spring feed shortage.



Nordhordland used to be a region of fishermen/farmers. There were many small farms, where fishing and smaller industry gave additional income. The mild winters in western Norway makes it possible for free range sheep to graze all year. The old breed of sheep was almost extinct but is currently very popular. Photo: The Heathland Center.

In the latter part of the 1800s the growing population led to greater need for supplementary income, and this accelerated in the 1900s. The farmers from Nordhordland and coastal Sogn had Bergen as an important market for fish, agricultural produce and handicraft. In addition, Nordhordland had many skilled carpenters who commuted to Bergen and participated in the construction of new buildings both before and after the great fire in 1916.

The technological development and more efficient farming led to major changes in coastal Norwegian agriculture in the 1900s. Farm work required less time than before, and the demand for a higher standard of living made it challenging to live from the farm alone. Today, many farms have closed down and people get their income from other sources. This has led to the traditional cultural landscape being replaced by forests and bush – especially outlying areas that previously were grazing for animals. The richer fields are still mostly used for grazing or for fodder. Many of today's farms consists of fields from several older farms – so that each producing unit is sufficiently large.

Some of those living on small farms, combine paid employment with raising sheep. In this way it is possible to keep the fields healthy. Old Norwegian sheep (wild sheep) are becoming more and more popular, they mostly manage the lambing themselves and utilize pastures even better than Norwegian white sheep. The milieu based on breeding this kind of sheep has grown, and products like sheepskin, wool and «wild sheep meat» has become popular.



Protected coastal waters between Bergen and Sogn through Nordhordland, here at Alverstraumen. Photo: Peter Emil Kaland.

3.1.2 Developing communications

Through the ages, the sea has been the most important mean of communication for the population in the biosphere reserve. The protected coast with a myriad of small and large islands made it safe to cross by boat, even when strong winds made voyages at the open sea impossible. In this way the coastal waters from Bergen to Fensfjord and further towards Gulen and the Sognefjord has always been a safe thoroughfare from the villages in the biosphere reserve to Bergen. There was indeed so much traffic that in the 1700s there were built inns at various points along the route so that travelers could get accommodation

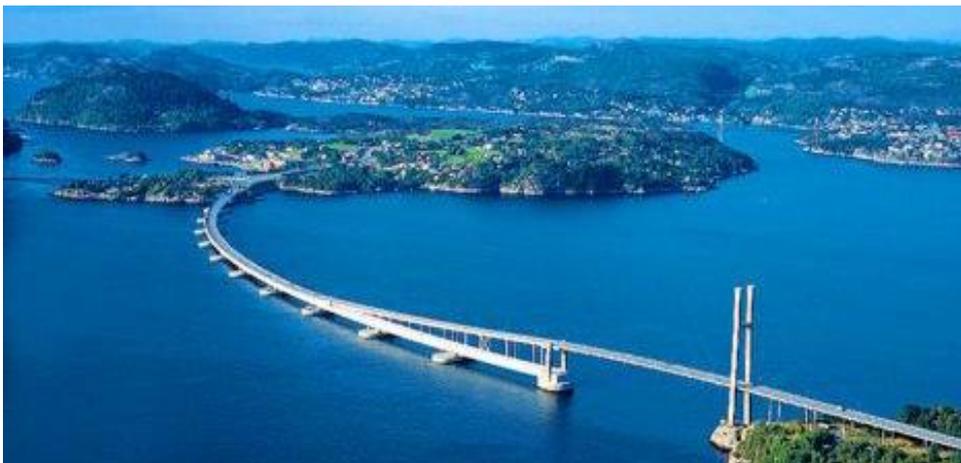


Fig. 3: The roads in Nordhordland about 1900, with the postal route to Trondheim. Red line: main road, white line: local road, blue line: the coastal route. Map: Sverre Mo.



Fig. 4: The roads in Nordhordland in 2013. Red line: main road, white line: local road. Map: Sverre Mo.

In the early 1900s the network of roads was badly developed in Nordhordland and in the western parts of Sogn, but the need for secure mail delivery along the coast from Bergen to Trondheim had already from the 1780s led to the construction of a main road which was connected to boat transport from Bergen through Nordhordland and Sogn. As shown on the map there were also some local roads in Meland, Radøy, Lindås, Osterøy and Modalen whereas the western part of Sogn and the outermost islands in Nordhordland did not have any roads at all.



The Nordhordland Bridge, opened in 1994, has been an important infrastructure project for developing the region. The traffic in the first year was about 6,000 AADT (average annual daily traffic) and has now increased to about 16,000 AADT.

The network of both main roads and local roads was gradually developed in the 1920s and 1930s, but the major road building leading to significant increase in the car traffic did not take place until the 1960s. In the next decades the roads got higher standards. New ferry-connections were established, bridges and tunnels were built. This changed the pattern of communications from sea to land. But even at sea the means of transport changed after 1960, with the introduction of fast hydrofoils and catamarans. The changes in communications and infrastructure is the foundation for the major changes in business and employment happening after 1960, and even for changes in the municipal structure.

The Nordhordland Bridge, which made the region accessible from Bergen, opened in 1994 and has meant a lot for the labor market and for where people chose to settle. Several major road projects are being planned - both local road improvements and not least tunnels from the Nordhordland Bridge to Åsane. Improved communication has led to increased influx of people and this will move northwards with the tunnel in place.

3.1.3 The municipalities in the biosphere reserve

In the early part of the 1900s there were 22 municipalities within the biosphere reserve. It is important to note that the boundaries between the municipalities were not limited by the sea.

The new municipal structure in Norway was adopted in 1964. For the coastal regions the new boundaries take into account the ongoing changes in communications from sea to road, and there are minimum requirements for the size of the population and the area of the municipalities. For the biosphere reserve this meant a reduction to 13 municipalities with large

changes in the boundaries between municipalities. Only Fedje municipality has its original boundaries. While municipal boundaries before 1964 was based on the sea, the new municipal structures is based on roads as a means of communication.

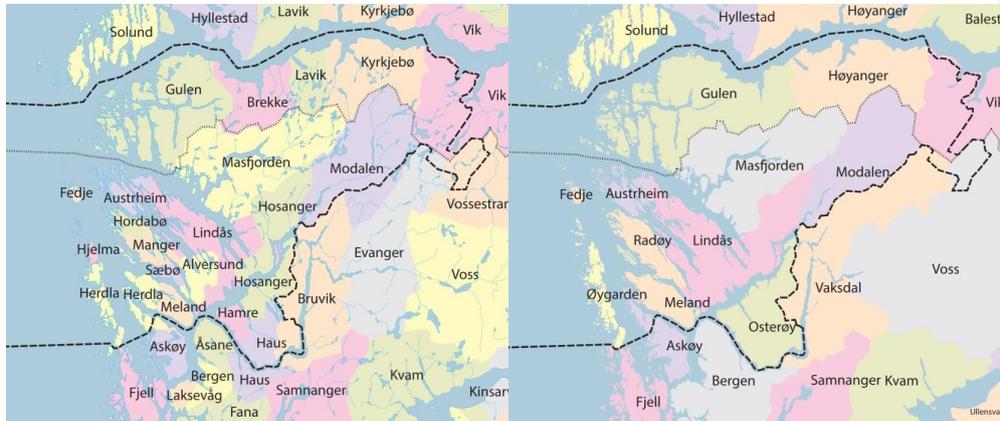


Fig. 5: Municipal structure in Nordhordland before 1964. Map: Sverre Mo

Fig. 6: municipal structure in Nordhordland after 1964. Map: Sverre Mo.

3.1.4 Cooperation between municipalities

Establishing Nordhordland Kraftlag (A municipal hydropower company) in 1920 is the start of a highly successful inter-municipal cooperation.

The discussion about the changes of municipal boundaries in the 1950s and the 60s made the municipalities in Nordhordland created Nordhordland tiltakskontor in 1961 a communal development company that subsequently continued as The Regional Council for Nordhordland and Gulen. Today The Regional Council of Nordhordland is a political arena for discussing and deciding common issues, and Nordhordland Development IKS is created as an administrative body organized to take care of intermunicipal projects. Nordhordland Development handle tasks which are of value to the whole region, for example within transportation, health and IT. Regional cooperation has been a strength for Nordhordland and has been important both for the internal dynamics of the region and for driving common tasks such as developing better roads from Nordhordland towards Bergen.

Most probably the cooperation between the municipalities will strengthen in the years to come. There is now organized a municipal structure project in order to evaluate a possible merger between some or all of the municipalities and the region is building a joint Health Clinic (Helsehus).

The stated goal of this cooperation is that *"Nordhordland shall be a good place to live and to work."*

3.1.5 Business and industry

Business and industry in Nordhordland region has developed partly as a result of natural conditions, partly in response to the needs of the nearby town of Bergen. As an example, Bergen urgently needed sand and cement in order to build roads. The large natural deposits of sand along Osterfjorden, in Modalen and in Matre made for a large activity and good incomes for both owners of the sand deposits and of the vessels that transported sand to the city.

Efficient sea transport has been a key to the development. During the last hundred years there has been tanneries, dairies, grain mills, sawmills, canneries and shipyards. All these needed transport of their products to market. There are currently only sporadic traces of these businesses, but they have all been important both for the development of residential areas and for the region's culture and identity.



The mountain in the inner parts of Nordhordland is supplying the region with renewable energy. Dam at Krokvatnet in Masfjorden. Photo: BKK.

An important factor for the economy and for the regional business is the extensive hydropower development that has happened in the mountains in the biosphere reserve. Revenue from the hydropower industry is of great value to many of the municipalities in the biosphere reserve.

The 1960s marked a major restructuring of the businesses in the region. In the decades that followed, the proportion of farmers and fishermen declined sharply, while trade and service industries increased. In addition, women entered the workforce. The biggest difference however, was the construction of an oil refinery at Mongstad in 1974 and the subsequent oil and gas terminals at Sture and Kollsnes. With this Nordhordland got its share of large industrial companies and the region became a driving force in the world of industrial both within the region and on the West Coast in general. Building on the oil and gas facilities, a large number of high-tech and service companies have been established.



The oil refinery at Mongstad is the largest in Norway. Next to the refinery there is an advanced test center for carbon capture and storage (CCS). Photo: Bergens Tidende.

Fishermen and farmers, and traditional crafts is history. The primary industries are no longer the central source of income in Nordhordland. The work force is now primarily engaged in manufacturing and in the service industries, with Knarvik and the industrial areas Mongstad and Sture/Kollsnes as the major "labor magnets".

Today the region has activities in a wide variety of industries. The main industry is oil and gas; with both onshore and offshore activities. At Mongstad there is presently about 100 different businesses with approximately 2,300 employees. Here is Statoil's oil refinery, supply base, port functions and various industrial companies. TCM Mongstad is a major center for testing and developing technology for CO₂ capture. Øygarden has the Kollsnes gas processing plant and the oil terminal at Sture.

The hydropower industry is important, not because the business employs so many, but because it generates a lot income to the municipalities in the region. The last major industry is aquaculture, which has been growing significantly in recent years and which will probably be even more important in the years to come. In addition, the region has different kinds of manufacturing plants, both large international companies and smaller national ones. The region has a lot of construction companies, trade and services are quite significant, and there is some tourism. For the latter has a large potential for growth.

3.1.6 Patterns of settlement

The wide spread settlement which was often tied to the limited farming areas, has over time lost its original function. It has been replaced by more concentrated and larger village centers connected to the national network of roads as this has been evolving. The regional center Knarvik, established in the 1960s, is a good examples of this. Bu Nordhordland still has many well-functioning villages and rural centers. Road building has made the distance to peoples place of employment shorter, no matter where one lives in the area.

