



United Nations
Educational, Scientific and
Cultural Organization



Man and
the Biosphere
Programme

VINDELÄLVEN-JUHTATDAHKA

Biosphere Reserve Application





Image 1 Photo: Grahame Soden

Application documents and contact details are on the homepage:

www.vindelalvenjuhtatdahka.se

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UNESCO:s introduction

Biosphere reserves are areas of terrestrial and coastal/marine ecosystems, or a combination thereof, which are internationally recognized within the framework of UNESCO's Programme on Man and the Biosphere (MAB) They are established to promote and demonstrate a balanced relationship between humans and the biosphere. Biosphere reserves are designated by the International Coordinating Council of the MAB Programme at the request of the State concerned. Individual biosphere reserves remain under the sovereign jurisdiction of the State where they are situated. Collectively, all biosphere reserves form a World Network in which participation by States is voluntary.

The World Network is governed by the Statutory Framework adopted by the UNESCO General Conference in 1995 which presents the definition, objectives, criteria and the designation procedure for biosphere reserves. The actions recommended for the implementation of biosphere reserves are set out in the "Seville Strategy" and were further developed in the Madrid Action Plan (2008-2013). These documents should be used as basic references for the completion of this nomination form.

The information presented on this nomination form will be used in a number of ways by UNESCO:

- (a) for examination of the site by the International Advisory Committee for Biosphere Reserves and by the Bureau of the MAB International Coordinating Council;
- (b) for use in a world-wide accessible information system, notably the UNESCO-MABnet and publications, facilitating communications and interaction amongst persons interested in biosphere reserves throughout the world.

The nomination form consists of three parts:

Part one is a summary indicating how the nominated area responds to the functions and criteria for biosphere reserves set out in the Statutory Framework, and presents the signatures of endorsements for the nomination from the authorities concerned. Part two is more descriptive and detailed, referring to the human, physical and biological characteristics as well as to the institutional aspects. Part three consists of two annexes: the first annex will be used to update the Directory of Biosphere Reserves on the MABnet, once the site has been approved as a biosphere reserve. The second annex will be used to provide promotional and communication materials of the biosphere reserve. Tables, illustrations and maps as appropriate throughout the nomination form are welcomed.

The form should be completed in English, French or Spanish. Two copies should be sent to the Secretariat, as follows:

1. The original hard copy, with the original signatures, letters of endorsement, zonation map and supporting documents. This should be sent to the Secretariat through the Official UNESCO channels, i.e. via the National Commission for UNESCO and/or the Permanent Delegation to UNESCO;
2. An electronic version (on diskette, CD, etc.) of the nomination forms and of maps (especially the zonation map). This can be sent directly to the MAB Secretariat:

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PART I

SUMMARY

Juhtát movement

The River Vindelälven is one of Europe's last major free-flowing watercourses. When plans were drawn up in the 1960s for the construction of a series of hydroelectric power plants on the river, major opposition to the scheme was expressed locally, regionally and nationally – and in 1970 the Swedish government decided that the River Vindelälven should remain free-flowing. The involvement of people in opposing the scheme grew into a movement in the area, which continued even after the plans for the expansion of power generation had been abandoned. The work to incorporate the area into UNESCO's World Network of Biosphere Reserves had its roots in this very involvement and in a broad, deep-seated desire to bring together the region and the people, from the mountains to the coast, to enable a long-term positive and sustainable development of the area.

The River Vindelälven as a migration route – Juhtatdahka

The River Vindelälven and its adjoining lands present a route for people, plants and animals, in both directions between the mountains and the sea. The long journey with reindeer which mountain Sami communities make along the River Vindelälven between coast and mountain is unique and one of the longest livestock migrations known today. "Juhtatdahka" means migration route in the Ume Sami language. Many other animals make similar, but shorter seasonal migrations. The area's trapping pits present a clear overall picture of where cloven-hoofed game has travelled, and research into elk (*Alces alces*) shows that cervids still have the same pattern of migration today. Many migratory birds stop over on the banks of the River Vindelälven on their way to or from the mountain region. The river itself is both the birthplace and the lifeblood of salmon and brown trout. They are born and grow up there, migrate as smolt to the Baltic Sea to mature, and then return to the place where they were born and grew up, in order to breed. The river is also an important dispersal route for the seeds of many plants and, because the river is free-flowing, many mountain plants can spread a long distance down into the forest region.

People have also used the river as a migration route since the ice sheet melted c. 9000 years ago. From the point of view of dialects and human interactions, people nowadays are more closely related within a river valley than between different river valleys. The Sami have followed the reindeer up and down the river, first to hunt them and then, several hundred years later, as reindeer herders, a practice which developed over time. When settlers began to colonise the area, the river was the obvious route into the interior and towards the mountains.

The area has a range of natural resources such as forests, minerals, and river water which, since the mid-1900s, have been of growing economic significance for Sweden. When the felling of forests in the interior of Västerbotten gathered momentum in the mid-1800s, the river and its tributaries were used to float timber to saw mills and paper mills on the coast. Since timber flotation was discontinued on the River Vindelälven in 1976, the timber has been transported by roads which run along the valley.

In particular, rationalisations in agriculture and forestry have meant that many people from rural areas have left to seek jobs in towns and cities. One result was a change in the demographic structure in large parts of the area, with the proportion of older people increasing and that of younger people decreasing. In the work to create the Vindelälven-Juhtatdahka Biosphere Reserve, it has become clear that there is a strong wish that we should endeavour to make the whole area an attractive place to live, work and visit – to draw people to the entire area.

New energy along the River Vindelälven

Vindelälven-Juhtatdahka encompasses seven *sameby* reindeer grazing areas, extensive forestry, a growing tourist industry, agriculture, societies, small and large companies, energy production, ongoing mining and prospecting operations, as well as protected areas. There is also recreational space for rambling, hunting, skiing, fishing, berry and mushroom picking, etc. The strong involvement and interest in the river valley has led to a large number of development projects and internationally recognized research. By bringing together ongoing sustainability work and including all the area's different projects, research, interests and stakeholders, the planned biosphere reserve can serve as an instrument and an arena in which a common strategy is devised, with further investments in long-term sustainable development.

Vindelälven-Juhtatdahka should also become a unique biosphere reserve for Sweden, as there are currently no biosphere reserves in the country's alpine environments. The planned biosphere reserve contains high mountain environments, mountain heaths, and large continuous areas with undisturbed mountain forests. Vindelälven-Juhtatdahka also stretches through a boreal region with forests, bogs, lakes and watercourses. Closer to Bottenviken is the coastal region which has agricultural land and is where the Vindelälven-Umeälven river system flows into a unique delta area. The settlements along the river, in small and major communities, are characteristic and specific to the locality, with features of settler culture in coastal and forest regions; the Sami presence becomes more pronounced towards the west. There are local cultural expressions and customs, such as languages, dialects and craftwork. Vindelälven-Juhtatdahka therefore has a diversity of natural and cultural environments and values that are not represented elsewhere in the network of biosphere reserves, either in Sweden or internationally.

Using the area's unique diversity of natural and cultural environments, people's involvement, ongoing initiatives, research, and existing strategies as a starting point, the planned biosphere reserve will enable us to find new energies and resources for the work that needs to be carried out, thereby putting the area on the world map, where it belongs. Everything looks set for a long-term sustainable development of Vindelälven-Juhtatdahka.

1. PROPOSED NAME OF THE BIOSPHERE RESERVE

Vindelälven-Juhtatdahka Biosphere Reserve

2. NAME OF THE COUNTRY

Sweden

3. FULFILMENT OF THE THREE FUNCTIONS OF BIOSPHERE RESERVES

(Article 3 of the Statutory Framework presents the three functions of conservation, development and logistic support. Explain in general terms how the area fulfils these functions.)

As a biosphere reserve, Vindelälven-Juhtatdahka will implement the Lima Action Plan (LAP) for the MAB Programme and its World Network of Biosphere Reserves. This means that objectives and activities affect all aspects of the functions of conserving, developing and supporting.



Figure 1. Location map

A biosphere reserve implies a major local and regional opportunity, with a clear global link, for working with sustainable development. At the same time, it involves a major challenge as it requires collaboration between many different stakeholders. Some interested parties mainly prioritise the development of economy, business and community, while others mainly give priority to the conservation of nature and culture.

Through the initiation of collaborative efforts and the establishment of networks, Vindelälven-Juhtatdahka Biosphere Reserve will:

- contribute to wide-ranging dialogue within and between different stakeholder groups, as well as across municipal boundaries;
- contribute to new collaborations which intensify sustainability work that is already ongoing;
- provide contacts, expertise, experiences from the World Network of Biosphere Reserves;
- market the area and its unique characteristics;
- provide resources for projects which deal with sustainable social, ecological and economic development.

UNESCO has acknowledged all the sustainable initiatives and efforts being carried out in the area and believes in Vindelälven-Juhtatdahka as a future model reserve for sustainable development. Becoming a member of the World Network of Biosphere Reserves promotes local values as well as the area's reputation as an attractive place to be, live and grow up in.

3.1 Conservation - contribute to the conservation of landscapes, ecosystems, species and genetic variation.

(Stress the importance of the site for conservation of biological and cultural diversity at the regional or global level.)

With its many rapids and stretches of calm water, the River Vindelälven is a unique, wild and vital lifeline running through the Swedish landscape. It is the southernmost of Sweden's four national rivers. It is free-flowing and has no hydroelectric power facilities between the mountains and the Stornorrforss hydroelectric power plant on the lower River Umeälven (see figure 5). The planned biosphere reserve contains the entire drainage basin for the water system of the rivers Vindelälven, Laisälven and lower Umeälven (13,294 km²). The area stretches 450 km through two biogeographical regions, the alpine and the boreal, from the Norwegian border in the west to Bottenviken in the east. The water system is protected by both Swedish and European legislation.

In Vindelälven-Juhtatdahka, one can experience a broad mountain vista, vast forest landscapes, and the power of free-flowing rivers, as well as invigorating sea breezes. The protected river flows from the alpine region of the mountains before wending its way down through the boreal coniferous forest region, known as taiga. Immediately upstream from Sorsele, the River Vindelälven is joined by its largest tributary, the River Laisälven. Circa 40 km from the coast, the River Vindelälven in turn unites with the River Umeälven. Downstream from the city of Umeå, this flows through the River Umeälven delta and farther out into Bottenviken.

34% of the total area consists of voluntarily and formally protected natural environment: nature reserves, Natura 2000 sites, biotope protection and nature conservation agreements contribute to the conservation of biodiversity at genetic, species and ecosystem levels.

The planned biosphere reserve has the following protected areas and agreements:

- 1 national park (Pieljekaise), total 5 581 ha;
- 90 nature reserves, total 264 569 ha;
- 43 nature conservation agreements, total 709 ha;
- 120 protected biotopes, total 482 ha;
- 3 Ramsar sites, total 7 956 ha;
- 2759 areas with voluntary provisions, total 25 789 ha.

The two major nature reserves are Vindelfjällen and Laisdalens Fjällurskog. Vindelfjällen nature reserve is one of the largest in Europe and is of major importance with regard to outdoor activities in the area. Many of the protected areas overlap and therefore the total area of protected sites does not match the sum of individual protected areas (see Annex 6).

There are many species in the planned biosphere reserve that are worthy of protection and/or are threatened (for details see Annex 12):

- 20 species are worthy of protection according to the EU Habitats Directive;
- 51 are worthy of protection according to the EU Birds Directive;
- 19 species are under threat according to the global IUCN Red List;
- 488 species are on the national Red List.

Nature that is protected also secures the provision of many of the ecosystem services that people depend upon, such as nature's ability to respond to changes in the environment. Large parts of the protected areas are unique from a global perspective. This includes, for example, the free-flowing River Vindelälven, mountain forests, and raised beaches.

The area contains extensive ancient and natural forests. In Scandinavia, ancient and natural forests mainly persist in the form of mountain birch forests and montane coniferous forests. Ancient forests have never been exposed to human exploitation and only minimal traces of human influence are to be

found in natural forests. The large numbers of sand heathlands and ridges in the forest landscape are excellent environments for pine forests with a rich and, in some places, unique lichen flora. The lichen in these forests provide important winter feed for reindeer.

The River Vindelälven has Sweden's most species-rich riverbanks. The riverbank environments are exposed to major seasonal variations in water flow because the river is free-flowing. This creates diverse environments that are beneficial for the rich flora. River meadows, so-called flood meadows, are typical features of the river's cultural landscape. At several sites along the river, a natural grazing project has recreated open river meadows which had started to become overgrown when their maintenance was abandoned. This project contributes to increased landscape diversity. A biosphere reserve provides a good opportunity to further develop this significant investment in natural grazing. The area also contains many fish species worthy of protection or unique families and varieties of species. Restoration of the tributaries and a new fish trap by the Stornorrforss hydroelectric power plant on the River Umeälven have improved the situation for migratory fish such as salmon and trout

The River Umeälven delta is an internationally valuable Ramsar area. Similarly, the River Vindelälven with its tributaries is included in the delta in the European Natura 2000 network. The delta's basic areas, namely river meadows, wetlands, lagoons and nutrient-rich shoreline forests, have high nature values. Around the delta are Upper Norrland's largest agricultural lands, Degernässlätten and Röbäcksslätten, which have been built up from silt supplied by the river. The landscape's multifaceted nature and its alternation between wet and dry states is perfect for a diversity of plants and insects. The plain is also an eldorado for many birds which stop over or breed in the area.



Image 2. View over River Vindelälven lined by mountain birch forests. Foto: Ola Jennersten



Image 3. The River Umeälven delta

The whole of Vindelälven-Juhtatdahka has magnificent nature values with regard to birds, as the River Vindelälven's banks serve as stopover sites for many birds on the way to or from their breeding grounds in the mountains. Bats also make use of this migration route. Wetlands and natural grazing areas crammed into the river valley's forest landscape provide important sites for many birds staying over for moulting or breeding. In summer, mountain environments abound with a rich bird life for a short intensive period, with sunlight being available almost round the clock.

The whole River Vindelälven valley constitutes an area of national interest for the conservation of cultural environments. This means that the area is judged to have such major cultural environmental value that it is of significance to the country as a whole. It is therefore also protected against any substantial exploitation.

The area has a rich cultural heritage in the form of Sami and Swedish agrarian and forestry culture, hunting and fishing traditions and Sami reindeer herding, which is very much alive. The valley is one of the last areas in the world where Sweden's indigenous people, the Sami, can still, to a large extent, carry on traditional seasonal reindeer herding. This is organised according to *samebys*: Sami communities which are cooperative and administrative associations charged with managing reindeer herding in a specific geographical area (see section 15.4.1). In this area, the *samebys* lead their reindeer herds down the

migration route, *juhtatdahka*, along the River Vindelälven. Mountain *samebys* migrate with their reindeer along the entire length of the valley between mountains and coast, while the forest *samebys* move their reindeer shorter distances within the area.

The cultural diversity in the river valley represents a marvellous resource, an abundance which also brings challenges. There is a valuable knowledge base in the form of languages, craftwork, culture and businesses, which are at risk of being lost. There are also gaps in knowledge as well as issues concerning rights and injustices that still rankle. The Norrland story-telling tradition, just like the Sami tradition for handing down knowledge, *árbbiemáhttu* (Ume Sami)/ *árbediehtu* (northern Sami), has much to teach modern society. The story-telling tradition has transferred knowledge from generation to generation, between neighbours and between friends. It has been noted that tales of the River Vindelälven, the people who live there and their traditions, create an understanding of our unique culture amongst new Swedish nationals and immigrants.

As a biosphere reserve, Vindelälven-Juhtatdahka can serve as a model area for new ideas, should be able to contribute new ways of accumulating and preserving knowledge, and can deal with issues, thereby amassing valuable experience from which many people can benefit. It also offers the opportunity to inventorise and document traditional knowledge gathered within the area and to combine traditional knowledge with new technology and research. Through dialogue and the sharing of experiences, it should be possible to find ways to combine nature conservation and cultural heritage conservation with economic growth. Present-day reindeer herding has been modernised, but is nevertheless based on knowledge gleaned from older generations. But not everything is learned from elderly members of the community. Ongoing climate change places reindeer herding in a situation not experienced by previous generations. Combining the experiences of reindeer herders and climate scientists allows both social and economic development. A biosphere reserve will promote the area and share experiences and positive examples at the same time as gaining the opportunity to learn from other biosphere reserves throughout the world. Collaboration with other biosphere reserves can, for example, strengthen international cooperation around issues of indigenous people.



Image 4. Reindeer herding Photo: Grahame Soden

3.2 Development - foster economic and human development which is socio-culturally and ecologically sustainable. (Indicate current activities and the potential of the proposed biosphere reserve in fulfilling the objective of fostering sustainable economic and socio-cultural development, including by securing flows of ecosystem services from the biosphere reserve).

In Vindelälven-Juhtatdahka, there are many people with big ambitions, a strong driving force and substantial expertise. Because of different circumstances, community development takes on different aspects in the mountain, forest and coastal regions; the latter includes the expanding city of Umeå. There are also peri-urban rural areas and smaller municipalities with rural areas well away from large cities. The local potential of the entire area needs to be utilised if the area is to be developed sustainably and to attract new residents and visitors.

Industries that are traditionally associated with the area include forestry and timber processing, agriculture and reindeer husbandry. Businesses in the area contribute to, amongst other things, job opportunities, income tax and services. Entrepreneurship is strong throughout the area; most entrepreneurs are in the forestry sector. Companies, both large and small, are driving forward the development. The area is

home to world-leading technology companies that are part of the nationally renowned Cluster of Forest Technology centred on Vindeln. There are also a lot of entrepreneurs in sectors such as IT, the tourist industry, service companies and commerce.

Civic society, clubs and associations also take on major responsibilities for local services and infrastructure in Vindelälven-Juhtatdahka. Clubs and associations also contribute creativity, diversity and knowledge. The not-for-profit sector is of great importance in generating a sense of community. Not-for-profit organisations and groups, such as various sports associations and religious communities, have played prominent roles in integration work associated with the major influx of migrants in recent years.

If continuing growth is to be achieved in a world that has changed significantly, capacity is required for finding solutions as well as for being innovative, combining urban investments and developing rural areas. The planned biosphere reserve also involves investments by the counties of Västerbotten and Norrbotten in expanding broadband, so that many households in the area already have or will get access to a good internet connection. Digital infrastructure is a vital precondition for growth through the development of new markets and networks, enabling many service companies to operate from a distance. The data and electronics sector is expected to show strong development, thanks in part to the extension of the digital network. From an international perspective, the roll-out of broadband in the area, most of which is situated some distance from the boundaries of large communities, has world-leading status and is an example of a long-term investment which enables development throughout the planned biosphere reserve.

The rich natural and cultural environments of the planned biosphere reserve also offer remarkable opportunities for active outdoor pursuits all year round. Moreover, they are a prerequisite for nature and culture tourism, which is growing. Things which local residents perhaps do not always appreciate – for example darkness, tranquillity, quietness, ice and snow – are the very reasons why many visitors travel here. There are also many summer and winter trails. The 400-km trail Vindelälvsleden, which stretches along large parts of the River Vindelälven and in winter time also traverses the river ice, has great potential to further enhance the area's outdoor recreational profile, from mountain to coast.

The six municipalities that are involved in working on the planned biosphere reserve (Arjeplog, Sorsele, Lycksele, Vindeln, Vännäs and Umeå) carry the main administrative responsibility for the area. In the mountain municipalities, the population trend currently presents the greatest local sustainability challenge, so that the municipalities are working on a broad front to achieve functional integration, making the area welcoming and attractive for residents, visitors and businesses. Moreover, issues concerning nature and outdoor life, with the development of fishing and a sustainable tourist industry, are particularly important in the municipalities' sustainability work.

All the municipalities are working in one way or another to reduce climate impact and to adapt to climate changes as part of the local efforts to achieve environmental objectives. Most of the municipalities have high sustainability requirements for building technology, future energy consumption and choice of materials for the construction of new municipal premises and housing. All municipalities have implemented major energy-saving measures for heating systems and outdoor and indoor lighting, as well as providing some buildings with extra insulation.

Other examples of climate work by municipalities:

- Vännäs and Umeå municipalities are participating in the national enterprise Klimatklivet which, amongst other things, means that municipalities have been given funding for installing a large number of charging points for electric vehicles in their areas.
- By 2020, municipalities in the Umeå region (including Umeå, Vännäs and Vindeln) will have developed a system for collecting household waste from homes. Dustbins are being replaced with multi-compartment recycling bins where food waste, residual waste, packaging and paper for recycling are sorted as they are collected. This is expected to bring about an improvement in waste sorting and a reduction in individual car journeys to recycling centres.
- In Vindeln, the local authority has purchased hybrid cars for municipal purposes, and local public

transport enables the public to travel on school buses.

- Lycksele is working on a strategy for sustainable transport and has received funding from SMHI to develop a web-based tool for integrating climate change adaptation work into municipal planning and action processes.
- Arjeplog municipality is working to facilitate testing for the development of fossil-free technology, for example, electric and driverless vehicles. Arjeplog is the world leader in vehicle and component tests under Arctic conditions.
- Sorsele is a member of the national network Sveriges Ekokommuner: a collaborative organisation for municipalities, county councils and regions that aims to promote sustainable community development from ecological, social and economic perspectives. The local production of renewable energy, amongst other things, has been prioritised in the municipality and work is underway to establish charging points for electric cars.

All municipalities are carrying out sustainability projects in accordance with the Swedish environmental objectives system, which has clear links to Agenda 2030 and the global sustainability goals. UNESCO's designation of the area as a biosphere reserve will give the municipalities positive synergy effects in their active sustainability work, by inspiring and contributing tools for wider cooperation between municipalities and coordination with many players and stakeholders. A joint approach contributes to the achievement of not only local, but also regional, national and global sustainability goals.

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In many communities along the River Vindelälven valley, excellent work is already being carried out to develop villages. What might also be needed is an overall view of development across municipal boundaries and between urban and rural areas. There are common challenges with regard to, for example, the social development of rural areas, which can be addressed across municipal boundaries via the platform which the biosphere reserve presents. For example, community-wide cooperation can facilitate work on communication and transport possibilities in the river valley. The same applies to investments and the prioritisation of various rambling and cycling trails in the area.

As a biosphere reserve, Vindelälven-Juhtatdahka can become an interesting model area for testing national proposals on investment in, for example, rural development and employment. Improved links between communities, industries and not-for-profit organisations can create cross-sector cooperation, networks and opportunities. The extensive digital infrastructure creates opportunities for businesses, as well as growth, new ideas, collaboration, and education. The planned biosphere reserve can, moreover, contribute interesting and high-quality solutions for specific issues arising in other biosphere reserves in the World Network as a result of similar challenges, so-called benchmarking.

Foundations of biosphere work

The vision for Vindelälven-Juhtatdahka:

Wild, beautiful and world-renowned.

A sparkling adventure from mountain to sea, with a diversity of nature and culture as a basis for development and a source of experiences and good quality of life!

This vision lies at the core of the overall objective:

"To work together to develop, preserve and support rich and unique nature, culture, and people's quality of life in Vindelälven-Juhtatdahka so that everyone can live, grow and thrive in towns as well as the countryside, today as well as in the future."

Our mission statement:

The biosphere reserve Vindelälven-Juhtatdahka is a neutral arena and a catalyst for sustainable development throughout the whole of the River Vindelälven valley. The biosphere organisation will work through collaboration, not through adopting independent positions on various issues and running all projects in isolation.

The ambition is to

- Implement the three dimensions of sustainable development – ecological, socio-cultural and economic – in a practical manner and establish them through different projects;
- Conduct local work in a way that contributes to solutions to global challenges;
- Preserve and develop the area's unique values and opportunities and communicate these to people who live and work in the River Vindelälven valley, as well as to visitors;
- Support research and work experience as well as being a bridge between scientific observations and local knowledge and its application;
- Serve as a meeting place for researchers and the public, as well as for authorities, not-for-profit organisations, businesses and individuals;
- Increase knowledge of the Sami culture and of reindeer herding in Vindelälven-Juhtatdahka.

The vision, the overall objective and the basic principles collectively permeate the development plan that is being drawn up and which will direct the work of the biosphere reserve. These ambitions also underlie those projects which in various ways receive support from Vindelälven-Juhtatdahka.

Regional investments and the planned biosphere reserve's focal areas

A number of efforts to promote sustainable economic and social development are underway in the planned biosphere reserve. Besides those projects, which in one way or another have been supported by Vindelälven-Juhtatdahka (see 15.1), there are many other collaborative initiatives:

- Work is being conducted for the Global Sustainable Tourism Council, in accordance with UN methodology, on quality marking and sustainability analyses amongst destination management companies and individual tourist firms.
- *Vindelälvens Naturbeten* (natural pastures) was initiated by the World Wide Fund for Nature (WWF) and Sorsele municipality. The project involved cooperation between farmers, municipalities, WWF and the County Administrative Board in Västerbotten to enable the restoration of riverside grazing lands along the entire River Vindelälven. *Vindelälvens Naturbeten* continues today as an economic association.
- The County Administrative Board in Västerbotten County, together with landowners (the forest companies Holmen Skog, Sveaskog and SCA as well as individual landowners, the Church of Sweden, Vindelä municipality and the Swedish Environmental Protection Agency) has brought forward proposals on how deciduous forest environments can be preserved and developed in Vindelä municipality.
- The National Rural Development Programme funds several development projects which contribute towards creating a living countryside in the area.
- Many fisheries management and river restoration activities have been brought together under the umbrella project "*Från Kust till Fjäll*" (from coast to mountain) which is characterised by constructive collaboration between authorities and researchers, as well as other users of water and fish resources.
- In Sorsele, around 20 associations have established Sorsele United, a collaborative forum for information, marketing and the development of various activities, with an emphasis on children and young people.
- Under the umbrella organisation Arena Vindelälven and other bodies, a number of fitness events are organised which also draw in participants over long distances.
- "*Two women, a dog and a thousand reindeer as indicators of a sustainable landscape*" is a collaborative project which involves researchers at the Swedish University of Agricultural Sciences (SLU) and reindeer herders in the Grans *sameby*. The project is part of an international collaborative

project funded by the EU's Northern Periphery and Arctic Programme. The aim of the local project ' is to create better foundations and tools for joint consultation between those involved in reindeer herding and other forms of land use.

- An arena is being created for improved communication and dialogue between different parties with regard to land use issues.
- Villages along the river have associations which invest in systems of rural pathways and sports facilities. There are also active local history societies, cultural associations, organisations for managing fishery conservation areas, village associations, etc., which empower and connect people.
- Stiftelsen Naturvård (nature conservation board) on the lower River Umeälven was established in association with the construction of the high-speed railway line Botniabanan (Bothnia Line) through the River Umeälven delta. The board's objective and mission is the long-term management of nature conservation in those areas where Banverket (now Trafikverket – Swedish Transport Administration) was commissioned to carry out restoration/improvement work as compensation for intrusion of the railway construction into the Natura 2000 area of the River Umeälven delta and hay meadows. The board includes representatives from the County Administrative Board in Västerbotten, Trafikverket (Swedish Transport Administration), Umeå University, the Swedish University of Agricultural Sciences, Umeå municipality, not-for-profit organisations, landowners and agriculturalists.
- In an effort to develop food tourism in the interior, producers, shops and restaurants, and several interested parties are working with each other on the regional food strategy.
- A preliminary study is underway to improve public transport which should help both industry and tourism.
- A number of so called Local nature conservation projects (LONA) are taking place which involve both protecting nature and making it more accessible, not only physically but also digitally.
- A number of conservation projects (Chap. 14) are being conducted for various threatened species. Representative examples include the Fjällgås Project for a viable lesser white-fronted goose population in Sweden, which is being conducted by the Swedish hunting association Jägareförbundet, and conservation work with Arctic foxes in the EU-funded Interreg projects "*Arctic fox together*" and "*Felles fjellrev*".
- The County Administrative Board in Västerbotten is conducting a review of places along the River Vindelälven that are of national interest with regard to cultural environments.
- Sorsele, Arjeplog and other municipalities are involved in the project "Destination Capacity Building in Swedish Lapland". The project aims to contribute to the growth of existing companies on the international market, the establishment of new companies and the creation of jobs in the tourist industry.



Image 5. Mårdsele rapids. Photo: Cecilia Wallinder

The biosphere work in Vindelälven-Juhtatdahka has four principle objectives (see 13.2). Work to achieve the first objective, "a model area for sustainable development", is very clearly linked to promoting sustainable economic and social development. Progress is dependent on the involvement and participation which the planned biosphere reserve manages to inspire; the key to progress is local relevance and benefits. To ensure this, the plan is to work towards achieving objective 1 in six focal areas with clear local associations. The focal areas have been derived, for example, from the regional collaborative efforts presented above, from the projects that have been funded by Vindelälven-Juhtatdahka (15.1) and from ongoing dialogue with people who live and work in the area. In the focal areas, development, support and conservation are all realised through local collaboration. The six focal areas, which overlap to some extent, are:

1. Living landscapes
2. Fishing in flourishing lakes, watercourses and sea

3. Tourism industry and outdoor life for everyone
4. Thriving reindeer husbandry
5. Development of the local community
6. Diversity of cultural expressions

All activities and investments in these six focal areas should in one way or another promote the development of Vindelälven-Juhtatdahka as a well-functioning model area for sustainable development. The planned biosphere reserve's communications plan forms the basis for ongoing work, with a PR plan created to facilitate the public's understanding of what a biosphere reserve is and to increase public involvement in the biosphere work. As a biosphere reserve Vindelälven-Juhtatdahka will therefore have major potential to promote sustainable economic and social development.



Image 5. Outdoor dinner
Photo: Cecilia Wallinder



Image 6. The river valley dressed in snow



Image 7. Recreational play

Ecosystem services from the area

The ecosystem services which Vindelälven-Juhtatdahka provides (see Chap. 12) are fundamental to the area's development potential. Nature in the planned biosphere reserve is an important asset in strengthening community development and people's wellbeing, and the ecosystem services generated by the area's natural environment form the basis for business and entrepreneurship. Forests are a prerequisite for the forest industry which is an important cornerstone in the area's economy. Lichen and herbaceous plants are a basic prerequisite for reindeer husbandry. Fishing in the area's watercourses provides food and recreation for local people, and also attracts tourists. Fields and meadows in the agricultural landscape provide food for people and animals, as well as biological diversity and beautiful scenery.



Image 8. Bumblebee (*Bombus terrestris*) on Västerbotten landscape flower Moor-king (*Pedicularis sceptrum-carolinum*). Photo: Cecilia Wallinder

The area contributes all types of ecosystem services: provisioning, supporting, regulating and cultural. Several ecosystem services are assured through the area's many existing nature protection areas, for example in the form of nature reserves, national parks and Ramsar sites. There are cultural ecosystem services, for example, in the mountains with their open spaces and ancient forests, and along the river with its species-rich river banks and grand forest environments. Many people live in or visit natural environments to enjoy the beauty of these places as well as hunting, fishing, sports, berry and mushroom picking or just being alone in the silence. Together with the Swedish allemansrätten (public right of access), which gives everyone the right to be close to nature, the planned biosphere reserve's diversity of natural environments and ecosystem services creates a stable basis for the development and growth in tourism and themed holidays. For decades, the river valley has seen land restoration, the restoration of watercourses once used for timber flotation, the removal of obstacles to rambling and animal migration, and the management of fisheries. This ensures a strong conservation expertise in the area and also forms the basis for enabling the development and expansion of fishing, hiking and other tourist experiences. Forecasts indicate that tourism will become increasingly important, as people nowadays are in good health and relatively well-off long after they retire.

The extended infrastructure in urban centres increases access to ecosystem services. Generally speaking, natural environments close to urban centres have the greatest social value, simply because the majority of the population live in or close to urban centres. Green spaces are being created in built-up areas in association with surrounding nature and are contributing a number of supporting and regulating services.

Maintaining ecosystem services requires a functioning green infrastructure, which is well-developed in larger parts of Vindelälven-Juhtatdahka. This means that there are coherent networks in a landscape of utilised and protected natural environments which are managed to ensure a diversity of species and important living environments. Conditions are favourable for the planned biosphere reserve also serving as a model area for Sweden's work in mapping out and planning for green infrastructure. The collaborative processes that have already been initiated can become an important tool for enabling people to acquire more knowledge of what green infrastructure involves and to discuss how it should serve the greatest good.

3.3 Logistic support - support for demonstration projects, environmental education and training, research and monitoring related to local, regional, national and global issues of conservation and sustainable development (Please indicate current or planned activities).

Research, education and information

Many activities related to environmental education, research and training, as well as public engagement are already underway in the planned biosphere reserve. There are strong foundations for such activities, thanks in part to the presence of two major universities, the Institute for Subarctic Landscape Research (INSARC), a number of primary and secondary schools, and a number of more specialist schools. Vindelälven-Juhtatdahka should become one of the world's largest biosphere reserves (1.3 million ha) which, from a communication perspective, presents a challenge. However, present-day communication tools offer an enormous potential for the biosphere reserve and there is a need to expand the use of these tools to enable information dissemination, dialogue and learning. Digital solutions such as digital citizen's forums and web surveys will therefore become important tools for involving and engaging as many people as possible in the planned biosphere reserve. The biosphere candidature has prompted the training of biosphere ambassadors who, in their turn, will disseminate information and promote involvement in the planned biosphere reserve as well as teaching us how we can protect, utilise and develop the reserve's unique assets (see also 4.7.d and 16.2.1).

Environmental and sustainability education in the River Vindelälven valley is associated with a range of local schools, organisations and associations, as well as municipal strategies, project activities, the Naturum visitor centre at Ammarnäs, and the nature centre located in and run by Vindelns municipality.

The latter two are open to everyone and offer an opportunity for people of all ages to learn more about nature and the environment. The Swedish Environmental Protection Agency owns the rights to the name Naturum. These centres, which can be found all over Sweden, are run by a county administrative board, municipality or trust.

During the candidature, Vindelälven-Juhtatdahka has entered into a collaboration with Naturskolan in Umeå, which now offers education and training in sustainable development, as well as outdoor education and an account of what a biosphere reserve means for us. Those involved have been both teachers and pupils in years 4 and 5, from Arjeplog and Sorsele in the west to Umeå in the east. Naturskolan's work in schools in the river valley is highly valued, not least in the smaller municipalities. The knowledge and the pedagogical tools that Naturskolan provides are resources which inland schools would otherwise rarely get to use. This is an example of how the planned biosphere reserve is working to disseminate knowledge to children and educationalists. As well as Naturskolan, a range of other players, such as adult education associations, adult education providers and local societies, also provide education in the areas of environment, sustainability, etc. Basic research, applied research and environmental monitoring in the planned biosphere reserve is conducted by Umeå University and the Swedish University of Agricultural Sciences, which together have more than 42,000 students and employees, as well as the Institute for Subarctic Landscape Research (INSARC) in Arjeplog municipality. INSARC is an independent undertaking within the framework of the Silvermuséet organisation, independent of the university and colleges.

Umeå University houses three centres which coordinate Arctic research, Sami research and regional science: Arktiskt centrum (Arcum: Arctic Research Centre), Vaartoe, and Cerum (Centre for Regional Science). Umeå University is also home to Umeå centrum för genusstudier (Umeå Centre for Gender Studies, UCGS), internationally renowned for research and education in gender equality. Many relevant subject areas have natural associations with Vindelälven-Juhtatdahka, including cultural geography and economic history, political science, ecology, environmental sciences and geosciences, various subjects at the college of design, and environmental and natural resource economics at the School of Economics.

The Swedish University of Agricultural Sciences, SLU, conducts research into forested rural areas, forestry production, forestry resource management, wild game, fish, the environment, environmental monitoring, etc. SLU also has the internationally renowned research station Svartberget which is a Long Term Socio-Ecological Research station (LTSER) and a hub for forest field research in northern Sweden. It has extensive infrastructure for research into bog ecosystems, drainage basins and productive pine and spruce forests. It offers unique opportunities for researchers to study processes and water flows at both the ecosystem and landscape levels. SLU has the country's only training courses for foresters. Other universities, principally Lund University and Stockholm University, also have research and education activities in the planned biosphere reserve.

The above-mentioned education and research facilities offer excellent opportunities for the joint development of knowledge of issues in a range of different areas of major relevance to sustainable development, both in the river valley and within a global perspective.

Environmental monitoring

The Swedish Environmental Protection Agency (SEPA) coordinates environmental monitoring throughout the country. At a national level, SEPA is responsible for eight programme areas (mountains, health-related environmental monitoring, agricultural land, landscape, atmosphere, coordination of environmental toxin monitoring, forests, and wetlands) while the Swedish Agency for Marine and Water Management is nationally responsible for the coast and the sea, as well as for fresh water. Monitoring of all national programme areas is conducted in the planned biosphere reserve. In addition, environmental monitoring programmes are carried out by both the county administrative boards and the universities. They examine, for example, the condition of forests and bogs as well as changes in these environments, biological diversity, the size and distribution of animal populations, lakes and watercourses (by trend monitoring), the transport of nutrients and other substances in watercourses, as well as metals and environmental toxins in fish (see 16.1.1).

Research and learning in a future biosphere reserve

The Swedish Agenda 2030 delegation, an independent committee with the aim of promoting, facilitating and stimulating the implementation of the 2030 Agenda for Sustainable Development, has concluded that society needs to change if sustainable development is to be achieved. Such a change will take time and involves a learning process. The delegation points out that a precondition for sustainable development is public awareness and involvement. Education and learning are therefore central to Vindelälven-Juhtatdahka, particularly with regard to getting people to become engaged in, and learn about, the practical side of sustainable development.

Vindelälven-Juhtatdahka will work to attract resources for research and education and to serve as a model for bringing together academic expertise and the awareness and needs of local communities. The planned biosphere reserve can help the universities to develop more specific projects to meet these needs. Arcum, at Umeå University, has taken on the task to act as a platform for developing research in the biosphere reserve. They invited the public, various interested parties and operations in Vindelälven-Juhtatdahka, as well as researchers at Umeå University, SLU, and INSARC to a workshop in April 2018. The aim was to identify relevant issues and research objectives for the planned biosphere reserve and to seek research funding for the coming years. The initiative was well received and the workshop generated a large number of ideas of which many included citizen science as a method with high potential. In a follow-up meeting, the organizers agreed to have another workshop in the coming autumn, to distribute updates on how work develops, and also to form a group of motivated researchers who could respond to upcoming calls by writing research proposals. As the academic expertise is to a large extent international, there also needs to be a strengthening of international collaboration, for example, on issues concerning migrants.



Image 9. Naturskolan with outdoor pedagogy in schools along the river.



Image 10. Public transportation in Taveljö. Photo: Fredrik Larsson

4. CRITERIA FOR DESIGNATION AS A BIOSPHERE RESERVE

(Article 4 of the Statutory Framework presents seven general criteria for an area to qualify for designation as a biosphere reserve. These criteria are presented below.)

4.1 The area should encompass a mosaic of ecological systems that are representative of major biogeographic regions and include a gradation of human interventions. (The term “major biogeographic region” is not strictly defined but it would be useful to refer to the Udvardy classification system (http://www.unep-wcmc.org/udvardys-biogeographical-provinces-1975_745.html)).