Most municipalities, especially in the south, has had population growth in recent years. Altogether there are currently approximately 50,000 people living in the biosphere reserve and the number is expected to increase to between 60 and 70 000 inhabitants by 2040. If the region shall be able to control this growth, it must start preparation now.

Municipality	Year 2000	Year 2010	Year 2014	Progn 2020	Progn 2025	Progn 2030	Progn 2040
1252 Modalen	354	344	372	408	430	453	469
1253 Osterøy	7 006	7 421	7 786	8 423	8 967	9 442	10 182
1256 Meland	5 353	6 631	7 544	8 913	10 044	11 055	12 753
1259 Øygarden	3 623	4 267	4 704	4 822	5 044	5 230	5 456
1260 Radøy	4 585	4 825	5 039	5 521	5 845	6 106	6 418
1263 Lindås	12 492	14 286	15 069	16 468	17 491	18 368	19 635
1264 Austrheim	2 527	2 738	2 833	3 340	3 655	3 926	4 283
1265 Fedje	682	594	561	520	492	470	439
1266 Masfjorden	1 774	1 635	1 693	1 763	1 818	1 867	1 914
1411 Gulen	2 489	2 302	2 315	2 328	2 359	2 386	2 428
Total	42 885	47 053	49 930	54 526	58 170	61 333	66 017

Figure 7: The table shows population growth and forecast in Nordhordland (incl. Øygarden) between 2000 and 2040. Source: SSB.

3.1.7 Education

The many small schools from the years around 1900, which were built within walking distance from settlements and villages, are gone. The new schools and the after-school facilities have been constructed in central areas and you need a car to get there.

Nordhordland has three secondary schools with a wide curriculum. The region also has two Folkehøgskoler (folk high schools), focusing on tourism and music. The nearest center for higher education is Bergen.

3.1.8 Cultural activities

Nordhordland has a long tradition of local cultural activities directly related to the rural communities. This is exemplified by a diversity of clubs and associations. Small local cultural houses were natural meeting places in the past. Many of these are still important, demonstrated by the active amateur cabaret groups in Nordhordland. Even so, there is a strong wish to build a community cultural center that may unite all the cultural activities, and at the same time showcase the cultural heritage of the region.

Brass bands has a special position in Nordhordland, with two corps (Eikanger Bjørsvik and Manger musikklag) competing at the highest level both in Norway and in Europe. The region offers a large varieties of sports activities.

The region has a lot of festivals that attracts a lot of people. The main events are Knarvikmila, Havsportveka, Utkant-festivalen and Kraft Spela. Kystsogedagane is also very popular.

3.1.9 Tourism

The first tourism in Nordhordland was linked to the many small inns along the inner costal waterway. This waterway has been used as main transportation artery between the southern

and northern Norway for hundreds of years. There are several cultural heritage sites connected to the active transport of cargo with a plethora of coastal inns and excellent harbors. In the early part of the 20th century many families in Bergen spent their summers at farms «in the country». The farms vacated their rooms and the people from town got an exotic and exciting vacation. Later in the century the visitors from town built their private summer cabins in the region. These are primarily used in summer. Traditional tourism has never been important for Nordhordland and most of the businesses are small. But there are several hotels, inns, campgrounds and a varied range of organized activities related to culture and nature.

The stunning coastline and the friendly archipelago makes Nordhordland an Eldorado for activities related to the sea. In summer the conditions are excellent for touring with small private boats and there are quite a few organized guest harbors. You can also rent boats and explore nature and ocean. Havsportveka (The Ocean sport Week) is focusing on developing this potential.



Nordhordland offers many activities related to the sea. With kayak one gets in close contact with nature. Photo: Region Nordhordland.

Nordhordland is a paradise for hikers. Stølshimen is the mountainous area between the Sognefjord in the north and the Bergen Railway in the south. It stretches from the ocean in the west to the Nærøyfjord in the east. The area gives you a powerful and diverse mountain scenery towering over deep fjords and ending in rounded blue-gray bare rock in 1200-1300 meters altitude. There are many cabins owned by The Norwegian Tourism Organization (DNT) and a network of well-marked trails in a beautiful scenery. The North Sea Trail and The old postal road to Trondheim are good examples of hiking trails in the cultural landscape. It is easy to find good tour guides and route maps for many of the municipalities in Nordhordland.

There are several well-established attractions in Nordhordland such as The Heathland Center (Lyngheisenteret), The Western Norway Emigration Centre, the Gulatingstaden the oldest and

largest parliamentary assemblies in medieval Norway, and Fedje - the island in the middle of the ocean which is an attraction in itself. Nordhordland reiselivslag, a regional tourism organization, was established 1987, but temporarily closed down 2012 as part of a plan to reorganize this type of destination organizations into larger units.



In Øygarden you find a traditional coastal culture. Photo: The coastal Museum in Øygarden.

3.1.10 Conclusion

Nordhordland is a good example of what has happened with small communities along the Norwegian coast in the past 100 years. The region has seen a rapid development of the old farmer and fisher community to the current situation with a variety of businesses, ranging from trade to heavy industry.

Today Nordhordland is a growth region, integrated with Bergen and the other municipalities around the city. The employment situation is good, the environment safe. It is a good place to raise a family with a rich organizational life.

The infrastructure and the communications that ties the region together, is getting better. Geographically and socially Nordhordland is still **one region**, but it is a region that is very different than it was 100 years ago.

4 The three functions of a UNESCO biosphere reserve

In order to obtain status as a biosphere reserve a region need to fulfill the three central regulations set out by UNESCO: "conserve, develop and support." In this chapter we will demonstrate how Nordhordland may fill these guidelines.

4.1 Conserve

«Protecting cultural diversity and biodiversity, including genetic variation, species, ecosystems and landscapes and securing services provided by such diversity»

The Nordhordland biosphere reserve has a magnificent and varied landscape that has been utilized by the local population from the end of the ice age to the present day. The vast ocean areas to the west, the wide archipelago of large and small islands and the fjords make up the characteristic landscape of Western Norway. The biosphere area is planned as a profile starting in the ocean to the west through the coast and the fjords, over mountains and down to the Sognefjord. With such a profile, all important ecosystems - sea, rivers and inland waters – as well as the two main types of landscape – the open heathlands and the inland valleys - are represented.

The biosphere reserve is characterized by a great variety of inlet systems. In addition to the large Sognefjord there are many small fjords with a gradual change in the salt content of the water from the mouth of the fjord to the inner waters, with a great variation in biodiversity, both with regard to flora and fauna. A good example is Osterfjorden with an arm stretching east into the Mofjorden. Here the fjord meets the river Movassdraget which has its catchment area in Stølsheimen.

There are strong research interests in two of the fjords. Masfjorden is a small fjord that is very similar to the major Western Fjords. Therefore, marine scientists have used Masfjorden as a model environment and has conducted major research projects studying both the general environment and the fauna. Lurefjord between the Lindås Peninsula, Fosnøy and Radøy can best be characterized as a marine lake, because the outlet towards the surrounding fjords is through narrow straits with strong tidal currents. From the Lurefjord there are other narrow inlets leading to a system of small inlets and bays with powerful changes in the salinity of the water and very high biodiversity. In one of the bays there is a local type of herring tribe with an extra high value for research on herrings in general. The Lurefjord (approximately 47 km²) with its system of inlets are among the highest prioritized marine environments in the national plan for marine protection which is being developed by the Ministry for Climate and the Environment. In sum the diversity of large and small inlet system within the biosphere reserve is a very important resource for marine research, and this area is among Norway's most surveyed waters.



Photo 1950 of the farm Havrå. The farm is conserved in its original form with the myriad of plots and small fields shown on the photo. Photo: Sigurd Angell.

Nordhordland has areas with **valuable types of landscape**, both from a biological, ecological and cultural perspective. There are areas set aside as national conservation areas, in order to keep these values for future generations. The goal of the protection is to preserve biodiversity and to make sure that traditional knowledge is not forgotten in the future.

A good example is the steep farm Havrå on Osterøy, one of the best preserved cluster farms of western Norway. Here one continues with an almost authentic way of farming parts of the infields through the Foundation Havråtunet, which is administered by the Museum Centre in Hordaland. The farm was the first area in Norway which was protected under the Cultural Heritage Act §20.



© Arnt Flatmo 2004 Osterøy.com 2007

The cluster farms at Havrå – one of the best preserved in Western Norway. Photo: Arnt Flatmo.

It is the mixture of old cultural landscape, areas with large biological value and a well-functioning modern society that makes the proposed biosphere reserve valuable from a national

perspective, as a model area for the western coast of Norway.

There are 49 areas protected by the Nature Conservation Act (Fig. 8, Appendix 1) for various biotopes within the biosphere reserve. This includes the marine protected area in Lurefjord that is being considered as a protected area by the Ministry of the Environment.

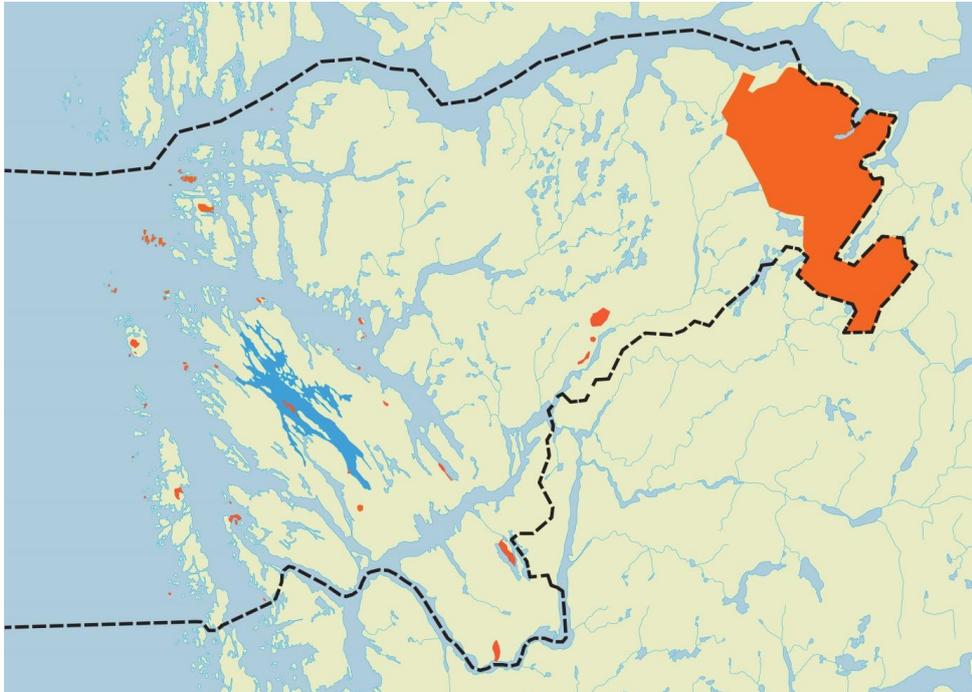


Figure 8: Overview of protected areas in Nordhordland by the Nature Conservation Act and the Cultural Heritage Act. Red are protected areas on land, dark blue is the planned marine conservation area in Lurefjord. Map: Sverre Mo.

The biggest protected area is **Stølsheimen Landscape Area** (337 km²) which make up the central part of the mountains west of Vikafjellet. Within the area there are 56 mountain farms where local people west and east of Stølsheimen have used the mountain for summer grazing. Keeping animals at the summer farms created a special landscape. There are the old buildings surrounded by fields which were marked by heavy grazing, and the vast areas where you had a much lower grazing pressure but where grazing nevertheless has set its mark on the vegetation.