Biogeographic region

According to Udvardy’s system for biogeographic regions, the area stretches over two regions: the alpine region with high mountain environments, flat low fells and mountain heaths; and the boreal region with forests, bogs, lakes and watercourses.

A mosaic landscape from mountain to coast

The entire landscape in the planned biosphere reserve has been sculpted by the inland ice sheet. The area includes a large number of habitats and types of land use, either in a limited part of the area or in

widely scattered locations.

The mountains are often barren, inhospitable, demanding environments for vegetation, but their climate is stable throughout the year. However, in recent decades, mountain environments have been affected by ongoing climate change. The mountain heaths are home to low-growing alpine and subalpine vegetation of the type that is normally impacted by long-term grazing. Reindeer are the dominant grazing species in the barren mountain region, but grazing by small rodents also has an impact on mountain biotopes. Outbreaks of the autumnal moth are a prime disturbance in mountain birch forests. These forests stretch in a belt along the entire mountain chain and therefore constitute a relatively large and extensive forest type.

From a global perspective, Sweden is one of the most bog-rich countries in the world, and the planned biosphere reserve has many wetlands. Wetlands play a role in water management in the ecosystem and also serve as grazing lands for many animals, including reindeer. Nevertheless, a large part of the planned biosphere reserve is covered by boreal forest (taiga) and the most commonly occurring types of tree are pine and spruce. A substantial part of these forest lands is cultural forest with ongoing forestry activity, although some forest is within the large number of protected areas.



Image 11. The river by the village Hjuken. Photo: Bertil Hagberg, Sesamphoto

The landscape is also characterised by many lakes and watercourses. There are village environments with open cultivated landscapes along the entire River Vindelälven and the lower River Umeälven. The area is also rich in sandy and fine sandy material that has formed extensive floodland, flood meadows which have to a large extent been used as hay meadows. With the help of Vindelälvens natural pastures, overgrown grazing lands have been restored along the River Vindelälven, to the delight of local residents and visitors who appreciate the views over grazing pastures and the river. Even though cultivated land makes up only a small part of the total area, it is an important feature of the

environment around settlements. Towards the coast, the presence of urban environments increases: Umeå is the largest urban centre in the planned biosphere reserve.

River and water in the landscape

The rivers Vindelälven and Laisälven, together with the lower River Umeälven, flow as a source of life through Vindelälven-Juhtatdahka. The valley is influenced by the original bedrock and by several ice ages which have left sediments and divided the landscape through variations in maximum coastline elevation. A large number of lakes and tributaries are linked to the river. The area's larger lakes are situated inland and in the montane valleys.

The water in the River Vindelälven and its tributaries is home to many fish species. The best-known include salmon, trout and grayling. The tributaries also contain freshwater pearl mussels whose population has been boosted by a number of conservation efforts. Restoration work in many of the tributaries has improved the living environments for many of the area's aquatic species and for many plants along the river banks. However, many larger facilities for timber flotation have been preserved as heritage items in large parts of the area. Several plant species from the western part of the area can be found along the river banks far into the forest area, thanks to their propagation via free-flowing water. In combination with land elevation, the transportation of sediment by the rivers Vindelälven and Umeälven means that delta formation is still ongoing where the river flows into Bottenviken near Umeå. The delta has high nature values in the form of unique marine and raised beach environments, nutrient-rich coastal forests and its unique bird life.

A scale of human impact

Throughout history, land use has been dictated by basic considerations, such as soil type and climate, but has also been constantly influenced by cultural processes and state intervention. The landscape contains the remains of extensive trapping pit systems and of 8000- to 9000-year-old sites of human habitation. Reindeer herding still uses different types of land throughout almost the entire area. The extensive mountain region is sometimes referred to as Europe's last wilderness, despite much evidence of human presence. This is actually a cultural landscape which, above all, bears the stamp of many hundreds of years of reindeer grazing: an ecosystem service which constitutes an important basis for the Sami culture. Reindeer grazing is also a prerequisite for the biological diversity of the mountains. Grazing benefits many weakly-competitive plant species that are able to coexist with brushwood and scrub which, without grazing, would dominate. Even though reindeer herding has become mechanised and rationalised in recent decades, it still largely involves open natural grazing on large areas of land. The Sami's use of both mountain and forest areas has left a clear imprint on the landscape. New building and small-scale agriculture are also typical of these areas, including community centres, club houses, chapels and church villages.

There are also many traces of earlier land use in the area's forests. These include the remains of many tar pits and charcoal kilns which are mainly found in the eastern parts of the area, as well as tree stumps and abandoned lumberjack barracks. While there are generally more original forests remaining in the montane areas, most of forest area is productive forest with ongoing forestry operations. The conservation of biological diversity and other environmental assets is today regulated by The Swedish Forestry Act as well as by tree felling permits. The city of Umeå, located close to the coast, has green areas of its own. Despite Umeå being a relatively major city, its fringes are rural in character. Rökbacksslätten has large agricultural areas between the river and the sea and retains a rural atmosphere despite being situated just outside the Umeå urban conurbation. The outermost coastal strip contains the remains of fishing and seal hunting, and commercial fishing still takes place.

4.2 The area should be of significance for biological diversity conservation

(This should refer not only to the numbers of endemic or rare species, but may also refer to species on the IUCN Red List or CITES appendices, at the local, regional or global levels, and also to species of global importance, rare habitat types or habitats with unique land use practices (for example traditional grazing or artisanal fishing) which favour the conservation of biological diversity).

The whole of the proposed biosphere reserve, with its mountain landscapes, forests, river valleys and coastal areas, provides a mosaic of species and habitats. Traditional reindeer grazing is an important factor in maintaining diversity in the alpine areas and also makes its mark on forest habitats. Biological diversity at the local, regional and global levels benefits from the fact that Vindelälven-Juhtatdahka is home to and helps conserve many species. 488 species in the area are on the national red list, and there are also species that are unique to and characteristic of this area, such as the Arctic fox. A large proportion of Swedish Arctic foxes live in Vindelfjällen. The species as a whole is not threatened, as there are large numbers of individuals in the rest of the Arctic region, but its population in Scandinavia is small. Other examples are the local strain of mature trout, referred to as Ammarnäs trout, and the Jämtland dandelion (*Taraxacum crocodes*) which is endemic to the Nordic countries, with the largest populations nowadays probably found along the water's edge on the River Laisälven. The original area of distribution of the Jämtland dandelion has been greatly reduced as a result of the introduction of hydroelectric power plants.

The two largest protected natural areas in Vindelälven-Juhtatdahka are the mountainous nature reserves Vindelfjällen and Laisdalens Fjällurskog. The entire River Vindelälven is classed as a site of national interest for nature conservation and is part of the Natura 2000 network. The river is surrounded by other places of national interest with regard to reindeer husbandry, outdoor life and cultural heritage conservation. Some sections of the River Vindelälven and many of its tributaries have been restored to boost populations of aquatic and riverbank species. Extensive fisheries management work is now being carried out along the entire length of the river, from the mountains to the coast. Work in the Ume delta, in which the Swedish Transport Administration implemented measures to compensate for the construction of Botniabanan (the Bothnia Line high-speed railway), has included the establishment of

protected areas, practical nature conservation, and the creation of valuable land areas, such as river meadows and wetlands, to facilitate stopovers by migrating birds in the cultivated landscape. Together these measures provide favourable conditions for continuing conservation work in the area.

4.3 The area should provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale. (Describe in general terms the potential of the area to serve as a site of excellence for promoting the sustainable development of its region (or "eco-region").

Since the River Vindelälven was designated in 1975 as one of the country's 25 primary recreation areas, a great deal of work has been carried out to coordinate various investments in the area, creating favourable conditions for ongoing cooperation. Stakeholders on the board of the planned biosphere reserve – the county administrative boards in Norrbotten and Västerbotten, the World Wide Fund for Nature (WWF), some *sameby* in the area, the six municipalities (Sorsele, Arjeplog, Lycksele, Vindelön, Vännäs and Umeå), villages, tourism, fishing, agricultural industries, forestry, universities, not-for-profit associations and Region Västerbotten – are all important representatives for biosphere reserve work. The network of interested parties, specific knowledge and experience will become ever more valuable in a larger context and contribute to broader support for the area's challenges and opportunities.

The many activities that are carried out jointly or individually throughout the area are suitable for demonstrating methods for sustainable development. These include local projects, internationally renowned research at universities and research institutes, and local and regional work based on the strategies of various organisations and management plans concerning sustainable development. The sustainability work currently being carried out by the six municipalities and other authorities is very much in line with Agenda 2030, but more collaboration is needed for it to be completely successful. As a biosphere reserve Vindelälven-Juhtatdahka, will proceed from these positive examples and bring together ongoing sustainability work, link this to the Lima Action Plan and the UN's global objectives, and help devise a common strategy for sustainability work in the area in the form of a common development plan (see 17.4.5).

The planned biosphere reserve has already contributed to the major project activities being conducted in the area. However, Vindelälven-Juhtatdahka will not itself initiate and run a large number of projects, but aims rather to bring together local initiatives and activities and to establish the conditions necessary for these activities and initiatives to become permanent rather than disappearing after the projects come to an end. It is easier for a joint biosphere organisation than for individual players to take stock of, and bring together, ongoing projects. With its wide network, it can direct and support projects and activities throughout the entire area.

Many of the aims and objectives in the development plan and its focal areas converge with activities which utilise land and water in the planned biosphere reserve. Many of these activities compete for the same land; some contribute directly to the conservation of cultural landscapes, ecosystems and species. Reindeer husbandry, forestry, agriculture, fishing, tourism, outdoor life, mining, energy production, local businesses and club activities all contribute job opportunities. There are differences in how individual activities generally contribute to the planned biosphere reserve's sustainable development objectives. Bringing together and coordinating different interested parties under a commonly agreed goal, at the same time as protecting conservation values associated with landscapes, ecosystems and species, provides a model for sustainable development which has already been initiated and is well suited to development in the area.

4.4 The area should have an appropriate size to serve the three functions of biosphere reserves.

(This refers more particularly to (a) the surface area required to meet the long term conservation objectives of the core area(s) and the buffer zone(s) and (b) the availability of areas suitable for working with local communities in testing and demonstrating models for sustainable uses of natural resources)

Vindelälven-Juhtatdahka covers 13 294 km², a sufficiently large area to accommodate the three primary functions – to preserve, develop and support – that should be fulfilled in a biosphere reserve. The sizes

of respective zones are presented in Table 1. The long-term conservation goal is secured by the fact that the core area and buffer zone are derived from existing protected areas. The core areas have been designated as Natura 2000 sites (the River Vindelälven with the River Laisälven and the Ume delta) so this zone is accorded the equivalent of Natura 2000 protection. Those areas adjoining the river, which are sites of national interest, nature reserves or protected shoreline, have been chosen as the buffer zones. The area between the buffer zone and the outer border of the planned biosphere reserve is the transition area. As defined by the Swedish Meteorological and Hydrological Institute (SMHI), the outer boundary derives from the drainage basin of the River Vindelälven (including the River Laisälven). The drainage basin for the lower River Umeälven has also been included in order to link the entire course of the River Vindelälven from its source to its outlet.

Table 1. Area (ha) in respective zones

Zone	Area (ha)
Core area	20 865
Buffer zone	402 707
Development area	905 546

Accessible areas for testing sustainable utilisation of resources

Most of Vindelälven-Juhtatdahka is accessible for recreation and outdoor life. The Swedish *allmansrätten* (public right of access) gives everyone the right to be surrounded by nature. These rights come with the responsibility to behave with care and consideration towards nature and wildlife, as well as towards landowners and other people. Special rules apply to nature reserves, where public right of access may be restricted. As each reserve has its own unique rules, information on these rules is clearly displayed at various points throughout each reserve. The nature-based tourist industry and other organised outdoor pursuits present significant opportunities to develop activities that can be enjoyed in natural environments.

Large parts of the development area have ongoing forestry operations. Agreements between the government and the forest industry have laid the foundations for the Swedish forestry model. This means that high levels of valuable forestry production and social values are maintained and developed while, at the same time, nature reserve provisions, voluntary contributions and general respect should ensure the conservation of biological diversity from a landscape perspective. Considerate use and nature conservation will be secured by national investment in green infrastructure, i.e., the preservation of networks of core value areas in the landscape, connected by ecological corridors.

The large diversity of natural habitats –mountains, watercourses, lakes, wetlands, forests, agricultural lands, delta areas, coastline, sea and peri-urban green areas – means that conditions are favourable for demonstration projects from which the local population and other parts of the world with similar habitats can benefit. A workshop has been opened which is involved in a number of projects; this is a good start (see 15.1). Ten of the River Vindelälven’s tributaries already have areas which demonstrate adaptive watercourse restoration. Research in those demonstration areas contributes knowledge of how watercourse ecosystems recover ecologically after restoration, and how abiotic and ecological processes at local and landscape levels work together in regulating the biological diversity of watercourses.

Through links developed with communities, businesses and not-for-profit organisations, Vindelälven-Juhtatdahka has great potential to create models for demonstration work which can benefit large and small landscape areas throughout the world.

4.5 The area should have appropriate zonation:

a) a legally constituted core area or areas devoted to long term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives

(Describe the core area(s) briefly, indicating their legal status, their size, and the main conservation objectives.)

The core area consists of protected areas. The rivers Vindelälven and Laisälven are protected in accordance with chapter three of the Swedish Environmental Code (areas of national interest for nature conservation), chapter four (national rivers) and chapter seven (Natura 2000, the Species and Habitat directives). The core area also includes the River Umeälven delta, a large, diverse peri-urban area on the coast, where the river meets the Baltic Sea. The Ume delta is part of the Natura 2000 network and also protected as a nature reserve. The core area has high conservation values and high biological diversity and contributes to many ecosystem services.

b) a buffer zone or zones clearly identified and surrounding or contiguous to the core area or areas, where only activities compatible with the conservation objectives can take place. (Describe briefly the buffer zones(s), their legal status, their size, and the activities therein which are ongoing or planned).

The buffer zones surround or connect the core areas. The buffer zones consist of areas of national importance, Natura 2000 areas and nature reserves, as well as the lower River Umeälven with its protected riverbanks, which connects the River Vindelälven core area with the Ume delta core area. The Ume delta is surrounded by a buffer zone which is the land area in the delta (Natura 2000 and nature reserves). The most easterly buffer zone comprises an exclusion area which is subject to more stringent restrictions with regard to fishing. The buffer zone which encloses the River Vindelälven mainly consists of sites of national interest for nature conservation and outdoor life. Other types of areas of national interest in the buffer zone relate to reindeer husbandry and cultural environments. Areas of national interest should, according to The Swedish Environmental Code (Chap. 3 §6), be protected from any actions that could clearly harm the natural or cultural environment. However, places of national interest are subject to management rules that only directly affect the assessment of businesses involved in resource exploitation which, in legal terms, means altered land use. The buffer zone also includes large parts of Vindelfjällen which, with a total area of 550,000 ha, is northern Europe's largest nature reserve, as well as the Natura 2000 site and nature reserve Laisdalens Fjällurskog. The nature reserves are protected by the Swedish Environmental Code (Chap.7 § 4–6).

c) an outer transition area where sustainable resource management practices are promoted and developed. (The Seville Strategy gave increased priority to the transition areas as this is where the key issues of environment and the development of a given region will be addressed. Describe briefly the transition area(s) and the types of issues to be addressed there in both the short and long term. The Madrid Action Plan states that the outer boundary should be defined through stakeholder consultation).

The remaining area, which is part of neither the core areas nor buffer zones, comprises the transition area. Most of the urban centres, large and small, are situated in the transition area, as are the major forest areas and agricultural areas. Long-term, locally-based sustainable development work will be prioritised in the transition zone. The biosphere work involves linking people with nature so that future generations will have the same opportunities that we have today. As most of those who live and work in Vindelälven-Juhtatdahka are in the transition area, current initiatives are being carried out in this zone, and many of the anticipated future initiatives will also be implemented here.

The municipalities' comprehensive plans are of major significance with regard to the management of developmental issues by providing guidance in deciding how land and water areas should be used, which areas should be set aside for recreation, and what should be conserved or developed. The board of the planned biosphere reserve has already started talks on collaboration with several municipalities which are revising their comprehensive plans. This collaboration will be extended to all municipalities in the near future. This has been prioritised, as the comprehensive plans have an important role to play as target documents and as a guide to a more sustainable future.

d) Please provide some additional information about the interaction between the three areas.

The reciprocal relationship between the three zones and among and between the rural and urban areas is important for long-term sustainable development. The city of Umeå, the largest population centre in the transition area, is an international city with a progressive attitude towards sustainability, an education

system, a strong business sector and a relatively resource-rich population. The planned biosphere reserve is working to make Umeå's knowledge bank for sustainability work, as well as its city-based education system and other urban resources, accessible to other parts of the planned biosphere reserve. The area's mountain regions and interior, with its free-flowing river and large forest and mountain landscapes, are in turn a resource for many, not least for the population of Umeå – and also for many of the area's visitors, who travel there via Umeå. There is a lot of interest in locally-produced goods and eventually there should be excellent opportunities for selling local products in the immediate area. Umeå is the most promising market for products made in Vindelälven-Juhtatdahka.



Image 12. Farmer in Spöland
Photo: Johanna Gardeström



Image 13. Bumblebee on Wolfs-bane
Photo: Ola Jennersten



Image 14. Honey farmer in Mårdsele.
Photo: Robert Karlström

4.6 Organizational structures should be established to initiate and facilitate the cooperation of a suitable range of, for example, authorities, local communities and private interests in the design, development and running of the biosphere reserve.

4.6.1 Describe the work that is being carried out or planned. (Describe involvement of public and/or private stakeholders in support of the activities of the biosphere reserve in core, buffer and transition areas (such as agreements, protocols, letters of intent, plans for protected area(s)).

In the early nomination work, when a preliminary study was carried out to assess the potential of the planned biosphere reserve and people's willingness to become part of UNESCO's World Network of Biosphere Reserves, a steering group was established by the project's originators, the County Administrative Board in Västerbotten, VIKOM (the economic association of the Vindelälven municipalities), and the World Wide Fund for Nature. A lesson learned in the preliminary study was that a broad collaboration which includes many interested parties is the best way to generate involvement and initiative. It was therefore decided that the candidature should in the first instance be administered by an interim management board with broad representation. However, a large board presents challenges. Many, sometimes conflicting, interests are heard and the various organisations often have different expectations with regard to the project and its outcomes. However, once the nomination work was underway, it was found that the board's broad representation proved to be not so much a challenge as a major asset. Over time, considerable trust has developed within the board, not least with an increased understanding that each faction faces different realities and has to live up to different expectations from its respective organisations and stakeholders. With time, this has resulted in open discussions and helpful dialogue which have created positive energy, major involvement, and a solid basis for constructive work in both the short and long term.

The current interim board has a broad and local representation, with participants from villages, authorities, municipalities, *sameby*, fishing, tourism, universities, businesses, agricultural industries and not-for-profit organisations. The board has full responsibility for managing the work of the planned biosphere reserve by advising what activities can take place within it, but the board itself does not administer the

area. On the other hand, some of the board's members represent various administrations within the area. All municipalities are also represented in the municipal working group, which is associated with the secretariat, in order to incorporate local interests and to inform the next paragraph the secretariat in its work. As the area is so large, board meetings are held at different venues, and travel expenses are paid to encourage as broad a geographical representation as possible. To encourage their participation on the board, private stakeholders' costs are reimbursed.

Before the area becomes an officially declared biosphere reserve, a not-for-profit organisation will be formed. Voluntary associations are often depicted as unique to Sweden because they have a democratic structure and a high degree of integration. Most people in Vindelälven-Juhtatdahka are or have been members of one or more associations of some kind. Many are members without being directly active. Others choose to become involved in different ways. The tradition of associations amongst the Swedish people is an asset for the biosphere work and for the not-for-profit organisation that will be formed.

Membership of the Biosphere Reserve Vindelälven-Juhtatdahka Association is open to businesses, associations, organisations and private individuals. Following assessment by the nomination committee, future board members will be selected at the annual association meetings. To ensure that the work continues smoothly, board members should not all be replaced en masse, but rather each individual member should resign when his/her mandate expires. The future interests of the association should be assessed by the board.

Many organisations will be able to play an active role in taking the initiative and carrying forward projects within the framework of the biosphere undertaking. Local initiatives and participation also affect the direction of the development plan, which will be open to adaptation. *A diversity of cultural expressions* is perhaps the focal area that might be expected to experience the greatest variation in direction and initiatives as culture is a complex concept. There are many professional and amateur artists and the area is permeated with both Sami and Swedish culture.

The legal protection of lands in the area will not be altered by the awarding of biosphere status and those administering protected areas will remain in place. The Swedish Environmental Protection Agency and the county administrative boards in Norrbotten and Västerbotten are responsible for conservation plans and the managing and monitoring of formally protected areas. Many private forest owners and authorities are signed up to forest nature conservation agreements.

4.6.2 Have any cultural and social impact assessments been conducted, or similar tools and guidelines been used?

(e.g., Convention on Biological Diversity (CBD)'s Akwé: Kon guidelines: Free, Prior, and Informed Consent guidelines, Biocultural Community Protocols, etc.). (UNESCO's Programme on Man and the Biosphere (MAB) encourages biosphere reserves to consider and respect indigenous and customary rights through programmes or tools, in accordance with the United Nations Declaration on the Rights of Indigenous Peoples (http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf when relevant and appropriate)).

Throughout the nomination process, many of the area's stakeholders have participated in a systematic, organised manner in dialogue about expectations for the planned biosphere reserve. Local meetings have been held in villages in all six municipalities (see 17.3.1), with members of different *sameby* and Sami coordinators in administrative local authorities, with agricultural industries, fishing, authorities and municipalities who are responsible for nature, outdoor life and culture, as well as many other stakeholders. During the dialogue process, there emerged a clear desire and will for the board to have a broad representation and geographic spread, with representatives from coastal, forest and mountain municipalities and villages, and to strive towards an equitable gender balance.

Some Sami have expressed a fear that their interests will not be considered and that their culture will be used to promote the area without their consent and involvement. The Sami's historical experience of oppression and abuse of the Sami culture is a fundamental reason for this suspicion. During the candidature, meetings and discussions have therefore been held with Sami coordinators in administrative local authorities and with representatives of *sameby*. The coordinators have participated in the Lapland assembly, held Skype conferences with various Sami representatives and joined in Sami events, to come

up with ways of involving and engaging Sami. One challenge is that many Sami, particularly in reindeer herding, find it hard to prioritise the work of the biosphere reserve as they already have to spend much time protecting their rights through joint consultation with various agencies and authorities on, for example, forestry, mining operations, wind power, tourism and town planning. Activities which have helped to persuade Sami to become involved in the planned biosphere reserve include international exchanges with other indigenous peoples, Sami participation in national and international conferences of the MAB Programme, clarification of strategies concerning the importance of Sami culture and reindeer herding in Vindelälven-Juhtatdahka, and work to disseminate knowledge of Sami history, culture and reindeer herding, which is already underway. This is not something that will “be completed yet”, but will continue to be an important part of the work when Vindelälven-Juhtatdahka becomes a biosphere reserve. In the same way, dialogue with other stakeholders, such as entrepreneurs and forestry, has in no way been completed, and will continue.

When this application was circulated in the area for consideration, it generally received a lot of support from the public and organisations. But there were also those who expressed disquiet. To get across more clearly the message of what a biosphere reserve is and is not, a number of discussions were organised, as were several open meetings for providing information before the application was completed. These meetings have been rewarding and have resulted in increased knowledge about the contribution of industry and commerce to sustainable development as well as the challenges it faces in the area.

The future work in Vindelälven-Juhtatdahka will involve developing further the discussions that have already begun, as well as listening and acting within the scope of a sustainable development of the area. The extensive process described above has contributed to a broad interdisciplinary involvement in the proposed biosphere reserve, creating favourable conditions for future development work.

Clarification of what a biosphere reserve is and is not

A biosphere reserve is a voluntary undertaking which implies that UNESCO has designated the area to serve as a practical model for sustainable social development - a global model. This does *not* mean that new laws and regulations will be introduced. Designation as a biosphere reserve does *not* mean further restrictions or any compulsory measures for either municipalities, companies, interest organisations or individuals. *Nor* does it affect ownership rights. On the other hand, a biosphere reserve can present opportunities for the area and for those who choose to become involved. Vindelälven-Juhtatdahka is a model area for sustainable development and can inspire people to new forms of collaboration amongst *those who want to participate*; this cooperation will drive the work forward. A biosphere reserve is in every sense an area of collaboration!

4.7 Mechanisms for implementation:

Does the proposed biosphere reserve have:

a) mechanisms to manage human use and activities in the buffer zone or zones?

If yes, describe. If not, describe what is planned.

Activities and resource utilisation are regulated in both the buffer zones and other parts of the area through the application of Swedish legislation. Important legislation includes the Swedish Environmental Code, the Swedish Forestry Act, the Planning and Building Act, and the Cultural Heritage Act. Areas that are designated places of national interest are protected against substantial exploitation (see 9.3). The use of land and water resources is described in the municipalities' comprehensive plans and then expressed in more concrete terms in subsequent planning, in full accordance with the Planning and Building Act. Allemansrätten (right of public access) applies to the whole area, giving everyone the right to roam freely through the countryside, subject to certain obligations.

b) a management policy or plan for the area as a biosphere reserve?

If yes, describe. If not, state how such a plan or policy will be developed, and the timeframe. (If the proposed area coincides with one or more existing protected natural area(s), describe how the management plan of the proposed biosphere reserve will be complementary to the management plan of the protected

area(s)).

The board of Vindelälven-Juhtatdahka includes representatives from land and water management in the planned biosphere reserve. However, the planned biosphere reserve will not formally manage the area, but rather will constitute a collaborative arena in which different types of stakeholders are brought together - vertically and horizontally.

There is currently no management plan which covers the entire proposed biosphere reserve, but rather there are various protected areas administered in accordance with existing management and conservation plans. Work is underway on a development plan for Vindelälven-Juhtatdahka which will be applicable until June 2024. This will be based on the Lima Action Plan (LAP) and will remain in force during the period 2018-2024 (see 17.4.4). The development plan describes the overall objectives and anticipated effects of the work to implement the biosphere reserve and how results are measured. It also describes the six locally-adapted focal areas, all of which meet objective 1, "a well-functioning model area for sustainable development". The plan also describes the planned biosphere reserve's vision, overall objectives, constituent and interim objectives, and mission statements.

The contents of the plan have been derived not only from the LAP, but also from regional and national strategies and ongoing project activities in the area. The conservation objectives follow and reinforce the conservation plans for the corresponding protected areas. The plan is adaptive and can be altered in response to experience gained and local involvement. Talks were held with various stakeholders as the plans were being developed. Organisations which choose to actively participate in the work of the biosphere reserve and to drive this forward can come to play active roles in, for example, creating new projects and further advancing the development plan.

c) a designated authority or mechanism to implement this policy or plan?

During the nomination process, the board is responsible for the planned biosphere reserve and for the structure and practical implementation of the plan. Once the plan is in place, the not-for-profit association "Biosphere Reserve Vindelälven-Juhtatdahka" will take over this responsibility. Associations have considerable status in Sweden (see 4.6.1). The biosphere secretariat is responsible for the day-to-day work involved in implementing the development plan.

d) programmes for research, monitoring, education and training?

If yes, describe. If not, describe what is planned.

Organisations that are already contributing to research and education in many different disciplines pertinent to the whole of the planned biosphere reserve include Umeå University, the Swedish University of Agricultural Sciences (SLU), and the Institute for Subarctic Landscape Research (INSARC) at Silvermuséet (3.3 and 16.1.1).

Using northern research carried out at the Arctic Research Centre (Arcum) as a starting point, Umeå University intends to create a multi- and inter-disciplinary scientific and educational programme around the biosphere reserve Vindelälven-Juhtatdahka, where the challenges faced by the area will be a first point of engagement for national and international efforts. The conditions are excellent for Vindelälven-Juhtatdahka to be able to develop an innovation initiative with clear social relevance and good opportunities for initiating and funding new research projects. The initiative has dual objectives in the sense that the research results will not only contribute to sustainable, safe and positive development in the region, but also boost Arctic research internationally. It is intended, with the existing organisational structure, to commence innovative work involving people, businesses, organisations and researchers in the area. The foundations are being laid through educational investments linked to research initiatives.

Sweden has a well-developed system for monitoring the country's environmental status. At a national level, the Swedish Environmental Protection Agency is responsible for eight programme areas (mountains, health-related environmental monitoring, agricultural land, landscape, atmosphere, coordination of environmental toxin monitoring, forests and wetlands) while the Swedish Agency for Marine and

Water Management is nationally responsible for the coast and the sea, as well as for fresh water. The regional and local environmental monitoring is mainly conducted by the county administrative boards in Norrbotten and Västerbotten. Environmental monitoring programmes being conducted in the area include The Swedish National Forest Inventory at SLU, an inventory of predatory species and monitoring of, for example, small rodents, breeding birds, Arctic foxes and freshwater pearl mussels. Various environments, such as lakes, trend watercourses and wetlands, are also being monitored.

A research station at Ammarnäs was built to support, inspire and expand research opportunities in the Vindelfjällen Nature Reserve. The station is run by Vindelfjällens Forskningsällskap (Research society) in close collaboration with the County Administrative Board in Västerbotten. Its location gives it the potential to develop into an important resource for, for example, future climate research in Vindelälven-Juhtatdahka. Development work is already underway to make the Naturum in Ammarnäs a biosphere node (see Table in 15.1). The Naturum and the Nature Centre at Vindeln present information and displays on nature and culture in the area. A preliminary study is being conducted into the possibility of opening a Naturum in the Umeälven delta. In addition, Silvermuséet/INSARC in Arjeplog is developing its function as a knowledge, visitor and information portal/node, recreating an experience of the Arctic landscape, and is producing a programme for converting research results into practical applications.

Vindelälven-Juhtatdahka has begun collaborating with Naturskolan in Umeå (see 3.3). Ongoing collaboration with Naturskolan ensures that, regardless of where they are working, teachers and pupils are given the same opportunity to access knowledge about sustainable development.

Biosphere ambassador training is about to be established in the planned biosphere reserve, where people with different knowledge related to sustainable development will be involved in the education (e.g. researchers, entrepreneurs etc.). The aim of the work is to spread interest in and knowledge of the planned biosphere reserve Vindelälven-Juhtatdahka. Educated and involved biosphere ambassadors then further disseminate this knowledge to their contacts and through their networks. We hope thereby to increase understanding of the concept of our model area; to simultaneously preserve and utilise the landscape's values. Anyone who is interested can become a biosphere ambassador. The ambassadors come from different backgrounds, but they all have the common desire to be involved in developing the planned biosphere reserve into a model area for sustainable development. The fact that the ambassadors come from different backgrounds helps in reaching out to a variety of movements and contact networks.



Image 15. Aurora Borealis Photo: Grahame Soden

5. ENDORSEMENTS.

For signed endorsements see Annex 14

5.1 Signed by the authority/authorities in charge of the management of the core areas.

For nature reserves, Natura 2000 areas and Ramsar areas:

County Administration Board Västerbotten

Address: Länsstyrelsen Västerbotten, 901 86 Umeå

Email: vasterbotten@lansstyrelsen.se

Phone: 0046 10 225 41 00

Full name:

Title:

Date and signature:

County Administration Board Norrbotten

Address: Länsstyrelsen Norrbotten, 971 86 Luleå

Email: norrbotten@lansstyrelsen.se

Phone: 010 - 225 50 00

Full name:

Title:

Date and signature:

For forest habitat protection areas:

The Swedish Forest Agency

Address: Box 284, 901 06 Umeå

Email: skogsstyrelsen@skogsstyrelsen.se

Phone: 0046 36-359300

Full name:

Title:

Date and signature:

5.2 Signed by authorities in charge of the management of the buffer zones.

For nature reserves, Natura 2000 areas and Ramsar areas:

County Administration Board Västerbotten

Address: Länsstyrelsen Västerbotten, 901 86 Umeå

Email: vasterbotten@lansstyrelsen.se

Phone: 0046 10 225 41 00

Full name:

Title:

Date and signature:

County Administration Board Norrbotten

Address: Länsstyrelsen Norrbotten, 971 86 Luleå

Email: norrbotten@lansstyrelsen.se

Phone: 010 - 225 50 00

Full name:

Title:

Date and signature:

For forest habitat protection areas:

The Swedish Forest Agency

Address: Box 284, 901 06 Umeå

Email: skogsstyrelsen@skogsstyrelsen.se

Phone: 0046 36-359300

Full name:

Title:

Date and signature:

For areas of national interest and shore protection areas:

Umeå municipality

Address: Umeå kommun, 901 84 Umeå

Email: umea.kommun@umea.se

Phone: 0046 90 16 10 10

Full name:

Title:

Date and signature:

Vännäs municipality

Address: Vännäs kommun, 911 81 Vännäs

Email: vannas.kommun@vannas.se

Phone: 0046 935 140 00

Full name:

Title:

Date and signature:

Vindelns municipality

Address: Vindelns kommun, 922 81 Vindelns

Email: [vindeln.kommun@vindeln.se](mailto:vindelns.kommun@vindeln.se)

Phone: 0046 933 140 00

Full name:

Title:

Date and signature:

Lycksele municipality

Address: Lycksele kommun, 921 81 Lycksele

Email: kommun@lycksele.se

Phone: 0046 950 166 00

Full name:

Title:

Date and signature:

Sorsele municipality

Address: Sorsele kommun, 924 31 Sorsele

Email: kommun@sorsele.se

Phone: 0046 952 140 00

Full name:

Title:

Date and signature:

Arjeplog municipality

Address: Arjeplogs kommun, 938 81 Arjeplog

Email: kommun@arjeplog.se

Phone: 0046 961 140 00

Full name:

Title:

Date and signature:

5.3 Signed as appropriate by the National (or State or Provincial) administration responsible for the management of the core areas and the buffer zones.

Responsibility in Sweden for managing the forms of protection pertaining to core areas rests at institutional level within national and provincial government agencies.

There is no institutional responsibility in Sweden for managing buffer zones. However, there is a general responsibility and, in certain instances, a statutory supervisory responsibility in accordance with current Swedish legislation (see 5.1 and 5.2).

5.4 Signed by elected local government recognized authority or spokesperson representative of the communities located in the transition areas.

Umeå municipality

Address: Umeå kommun, 901 84 Umeå

Email: umea.kommun@umea.se

Phone: 0046 90 16 10 10

Full name:

Title:

Date and signature:

Vännäs municipality

Address: Vännäs kommun, 911 81 Vännäs

Email: vannas.kommun@vannas.se

Phone: 0046 935 140 00

Full name:

Title:

Date and signature:

Vindelns municipality

Address: Vindelns kommun, 922 81 Vindelns

Email: [vindeln.kommun@vindeln.se](mailto:vindelns.kommun@vindeln.se)

Phone: 0046 933 140 00

Full name:

Title:

Date and signature:

Lycksele municipality

Address: Lycksele kommun, 921 81 Lycksele

Email: kommun@lycksele.se

Phone: 0046 950 166 00

Full name:

Title:

Date and signature:

Sorsele municipality

Address: Sorsele kommun, 924 31 Sorsele

Email: kommun@sorsele.se

Phone: 0046 952 140 00

Full name:

Title:

Date and signature:

Arjeplog municipality

Address: Arjeplogs kommun, 938 81 Arjeplog

Email: kommun@arjeplog.se

Phone: 0046 961 140 00

Full name:

Title:

Date and signature:

5.5 Signed on behalf of the MAB National Committee or focal point

Address: Naturvårdsverket, 106 48 Stockholm

Email: goran.blom@naturvardsverket.se

Phone: 0046 10-698 00 00

Full name: Göran Blom

Title:

Date and signature:

DEL II

DESCRIPTION

6. LOCATION (COORDINATES AND MAP(S)):

6.1 Provide the biosphere reserve's standard geographical coordinates (all projected under WGS 84):

Tabel 2. Standard geographical coordinates in Vindelälven-Juhtatdahka

Cardinal points	Latitud	Longitud
Most central point	65,35706	17,849247
Northernmost point	65,56483	15,56046
Southernmost point	63,61567	20,2293
Westernmost point	66,2531	15,37727
Easternmost point	63,67642	20,4131

6.2 Provide a map(s) on a topographic layer of the precise location and delimitation of the three zones of the biosphere reserve

(Map(s) shall be provided in both paper and electronic copies). Shapefiles (also in WGS 84 projection system) used to produce the map must be attached to the electronic copy of the form. If possible, also provide a link to access this map on the internet (e.g. Google map, website).

Link to a map:

<https://www.arcgis.com/apps/SimpleViewer/index.html?appid=b28e4effd6a948849dad5b01f79ac442>

A map showing the location of the planned biosphere reserve is shown in chapter 2. A map for the the three zones is shown in chapter 7. Other maps (including the attached digital shape-files) are listed in chapter 19 and are attaced as appendices.

7. AREA

The size of the marine area has been calculated using continuous ecosystem mapping of protected areas (KNAS) which have distinct boundaries between freshwater and sea. The marine area also contains rocky islets in the part of Bottenviken included in the planned biosphere reserve.