The need for energy to heat houses and for cheese production badly affected the birch wood and led to a significant lowering of the tree line. During the last century, the traditional mountain farm husbandry ended, but even today many mountain farms are used as grazing areas for sheep, goats and cattle that are not being milked.

Another characteristic landscapes are the coastal heathlands. Life on the coast is presented at the Coastal Museum (Kystmuseet) in Øygarden and at the Heathland Center (Lyngheisenteret) on Lygra. Kystmuseet portrays the coastal culture of the western part of the biosphere reserve. The museum places particular emphasis on fisheries and sea-related tasks, and display items that have been important for the culture in Øygarden.



Summer mountain farm Solrenningen Stølshøyen conservation area. Photo: Mons Kvamme.

Another initiative aimed at maintaining biodiversity in the coastal landscape and preserve knowledge of the operation of coastal heath is The Heathland Center on Lygra. Here the coastal heathlands are maintained as authentic as possible, integrated with traditional farming at five local farms. The center works closely with the University of Bergen and is part of the Museum Centre in Hordaland. The national action plan for coastal heathlands are being developed by the Ministry for the Climate and the Environment. The Heathland Center on Lygra and Lurekalven are central to this initiative.



The Heathland Center on Lygra is a living museum working to preserve coastal heathlands, a type of landscape that was common along the coast, but today is being covered by trees. Photo: Peter Emil Kaland.

Merknad [AA2]: Usikker på hvordan vi kan få lagt inn korrekt tekst på dette bildet.

Sæbø Landscape Park is situated in a special cultural landscape by Sæbøvågen in Radøy municipality. There you will, among other things, find a multitude of walks and marked trails around Solheim hill. There is currently little activity in the project, but it will later fit excellently into a biosphere reserve.

There are also areas that have status as **biodiversity areas**, or which has been set aside for various purposes in the municipal plans such as **supervisory zones** and recreation areas – aimed at protecting the assets in the area. Governmentally appointed **recreation areas** are areas that have been secured for recreational purposes, contributing to human welfare and public health.

The landscape of today is the result of a long process created by both natural development and human influences. Within the biosphere reserve there are more than 800 historical relics protected by the Cultural Heritage Act. They tell the story of how people settled the area, of how they have used local, natural resources and of their level of activity. Ancient remains are part of the cultural heritage and are important for the local communities in the area. The map (see figure 9) shows the dense settlement along the coast through the older and the younger Stone Age. Graves, dwellings and other traces of agriculture also testify to a high level of activity throughout the Iron Age. It is interesting that there are fewer prehistoric sites in the fjord district east of Fensfjord. The blue dots on the map show the large number of summer farms in Stølshøyen. Archaeological and vegetation historic investigations of mountain farming in other areas in western Norway have documented that these summer farms have been utilized for at least 2,000 years. We believe that further studies will demonstrate that a large proportion of the farms in the biosphere reserve can trace their origins to prehistoric times.

Merknad [AA3]: tilsynsområder

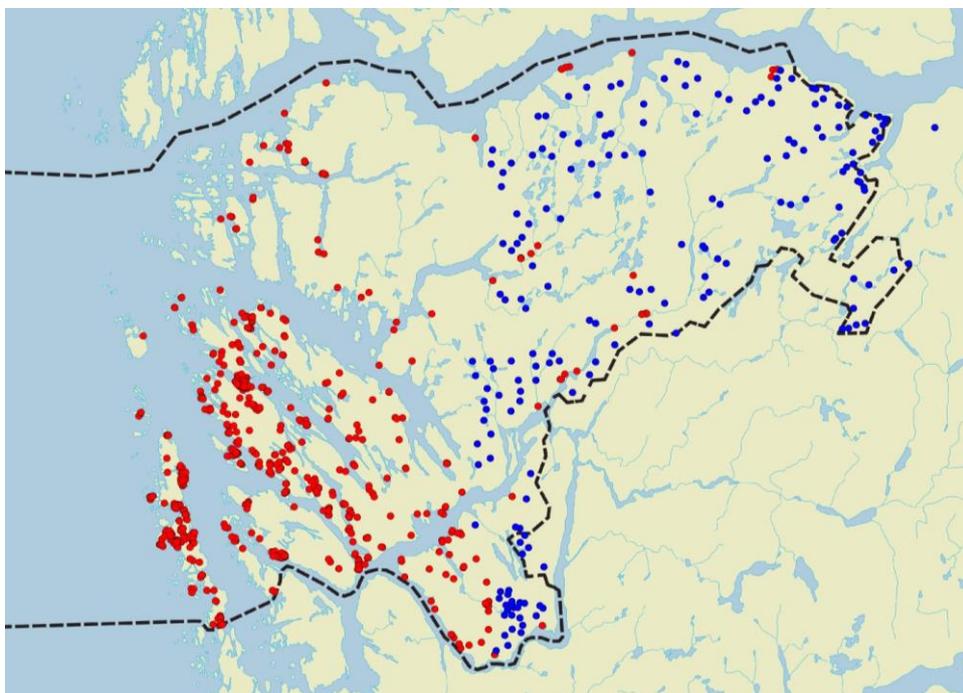


Figure 9: Overview of historical sites and summer farms in Nordhordland. Red dots: Relics. Blue dots. (NB: We miss complete data on summer farms in Masfjorden, Gulen and parts of Lindås). Map: Sverre Mo.

Eivindvik in Gulen, where the old parliamentary assembly Gulatinget was located, from the end of the 800s and up to about 1300, is a treasure of great value to Norway as a nation. The oldest legislation in Norway – *The Gulating Act* - was created here. Gulatinget was first a parliamentary gathering where all free men could meet. Later Gulatinget became a representative law- assembly where delegates were representatives from their district. In the beginning the laws were conveyed orally from generation to generation of lawyers mainly men, but at the end of the 1000 century, they were written down. The Gulating Law became the inspiration for Magnus Lagabøter who created his national law in 1274. The Gulating Act were also applicable in the Faroes, and Norwegians who moved to the Island took along the Norwegian parliamentary tradition. There was also a parliamentary assembly on Lygra in Lindås, which was part of the royal estate at Seim.



This illustration by Bernt Kristiansen interprets how Gulatinget took place in the past.

4.2 Develop

"Promoting economic development and social development which is socio-culturally and ecologically sustainable"

(Indicate the potential of the proposed biosphere reserve the meet that goal)

Sustainable development and sustainable value creation is described among other places in the Norwegian Parliament's message number 7 (2008-2009) *An Innovative and Sustainable Norway*, pointing to three areas where we have to work in order to achieve sustainable development. These are environmental, economic and social conditions. As a basis for the description of how the biosphere reserve can contribute to sustainable development of the region, we have chosen the goals Nordhordland Development IKS has set for regional cooperation:

- *We will strengthen the quality of life for those living here*
- *Create «a good life» with leisure, work and good health*
- *Strengthen the collaboration between the region and the outside world*
- *Economize on the use of public resources*

- *Contribute to development and environmental protection*

Politicians in Nordhordland want to develop a plan (intermunicipal plan for social and economic development) for how Nordhordland region can become an even better region with a greater emphasis on more sustainable environmental and social development. They also want to promote the Nordhordland region in a better way. The area has a multitude of businesses and other stakeholders - important for the socio-economic development of region. The region has the possibility of being in front in terms of sustainable development in Norway. Within this framework the biosphere reserve will try to help the region achieving the overall goals.

Many of the businesses in Nordhordland are based on commercial use of the area's natural resources. Either directly (hydropower, oil, agriculture, fishing, etc.) or indirectly (experiences, tourism). By focusing on long-term sustainable use of these resources, the area's economy may be strengthened.



The value of the cultural landscape needs a thriving agriculture industry. Here from Landscape Park in Sæbo. Photo: Jostein Vågnes.

4.2.1 The landscape with agriculture and forestry

Agriculture and the landscape have been at the losing end of the development in Nordhordland during the last ten years. Many farms are gone, and the cultural landscape have been overgrown. The biosphere project alone will not change this development, but because the project is focused on a progressive and flexible exploitation of these resources it may vitalize agriculture and ensure that that it is integrated into the modern society. Through the project we will try to preserve and rebuild some of the open countryside the western coast is known for.

4.2.2 The "new" industries: hydropower, fish and oil

The 'new' industries like hydropower, fish and oil represent a high-tech exploitation of the natural resources in the region:

Fish and other marine resources. Western Norway has substantial resources of pelagic fish. The coastal area have both professional and recreational fishing for cod, pollock, herring, sprat, lobster and crab, as well as kelp trawling. In the North Sea, fishing for mackerel is of special importance. Aquaculture is a major industry in the biosphere reserve.

Water. Coastal Norway has an oceanic climate and receives a substantial part of the rainfall in the nation. The biosphere reserve has seen a massive development of hydropower. This has given us environmentally friendly energy, new roads, jobs and a sustainable income for "the hydropower-municipalities", but there has been a trade-off when it comes to nature. A large part of Bergen's need for electricity is covered by hydropower from the biosphere reserve.

Oil. The biosphere area is strategically located when it comes to the oil industry on the continental shelf. Several major oil fields such as Gullfaks and Troll have pipelines to Nordhordland. In the region there are 3 major industrial areas related to oil and gas, the oil refinery Mongstad in Lindås and Austrheim municipalities - and the industrial area of Sløvåg in Gulen Municipality, and Kollsnes and Sture near Bergen. The oil industry has had spillover effects and created a base for support industries in the area.



Aquaculture is big in Nordhordland. Ola Braanaas (photo) is one of the major players in salmon production. Photo: Marit Hommedal.

There is a national debate about the environmental impact of these industries. This is very important for the future development of environmental standards and social development in coastal Norway, which is the main venue for the country's two largest sources of revenue - aquaculture and oil. The biosphere reserve represents a new way to promote sustainable development.

Both research institutions and nonprofit organizations are important stakeholders in the environmental debate that has changed the attitude among both politicians and "ordinary people". People in Nordhordland are close to the national debate about CO2 storage. What

happens to the CCS project, what about CO₂ storage from the oil production at Mongstad which is the largest source of CO₂ emissions in Norway? What is the future of the oil refinery at Mongstad? How will the region cope with the transition to a life after the oil age? The aquaculture industry also entails questions about environmental impact. Fish fodder production, fish-lice, escapes from the aquaculture farms and pollution of the marine environment are major themes in the Norwegian debate.

When it comes to electricity, there are within the biosphere reserve, challenges in terms of how to get electric power from Mongstad to the gas terminals in Øygarden. The municipalities tried to ensure power through subsea cables and not through overhead lines and "monster-masts", but they did not succeed. But by working together, they manages to move the line to areas that made less problems for most people.



A lot of local businesses are using the area's natural resources. By focusing on long-term sustainable use of these resources, the businesses in the area may grow. Photo: Bergens Tidende.

The biosphere organization will work with the municipalities, with industry and with the general population in order to develop the region in a more sustainable direction. It is important for Nordhordland to build on the expertise at the Mongstad CCS project so that the region can retain its leading position in the development of technology and expertise on carbon capture and storage. The project using spill-heat and CO₂ from the plant in order to produce algae has a potential for new products.

4.2.3 Tourism

The tourism industry may be further developed based on the area's natural values and the potential for new activities. New trends in tourism have focus on «the good life», where authenticity and closeness to culture, nature and people is important. The biosphere project and these new trends go very well together. Local cooperation will be important especially when it comes to product packaging and developing comprehensive entertainment facilities. Well-functioning organization at the various destinations will be crucial.