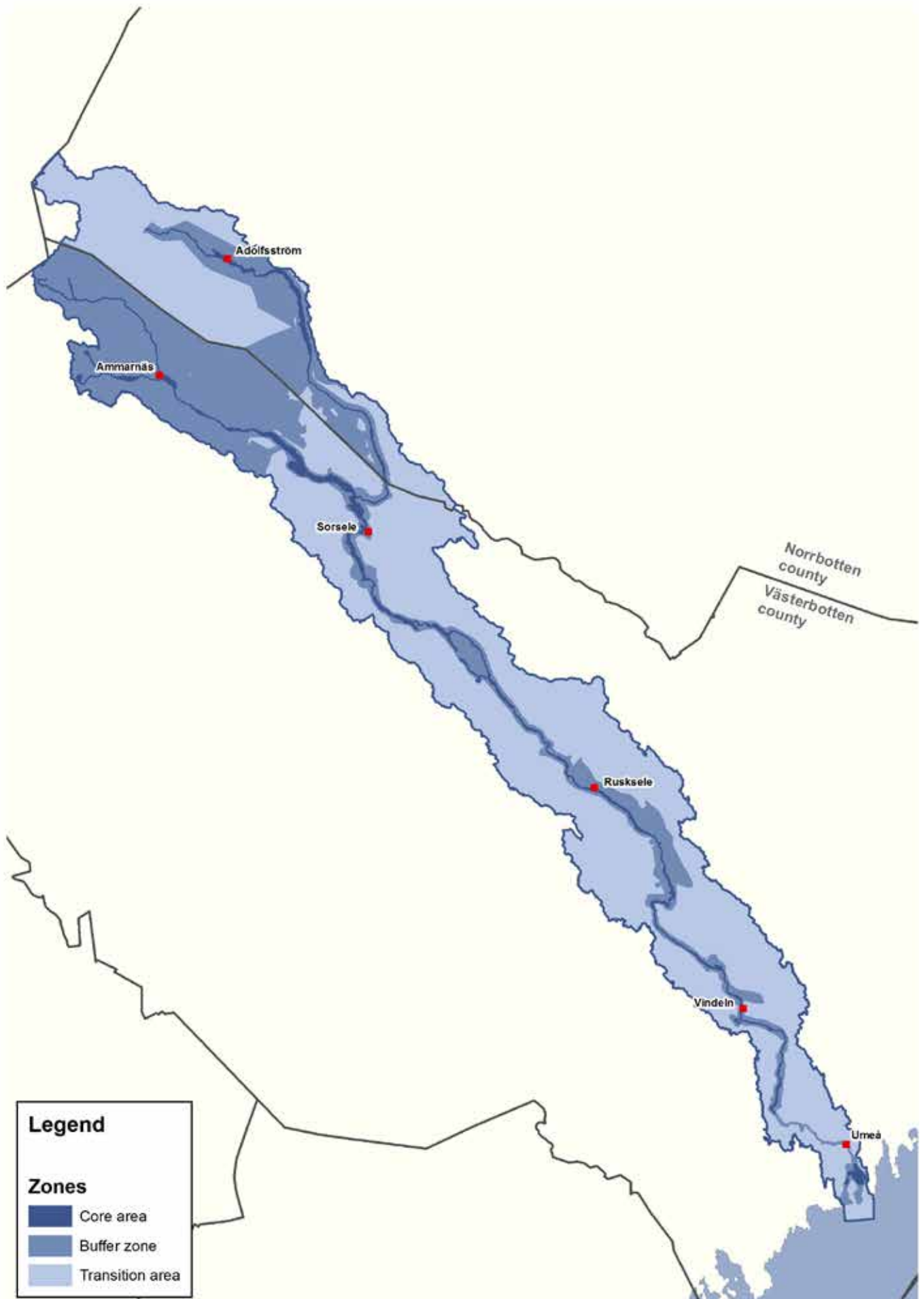


Figure 3. Zonation map of the planned biosphere reserve. For more detailed zonation maps (for mountain, forestand transition areas) see Annex 3.

7.1 – 7.3 Size of Core Areas, Buffer Zones and Transition Areas:

Total: (ha): 1 329 118

Table 3. Size of terrestrial and marine (brackish water) areas in different zones of Vindelälven-Juhtatdaha.

	Terrestrial area	Marine area	Total
7.1 Area of Core Area(s)	19 784 ha	1 081 ha	20 865 ha
7.2 Area of Buffer Zone(s)	401 219 ha	1 388 ha	402 707 ha
7.3 Area of Transition Area(s)	900 308 ha	5 238 ha	905 546 ha
TOTAL	1 321 411 ha	7 707 ha	1 329 118 ha

7.4 Brief rationale of this zonation in terms of the respective functions of the biosphere reserve. If a different type of zonation also exists indicate how it can coexist with the requirements of the biosphere reserve zonation.

(e.g., if national criteria exist for the definition of the area or zones, please provide brief information about these).

A biosphere reserve is divided into three different zones: core area, buffer zone and transition area. Each zonation should be dictated by and established within the sectors concerned. In Sweden the designation of a biosphere reserve does not involve any new restrictions with regard to ownership rights, exploitation rights and user rights, as well as rights of public access, as it is based on existing laws and protections. Zonation should instead be seen as a support for strategic planning in the biosphere reserve.

1. **Core areas** should be protected according to law, e.g., nature reserves, national rivers, national parks, biotope protection areas or Natura 2000 areas, with the aim of preserving the value of nature and the outdoor environment.

2. **Buffer zones** should encircle or connect core areas. Activities and resource utilisation in these areas should be in harmony with the preservation of core area values. In Sweden, nature conservation areas, areas of national importance with regard to nature conservation, areas of conservation of cultural heritage and outdoor life, and areas of landscape preservation or coastal conservation can be regarded as buffer zones. Although a buffer zone is required to fulfil some of these criteria, not all areas which fulfil these criteria constitute buffer zones.

3. **The transition areas** constitute the biosphere reserve's outermost zone in which locally established and long term, continuous development work is prioritised. The transition area comprises all areas within the biosphere reserve that are not made up of core areas or buffer zones, including urban centres.

The outer boundaries correspond to the drainage basin for the River Vindelälven, the River Laisälven and the lower River Umeälven, as well as the villages of Taveljö and Hissjö in the Umeå municipality. These villages are located in the trench through which the river used to flow before the final stages of ice sheet thinning redirected the water into its current channel. The following requirements have been observed in the zonation of the area. Each core area should be encircled by a buffer zone/area. As it is also considered that a buffer zone should constitute a natural boundary in the form of a nature conservation area, an area of national interest, or similar (as opposed to an arbitrarily drawn boundary), and because the Vindelfjällen Nature Reserve and the River Laisälven's ancient forest lack such buffer zones, both these areas have instead been themselves designated as buffer zones. The same is true of the River Vindelälven's other tributaries: They are not surrounded by any natural boundaries/buffer zones (e.g., in the form of areas of national importance) such as the main channel of the River Vindelälven and the River Laisälven tributary. Therefore the tributaries, apart from those of the River Laisälven, belong to the transition area.

The core area coincides with the River Vindelälven, including the River Laisälven. The river is protected by Chapter 4 of The Swedish Environmental Code (national water protection areas, national rivers) and Chapter 7 (Natura 2000, Species and Habitat directives). There are also 19 nature reserves in the core area, all of which are connected with the river. The core area also includes the River Umeälven delta, a large, diverse coastal area, close to urban areas, where water from the river meets the Baltic Sea. The River Umeälven delta is part of the Natura 2000 network and is also protected as a nature reserve. The core area has high conservation value in the form of highly biologically diverse, unique biotopes as well as protected and threatened species, and contributes to a variety of ecosystem services. The conservation targets in the core area are mainly associated with the river.

The buffer zone consists of areas of national importance and nature reserves, as well as the lower River Umeälven which connects the River Vindelälven core area with the River Umeälven delta core area. The buffer zone around the River Vindelälven mainly consists of areas of national importance for nature conservation and outdoor recreational activities. Other objects of national interest in the buffer zone include areas of reindeer husbandry and sites of cultural interest. Areas of national importance should, according to The Swedish Environmental Code (Chap. 3 §6), be protected from any actions that could clearly harm the natural or cultural environment. A part of the small nature reserve along the river is included in the buffer zone. In addition, the buffer zone includes large parts of Vindelfjällen which, with its ca. 550,000 ha, makes up the largest nature reserve in northern Europe. Vindelfjällen is included in Naturvårdsverket's (the Swedish Environmental Protection Agency, SEPA) national parks plan but will not figure in the implementation plan for the next five years. The Laisdalens fjällurskog Nature Reserve is also included in the buffer zone. A small section of the buffer zone Vindelfjällen lies along the border with Norway. However, this does not constitute a problem as 1) it is a buffer zone (as distinct from a core area) and 2) the bordering area in Norway lacks roads and is in principle uninhabited, has insignificant land use, and is subject to stringent restrictions on off-road vehicles.

The transition area is the biosphere reserve's outer zone. Forestry, reindeer herding, mining and mineral prospecting all take place in the transition area. In addition, many villages as well as the city of Umeå are located within the transition area. Lycksele town centre is situated just outside the boundaries of the envisaged biosphere reserve, but Lycksele will be included in the work of the biosphere reserve as the activities there have a major impact on the biosphere reserve and vice versa.

The main focus for future conservation, restoration and sustainability work in the core area and in the buffer and transition zones is voluntary agreements between land owners and the community. Reindeer herding takes place throughout most of the area; the reindeer migration route, juhtatdahka, traverses and connects all the zones. The area as a whole, primarily the core area and the buffer zones, is highly significant as a recreational area for both local people and visitors. The reciprocal relationship between the three zones and with Umeå (located in the transition area) is important for long-term sustainable development. Umeå, a major population centre, has education services and a relatively resource-intensive population who will be the majority of those visiting the inner regions of Vindelälven-Juhtatdahka. There is significant interest in locally produced goods and, in the longer term, there are good prospects for the sale of local products in neighbouring areas. As a major urban centre, Umeå is therefore the most promising market for products manufactured in Vindelälven-Juhtatdahka.

This is a large area with a low population density which, in European terms, is highly unusual. It is an area that is affected by humans, in part through resource exploitation and also because there are large areas of natural beauty through which one can move freely without being crowded together with other people. We see this as an asset not only for those living in the area but also for Swedish and international visitors.

The biosphere reserve's functions of conserving, developing and supporting are relevant in all three zones, but in different ways. For example, the work of conserving biological and cultural diversity takes place throughout the entire area and not just in the core areas. The development work is perhaps most relevant in the transition area, but can also affect other zones. For example, it may involve innovative adaptations to climate change. This will not be restricted to particular parts of the area and the work must be holistic. Reindeer herding takes place throughout the whole area, in all zones. This activity is

already clearly being affected by climate change through, for example, shorter winters with thinner, more treacherous ice and negative impacts on the access of reindeer to grazing land. Work is being conducted throughout the entire area to provide support in the form of knowledge acquisition and research. A lot of research is already being carried out into the river and its tributaries, the mountains, the area's forests and Bottenviken. The biosphere reserve will conduct work in order to provide people in the area (who live and work in the buffer zone and transition area) and visitors with the possibility of influencing the direction of research (via the biosphere reserve's network at the regional university) and of participating in research relevant to the area.

8. BIOGEOGRAPHICAL REGION

[Indicate the generally accepted name of the biogeographical region in which the proposed biosphere reserve is located.] (The term "major biogeographic region" is not strictly defined but you may wish to refer to the Udvardy classification system (http://www.unep-wcmc.org/udvardys-biogeographical-provinces-1975_745.html)).

Vindelälven-Juhtatdahka straddles two biogeographical regions as defined by the European Union: the Alpine and Boreal regions.

9. LAND USE:

9.1 Historical:

(If known, give a brief summary of past/historical land use(s), resource uses and landscape dynamics of each zone of the proposed biosphere reserve).

Land use has been dictated by basic considerations, such as soil type and climate, throughout history, but has also been constantly influenced by cultural processes and state intervention. The River Vindelälven, together with the River Laisälven and the lower River Umeälven, has played a central role in all land use in the area.

After the melting of the last ice sheet ca. 10,000 years ago, northern Scandinavia was populated by hunter-gatherers. The climate was warm, and pollen analyses have shown that the ice sheet was quickly replaced by plant and animal life that could support humans. The introduction of agriculture ca. 3000 years ago ushered in the division into coastal land and interior land which came to characterise the area. For a long time, agriculture was restricted to the coastal land, while reindeer herding developed inland. The division arose not only between food sources, but also between population groups, between Sami in Lappmarken/the Sami district in the interior, and Swedish speakers on the coastal land. However, the two population groups worked in the other's land areas and traded with each other.

Hunting and fishing

The entire region of Norrland, where the ice sheet gradually melted after the Ice Age and which did not lie below the coastline as it was then, was populated in around 6500 B.C. The first people arriving in the area were hunters and fishermen. Hunting involved the use of traps and weapons. During the winter, skis enabled hunters to track and find wild game. Trapping pits, some arranged in extensive systems, helped in capturing wild reindeer (*Rangifer tarandus tarandus*) and elk (*Alces alces*). Seals quickly became an important prey in the outermost coastal strip. Besides meat and skins, whale oil was extracted as a commodity for fuelling lamps as well as for impregnating skins and timber. There is no evidence of reindeer in the oldest archaeological find, the 5000-year-old rock carvings near the lower River Umeälven, but the species was found in the area early on in history. The Sami obtained skins and sinews from the reindeer, which allowed them to sew clothes. Although homespun wool was also already used as summer clothing in the 1600s, the use of reindeer skin as winter clothing continued into the recent past. Animal pelts, such as from foxes (*Vulpes vulpes*), pine martens (*Martes martes*) and red squirrels (*Sciurus vulgaris*), have been important items, not least as trading goods. Large predators, such as brown bear (*Ursus arctos*), wolverine (*Gulo gulo*), Eurasian lynx (*Lynx lynx*) and wolf have been hunted to protect domesticated reindeer and livestock. As reindeer herding and agriculture developed, hunting continued as a secondary activity, perhaps mainly in the form of elk hunting, and in mountain regions grouse hunting brought in extra income from the sale of the meat.

Fishing provided a reliable and well-utilized livelihood even for the first people in the river valley. Particularly important was the river with its varied environments and many different fish species, but the sea and the innumerable lakes were also highly significant. The sea offered bountiful fishing for both coastal populations and town dwellers in Umeå. Farmers installed fish traps in the lower stretches of the River Umeälven and the River Vindelälven for catching salmon. The farmers also went on long swamp fishing expeditions into Lappmarken/ the Sami district. They sometimes competed with the forest Sami population for whom fishing was the main means of livelihood. Even though reindeer herding and agriculture developed and grew in importance from the 1700s onwards, fishing remained a significant secondary activity for both agriculturalists and reindeer herders.

Wild plants

Wild plants have always been part of the human diet. The two food plants that were possibly most important for the Sami were Scots pine (*Pinus sylvestris*), the inner bark (living bark) of which was added to casseroles and soups, and wild Angelica (*Angelica sylvestris*) which was mixed with reindeer milk. An infusion of pine needles from new shoots provided vitamin C which prevents scurvy. The Sami have also used many other plants as food, particularly common sorrel (*Rumex acetosa*), mountain sorrel (*Oxyria digyna*) and alpine sow thistle (*Cicerbita alpina*). Sorrels also contain vitamin C and were used by Sami to acidify reindeer milk so that it could be stored for the winter. The agricultural population could also eat bark and wild plants, but preferably as an emergency food. Berry picking has always taken place. Though all possible species have been eaten from the Stone Age onwards, the most important berries have probably been bilberries (*Vaccinium myrtillus*), lingonberries (*Vaccinium vitis-idaea*) and to some extent cloudberries (*Rubus chamaemorus*). During the 1900s, picking berries to sell became a source of extra income. Subsequently, berry picking was largely taken over by immigrant workers.

Wild plants have also provided valuable raw materials. Sedges (*Carex spp.*) were harvested on wetlands, combed and rubbed until they became soft, and then used as insulation in shoes and gloves. Although the land along the river was good for mushroom growth, mushrooms were not utilized until later.

Timber has been used as a building material and in manufacturing means of transport and items for everyday use. Each wood species had areas of application to which it was best suited. Roots from Norway spruce (*Picea abies*) and birch (*Betula spp.*) were used for rope making and for manufacturing everyday household items. Birch bark has been used in baskets, roofing and much more besides.



Image 16. Lingonberry (*Vaccinium vitis-idaea*) is common in the forests. Photo: Cecilia Wallinder



Image 17. Reindeer herding, Grans sameby. Photo: Ola Jennersten

Reindeer herding

The historical development of reindeer herding has been a matter of debate and has undoubtedly followed different trajectories in different parts of the reindeer herding area. During Viking times, the Sami used their reindeer as bait when hunting wild reindeer. So-called stalotomter (Stalo grounds), which are found at Ammarnäs and other locations, are witness to Sami settlements on barren mountain areas. Sami hearths, probably belonging to both reindeer herders and fishermen, are common as ancient remains in the interior region. At the start of the 1500s, Sami were milking domestic reindeer which were also used as draught animals, mostly to draw Sami sleighs. Sources from the middle of the 1600s indicate

that mountain Sami herded reindeer extensively in the Vindelälven Valley. At that time, mountain Sami, so-called because in summer they use the mountain region's alpine pastures, lived almost exclusively by reindeer herding and used the reindeer as a source of meat and milk. In winter, they migrated far to the east to woodland lichen pasture. Mountain reindeer herding is still characterised by long seasonal migrations between summer work in the mountains and winter work in coastal regions.

In the 1600s, the forest Sami led a completely different life from the mountain Sami. Most of them probably owned only a handful of domestic reindeer which were milked and used for transport and only rarely slaughtered. During the year, the forest Sami migrated between fixed settlements within their own lappskatteländet (taxation land) and mostly devoted themselves to fishing. Forest Sami, whose land included good winter pasture for reindeer, also used to take in the mountain Sami and their reindeer herds during the winter in return for payment in the form of reindeer cheese and reindeer meat. After the colonisation of Lappmarken/the Sami district began and competition for land and water grew during the 1700s, the forest Sami culture disappeared from Lycksele and from most of Sorsele. At Malå, Arjeplog and parts of Sorsele, the forest Sami instead focused increasingly on reindeer herding. Just as the mountain Sami, the forest Sami started to migrate their reindeer to winter pasture in the coastal territory. As a monetary economy replaced the subsistence economy during the first half of the 1900s, mountain reindeer herding and forest reindeer herding both changed from being intensive and focused on milking to becoming more extensive and focused on meat production.

Agriculture

The earliest traces of cultivation in the area are around 3000 years old and were discovered at what was then the mouth of the River Umeälven, near to Backen Church. Continuous agriculture has been found to have taken place around the lower River Umeälven from the 6th century onwards. The oldest known cultivated lands are located in a tract of fine-grained sediment which continues upstream along both the River Umeälven and the River Vindelälven. The basis for livelihood was livestock farming, while the extent of arable farming was limited. During the summer, the animals grazed in the forest, but in winter they were kept indoors, which meant that large quantities of hay had to be gathered in. The most important haylands were so-called floodplain meadows along the rivers. Each year, these low-lying lands were flooded and fertilised by the spring floods. Scrub and deciduous vegetation were cleared, creating shoreline meadows where large amounts of grass and sedges could be harvested. Fire was used in forests to create improved forest meadows and to allow rye to be sown in the ashes. To a large extent, agriculture built on whatever nature could offer.

In the mid-1500s, established villages and homes were found from Obbola, beyond the mouth of the river, to Hjuken, about nine Swedish miles (90 km) upstream on the River Vindelälven, and outside the river valley, for example, at Taveljö and Hissjö. After King Karl XI issued the so-called Lapplandsplakatet (Lapland proclamation) in 1673, the government encouraged agriculture in Lappmarken/ the Sami district. Anyone erecting a new building was promised a 15-year tax exemption followed by a low taxation level and exemption from military service. Despite these benefits, the policy was not a success and the first settlers in the area migrated from Hjuken to Rusksele in 1694. During the 1700s and 1800s, new buildings were gradually occupied by immigrants or Sami who already lived in the interior. Small areas of cultivation were tilled close to the farms but, as in the coastal area, agriculturists in the interior mainly lived off their animals which, in turn, lived off forest pastures and hay from extensive haylands. To a large extent, all natural shoreline meadows were converted to floodplain meadows. Further hay came from the innumerable bogs where sedge could be harvested and where production could sometimes be improved using an artificial irrigation system.

Conflicts over land use grew as the number of settlers increased. The government eventually came to see reindeer husbandry and the Sami culture as under threat, which prompted the establishment of boundaries for areas of cultivation in 1890, above and beyond the land that had been reserved for reindeer herding, and no further new construction was to be allowed. The boundary for cultivation intersects the River Vindelälven just west of Grannäs, crosses the River Laisälven between Björkliden and Marielund, continues up through Selakbäcken and then adjoins the upper section of Uddjaure. When the boundary was established, an extensive amount of agriculture was already taking place on the

“wrong” side, particularly in the Vindelälven Valley. Many new constructions also appeared beyond the cultivation boundary after 1890 and were retrospectively legalised as country dwellings. Some were built by Sami. Around 1900, precise ownership boundaries were drawn up in Lappmarken/ the Sami district, firstly through land allocation, then via changes in the law. These reforms did not give the reindeer herding Sami any ownership rights to the lands they used. Around the start of the First World War, the government encouraged further colonisation of lands that were less suitable for agriculture. The government instigated and funded new settlements which made it possible for landless people to settle on crown land. The idea was that these people would provide the forest industry with a workforce during the winter and would work on their own smallholdings during the summer. Extensive drainage created bog cultivation which could sustain a few animals over the winter. But the last to established settlements were often the first to be abandoned when the forest industry’s demand for workers fell and agriculture was rationalised. Today’s settlements in the interior largely coincide with the oldest agricultural districts.