Examples from other countries shows that UNESCO biosphere reserves get a marked increase in both business- and leisure-tourism. It is therefore important to get local cooperation within the industry so that it is ready for the opening of the biosphere reserve. One element in this is to develop 'biosphere reserve' products that will be profitable for industry and attractive to both local people and to visitors.



Skjerjehamn is one of the old inns along the coast. The main building from 1891 has been repaired, and new owners have created activity and development in the area. Today Skjerjehamn is a center for tourism, a conference center and a popular spot for people visiting by boat. Photo: Skjerjehamn AS.

4.2.4 Entrepreneurship, local handcrafts and products

Development of local brands and products may give consumers a greater choice and a stronger identity to the village life. There is unfortunately not a well-established tradition of entrepreneurship in the region. The exception is Osterøy, which has a vibrant entrepreneurial milieu. But there is a tradition for local handcrafts such as the augur-smiths in Meland. A special interest group for forging has led to an interest in taking care of the many forges that were common on the farms in the region.

Nordhordland has rich traditions in textiles. Hillesvåg ullvarefabrikk (Wool-mill), one of the few remaining spinning-mills in the country, was recently appointed Economuseum. An Economuseum is a company that has been selected because of its commitment to quality and authentic work. Hillesvåg makes user-friendly products using traditional methods and techniques. The factory offers guided tours where you can follow the production process from the wool comes in to the finished products.

Increased interest in knitting has led to a demand for special types of yarn, and the year from «wild sheep» is a new local product. The Heathland Center on Lygra is important in promoting this effort and in developing other local products linked to the sheep. It will be possible to build on the "new" sheep farming interest in order to strengthen the industry while keeping the cultural landscape intact.



Hillesvåg wool factory produces wool and yarn using traditional machines and have recently been appointed Économusée. You can get guided tours and see the whole process from the wool enters the factory to the finished product. Photo: Kjersti Isdal.

With focus on **local and regional food** we want to promote both emerging and traditional food producers. The "Farmer's Market" in Bergen is a showcase of food from Nordhordland, and many use this venue in order to sell their goods – as it was done in the past. There is a great interest in old traditions, and the production of "clean" and local food. One example is a course in traditional manufacture of sausages and meat at the Alver deer farm and at the Norwegian deer center on Svanøy. Such courses can be established for all small producers in Nordhordland. It is important to keep the focus on local traditions, but at the same time develop efficient production, and professional marketing.

4.2.5 Research, collaboration, knowledge sharing, national and international contact

Based on UNESCO's extensive network the biosphere organization may help Nordhordland by demonstrating how other biosphere reserves have tackled similar challenges. The region can also use the network in other ways and participate in international projects about different topics. In addition, the biosphere reserve will benefit from the cooperation with the University of Bergen and hopefully later also with Bergen University College. The two institutions complement each other and can provide the biosphere reserve with a solid research and knowledge base.

4.2.6 Green environmental focus.

The energy production in the biosphere reserve is enormous. This is important for economic growth and employment, but has a substantial impacts on the climate. In Hordaland County we produce about ten times more energy than we consume. In the climate plan for Hordaland 2013 - 2030 the target for greenhouse gas emissions is a reduction of 22 % by 2020 (compared to figures from 1991) and by 40 % in 2030. The goal for total reduction in use of energy is 20 % by 2020 and 30 % by 2030 (compared to 2007).

A green environmental focus stimulates energy efficiency, innovation in the production of renewable energy and public awareness. Through the biosphere project, we want to encourage an environmental focus in all parts of society and in business. The biosphere project will strengthen the development of "green" industry. In a way the challenges of the climate change offers opportunities for new growth and development - which among others TCM and CO2Bio are spearheading. Although plans for full-scale plant at Mongstad TCM, have been shelved, the plant is still the largest center for testing and improvement of technologies for CO2 capture. Adjacent to TCM there is a pilot center attempting to use CO2 for production of microalgae. Algae production may be used as part of fodder for the aquaculture industry.

It may be appropriate for Nordhordland biosphere reserve to develop bioenergy. We have both the expertise and an innovative academic environment. This is an industry that may strengthen the communities and maintain the cultural landscape. We must examine the challenges of access to market and the development of better infrastructure for distribution.

It is at the same time a goal that the region is integrating green values both at the municipalities and in the industry. We believe businesses in Nordhordland will support this effort. Some have already done much in order to achieve a more sustainable and environmentally friendly operation. The biosphere area had about 20 eco-certified businesses in 2013. We will strive for better support for environmental measures, raising awareness of climate change / climate adaptation and try to make "everyone" engaged in sustainable thinking and action.

4.2.7 Children and youth

Many of the biosphere areas in the world have excellent educational programs for schools up to and including high school. We will do likewise in Nordhordland. The focus areas will be knowledge about the local communities, about the municipalities and the region demonstrating how this can be put into a long term perspective for the future. We aim to establish a UNESCO school in Nordhordland, in order to strengthen this effort.

4.2.8 Marketing and brand building

Nordhordland Biosphere Area will be a highly visible brand that will provide companies in the area with a distinct environmental profile, which will give them a competitive advantage both nationally and internationally.

A UNESCO status makes for international attention and can give good results in terms of marketing of Nordhordland. We will develop a comprehensive brand for the biosphere reserve built on the region's natural conditions and on the new activities that the biosphere project will initiate. This will draw attention to the region, and because we want others to learn from our experience Nordhordland biosphere area will be developed as a "showcase for sustainable development." Our goal is that the biosphere reserve should be so unique that it will attract travelers from both home and abroad.

4.3 Support

"Support for demonstration projects, environmental education and practice, research and monitoring related to local, regional, national and global issues relating to preservation and sustainability"

4.3.1 Research

Nordhordland has for 10 years been in focus for research in many fields at the University of Bergen. In 1970 the university ran 2 major research projects in Nordhordland. The Lindås project was an interdisciplinary environmental project that assessed the traditional use of resources and the social development before the establishment of the oil refinery at Mongstad. The Lindås project led to the establishment of the Heathland Center and to many botanical research projects. In the Lindås Bay project marine biological research was related to the marine environment and to the herring population in Lindåspollane. Subsequently, a number of marine research projects in Nordhordland, in Lurefjord and in Masfjorden were conducted. The Institute of Geography has conducted projects related to the cluster around the oil refinery at Mongstad, and have conducted health research both on workers in the oil industry and in the aftermath of the explosion in Sløvåg (2007).



Building tunicate-farms in the Norwegian fjords one may reach a protein production that is 100 times higher per Square kilometer Ocean than what is possible per square meter anywhere on land. The picture shows tunicates at a pilot plant near Bergen. Photo: Bård Amundsen.

There are currently several research projects that may have great value for a more sustainable **aquaculture**. Today Norwegian aquaculture consumes about 2.8 million tons of wild fish in order to produce approximately 0.8 million tons of salmon and trout annually (Source: WWF). At Rong in Øygarden there is a project trying out production of sea squirts (**Tunicates**). These animals feed on microorganisms and quickly produce large amounts of protein. If the project succeeds on an industrial scale, the tunicate-products may be an important part of the future fish fodder and a number of other products. Another interesting project is located at Mongstad where they attempt producing algae using CO₂ from the refinery. The algae may, among other things be used as additives to fish fodder. UNI Miljø's marine biological research branch is responsible for the new generation of **floating fish cages made of plastic** which will now be tested by Marine Harvest.

The University of Bergen wants to cooperate with the authorities, the business community and the population in Nordhordland having a broad research focus in order to support Nordhordland's plan to develop the area in a more sustainable direction. A preliminary survey

assessing the interest among researchers to work in Nordhordland, demonstrates that institutes from all faculties are interested in participating. As part of the preparations for establishing a biosphere reserve the Directorate with support from the Norwegian National Commission for UNESCO has submitted an application to UNESCO in order to establish an UNESCO Chair in "Sustainable Heritage and Environmental Management". In addition, there are plans to engage 5 researchers in 20 % additional positions from the faculties of humanities, social sciences, medicine, science and law. This interdisciplinary group will be responsible for organizing the university's work in the biosphere reserve. In addition, the experienced British UNESCO Professor Martin Price has been employed as an adjunct professors (10 % position) for three years in order to ensure that the application for the biosphere reserve fulfills all UNESCO's formal requirements.

Demonstration Projects

The Heathland Center at Lygra is an important institution for research, teaching and dissemination of knowledge about the coastal landscape and especially about the coastal heathlands. This activity demonstrates how a local initiative in Nordhordland biosphere area can be used in other parts of the country and in other countries. The Heathland Center has good facilities for research, and a number of large projects on coastal vegetation and on the Old Norwegian sheep ("wild sheep") are carried out here. The center organizes a comprehensive research-based environmental education for students from primary school to university level. For kindergartens there are "feel"-tours where children may experience nature's small and big miracles. In addition, there are theoretical and practical courses on management of coastal heathlands for farmers, where professional heath burning and handling of landscape fires is an important part of the course. This training program is also sought after by others, and it is now being held for farmers associations in all coastal counties, for fire brigades in various parts of the country and even in Denmark.



People trained in professional burning of heather in order to improve grazing in the heathlands. Photo: Mons Kvamme

4.3.2 Others

There are a number of public and private organizations which may have a supportive role in the biosphere project. We can not mention all, but here are some of the key players:

- Team Nordhordland - a professional network for everybody working with business development in the municipalities
- Nordhordland Culture Forum - cooperation network for cultural workers in the municipalities
- Industriutvikling Vest AS - Industrial incubator at Mongstad
- Nordhordland Næringshage AS - prioritizing tourism, culture and events
- The various chambers of commerce in the municipalities
- Interest groups in the industry: Nordhordland Handverk og Industrilag, Osterøy Industrilag.
- Interest groups in agriculture: Nordhordland Bondelag, Nordhordland Småbrukarlag
- Glade bønder - a network for young / fledgling farmers
- The museum Center in Salhus
- Historical societies in the municipalities
- Environmental organizations

4.3.3 Environmental Monitoring

Norway has initiated a comprehensive environmental monitoring of nature which includes the sea, rivers and lakes, landscape and air quality. In addition to environmental monitoring performed by the state authorities, there are other programs carried out by counties, municipalities, universities and nonprofit organizations. The biosphere area is included in the environmental monitoring, but it is beyond the scope of the preliminary application to provide a comprehensive overview. We have however included three examples of environmental monitoring in the biosphere area: wild salmon, seabirds and a monitoring program for water region Hordaland.

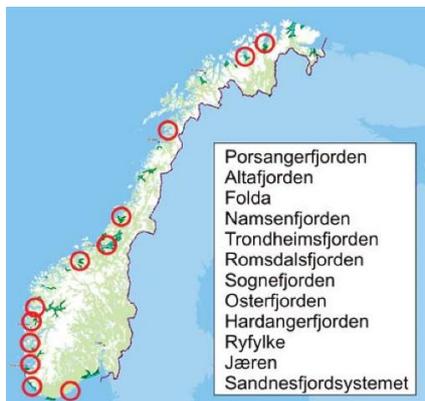


Fig. 11 Regions (red circle) being monitored annually counting the amount of lice to evaluate the national salmon fjords Map: Department of fisheries.



Fig. 12 Wild salmon recaptured in the Osterfjorden with ice on gills and head. Photo: Bjørn Barlaup, Uni Research .

Wild salmon

The Institute for Marine Research (IMR) has the overall national responsibility for the environmental development in the ocean, and there are major programs monitoring the

aquaculture industry, the state of the ecosystems in the coastal zone and in the open sea. The institute also monitors the development of marine resources with population measurements of the commercial fish species. In the biosphere reserve IMR's research station in Matre is an important platform for research in aquaculture and in fish research, with particular focus on fish welfare and genetic and ecological interactions resulting from escaped farmed fish. IMR has close cooperation with NIVA (The Norwegian Institute for Water Research), The Directorate for the Environment, The Department of Biology (University of Bergen) and Uni Research (UiB) on a variety of research and management project in Nordhordland.

The population status of **wild salmon and sea trout** varies a lot within the region, from closed rivers and stocks that are considered critical / lost to populations that are reduced / requiring attention. The two factors that contribute most negatively for the stocks of returning migratory salmon is farming and hydropower generation. Lime is currently being added to the Frøyset watercourse (NIVA and Uni Research) in order to help the salmon. In Modalen the salmon disappeared in the 1970s as a result of acid rain. Today one has started to reintroduce salmon in Modalen, with help from the Vosso watercourse. Salmon eggs from Vosso in the gene bank are introduced in the Modalen watercourse, and the plan is to establish a liming plant in the river by 2017.

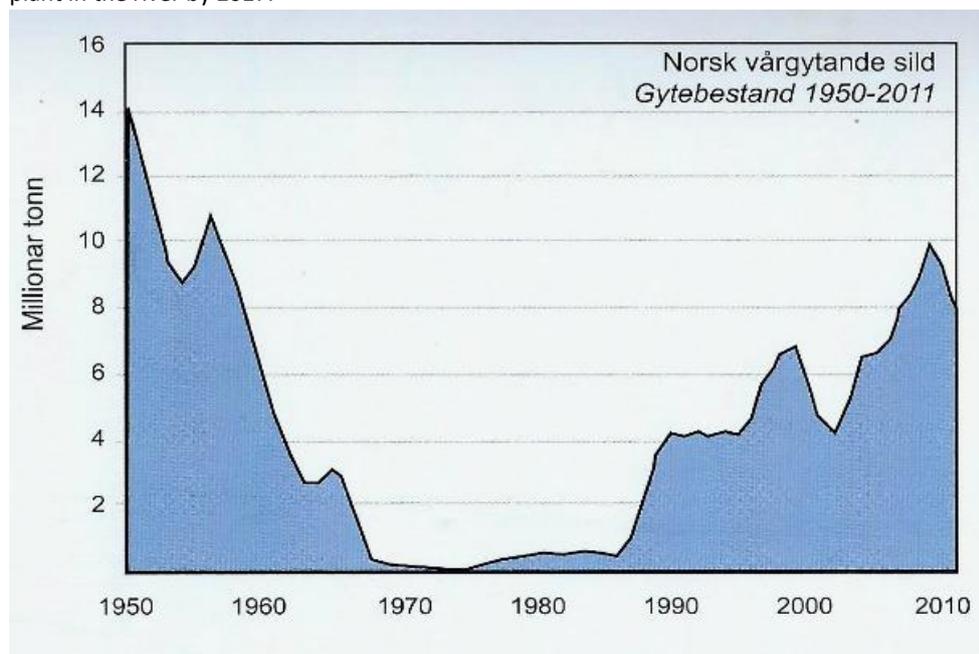


Fig. 13 Change in herring stocks from 1950 to 2011, © County governor of Hordaland in 2012.

An example of the cross-institutional cooperation on management of wild salmon is the major rescue operation that has been trying to save the salmon in river Vosso since 2000. As part of this, the inner part of Osterfjorden and Veafjorden have gained status as national salmon fjords with bans on salmon farming. The river is stocked with more than 100,000 migrating juvenile salmon (smolts), and there is an ongoing monitoring of the water chemistry in the rivers and in brackish water, removal of escaped farmed salmon and rainbow trout, and comprehensive measures against lice in the fish farms along the migration route. As part of a national project in the Norwegian salmon fjords (Fig. 11 and 12), IMR and UNI Research followed the development of the salmon in river Vosso studying among other things the

impact of sea lice on fish mortality and on time of return to the watercourse in the Oster Fjord basin. The rescue operation appears to have succeeded, and thousands of migrated smolts have returned as spawning salmon in recent years.

Seabirds

The Directorate for the Environment has the overall national responsibility for monitoring and protecting Norwegian nature. In the coastal landscape there is monitoring of seabird populations, and in 1988 a national surveillance program for nesting seabirds was established. This program is funded by the Directorate for the Environment while the Norwegian Institute for Nature Research (NINA) is scientifically responsible. The departments of environmental protection at the office of the county governors in Hordaland and Sogn og Fjordane are responsible for the practical monitoring work within the biosphere reserve where there are 30 seabird sanctuaries (ref. Fig. 8 and Appendix 1). In these sanctuaries, as in other part of the Norwegian coast, there has been documented a sharp decline in many species of seabirds. Fig. 14 exemplifies the decline in the breeding population of terns in Lurefjord from 1980 to 2011. The massive depletion of the herring in the North Sea (fig.13) and of sprat in the Western Fjords have been instrumental in this decline. The herring population is now on the rise, but the seabird population have still not increased.

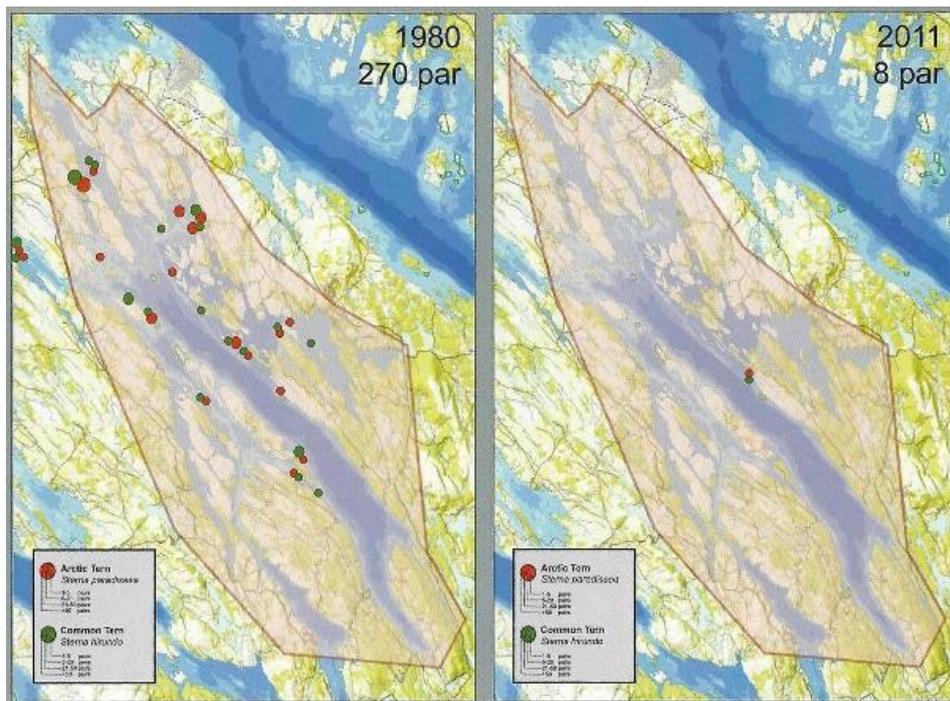


Fig. 14 The breeding population of Arctic tern (red dots) and tern (green dots) in Lurefjord in 1980 and in 2011. The decline was less than 97% in 30 years. © County governor of Hordaland 2012 / Sten Byrkjeland.

Water area Nordhordland

Water area Nordhordland is one of five water areas in Water region Hordaland. Hordaland County is the official authority for the water region.

The monitoring program for *Water region Hordaland* will form the basis for monitoring the measures that should be carried out in the water region in the years to come. The program also points out which water bodies need to be examined more closely in order to determine whether measures are needed to reach the goals in the water regulations. It also lists the proposed basic monitoring in the water region and try to provide the most complete overview of official and voluntary monitoring of water bodies in the water region and in the water area Nordhordland.

The county governor of Hordaland, has led the effort to make this monitoring program. The work has been done in collaboration with other sector authorities, project managers in the water districts and the regional authorities. DIHVA and Rådgivende Biologer AS have provided technical assistance to the program.

The ecological status of all water bodies was mapped in 2012 and in 2013 measures have been proposed in areas where the ecological condition of the water may be at risk. All data is entered into a database, www.vann-nett.no, which is publicly available. A plan has been formulated based on the analysis and on input from the municipalities and from the responsible sector authorities.

Sustainable management of our water resources is making a positive contribution to both regional and local development. Water resources should not be consumed and our production should not pollute so that environmental standards deteriorate.

Clean water is important for many initiatives in our county. Good water quality is important both for businesses and for people. It is essential for the fisheries and the aquaculture industry. The industry relies on an abundant and high quality water supply. Water is also important for tourism, recreation and the general quality of life.

The authorities are making sure the regulations are coherent and coordinated across all sectors using or effecting water. Freshwater and coastal lakes must be considered together. The goal is that it is the nature's own tolerance, that limits and provides the framework for how we take care of and exploit the water in the water-region. Clear environmental objectives have been set for all water bodies. All water shall be managed in accordance with these.

The work with the water regulations is also part of a common European effort and impetus towards a common schedule for all water bodies throughout Europe, from the smallest stream to the largest lakes and coastal areas.

5 UNESCO's criteria for being appointed a biosphere reserve

UNESCO has explicit criteria that must be fulfilled if the area shall be appointed as a biosphere reserve. In this chapter we look at how these criteria can be met in Nordhordland.

5.1.1 Ecosystems - biographical region

1. Criterion: "The area should have a mosaic of ecosystems that represents a major biogeographic region and include a scale of human impact"

(The term "mosaic" refers to a diversity of natural and cultural influenced plant communities originating from human activities, such as field areas, managed forests etc. The term "major biogeographic region" is not exactly defined, but it may be helpful to refer to the map of the "World network of biosphere reserves" which depicts 12 ecosystem types on a global scale).

5.1.2 Ecosystems

The biosphere area is a Western Norwegian coastal landscape that includes both ecosystems in the sea and on land. The area is representative of the outer part of Western Norway.

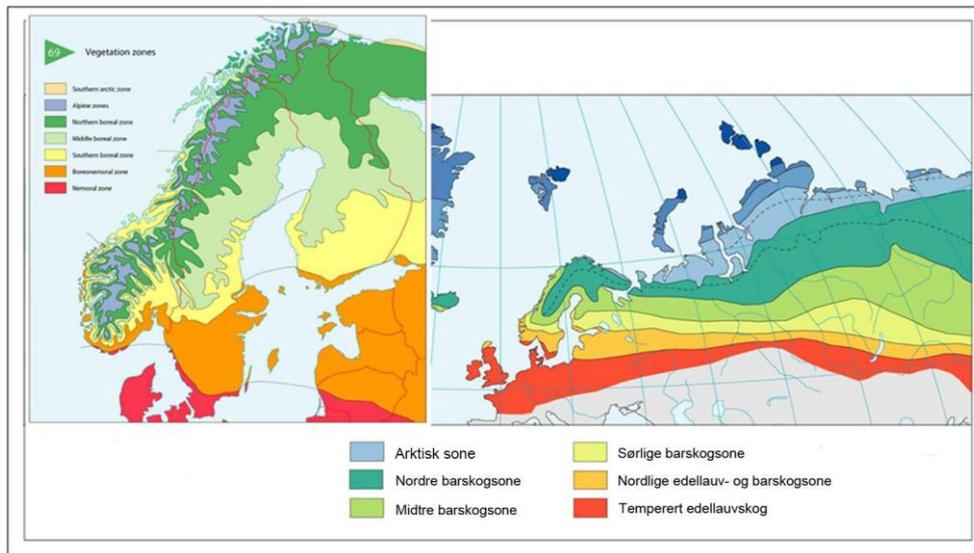


Fig.15. Overview of the major international vegetation zones which goes in wide ribbons from the west to the east. From the south to the north the vegetation zones are changing from the red deciduous forests to the blue arctic zones in the north. The temperature is the main reason why the vegetation changes. Map: Vegetation. National Atlas of Norway (fig. 69), modified.