Mining industry

The first mines established in the Swedish Lappmarken/ the Sami district were at Nasafjäll, near the source of the River Laisälven. In 1634, ore containing recoverable silver was discovered there and just one year later work began on exploiting the deposit. As there were no roads, all transportation had to be carried out using reindeer-drawn carriages and, as the reindeer were owned by Sami, most of the Sami in what are now the Arjeplog, Sorsele and Jokkmokk municipalities became involved in the transport system. Those who drove these carriages were granted tax exemption and were remunerated by goods in kind, but were often forced to work so much that they were unable to properly carry out their normal everyday work. As a result, many Sami migrated from the area, which meant that those who remained were exploited even more. This era ended abruptly in 1659, when both smelters and mines were destroyed by Norwegian soldiers.

In 1770, mining operations were restarted at Nasafjäll. As the area around the former smelter was still almost free of trees, a new smelter was built at Adolfström by the River Laisälven. A large number of new buildings were erected in Arjeplog in order to attract and retain permanently employed workers and transport personnel. But the operation never became profitable and in 1810 the smelter was closed.

In the 1930s, lead ore was found in Lake Laisan (also called Lájssö) on the River Laisälven. Prospecting was followed by mining operations, a processing plant was built, and the newly constructed Laisvall was transformed into a mining community. The mine was closed down in 2001. Laisvall remains a community, but the population has decreased substantially.

The Skellefte field is one of the world’s richest sulphide mineral deposits which contains a seam of much sought-after chemical elements. The field lies mostly to the north of Vindelälven-Juhtatdahka, but meets the River Vindelälven at Vindelgransele. In 1940, mining operations began at Kristineberg, mainly for zinc and copper ore. The mining together with the processing plant transformed a small village into a mining community with as many as ca. 700 inhabitants. The enriched ore was transported to Boliden via the world’s longest cable railway. The cable railway and the processing plant were closed when the mining operations were rationalised. The mining company also liquidated its ownership of local housing at the start of the 1900s. The future of the Kristineberg mine seemed uncertain, but things were turned around. New deposits were discovered deep in the mine which meant that mining remained a significant industry in the interior region. Four other mines were also established around Kristineberg, but have since been closed, though mineral prospecting is still going on.

Use of forest

The forest in Vindelälven-Juhtatdahka has always supplied the population with wood and timber, but in the mid-1700s exploitation of this resource became more industrialised. Two of the earliest products were tar and potash. Tar production became a major export business and was highly important for the entire Vindelälven Valley. The tar was produced by burning wood in tar kilns. The production of tar began in the coastal area, but was soon relocated to the parishes of Degerfors, nowadays known as Vindelön, and Lycksele where there was greater access to raw materials. Almost half the households in



Image 18. The horse was a valuable coworker in the forests. Photo: Cecilia Wallinder



Image 19. Dynamite cleared watercourses from stones. Photo: Cecilia Wallinder

Degerfors eventually became involved in tar production. The tar was produced locally and was poured into barrels for transportation to Umeå. A transportation system was developed which involved floating barrels down the River Vindelälven combined with land transit around river rapids where there was a risk of the barrels being broken apart. Rocks were gradually removed from the rapids so that barrels could be floated along longer stretches of the river.

Vindelälv retained its central role in the tar business during the 1900s. From the 1930s onwards, the head of purchasing was a woman named Ingegerd Levander, who was generally known as "Tjärdrottningen" (the Tar Queen). The other locally refined product, potash or potassium carbonate, was produced from birch ash and was used in the manufacture of glass and soap as well as dyes for textiles. In the first half of the 1800s, the production of potash by wood-burning became so popular that in large areas the raw material, birch, became a scarce commodity. Both tar and potash production generated important cash income for the rural population which would otherwise have mostly eked out a living on the basis of self-sufficiency. Wood charcoal production, on the other hand, was less common in the river valley in earlier times as there were no ironworks in the area. Not until the First World War, when there was a major fuel shortage and transport options had improved, did charcoal manufacture become more extensive.

The raw material that became most important was timber. Until the beginning of the 1800s, logging activity in forests was fairly modest and trade in timber was on a small scale. Some water-powered saw mills with rough, forged saw blades were to be found in the coastal area as early as the 1500s, but their output was only intended to meet local needs. After 1750, a major international industry was developed by cash-rich financiers building larger saw mills with thinly layered laminated saw blades that were effective, though imported and expensive. To start with, only large pine trees were chosen for timber and, during this time of so-called target diameter harvesting, the largest trees disappeared from the forests. Unlike tar and potash, this raw material underwent no onsite processing; the timber was floated to industrial locations which were mainly in the coastal areas.

The most important fine-bladed, water-powered saw mill in the area was at Baggböle, alongside the lowest rapids on the River Umeälven. As the rapids were a couple of Swedish miles from the coast, a shipment site was constructed outside the mouth of the River Umeälven, in Holmsund, to where the ready-sawn timber was floated. A large steam saw was built close by at Sandvik in 1860 and the Baggböle saw was soon replaced by a steam saw at Holmsund. In 1909, a sulphate pulp plant was constructed at Obbola on the south side of the mouth of the River Umeälven and, in 1927, a mechanical paper pulp plant came online at Sofiehem in Umeå. These pulp plants were able to process timber of smaller diameter.

The industrial revolution reached the area at the end of the 1700s with the establishment of a glass plant, a shipbuilding industry and sawmills in the coastal areas. During the 1800s, the forest industry was developed into a major export business. In the mid-1800s, the network of channels for floating timber was therefore expanded in order to facilitate and speed up the transportation of timber to the coast. This involved clearing rocks, boulders and rock slabs from watercourses using explosives. Stone caissons were constructed to secure wooden beams which guided the logs towards the main channel, and dams were built in smaller tributaries. The river's tributaries were modified so that they were more like straight

channels than naturally meandering watercourses. When timber flotation on the River Vindelälven was at its most intensive (during the 1930s and 1940s), there were at least 140 dams and 1600 kilometres of flotation channels. Timber flotation went on for about a hundred years.

During the 1800s, the owners of these industrial operations, now SCA and Holmen, acquired timber through felling rights, and also became major landowners in Vindelälven-Juhtatdahka. This first became possible after cadastral surveying (the establishment of property boundaries through surveying), which was conducted during the 1700s and 1800s and meant that the farmers' forests were taken out of state ownership and transferred into private ownership. When forest land became privately owned, it could also be sold, and companies systematically bought up, wholly or in part, those newly created properties which adjoined the timber flotation channels. The government became concerned over the destruction of forests and, in 1903, the first forestry legislation was passed, requiring that tree felling had to be followed by replanting. In 1906, forestry companies were banned from purchasing forest real estate, but by then SCA and Holmen already owned 35 % of the forest in Vindelän and 23 % in Lycksele. In Sorsele, the majority of forest land was set aside as common land and therefore could not be purchased by companies. Those areas which the state retained became Crown parks.

To begin with, felling was mostly just carried out in the winter, as it was then that the timber could be transported to timber flotation channels by horse. The forestry workers spent the nights in cabins in very basic conditions and the women stayed at home to do household chores and look after livestock. Timber flotation was a task reserved for spring and depended on large spring floods. These seasonal jobs fitted into the annual rhythm of agricultural work. Around the mid-1900s, it became more and more common to employ cooks to prepare food in the forestry huts, thereby opening up new opportunities for young women to earn income.

During the 1900s, the efficiency of the forest industry continued to increase. After the Second World War, sustainable, cyclical forestry, involving forest clearance and replanting, became increasingly common. Manual timber saws were replaced by chain saws, horses by tractors, and forest vehicle tracks were constructed and the forests opened to vehicles for transportation. Forestry work went on throughout the year and the workers had permanent employment. At the end of the 1960s, the first tree felling machines appeared; areas of tree felling became very large and the number of workers in the forest industry decreased. Timber flotation disappeared and was replaced by truck transportation. Timber flotation on the River Laisälven continued up until 1969, on the River Vindelälven until 1976, and on the River Umeälven until 1980.

Communications

For a long time, long-distance transportation preferably took place in the winter on snow-covered surfaces, whereas transportation in the summer was limited to short distances along simple tracks or via waterways. In the east, the sea was the most important link to the rest of the world. In the west, the mountain Sami regularly migrated to Norway to carry on trade and to pay tax. The entire Vindelälven-Juhtatdahka area has, in other words, been linked with the rest of the world as far back in time as we can see – and originally at least as much in the east-west direction as in the north-south direction.

When agriculture developed in the coastal area, the paths there became bridleways, but it was not until the 1660s that people could travel through the county in carts along the coastal roads. There were roadways leading from the coast into the interior. In their diaries from 1732 and 1832, Linné and Zetterstedt, respectively, describe the road to the church square in Lycksele traversing Hjuken before crossing the River Vindelälven. The winter tracks partly followed the river, and partly marshes and large lakes. The Sami built light boats which were used for transportation in summer. These could be carried on the shoulders when encountering rapids, where the river was not navigable. The construction of actual roads in Lappland/ the Sami district did not begin until the 1800s (see 10.6.3 The History of Settlements).

In the mountain region, contacts remained towards the west, with Norway, for a long time. In the 1890s, a winter roadway to Norway via the upper section of the Vindelälven Valley was cleared using public funds, which created the preconditions for extensive trade between the Ammarnäs area and Mo for a

couple of decades. The Bäckafors canal was built over a period of six years up to 1918 to allow boat traffic between Sorsele and Storvindeln. From 1921 until 1938, when the entire land route was completed, the boat Älvkungen navigated the 6-mile-long stretch between Gillesnuole and Sorsele.

The railway came to the area in 1891 when the main line to Vännäs was opened. Some years later, connections were also established further to the north and eastwards to Umeå. The Hällnäs - Lycksele line became operational in 1924 and the inland rail line through the area was built in 1928-1929. Station communities grew outside the old villages. Winter roadways became less important in 1932-1942, when the government paid for villages without roads to be connected to the public road network. From the 1960s, the construction of roads for forestry vehicles became so extensive in forested areas that one can no longer talk about regions without roads. During the 1900s, telephone lines were extended to almost every area where people lived.

The oldest communication route that is still used is the frozen River Vindelälven which serves as a reindeer migration route in the winter-spring period, thanks to the fact that it has no dam constructions, but does have relatively predictable ice conditions. The river is also used nowadays for outdoor recreational purposes as a snowmobile track.

Hydropower

The water flow of the river and its tributaries has long been used to power various facilities. Just about every village had one or more mills, sometimes also sawmills, woollen mills or bone mills (see 10.6.4). A more industrialised form of hydropower utilization was introduced during the 1700s during the era of the fine-bladed saw mill. Towards the end of the 1800s, large mills appeared on the scene.

The province's first hydropower plant was built in 1899 at Klabböle on the River Umeälven. This was followed by the construction of a large number of power plants in the first half of the 1900s, to supply energy locally to places where there were suitable small water courses. During the 1900s, large power plants were built on most rivers and the electricity grid was extended to cover the entire country. One of the country's largest power plants was built at Norrfors. The River Vindelälven was also considered and this was expected to be the last development of a major river, but it never materialised (Chap. 10.6.5).

9.2 Who are the main users of the biosphere reserve?

(for each zone, and main resources used). If applicable, describe the level of involvement of indigenous people taking into account the "United Nations Declaration on the Rights of Indigenous Peoples". (http://www.un.org/esa/socdev/unpfii/documents/DRIPS_en.pdf).

The Core Area

The rivers contribute to a large number of ecosystem services. For those living in the planned biosphere reserve, fishing is an important resource in the core area of River Vindelälven-River Laisälven: mainly recreational fishing, but also for private consumption. Examples of cultural ecosystem services for residents, holiday home owners, and visitors are access to white water rafting, canoeing, dog sledding, skiing and snowmobiling. Tourist businesses and associations conduct various activities on and by the river. The frozen river is used by reindeer herders who migrate between various territories with the changing seasons. The agriculturalists use the lands nearest to the river as grazing pasture and for grass cultivation. The core area of the Ume delta is used by many for bird watching, as north-south and east-west bird migration routes meet here. Successful research has long been conducted into the river and its tributaries.

The Buffer Zone

In the buffer zone along the entire river, both local residents and visitors can make use of cultural and ecosystem service provisions in the form of recreation and outdoor life. Vindelfjällen's and Laisdalen's Fjällurskog are amongst the largest nature reserves in Europe. Access to the reserve is provided by Kungsleden and other hill walking paths. Almost the entire buffer zone, apart from the lower River Umeälven and the estuary area, is used for reindeer herding. The hydroelectric power plant Stornorrors is located in the buffer zone. Agriculturalists use the area closest to the river as grazing land and for grass cultivation. Some professional fishermen fish in the sea outside the mouth of the River Umeälven.

Associations, tourism businesses and other companies also run activities in the buffer zone.

The Transition Area

The transition area contains extensive forests that are used for timber production. Nearly all productive forest land outside the nature reserves is used to produce wood and timber, and there is extensive processing of wood raw materials. Mining is currently concentrated at Kristineberg, but prospecting for new deposits is also taking place at other sites. The power industry is represented by a hydroelectric power plant on the River Umeälven and Fäbodliden's wind farm at Risliden in the Vindeln municipality, as well as a pair of wind farms northeast of Kristineberg. While no further expansion of hydroelectric power is expected, new wind power facilities are being planned. Local residents and visitors hunt elk and small game, fish in the lakes, and pick berries in the forest and marshes. Reindeer herding takes place in large parts of the transition area. This area includes reindeer pasture and, at selected sites, there are also slaughtering facilities, arable fields, and cottages. Winter pasture lands may only be used between 1 October and 30 April. Those Sami forest settlements which do not migrate to the mountain areas have defined year-round grazing lands in forest areas and also winter pasture lands nearer the coast. The Sami forest settlements almost exclusively remain in the transition area. Members of the local population are the main users of the community facilities in the area. Large parts of the transition area are also used for recreation and outdoor activities. With the exception of the mountain region, the entire area, and in particular the transition area, is traversed by a large number of public roads which run between regional centres, villages and forest lands.

Researchers are carrying out extensive work at Svartberget's and Kulbäcksliden's research parks, in Krycklan's flood area, and at Vindelfjällen's research station in Ammarnäs. Seasonal workers from different parts of the world earn part of their living here by berry picking and forestry work.

Locals are the predominant users of the facilities in the built-up areas. Many of Umeå's residents work, study, mature and live in the city. Each year, a large number of visitors come to Umeå to shop in the many stores, enjoy the rich cultural offerings, and receive medical care at Norrland's university hospital. Moreover, Umeå plays an important role for the Sami in the area through an active Sami association (Såhkje), the Sami cultural centre Tráhppie, and the annual Sami week (Ubmejen Biejvie). There are many holiday cottages around the lowest stretch of the River Umeälven that are used by their owners, who come mainly from the nearest urban centres, for short breaks and holidays.

Besides Umeå there are two municipal centres in the area, Sorsele and Vindeln. These offer work opportunities and more or less complete public services. However, the population in the central part of the River Vindelälven area looks more towards the centre of Lycksele which is located just outside the planned biosphere reserve.

9.3 What are the rules (including customary or traditional) of land use in and access to each zone of the biosphere reserve?

The regulations governing the planned biosphere reserve are listed in table 4. The regulations are summarised below.

Fishing rights

o Fishing laws, fishing regulations and directives of Fiskeriverket (the Swedish National Board of Fisheries) regulate fishing nationally and generally. There are also government directives which further regulate fishing for salmon, trout and grayling on the coast and in rivers, up to the first natural river barriers to fish migration. Owners of fishing rights that have joined up in fishing management associations to coordinate fishing licences and fisheries conservation, can also establish their own rules, with further restrictions on fishing in their region. All these regulations apply to all zones: the River Vindelälven and the River Laisälven in the core area; the lower River Umeälven and the fish protection area at the outlet of the lower River Umeälven in the buffer zone; and in other watercourses and lakes included in the transition area.

Environment, nature and culture conservation

• *The Swedish Environmental Code* aims to promote sustainable development so that current and future generations can live in a good, wholesome environment. This code includes economic provisions and provisions for the protection of nature and:

- regulates, amongst other things, the use of land in agriculture with the aim of securing good, long-term management of land and water;
 - protects the River Vindelälven and its tributaries from the expansion of hydroelectric power, including water regulation and water channelling;
 - regulates areas of national importance to assert national interests in the planning of future activities. Those areas designated as areas of national importance should, as far as possible, be protected against actions which clearly harm the area's existing valuable resources. Included in these are active outdoor recreation (the Vindelälven Valley), unbroken mountain terrain (Tärna-Vindelfjällen), reindeer herding, cultural heritage, nature conservation, and protected watercourses (the River Vindelälven). The entire buffer zone, besides the Ume Delta (Natura 2000), the lower River Umeälven and the outlet into Bottenviken, consists of areas of national importance;
 - Identifies specific parts of the natural environment as national parks or reserves, including the biotope protection areas, and protects them with the aim of preserving the best of nature and biological diversity for future generations;
 - protects some species through preservation, forbidding the catching or picking/digging up of these species and the disturbance of environments that are important to the survival of these species;
 - regulates the protection of shore lines along coasts, freshwater lakes and watercourses. Amongst other things, this means that buildings must not be erected and changes must not be made to the environment which would have a negative impact on public access to the shore area or on the living conditions of flora and fauna;
 - regulates the general rules that are obligatory to any activities, e.g., forestry, or measures which could result in environmental damages or risks;
 - regulates the notification for joint consultation to the regulatory authority, e.g., the Swedish Forest Agency and County Administrative Board, in case of an event that has a substantial environmental impact, but that is not covered by notification or permission requirement;
 - regulates the granting of permits and specifies the preconditions for ongoing mining operations and wind farms, together with mineral legislation (see Mining activity below);
 - regulates *Allemansrätten* (Swedish common law) which is ratified in constitutional law and dictates that everyone, both Swedish and foreign citizens, may freely carry out outdoor activities, including berry and mushroom picking;
- *The County Administrative Board's directives* regulate how nature reserves should be managed and how they should be used.
- *Natura 2000* – (the EU's Species and Habitats directives) – aims to contribute to ensuring that the natural habitats and species designated for the area have favourable conservation status in Sweden and in the EU. The planned biosphere reserve contains 56 Natura 2000 areas, including the River Vindelälven and the River Laisälven plus all their tributaries. Many Natura 2000 areas are also nature reserves. The rules are incorporated in the Swedish Environmental Code.
- *Water Framework Directive* – the EU Water Framework Directive regulates the minimum requirements regarding water quality and access to water in all EU countries. The rules are incorporated in the Swedish Environmental Code and regulations.
- Sweden's *Terrängkörning* (off-road driving) laws regulate all off-road driving of motor vehicles, including snowmobile driving. The laws allow the County Administrative Board to introduce restrictions on snowmobile traffic, e.g., during certain periods, snowmobile traffic is banned in specified mountain areas in the interests of reindeer herding. Water areas are a form of terrain, which means that, in principle, the off-road driving laws also apply to travelling on ice (Proposition 1995/96:226 p. 23).
- *The Cultural Heritage law* regulates the protection and preservation of cultural environments, buildings and ancient remains so that diverse cultural history is preserved for future generations. This law allows

a building to be designated a listed building. There are many such objects in the planned biosphere reserve.