The vegetation of the west Norwegian fjords and coast is easiest to understand if we first look at the map fig. 15. At the right we see the major international vegetation zones that go as broad bands from the west to the east. From the south to the north the vegetation zones changes from deciduous (red color on the map) to the arctic zones to the north (blue). The

temperature is the main reason why the vegetation changes. As long as the terrain is flat the vegetation zones are wide, but when they encounter the Scandinavian mountain chain (on the left of the map in fig. 15) they become narrow zones and align. In the coastal areas and in the fjords, the temperature changes sharply from sea level to the mountains, and the international vegetation zones are located in layers, one on top of the other: from deciduous and coniferous zones (orange) at sea level and up to the open Arctic (alpine) vegetation at the mountain tops (blue). What we see as our national landscape is in reality the international vegetation zones layered on top of each other when we move upwards in the terrain. They are important elements in the wonderful and varied landscape Norwegians are so proud of.

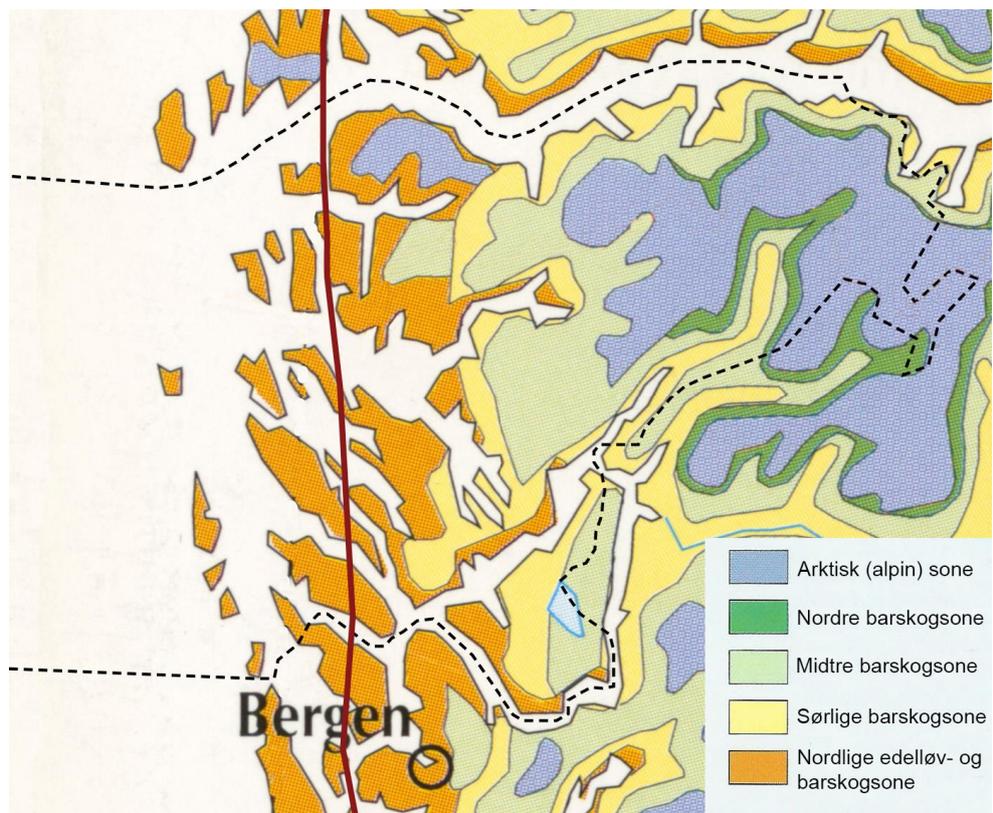


Figure 16: Vegetation Zones for the biosphere reserve. Red vertical line: Border between coastal heathland to the west and wooded area to the east. Dotted line: limit of the biosphere reserve. Map: Vegetation. National Atlas of Norway (Section of FIG. 70 modified).

The map (Fig. 16) of the biosphere reserve provides a more detailed picture of how the vegetation zones changes from sea level to the mountains. The lower zone (orange) is in the Nordic countries classified as the northern deciduous and coniferous forest zone, but because coastal farmers in prehistoric times have cleared forests for the benefit of coastal heathlands the zone is divided by an approximately vertical red line. The area to the west is largely heathland. To the east we find mostly birch and pine forests on nutrient-poor soils, and deciduous forests with oak, ash, elm, linden and hazel-facing slopes on fertile soil. In flat areas there is marsh.

The Northern deciduous- and coniferous zone forms a belt along the coast, but can also be followed in the fjord landscape. In the north-facing slopes and a bit higher in the terrain the southern coniferous zone (yellow) dominates. Here we find pine forest, but there are areas with alder and marsh, and patches of deciduous forest. Even a little higher in the valleys and on the hillsides the middle coniferous zone (light green) dominates. Coniferous forest is still important, but now we have passed the elevation border for the alder-cherry forest and for many thermophilic plant communities and species. Marshes are covering large areas and typical ground-marshes occur from this zone and further up through the northern coniferous forest zone (dark green). At the top we find the subalpine birch forests that form the tree line to the arctic (alpine) zones (blue).

5.1.3 A typical mosaic landscape

The major vegetation zones form a natural mosaic landscape, but in addition people through 5,000 years of agriculture have modified the natural landscape types. In the areas with the best soil, they cut down the forest, and broke up the soil with a shovel or a plow. On cultivated areas, the farmers have created entirely new, artificial plant communities such as fields and meadows. These plant communities are completely dependent on the farmer's regular work to be maintained. Even though the more remote areas may look pristine, the vegetation have been modified by agriculture there too. Over the past hundreds of years, farmers harvested various plant species for feed, to make their tools, for building materials and for fuel - and their livestock have grazed in the outlying areas. We may say that the farms in these areas have modified the natural plant communities in a favorable way for the people living in the area.

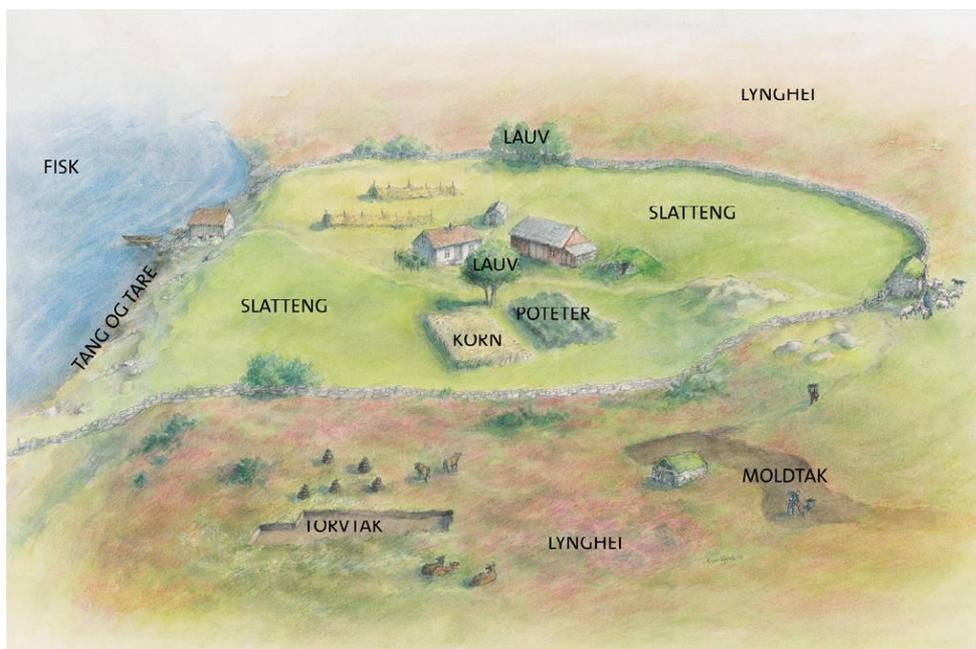


Figure 17: Production Area on a coastal farm. Illustration: Eva Gjerde, Kjersti Isdal, Peter Emil Kaland.

All vegetation zones of the biosphere reserve are greatly influenced by the peasant's work to provide their families with a safe food supply, and the landscape have looked like a "patchwork" of different types of cultivated areas. On the coast the dominating areas were the

coastal heathland, and farmers combined agriculture with fishing. The farmers who farmed in the deciduous forests in the fjord landscape got a lot of their fodder from outlying areas through collecting leaves from the trees whereas the farmers in the pine forest areas sold timber. In addition, the farms in the fjord area had the summer mountain farms with extensive grazing as well as hunting in the mountains.

5.2 Biodiversity

2. Criterion: "The area should be of value in order to preserve biodiversity"

(This section should not only specify the number of endemic or rare species and endangered species at the local, regional or global level, but also contain species that are of economic value in a global perspective, unusual habitats or unique operating methods in agriculture (such as traditional grazing or fishing with hand tools) that contribute to maintaining biodiversity. Give only a general description here.)

5.2.1 The ocean and the fjords

The marine component of the area extends from the continental shelf off western Norway via the coastal area defined by the Sognefjord in the north and Osterfjorden in the south and east, ca. 50 km from the outer part of the coast in through the fjords. Within this area we find a variety of habitats, with different degrees of exposure. Two areas stand out with their special marine fauna and localization: Lurefjord and Lindåspollane (also called Lindåsosane), nicknamed "marine lakes."

Marine lakes

Approximately 10,000 years a kilometer thick blanket of ice covered the area and weighed it down. The ice gradually disappeared and the land rose, increasing also the underwater thresholds. By Radsundet in the south (Radfjorden), at the Fosen peninsula to the west and at Kilstraumen in the north the thresholds reaches up to just 20-30 meters depth. This is Lindåspollane. The thresholds have given the various biotopes their special character. The Lurefjord is the outermost body of water and within we find 3 marine basins - Lindåspollane. The tide is the main source of renewal of the waters in the surface area, resulting in an environmental gradient through the thresholds.

The Lurefjord

The Lurefjord has an area of ca. 47 km², it is 440 meters deep and has a threshold of 20 meters. The Lurefjord is known for its population of the crown jellyfish *Periphylla periphylla*. While other deep fjords (Masfjorden) are characterized by large amounts of cm-sized mesopelagic fish, there are none of these in the Lurefjord. On the other hand there are some organisms that we normally only find in the Arctic, including glacialis, which are much larger and more nutritious than their closest relative the calanus. The Arctic rooster shell are also present in the Lurefjord.

Lindåspollane (Lindåsosane)



*Lurefjord is known for its population of the crown jellyfish *Periphylla periphylla*. Photo: Gulen Resort*

Merknad [AA4]: Her får du lese speisle gjennom Pter Emil

Lindåspollane, which are part of the marine lakes have 3 main bodies of water: Straumsosen, Spjeldnesosen and Fjellanger bay. As a result of the shallow threshold (3.5 m) leading into these waters, the tide is delayed and normally only the water at the surface is changed. The water at the bottom is only changed when heavier water enters the basin and sinks. Only then is the "old" deep water forced out. This only happens in especially cold winters when seawater with high salinity and low temperature are funneled in from the coast. It may take years between each main replacement of these waters. These particular environmental conditions attract special organisms that thrive in these conditions. The Lindåsosane ecosystem contains many of the same marine fish, seabird and mammal species that occurs naturally in other parts of the coast. Among other things, there is a species of herring known to spend all of their life in these waters.

The University of Bergen and the Institute for Marine Research have since 1960 studied the ecosystem and particularly the herring population. The special environmental conditions have made marine biological studies possible in this area, studies that are difficult to do elsewhere.

5.2.2 A traditionally used landscape with a unique biological heritage

Within the biosphere reserve there are still several types of traditional cultural landscapes which are maintained as they were hundreds of years ago. Several documentaries have been made focusing on the traditional culture, the cultural landscape and their products. Internationally, it is well known that many traditional farming methods formerly used all over Europe, are still living tradition in Norway. In Nordhordland there is a healthy tradition utilizing the coastal heathlands and the mountain summer farms. There are also a living tradition of traditional fisheries.

5.2.3 Species that are important for the economy and for ecosystem services

Ecosystem services are a new way to consider the value of a natural resource - the benefits we get from nature whether they be tangible or intangible. There are a number of resources in the biosphere reserve that we may define as ecosystem services, since they help maintain and improve people's lives. Describing ecosystem services for all ecosystems in the biosphere reserve is a challenging task. We will therefore, as an example, describe the ecosystem services delivered by coastal heathlands focusing on **goods and products, regulatory services and cultural or intellectual services.**

Today the coastal heathlands are considered marginal areas, unproductive and unprofitable compared to modern farming operations. By using the ecosystem services' way of thinking this will appear very different.

Goods and products. It relatively easy to see how these resources can be converted to cash. From the coastal heathlands it is meat and other products (wool, leather) from grazing animals that have the greatest economic value. In the last 20 years there has been an increased focus on Old Norwegian sheep ("Wild sheep"). This is the original sheep that have been living in the coastal areas since time immemorial. It is adapted to survive in the coastal heath all year without supplementary feeding. The taste and quality of the meat has made for a renewed interest in raising this kind of sheep. The production is completely natural and needs no external input. With proper management and controlled grazing pressure this is an example of how an ecosystem service can be used optimally.

In a biosphere we should also consider other domestic animals that may provide an equal utilization rate of production in the coastal heathland. There are still some small populations of an old type of meat goat called **coastal goat** and there are also types of cattle that do well in the heathland like: Vestlandsk fjord fe, Vestlandsk raudkolle og Nordlands fe.

There are of course goods and services from the heathlands not related to grazing. Most famous is the heathland honey. **Heather Honey** is by many considered the finest of all Norwegian honey varieties, and it is a big problem for Norwegian beekeepers that pressure areas for this production is shrinking.



Old Norwegian sheep, popularly called "wild sheep", is the original breed of sheep along the coast of Norway. It is adapted to survive in heathlands year round. Photo: Hilde Buer.

The regulatory services. This means nature's ability to "produce" clean water and clean air, natural sources for insect pollination and various positive effects on climatic evolution (carbon capture and storage). The coastal heathlands have a favorable carbon cycle. Much of the carbon captured from the air, is deposited in soil and peat. If you disturb these deposits you may get a powerful leak of fossil carbon back into the atmosphere. In areas with active grazing the carbon is used for producing climate-friendly meat.

Because of the positive water balance in the coastal heathland the area provides optimal growing conditions for a high number of insect species and a habitat for many species of birds.

Another regulating ecosystem service of the coastal heathland is that they reduce the risk of fire. But then heathlands have to be well managed. In an overgrown heath you get a buildup of

dry, combustible material. When this starts to burn uncontrolled on a dry and windy summer day may, it may lead to dangerous situations with large costs for society. In well-kept heathlands, which is grazed and burned in a controlled manner, a fire is easy to stop even in the driest summer.

The **cultural or immaterial services** have primarily a cultural dimension where the ability to experience this unique landscape is important. The coastal heathlands is the result of a way of cultivation that has been practiced since the Neolithic age. It is not uncommon to find areas where you find traces of culture reaching back several thousand years. Much of the heathland is outside the main pressure areas of today. Therefore the historical dimension is better protected than in more urban areas.

This timeless, open countryside towards the sea and the ocean, makes the coastal heathlands special for visitors to the area. Communities along the coast see the value of this and have made the heathlands part of their tourism concept. More than 200 000 people have visited the coastal heath at The Heathland Center in Lindås. For those who have grown up or who live in this landscape, it's also about cultural identity, and a growing recognition that this is part of their coastal heritage.



Erica cinerea is one of the species commonly found in the coastal heath. Photo: Kjersti Isdal.

Biodiversity is an important part of the ecosystem services and may also be viewed as an ecosystem service in itself. Genetic diversity and richness of species is considered by many being nature's memory and intelligence with great value for resilience and development potential when faced with environmental changes. Loss of biodiversity may therefore lead to reduced ability to meet future challenges.

The coastal heathlands do not represent particular species-rich plant communities in terms of higher plants, but if we take into consideration other groups of organisms the picture is very different. Both among insects and birds there are a number of species that are dependent on the heathlands for their survival. When it comes to higher plants *Erica cinerea* and gentian are abundant in the coastal heath, as well as birds like European stonechat, twite, curlew, arctic scua, snipe and meadow pipit. The black grouse, sea eagles and eagle owls thrive in the coastal heath.

Merknad [AA5]: Litt usikker på hvordan du oversetter Høyere planter.

Traditional farming methods have, over time, shaped the diversity and the qualities found in the coastal heath. Several studies demonstrate that diversity is greatest in areas that are well maintained. This demonstrates that sustainable interaction between people and nature over time creates new forms of diversity and values that were not there before, and that now are threatened as the coastal heath may disappear.

5.3 Sustainable development

3. Criterion: "The area should provide an opportunity to investigate and demonstrate methods for sustainable development at regional level"

(General description on how the area may serve as a pilot area in order to promote sustainable development in the region.)

Sustainable development is central to all parts of this application. We have described how the region may function as an example of coastal landscapes other places in the world so that the knowledge developed in the new biosphere reserve can help others succeed. We will therefore not write more about this here. Chapter 4, 2 has specific examples on how Nordhordland shall work with sustainable development.

5.4 Size

4. Criterion: "The area must be sufficiently large in order to fulfill the three functions of a biosphere reserve: protect, develop and support»

Area for the long-term fulfillment of three functions in the biosphere reserve:

The area's borders follow the boundaries of the municipalities Øygarden, Osterøy and Modalen in the south and east. We have included a small portion of Vik municipality in order to get all of Stølsheimen conservation area into the biosphere area. To the north the border follows the Sognefjord, so that half of Høyanger, all of Gulen and of Fedje are included. In the west the border goes all the way to the Troll oil field in the North Sea. As seen in the table below, the total area is 8250 km². The land area is 3,800 km², more than large enough to fulfill the biosphere reserve's three functions - protect, develop and support.

Area	Km ²
Land	3 800
Fjord	850
Ocean	3 600
Total	8 250

Table: Available areas for sustainable resource utilization.

5.5 Division into zones

5. Criterion: "The area shall include features which makes for a natural division into zones»

All biosphere reserves are based on a division into zones where you differentiate between **core areas, buffer zones and development areas**. The purpose of the zoning systems is to differentiate between the various functions of a biosphere reserve. The zoning system works

as a sort of "fundament for physical planning" and has strong links to the general plans developed by the municipalities. The zoning system does not imply new restrictions for the local community.

The core areas are formally protected areas, such as conservation areas or nature reserves. There are a total of 450.5 km² (see Appendix 1) protected areas within the region. This meets UNESCO's requirements. The Stølsheimen landscape area (365 km²) and the forthcoming marine conservation area in Lurefjord (47 km²) are the largest protected areas and will likely be central core areas. In addition there are many nature reserves for marsh, wetlands, forests and seabirds in the biosphere reserve (Ref. Fig. 8 and Appendix 1). Probably only some of these protected areas will be designated core areas in the future biosphere reserve.

The buffer zones are located next to and tie together the core areas. In the buffer zones all protection- and development activity is voluntary and done in collaboration with the local communities. If neighboring Lurekalven becomes a core area (a prehistoric- and nature reserve), The Heathland Center at Lygra could be a buffer zone. For core seabird sanctuaries on islands, the sea around the islands will function as a buffer zone.

The development areas in the outer zone will be the dominating part of the biosphere reserve. This is where people live and where the use of the resources are happening in a progressively more sustainable manner.

In the pilot project we have not set up the final division into zones, but plan to do that as part of the main application procedure. It will be done in close cooperation with the local community and with local, regional and national authorities after the project has been given status as a biosphere candidate by the Norwegian National Commission for UNESCO.

5.6 Organization - dialogue

6. Criterion: "Organizational structures must be developed to ensure involvement and participation by local communities, by the authorities and by private stakeholders both in developing and operating the biosphere reserve".

Promoting dialogue will be central to the biosphere organization. It will be important to develop a common arena where various stakeholders and businesses can meet, discuss and cooperate - a forum for developing the region in a more sustainable way. In other countries the biosphere organizations have managed to build trust through active contact both with politicians, businesses and NGOs. By professional management they have often functions as moderators in conflicts where different interests at play.

Once the area has been approved as a biosphere candidate, we need to determine how the biosphere organization shall work. At what level should the organization function in order to be an effective instrument for sustainable development in the region?

THE BIOSPHERE
AREA – A FORUM
FOR DIALOGUE

We will appoint a permanent board, allocate administrative resources to the organization, and establish various thematic groups in order to work on specific challenges and engage in the development of the project. These groups will be dynamic and may be established for shorter

or longer periods. We will also consider if it may be appropriate to establish a membership organization – where both industry and others may take part.

Different biosphere reserves have chosen different organizational models. We have so far not decided which one is best for Nordhordland.



A biosphere reserves is a forum for dialogue! Photo: Kjersti Isdal.

5.7 Management - theme and planning documents

7. Criterion: The proposed biosphere reserve should among other things develop mechanisms for regulating activity in the different zones, develop management plans and establish programs for research.

This section refers to administrative planning. We want to develop an integrated management plan for the biosphere reserve, but that belongs to the main application procedure. Here we have listed current plans that such a management plan must take into account, build on and complement.

National plans

The Norwegian Ministries are the administrative parts of the government and are responsible for their respective disciplines. The government creates national plans for national functions and develops white papers for the Norwegian Parliament.

The directorates are state administrative body responsible for national issues. They have a professional role both at developers as managers and as knowledge producers within their

fields of responsibility. This knowledge function is often linked to ongoing administrative tasks, but it may also be independent of this.

A variety of legislation will help preserve the valuable qualities found in the biosphere reserve, such as: The Cultural Heritage Act, The Act, The Pollution Control Act, The Planning and Building Act (protecting coastal areas), Allemannsretten (The right of everyone to use natural resources), and more.

Regional plans

Several regional plans are important for the management of a future biosphere reserve. These are. Climate Plan for Hordaland 2014 - 2030, Regional Transport Plan Hordaland 2013 - 2024, Regional Business Plan 2013-17, Strategic business plan for the Bergen region 2010-2014 (19 municipalities) and Regional Research Strategy for Hordaland (County Council 2010).

Furthermore, there are plans in the works that will be implemented in the near future. These include the Regional plan for land use and transport in the Bergen area, Regional plan for attractive centers in Bergen and the Regional Plan for Culture 2015-2025.