Apart from the Swedish Environmental Code, which applies to many different activities, there are also special regulations that apply within some of these activities.

Land, water and settlement planning

- *The Planning and Building law* (PBL) regulates the planning of future actions using comprehensive plans drawn up in each municipality. According to the PBL, every municipality has a Comprehensive Plan to offer guidance in deciding how land and water areas should be used, which areas should be set aside for recreation, and what should be conserved or developed. The comprehensive plan therefore has an important role as an objectives-document and a signpost to a more sustainable future. The comprehensive plan should also clarify how the municipality intends to provide for areas of national importance (The Swedish Environmental Code Chapters 3 and 4), to comply with current environmental quality standards, and to monitor those areas for rural development close to the shore line where shore line protection can be withdrawn.

Reindeer herding

- *The Reindeer Husbandry Law* (1971:437) regulates reindeer herding rights. Reindeer herding rights have been maintained since time immemorial, are in the nature of civil law rights, and have been developed through long-term use (NJA 1981 p. 1). The law gives reindeer herders the right to use land and water for themselves and their reindeer. Reindeer herding rights may only be exercised by Sami who are members of a *Sameby*. Each *Sameby* arrives at its own decisions at their committee meetings and community meetings in accordance with their by-laws. The Reindeer Husbandry Law also gives *Sameby* members the right to hunt and fish in Lappmarken/ the Sami district.

Forestry

- Forestry in Sweden is regulated by *The Forestry Act, The Forestry Ordinance and The National Board of Forestry's regulations and general recommendations*. The Forestry Act sets the frameworks and specifies the basic requirements for how forestry operations should be conducted. The Forestry Act is a so-called law of the minimum, which means that to achieve the goals of forestry policy, the country's forest owners are also expected to contribute beyond what the law demands. The goals should be achieved through cooperation between different agencies of forestry policy – for example, advice and education, government protection of forest land, and government support – as well as voluntary actions by forest owners in the form of, for example, clearing smaller plant growth and voluntary protection of forest land.
- *Forest Stewardship Council* (FSC) and *Programme for the Endorsement of Forest Certification* (PEFC). These certifications based on voluntary agreement between forest owners/users and the certification organisation (15.4.4). The forest industry is to a great extent also regulated by these certification provisions.

Mining activity

- *The Minerals Act* is required to facilitate the community's management of necessary metals and minerals and grants licences for extracting minerals from new deposits and for establishing wind farms.

Hunting

- *The Hunting Act* regulates hunting rights which, like fishing rights, belong to the land owners. The Act also regulates when and how hunting can be conducted.
- *The Game Conservation Areas Act* contains provisions concerning the coordination of hunting and game conservation in a game conservation area.

Table 4. Regulations which pertain to different activities in the respective zones in Vindelälven-Juhtatdahka.

Activity	Regulations	Core Area	Buffer Zone	Transition Area
Fishing rights	The Fisheries Act (1993:787)	X	X	X
	The Fisheries Regulations	X	X	X
	The Swedish National Board of Fisheries' provisions	X ¹	X ¹	
Environment, nature and culture conservation	The Swedish Environmental Code (1998:808)	X	X	X
	The Municipality's stipulations	X	X	X
	The Off-road Driving Act (1975:1313)	X	X	X
	Natura 2000	X	X	X
	The Cultural Heritage Act	X	X	X
	Water Framework Directive	X	X	X
Planning of land, water and building	The Planning and Building Act (PBL) (2010:900)	X	X	X
	Reindeer herding	X	X	X
Forestry	The Forestry Act (1979:429)		X	X
	The Forestry Ordinance (1993:1096)		X	X
	The National Board of Forestry's provisions and general recommendations		X	X
	Forestry certification regulations (FSC, PEFC), voluntary		X	X
The Mining Industry	The Minerals Act (1991:45)	X	X	X
	The Swedish Environmental Code (1998:808)	X	X	X
Hunting	The Hunting Act (1987:259)	X	X	X
	The Game Conservation Areas Act (2000:592)	X	X	X

¹ The stipulations apply in parts of the Core Area and Buffer Zones

9.4 Describe women's and men's different levels of access to and control over resources. (Do men and women use the same resources differently (e.g., for subsistence, market, religious/ritual purposes), or use different resources?).

Only a small proportion of the population in the area is directly employed in sectors involving the primary utilisation of natural resources. Amongst these, the forest industry is the dominant sector. The importance of agriculture with regard to employee numbers has decreased significantly, particularly in the interior regions. At the national level, nearly 40 % of forest owners are women, whereas women make up only 16 % of employees in large-scale forestry and 3 % of forestry entrepreneurs (The National Board of Forestry). In the planned biosphere reserve, women make up 14 % of employees in the forest industry (including both large-scale forestry and forest entrepreneurs). At the national level, 27 % of agricultural land is owned by women and women make up 43 % of agriculturalists (The Swedish Board of Agriculture). In the planned biosphere reserve, women account for 29 % of the workforce in plant cultivation, agriculture, and animal husbandry.

There is a similar imbalance in reindeer husbandry. There are fewer reindeer-owning women and they own fewer reindeer than the men. Men make up the majority of those active in the administration in the areas of fisheries and hunting. Currently there are no precise figures on the proportion of women in these administrative roles, but with regard to fishing this matter is now being taken up by Leader Fiskeområde Vindelälven, which aims to increase the proportion of women and young people in the area of fisheries and recreational fishing. Many households in Sweden and in Vindelälven-Juhtatdahka use berry picking beyond household requirements is used to provide a supplementary income. In many parts of Västerbotten and Norrbotten, there are now mainly large berry-picking companies who employ migrant workers. Swedish commercial berry picking is divided into two systems. In one the berry pickers

are employed: most come from Thailand and are employed by Thai temporary work agencies who hire out the workforce to Swedish berry-picking companies. The other system involves so-called free pickers who can sell directly to companies which purchase berries. Anyone can sell berries to suppliers. At least five percent of the employed berry pickers from Thailand are women. The proportion of women amongst free pickers is higher than amongst employed pickers, but the majority are men. Hill walking, skiing, snowmobiling, dog-sledding tours, white water rafting and camping are also common activities in the planned biosphere reserve. Both women and men are actively involved; the gender ratio varies from one activity to another.

Women are generally actively involved in and well represented at the community's decision-making meetings. Women account for at least 40 % of those attending municipal council assemblies.

Generally speaking, there are more men amongst entrepreneurs, but entrepreneurship is increasing more amongst women than men in this region. The majority of women working in professions in Vindelälven-Juhtatdahka are employed in the public sector, mainly in health and social care. In contrast, the majority of men work in the private sector (2014, Region Västerbotten), and it is primarily in the private sector where natural resources are utilized. Equality in the labour market is an important precondition for the sustainable development of the region's industry. All municipalities have subscribed to The European Charter for Equality of Women and Men in Local Life and several action plans and projects in the region address equality which is positive for development in the region. The Umeå municipality is a good example of an organisation in which equality is high on the agenda. For example, in town planning, a new website, genderedlandscape.umea.se, has been created where one can take a digital bus tour to around 20 places which show successful work in the area of equality, but also places where there is inequality.

10. HUMAN POPULATION OF PROPOSED BIOSPHERE RESERVE

(Approximate number of people who live within the proposed biosphere reserve.)

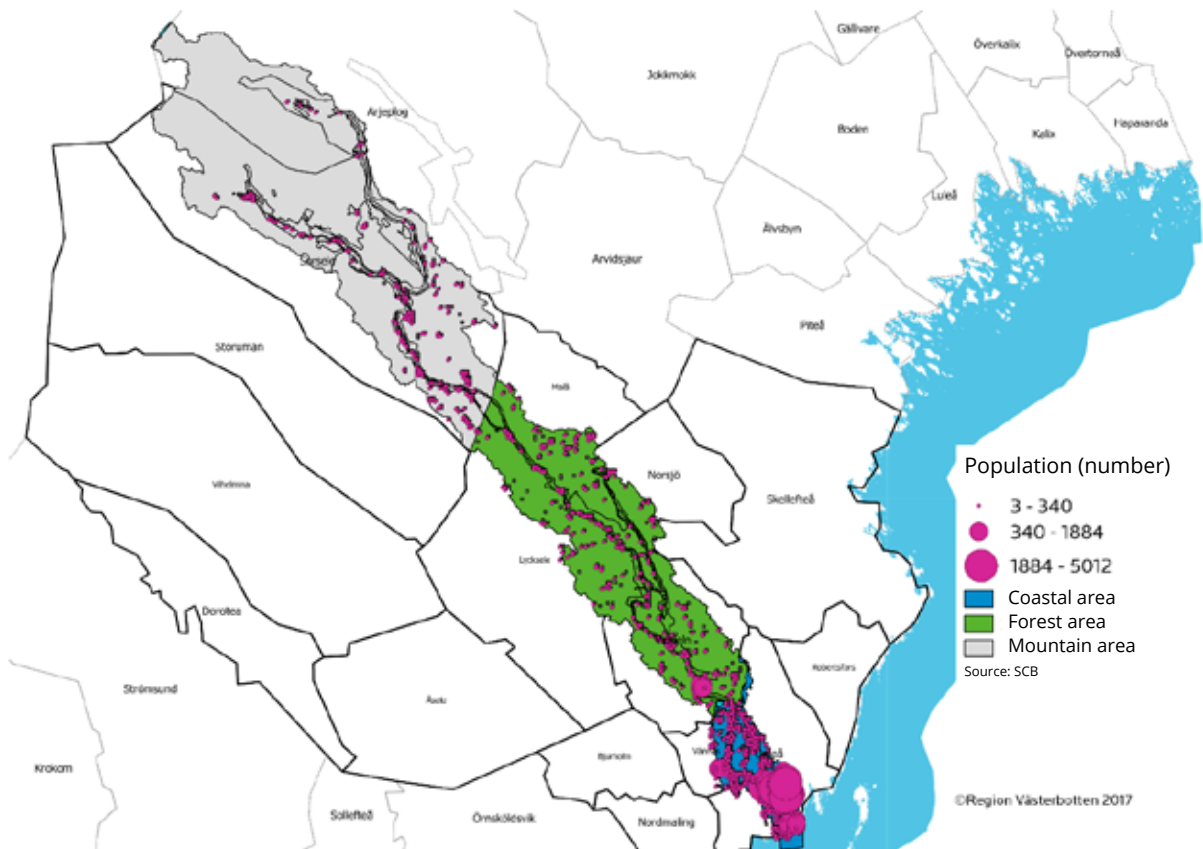


Figure 3. Population size and distribution in the planned biosphere reserve

10.1-10.3 Population per zone

Table 5. Population per zone

	Permanent residents	Seasonal residents
10.1 Core Area(s)	1 103	No data
10.2 Buffer Zone(s)	7 048	No data
10.3 Transition Area(s)	99 507	No data
Total:	107 658	

Table 6. Population per landscape area

	Permanent residents
10.1 Coast	99 584
10.2 Forest	5382
10.3 Mountains	2692
Total:	107 658

10.4 Brief description of local communities living within or near the proposed biosphere reserve.

(Indicate ethnic origin and composition, minorities etc., main economic activities (e.g. pastoralism, tourism) and the location of their main areas of concentration, with reference to the map (section 6.2)).

Urban and rural areas

The population of northern Sweden grew thanks to the region's natural resources in the form of forests, minerals and hydropower. The exploitation of natural resources required manpower. During the mid-1900s, the population was at its greatest in many rural areas. Since the mid-1900s, there has been a constant urbanisation, a flow of people from rural areas to cities on the coast and to the south. In 2012, Sweden was the EU country which underwent the most rapid urbanisation, with every fifth person residing in a major city. According to figures from Eurostat, Malmö, Umeå and Stockholm are, in percentage terms, amongst the EU's fastest growing cities. The county of Västerbotten currently has a net population growth, though several of its inland municipalities have shrinking and ageing populations. The age distribution varies most between the forest areas (people of the age 55-75 form the largest age group) and the coastal area (20-35 years of age largest group), see attachment 4.

Around 110,000 people live in Vindelälven-Juhtatdahka (Figure 3, Table 5). Of these, ca. 92.5 % live in the coastal area in the Vännäs and Umeå municipalities (2016, SCB). According to Statistiska Central Byrån, SCB, (Central Bureau of Statistics) the population density in 2016 was 0.33 people/km² in the mountain region (Sorsele and Arjeplog municipalities) and 1.27 people/km² in the forest area (Vindeln, Malå and Lycksele municipalities), whereas the coastal area had 123 people/km² (Vännäs and Umeå municipalities). By comparison, the Stockholm district had a population density of 349 people/km² in 2015 (SCB).

Conditions vary considerably in the region, which is challenging and can lead to segregation of people. Cooperation is important, as is making Umeå into a growth hub which will serve as a driving force for the whole of the river valley region. According to research carried out by Umeå University, growing cities are a key factor in avoiding stagnation. Ever since Umeå became the county town for the new Västerbotten County in 1637, the city has slowly developed into a centre for trade, administration and services. The university has been a major contributing factor in the Umeå municipality's rapid population growth since the second half of the 1900s. The university employs about 4000 people and facilitates the development of the region's knowledge-based and service sectors.

People who run businesses and involve themselves in local matters represent Vindelälven-Juhtatdahka's

greatest resource. Agriculturalists, reindeer herders, forestry workers and other entrepreneurs are enormously important in the development of the area. They all contribute entrepreneurship and income tax and keep the rural areas alive. Agriculture produces important food raw materials and supplies local food catering outlets, as well as maintaining rural landscapes and biological diversity. The same applies to reindeer herding but, instead of contributing to maintaining the landscape, it contributes to major areas of the cultural landscape in the mountain region. The forest industry makes the switch to a bio-based economy possible.

The various public services impact upon all people who live and work within the Vindelälven-Juhtatdhaka area. These are technical services, such as energy supply, waste disposal, water and sewage, as well as local services like pre- and elementary schools, care for the elderly and social services plus cultural and recreational activities. This also includes other public services within the county council, county administrative board, and other national institutions, such as health centres, the police, refugee hostels, etc. It is predominantly women who work in the large local sector of pre-school and elementary school education: jobs which form a substantial part of the local job market.

The rapid change in the rest of the world provides new possibilities, but also new challenges which increase the need to strengthen cooperation between urban and rural areas in the form of mutual relationships. Sustainable rural development also requires close cooperation between municipalities. Regional collaboration in Vindelälven-Juhtatdahka and also collaboration with the planned biosphere reserve, the Umeå region and the Leader areas can contribute to a positive community development between urban and rural areas and communities.

Forest and agricultural properties in villages are often privately owned. Because of urbanisation it is becoming increasingly common for the owners not to live in the villages, but many maintain strong links with their local villages. They use the forests, hunt, fish and spend some of their free time there. Most new incomers to the villages run small businesses, work via the Internet, or commute to work. The choice of village depends more on whether they have found housing which suits them rather than on whether they have any roots in the village. An interest in animals and nature may be another reason for them preferring to live outside urban areas. Horse paddocks, dog kennels, snowmobiles and wood stacks are common sights in the villages.

A typical trend in recent years is for the elderly to migrate to urban centres and for young families to move out to the villages where house prices are low. Blattnicksele, Rusksele and Tvärålund are examples of such villages. A positive consequence is that the number of children in the villages has increased. However, this development is being slowed in many areas by a lack of apartments and houses in both urban areas and villages. Young people who want to move away from home, as well as elderly people who want to sell their houses, have problems finding vacant apartments in their local areas. Families with children who want to buy a house have difficulties finding vacant apartments and obtaining financial support from banks for their house purchase. For example, in Vindelå municipality, the proximity to Umeå means that improvements in commuter traffic create development possibilities, while at the same time Umeå's strong, ongoing expansion in accommodation means it is hard to find builders and banks willing to invest in building new accommodation and renovating existing accommodation outside the city. The relocation of people within and into the municipality is highly desirable and fully realistic, but is unfortunately slowing down. The shortage of accommodation is an issue which needs to be resolved in the near future if sustainable development is to be maintained.

House prices are low in the central parts of the region. The cost of house renovation is higher than the resultant increase in house price that might be expected. Many villages have a significant number of holiday cottages which are mainly lived in during the summer. However, there is less construction of new holiday cottages in the mountain region than in the neighbouring mountain valleys. One reason for this is the absence of nearby road links to Norway.

Since Sweden's entry into the EU, it has been easier for citizens of other EU countries to live and work in the area. These new village residents come mainly from Western and Central Europe. A common

motive for their relocation to a village is a desire to get away from densely populated areas, to be closer to nature, and to live a freer life. One incomer stated “In the flat in Munich people complained if the volume of my television was too high, but here I can start up the chain saw in the evening without anyone becoming annoyed”.

The large migration influx has radically changed many communities in Sweden and also in the planned biosphere reserve. Challenges are met on arrival and later during integration work, but most of all the people who are placed, or have chosen to settle, here are a resource to cherish, and they can contribute to a positive development in various ways, through an increase in skills, new start-up businesses and generally increasing the population in the area.

The planned biosphere reserve is located within Sápmi, the Sami’s land area which stretches across the northern parts of Norway, Sweden, Finland and Russia. This region has seven *sameby* (a geographical, economic and administrative unit) areas of reindeer pasture (see Figure 4 below), but by no means all Sami in the area herd reindeer; this is the case throughout Sápmi, as in the rest of Sweden. The large majority of Sami live in urban areas and have other jobs. However, reindeer herding is extensive in Vindelälven-Juhtatdahka, from the mountain region to the coast. Reindeer herding is the second most common business sector in the mountain area, with 28 registered companies.

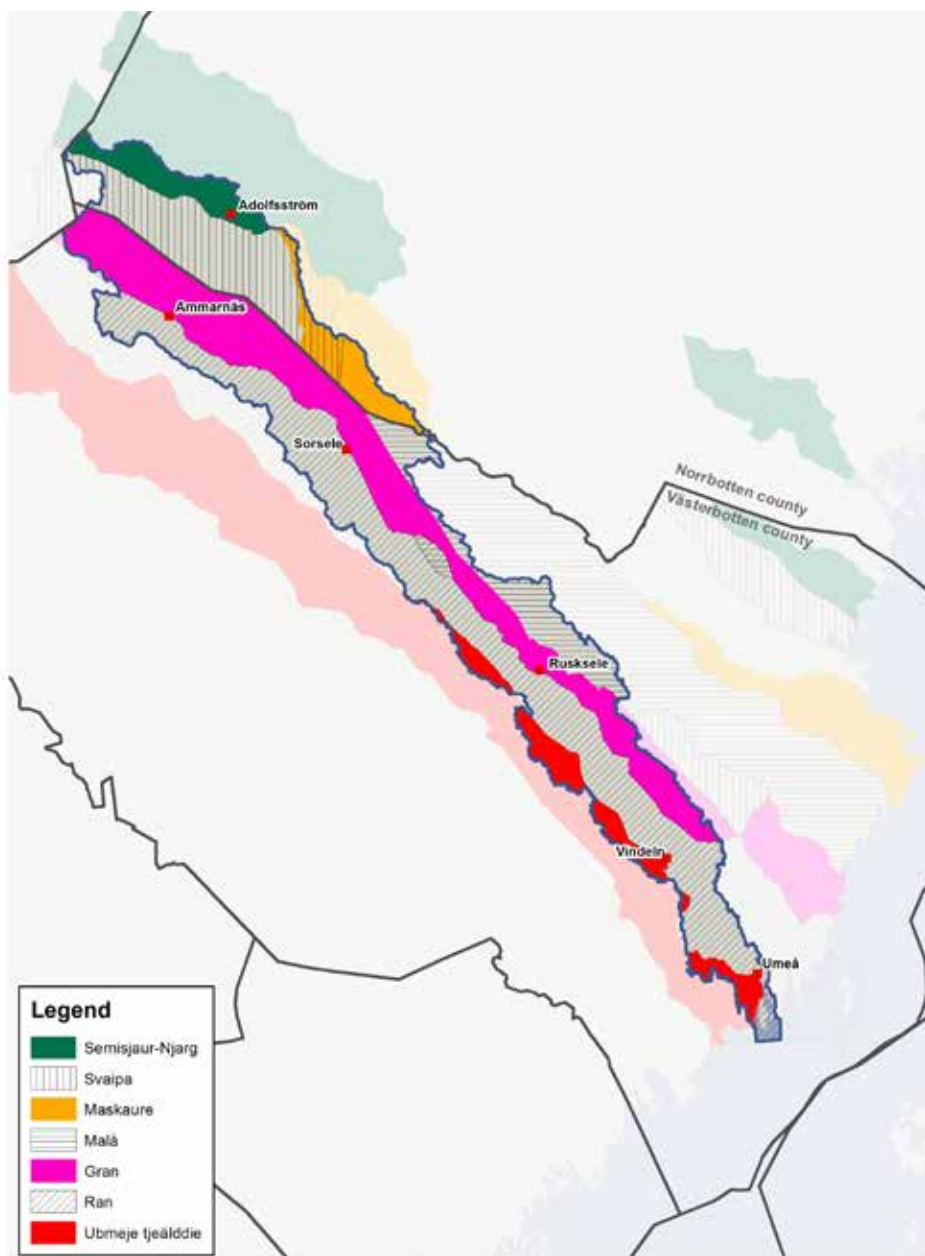


Figure 4. Areas of reindeer pasture in the seven *sameby* within the planned biosphere reserve.