In Nordhordland we have started the process of making a plan for Industry and communal development for Nordhordland. Nine of the municipalities in the biosphere reserve are part of the plan.

Municipal plans

The ten municipalities in the biosphere reserve have well-functioning municipal plans describing land and community development. In addition, the municipalities have various sub-plans for key fields such as nutrition, agriculture, culture, heritage, climate and energy, sports and outdoor activities. These are good and important plans that will support the biosphere reserve and on which a comprehensive management plan for the biosphere reserve must be based.

6 Next steps

From the time the Nordhordland region achieves status as a biosphere candidate, we have calculated that it will take three years in order to develop and get the final approval for the main application. This will build on the work planned in the candidate phase. Key elements in this are: specification of function and activity, communications and ownership to the project. The work will build on active cooperation between all stakeholders.

The external framework for Nordhordland biosphere area is described in this application, but it is only when the region is given the status of biosphere candidate, that we can start the work of developing the identity of the new biosphere reserve. During this period we need to establish an organizational model that takes into account what function the project shall have in the region and we need to develop unique activities for the biosphere reserve. In addition, we want to develop theme projects in order to see which ones will work in a biosphere and which ones do not. It is essential to create local commitment to the project and to ensure that national authorities recognize the value of the biosphere project. We therefore need an active dialogue with all stakeholders.

We have pointed out that a biosphere reserves in Nordhordland will help to:

- Strengthen the sense of cooperation in the region
- Focus on the values in the landscape in order to strengthen the local identity and make the area more attractive
- Give citizens and visitors increased opportunity for natural and cultural experiences
- Attracting relevant research projects and creating a knowledge center for partnership between tradition and scientific knowledge, and between theory and practice
- Better conditions for users, contractors and landowners in order to develop economically, ecologically and socially sustainable enterprises
- Inspire innovation, entrepreneurship and new knowledge
- Filling the regional environmental objectives through creating positive examples, spreading interest and encouraging involvement
- Develop Nordhordland a test landscape in order to strengthen the relationship between preservation and development, between urban areas and the countryside and between natural and cultural values
- Building international visibility based on the region's values
- Becoming an international, modern and attractive model region with clear integrity

Key concepts in the work of a biosphere reserves are dialogue, engagement, interaction and collaboration between government, industry, the general population and research institutions.

6.1 Project-objectives in the candidate phase

The objective of the main project is that Nordhordland (as defined in the application) is established as Norway's first model area for sustainable development, appointed by UNESCO as a biosphere reserve.

Secondary objectives:

- Develop the Nordhordland biosphere reserve based on the fundamental values in the region and on the requirements established by UNESCO
- Build local ownership and enthusiasm for the project
- Developing a healthy financial platform for the project
- Develop a robust organization and professional management
- Building a professional administrative framework making it possible for a future organization to continue the established activity.

6.2 Activities in the candidate phase

This application shall be submitted to the Norwegian MAB Committee. If we get a positive answer, the region will obtain a status as a biosphere candidate. In the candidate phase, there will be a lot of activities. It will be important to decide what role the project shall have in the region and which activities should be prioritized. We will work to create local support and involvement in the project and we must ensure a robust financial framework.

It will be a goal for this phase that Nordhordland as soon as possible start working as a biosphere reserve. That means that we want to establish projects with activities meant to continue in the established biosphere reserve.



The Fringe Festival in Skjerjehamn is a good example of how nature and culture creates activity and development in the region. Photo: Region Nordhordland.

We will also start working on the main application to UNESCO which is aimed to provide an overview of fully developed biosphere concept. The application shall include a description of the landscape and a description of the activities taking place in the area that fits into the biosphere reserve concept. At the same time, we will decide how the three functions - preserve, develop and support - can be strengthened through projects and activities.

The completed application will be send to the government who must approve the application and forward it for a decision during MAB ICC's annual strategy conference. The area can then be put on the [international biosphere reserve list](#) and be part of the world network of biosphere reserves. This process - from pre-study to the final appointment - usually takes between 3-4 years.

The list below describes the tasks which needs to be done during the candidate phase: (For a more detailed plan, see sec. 6.7 *Progress plan*.)

- Establish an well-functioning organization for Nordhordland biosphere reserve
- Develop a website, info letters, printed material and in other ways disseminate information about Nordhordland biosphere reserve
- Assess the need for a biosphere office/center
- Asses and support ideas and initiatives focusing on local produce and experiences
- Initiate and support thematic groups for various activities that support the biosphere reserve
- Further develop the demonstration area by initiating and supporting new businesses and projects
- Take the initiative to increase research and teaching by developing cooperation with colleges and universities
- Conducting seminars and workshops
- Develop a dialogue platform which may become a venue for communication and exchange between citizens, government, industry and research communities.
- Write, and create support for the new biosphere application to UNESCO
- Work out the plan for the zoning, develop the landscape themes and other important thematic issues
- Determine the geographic boundaries of the area drive the process in the border areas
- Develop contacts with other biosphere reserves and other landscape initiatives in Norway and abroad

6.3 Biosphere candidate office

In the biosphere reserve there shall be a biosphere office and we need to create a robust organization that can work when the biosphere reserve is approved. The office shall be a hub for the biosphere activities in the area and function as initiator, inspirer and supporter for local ideas and initiatives. It shall be a neutral platform for questions relating to use of the natural resources in the area, and on sustainable development. The biosphere office shall also be an academic resource and a meeting place for various disciplines where one can find solutions to common challenges.

We do not aim to establish a biosphere office at the beginning of the candidate phase. The aim is rather to establish an office during the candidacy so that it may be ready to use when we have received the final appointment as biosphere reserve. At the same time we want to assess

Merknad [AA6]: Skal vi først på reservelisten. Det har jeg ikke forstått. Eller er dette en feil også i den norske utgaven og skulle egentlig være liten over biosphere reerves?

whether we need a more comprehensive «biosphere center». In this, we will also assess synergy-effects we may get by linking such a facility to other functions like exhibitions, tourist-office, education, retail outlets for local goods, etc.



From Matre in Masfjorden. Photo: Kjersti Isdal.

6.4 Biosphere coordinator

The biosphere area shall be chaired by at least one coordinator who has the overall responsibility and make sure the activities are following the UNESCO guidelines, and that they follow local conditions. The coordinator needs to have an overall mandate from all organizations and interest groups in the region. During the candidate phase the coordinator's main task is to coordinate the application to UNESCO, and to develop the activities so that the biosphere reserve's three functions (protect - develop - support) can be structured and strengthened in the area.

In order to benefit from the expertise available in Nordhordland, the activities shall be developed by the coordinator in cooperation with biosphere candidate organization (see below).

6.5 The biosphere candidate organization

We want to develop a good organizational structure for Nordhordland designed in order to ensure that the wide participation that has characterized the work will continue. We will work hard in order to keep the local support while the organization grows both in scope and in activity. To make this happen representatives of the municipalities in Nordhordland, the Hordaland County Council, the County Governor of Hordaland, businesses and various interest groups shall be represented in the steering committee, in the working group and in the reference group. Nordhordland Development Company (NUI) has had the administrative responsibility for the work in the pre-project stage. This has worked well, and we will proceed with this organization to ensure continuity both in terms of people and organization. See below for a proposed organization for biosphere candidacy proposed division of responsibility between the various bodies.

Proposed organization for the biosphere candidacy with Nordhordland Development Company as project owner:

Steering committee

Task: Strategy - decide questions relating to the overall activities of the biosphere candidate. The steering committee shall have budgetary responsibility, but the representatives are not financially responsible for the project. NUI is directly responsible.

Members: About 8 people. One person from each "part" of society / private sector: The municipalities, the County Governor of Hordaland, Hordaland County Council, the University of Bergen, industry, environmental organizations.

Meetings: Come together when needed (approximately 4-5 times per year)

Working group

Task: Coordination of the work in the biosphere area, and being a forum for local and regional development, cooperation and knowledge development. Handles important issues related to the candidacy, business and various projects within the proposed biosphere area. Prepare proposals for the steering committee.

Members: About 4 people. Representative from the University of Bergen and the Nordhordland Development Company. The work is coordinated by the biosphere coordinator. The group may be supplemented if needed.

Meetings: Every week or as needed.

Reference group

Task: Provide input and generate ideas for biosphere activities and be ambassadors for the Nordhordland biosphere reserve.

Members: About 10-20 people. We want key people with different kind of competencies and from different parts of the biosphere reserve. Representatives from a number of local organizations will supplement the group.

Meetings: About two times per year.

6.6 Budget

Budget for the Nordhordland Biosphere project:

This is a project budget covering primarily management and employees. There are no funds allocated to running specific biosphere activities. These must find their own funding.

Cost:	Fall 2014	2015	2016	2017
Project leader(100%)	275 000	550 000	550 000	550 000
Scientific adviser	75 000	150 000	150 000	150 000
External project consultant	200 000	400 000	400 000	400 000

External expertise		100 000	100 000	100 000
Meetings and seminars	100 000	150 000	150 000	150 000
Communications	150 000	75 000	50 000	50 000
Application	50 000	75 000	100 000	100 000
Travel	50 000	50 000	50 000	50 000
Other	30 000	30 000	30 000	30 000
Sum:	930 000	1 580 000	1 580 000	1 580 000

Income:	Fall 2014	2015	2016	2017
The municipalities	300 000	500 000	500 000	500 000
University of Bergen	180 000	300 000	300 000	300 000
Public support	150 000	100 000	100 000	100 000
Ministry/UNESCO	300 000	500 000	500 000	500 000
Sponsors		180 000	180 000	180 000
Sum income:	930 000	1 580 000	1 580 000	1 580 000



The Nordhordland biosphere reserve will be a good place to live! Photo: Kjersti Isdal.

6.7 Progress plan

This is a rough estimate of the planned activities from now until the final approval of the application:

2013

August-November: Getting the project up and running

2014

January-April: work with the preliminary application to achieve the status as a biosphere candidate.

Mach: The project will be presented in conjunction with an international UNESCO conference in Bergen

June-September: The application process in the steering group, regional and municipal councils.

August-December:

- The application to the Norwegian National Commission for UNESCO.
- Start information and activity work as outlined earlier in the application.
- Create one or a few thematic groups
- Start planning the first biosphere activities

2015

Spring:

- Create topic groups on key areas.
- Establish at least 3 specific projects.
- Start work at schools.

Fall:

- Having from 5 to 10 ongoing biosphere activities - of which at least two will be in collaboration with the University of Bergen.
- First biosphere conference / market

An important task this year is the production of the main application. The university representative will serve as editor. The office of Research at UiB will conduct surveys on research initiatives at all faculties. A number of professionals, politicians, municipal employees, businesses and the general population in Nordhordland will contribute. Maps that is adapted to the needs of the biosphere reserve will be developed. Different workgroups will develop themes and projects in a true "Biosphere spirit."

2016

Continuing existing activities, and evaluating these.

Establish 5 to 10 new activities.

Develop programs for schools.

Application-production is completed in June.

September: Application ready for consideration in all municipal councils, in Hordaland County Council and at the office of the County Governor, leading up to final submission to the National Commission for UNESCO and the Government.

2017

September, 30: Final application is sent from the Norwegian Government to UNESCO, Paris.

2018

June: UNESCO appoints Nordhordland the first Norwegian UNESCO biosphere reserve.

August: Formal opening of the new biosphere reserve in the Nordhordland.

7 Attachments

7.1 Protected areas in Nordhordland

REGION
NORDHORDLAND

Nordhordland Utviklingsselskap IKS 2014