The villages as a driving force

Community involvement is generally higher in the villages. There are well over 50 villages in the region, where all residents contribute in different ways to the development of the area. Listed below is a selection of residents' activities.

The village of Ammarnäs is a good example of how many village residents, through their own small businesses, create the conditions for living and working in the mountain region. Entrepreneurship is strong in the village. Two young families have taken over the food shop which manages the supply of food in the upper part of the River Vindelälven, while a new generation wants to invest in a future life in the village and the tourist industry is growing. The direct sale of vacant properties in Ammarnäs shows an obvious interest in holiday cottages. There is also a strong element of community involvement, with the



Image 20. Gathering at the potatoe festival in Ammarnäs. Photo: Christer Nilsson

Sami association, the sports association, the fisheries management regional association, the guide association, Sami craftwork, the local history society and the snowmobile association, to name but a few. The Nature Centre serves as a meeting place for both visitors and local residents.

At Blattnicksele, a new generation has moved in and many children have been born in the village in the last few years. The school and local businesses are securely established. In the Laisälven Valley in Norrbotten municipality, around 160 permanent residents live in the villages of Laisvall, Laisvallby, Hällbacken, Gautosjö, Adolfström and Bäverholmen. The people here are entrepreneurs, particularly in the tourism sector. Many visitors come here, mostly in the summer when the majority of restaurants remain open, but tourists can also travel here on snowmobiles in the winter. The area hosts a variety of events, such as "Dagar in Laisdalen" (Days in Laisdalen), fishing contests and trail running, which are popular amongst both local residents and visitors.

At Rusksele, the village residents have long fought to maintain their school and food store. In 2016, a young entrepreneur took over ownership of both the shop and a restaurant in the village. By alternating personnel between the two, the entrepreneur has found an economically sustainable business model. The village school, which is constantly under threat of closure, now has a promise from Lycksele municipality that it will remain open. Previous challenges, such as lack of housing and lack of profiling and marketing for the village, have been resolved through goal-oriented work in study circles and working groups. In 2016, the neighbouring village of Vormsele experienced its biggest influx of new residents in many years when nine people moved into the village, six of whom became permanent residents. Both these villages have strong community activities with local history societies at the forefront. Tvärålund is another example of a village showing strong growth, with many new incoming families with children, very much thanks to the improved possibilities for commuting provided by the new rail platform (2014).

A local development company in Åmsele has persuaded the government to fund a completely new petrol station. Smaller chains which specialise in providing services in sparsely populated areas have in many cases replaced major food retail chains and petrol retailers. In 2011, the public bus service to and from Umeå and Åmsele, which previously served as a hub for public passenger transport in the area, was discontinued. There were strong demands for the rail platform at Åmsele to be reopened. Åmsele residents are actively involved in the issue of passenger transport in the hope that improved public transport will make the village more attractive. Vindeln, which lies 46 km south of Åmsele, is a relatively large urban centre in the planned biosphere reserve. For a long time, bus transport alone has allowed Vindeln residents to commute to Umeå. Ever since Norrtåg (train) began its regional passenger service in 2011, with a stop at Vindeln, interest in living there has increased, but there is still major potential for the development of public passenger transport, and more housing is needed in the municipality if more people are to relocate there. Important questions raised by business operators in Vindeln and the municipality with regard to sustainable transport solutions include more railway stations in the industrial

area in southern Vindeln and Åmsele, more and better scheduled commuting journeys, and electrification of the light rail line between Hällnäs and Storuman. It is clear that the public passenger transport issue is central for many residents in Vindelälven-Juhtatdahka.

The public transport issue is also important nearer the city of Umeå, though not so critical because carpooling can provide an alternative means of commuting. In the lower reaches of the River Vindelälven, the majority of smaller villages are within commuting distance of the coast; for example, Västra Spöland, Vännfors and lower Vännfors are attractive areas for many who work and study in Umeå. The villages of Tavelstö and Hissjö are located on the River Vindelälven's old glacial deposits. Väg 363 (Route 363), "Vindelälvsvägen", runs through these two active villages and the residents have a strong sense of belonging in the Vindelälven Valley. Proximity to the rapidly growing city of Umeå means that the populations of these villages are also increasing quickly.

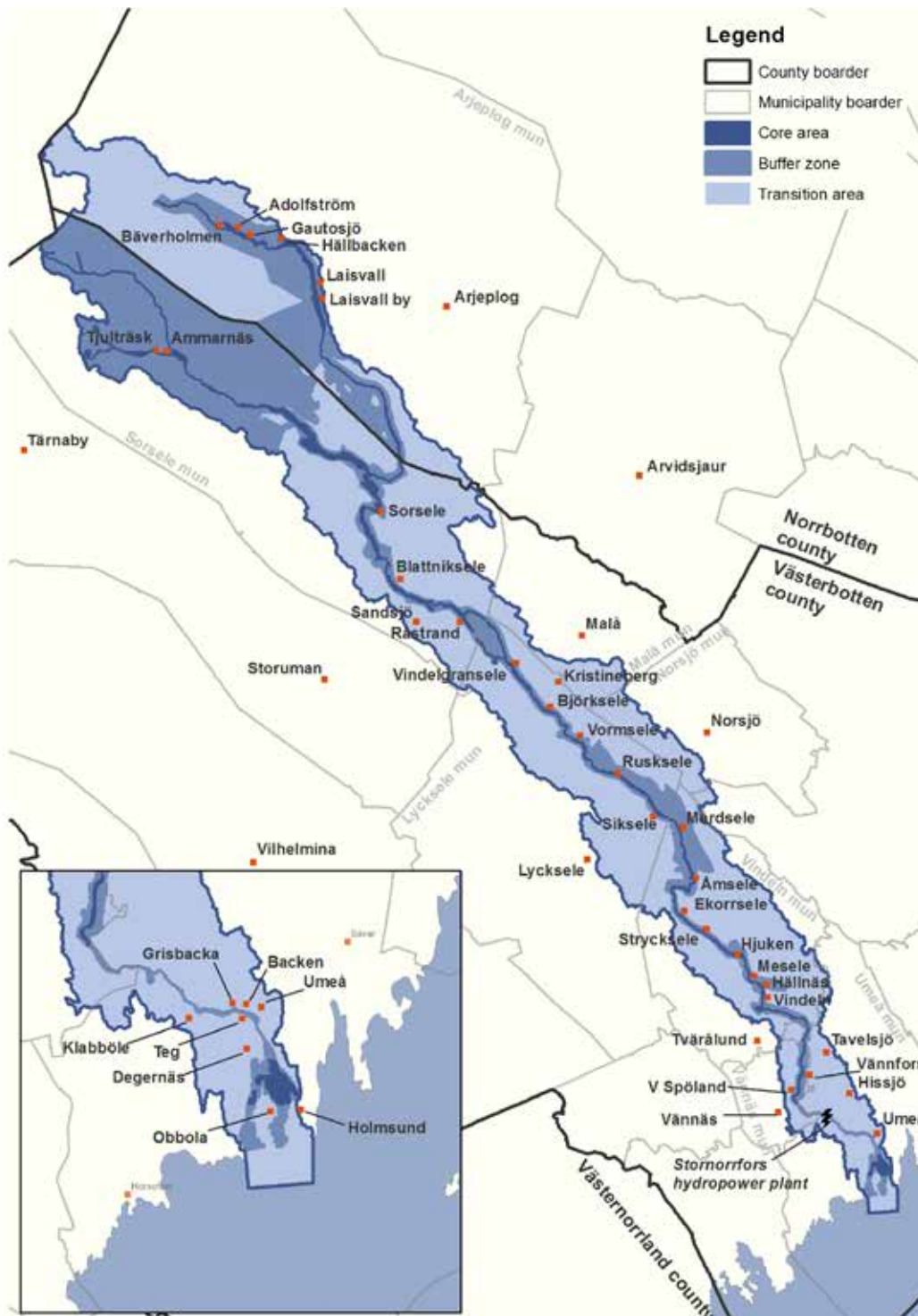


Figure 5. Map of the communities in the planned biosphere reserve

10.5 Name(s) of the major settlement(s) within and near the proposed biosphere reserve with reference to the map (section 6.2):

The population of Vindelälven-Juhtatdahka lives mainly in Umeå and in the larger communities in the valley (Vindeln and Sorsele), as well as in the villages, such as Hissjö, Tavelstö, Spöland, Vännfors, Tvärålund, Åmsele, Vormsele, Rusksele, Blattnicksele, Ammarnäs, Laisvall, and Adolfström. The Lycksele urban centre is a larger population centre which borders on the proposed biosphere reserve.

10.6 Cultural significance

(Briefly describe the proposed biosphere reserve's importance in terms of past and current cultural values (religious, historical, political, social, ethnological) and others, if possible with distinction between material and intangible heritage (c.f. UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage 1972 and UNESCO Convention for the Safeguard of the Intangible Cultural Heritage 2003 (http://portal.unesco.org/en/ev.php-URL_ID=13055&URL_DO=DO_TOPIC&URL_SECTION=201.html) and http://portal.unesco.org/en/ev.php-URL_ID=17716&URL_DO=DO_TOPIC&URL_SECTION=201.html)).

10.6.1 Ancient remains

Vindelälven-Juhtatdahka contains valuable ancient remains which reflect the development of the area from the Ice Age onwards. The area around where the River Laisälven flows into the River Vindelälven has an environment which is outstanding with regard to Stone Age trapping activities in the interior regions. There are the remains of five huts which are thought to have been permanent winter living quarters for nomadic trappers between 4000 and 1600 B.C. The site at the river outlet also contains about 20 dwelling places without discernible facilities. Nearby, there is an eight-kilometre-long system of 156 trapping pits which were used to trap elk and reindeer. There is a smaller system of trapping pits along the river which stretches almost the entire way to the river outlet. The importance of trapping animals is also reflected in the 5000-year-old rock paintings at Norrfors along the lower River Umeälven, with 27 depictions of elk, etc., and in the 4000-year-old arrow heads which were found on the shore of the River Vindelälven near Spöland. Nearest to the coastal region, the trapping culture is represented by the remains of huts, "tomtningar", which were used for fishing and seal hunting. They generally date from more recent times, from the Iron Age onwards, and are located at the mouth of the River Umeälven and other sites.

Spectacular finds of ancient Sami remains in the form of archaeological hoards have been made at Vindelgransele and Björksele on the River Vindelälven (see 10.6.6). Amongst other things, they contained metal objects manufactured during the period 900-1300 in various parts of Northern Europe, indicating extensive trade links. A type of archaeological remnant which is common throughout the entire area is the hearth, remains of fireplaces which are largely thought to have been installed in Sami huts. Hearths are found in both forest and mountain regions, mainly in Lappmarken/ the Sami district, but also in coastal communities. So-called "stalotomter" dating from 800-1100 A.D. have been found in the mountain region. These can probably be linked to reindeer herders/hunters.

10.6.2 Traces of agriculture and forestry

Around the lower reaches of the River Umeälven and the River Vindelälven and in some villages outside the river valley, there is a living agricultural landscape which was established from the Bronze Age onwards. Probably the oldest cultivated land can be found in those villages with names that are difficult to explain, such as Hiske and Kåddis which are located at what was the mouth of the river when they were first established. The first Christian church was also built between these two villages at Backen (see 10.6.6) in Umeå. Many other of the major villages on the coastal land, such as Degernäs, Klabböle, Vännfors, Rödå, Tavelstö and Hissjö, were well established when the first tax survey was carried out in 1543. The agricultural landscape above the Sami district boundary has developed from the end of the 1600s onwards. Villages were established where there was suitable land for cultivation, particularly alongside stretches of calm water on the river. Many of the village names end in "-sele" which simply means calm water. Along the entire river, there are village environments that are valuable from a cultural history perspective, as well as open cultivated landscape with old tracks, ferry landing stages and bridges, plus sawmills, chip mills and other mills (see 10.6.3). A central part of the cultural landscape of the extensive delta area featuring haybarns is located close to the mountain region in Ammarnäs and Adolfström. Ammarnäs also includes the remarkable Potatisbacken, where potatoes are cultivated on a steep moraine hill with a southerly aspect. It is mainly in the mountain region where one finds an agricultural landscape created by Sami pioneers. The environment around Tjulträskan, west of Ammarnäs, is prominent in this respect, with eight farms which, to a large extent, were built on previous Sami settlements and which were run in

combination with reindeer herding, hunting and fishing.

The area also has traces of many forms of forest utilisation from the 1600s onwards. The oldest remains include barktakter (areas on the lower part of pine trees where bark has been removed) which appear on old pine trees and which constitute marks of Sami harvesting of inner bark as food. These traces have almost entirely disappeared from the landscape where forest has been exploited but, in the uppermost valley of the River Vindelälven, there are a large number of sites of bark removal which date back to the period 1698-1881.

Tar and charcoal production represented early forms of commercial forest utilisation and often provided an important source of supplementary income for those who worked seasonally in the forest or as timber floaters. Traces of these activities can be found in the forest as the remains of charcoal kilns and tar pits, mainly in the coastal settlements, but also in the interior. Tar was floated in barrels along the river to the coast, and the ground still bears the marks of loading and unloading sites. Charcoal from the kilns was transported with the help of horses until the 1940s, when trucks became much more common. There is considerable interest in these forest cultural environments in the river valley. In more recent times, knowledge of forest history has been gathered in the work project "Forest and history". Investment, education and information have deepened our understanding of historical remains in forests.

The cutting of timber has been carried out almost everywhere below the mountain region, leaving traces in the form of coarse tree stumps and rejected sections of tree trunks. The oldest tree cutters' timber cabins and barns have generally rotted down and are difficult to find, but barracks for tree cutters dating back to the mid-1900s remain almost everywhere in the area. Cultural remains in the form of facilities for timber flotation can be found in all large watercourses in the area and are particularly well preserved on the River Laisälven. These include guiding structures (to facilitate the smooth flow of logs) and shore walls built of stone, dams and timber channels, as well as rest cabins and cycle paths. The timber was floated down to the coast, where a well-preserved hall at Baggböle sits on the bank above the remains of a once large water-driven saw mill. At the mouth of the River Västerbacken, there is a similarly well-preserved environment with living quarters for the workers at Holmsund's saw mill. On the other side of the bay, at Obbola, is a living industrial environment with a pulp industry which is still operational and has an impact on the entire community.

10.6.3 History of Settlement

The entire Vindelälven Valley is an area of national importance for cultural environment conservation, AC 24 a-e. The planned biosphere reserve also includes five smaller areas of national importance for cultural environment conservation, AC 23 Degerfors (part of the urban centre Vindeln), AC 28 the River Laisälven, AC 29 Gillesnuole, AC 30 Ammarnäs, and AC 31 Tjulträsk. There are also a number of listed buildings in the area.

The Vindelälven Valley reflects the course of settlement colonisation from the Bronze Age onwards. With regard to both their geographical location and their artefacts, the settlements in the area provide a valuable cross section of the county's agrarian history and settlement history from the 1700s up to the present day, with the high point in the latter part of the 1800s. The villages vary in size from a few individual farms to around fifty farms. The settlement is characteristic and highly representative of Norrland rural areas and the mountain regions. It is noticeably small scale and the villages are relatively sparse and often have a disorganised appearance, with no obvious village centre. The farther from the coast, the sparser are the settlements and the greater the Sami contribution.

The farms in the villages show many traditional features from the time when people were self-sufficient. The oldest dwellings are built from wood and painted red and have one to one-and-a-half storeys. Agricultural settlements include timber cow sheds, barns, store rooms, saunas, smithies, and summer barns, most often built in the 1800s, but a few buildings remain from the 1700s. There are still some tall, roofed hay-storage racks in the lower part of the river valley. Many villages had small hill farms relatively close by, often on the other side the river and reached by rowing boat. Barns for storing winter feed

are commonly found in grass meadows, floodplain meadows and grassy islets on the river. Virtually all villages had water-powered village saws, chip mills and water mills, sometimes also small hydropower facilities. The slightly larger villages still have shops, school houses and chapels dating from the early 1900s; some have been reused later as club or community halls. Relatively common features in the Vindelälven Valley are the settlements that were associated with state support measures at the start of the 1900s, such as private homes, small farms, and various forms of "kronolägenheter" (crown houses, i.e., lease of state owned land to individuals). The listed rural buildings Skogstorpet (forestcroft) Zakrisbo, Sorsele, and the Örnbo mountain cottage above Ammarnäs are valuable examples of crown houses.

In former times, the River Vindelälven had ferry crossings and remains of the infrastructure can still be seen. There is still an old cable ferry at Bjursele in the Vindeln municipality; it was previously owned by Vägverket (the Swedish National Road Administration), but is now owned by the village. Bridges over the River Vindelälven first appeared in 1892 and with the routing of the mainline by Vindeln. The number grew later with the building of new rail lines and roads, mainly from the 1920s onwards.

Three stretches of rail lines connect with the valley: the main line, the light rail line, and the inland line (see 9.1 Communications). The railway affected the development of communities at the beginning of the 1900s. The centre of the old Degerfors village and the church square were located adjacent to the railway station and the village changed its name to Vindeln. The new railway community of Hällnäs developed one kilometre from the village of Hjuken, which was the uppermost of the villages from the 1500s. Buildings associated with the railways include station houses, staff houses, warehouses and water towers around the larger stations, as well as stopping places and railway cottages located at intervals along the lines. Many of these buildings remain; some are still being used, while others lie abandoned or have been sold to private individuals or associations. The railway station at Hällnäs was the first to be built according to the state-sponsored design, referred to as the Hällnäs model. This model was then used in the construction of over 40 train stations throughout the country. In the mid-1920s, Hällnäs sanatorium was established for the treatment of tuberculosis on the heights above the railway station. This extensive facility, which for a while was the largest in Sweden, still remains as a grand monument, though it is now used for different purposes.

Sorsele was declared a town in 1718 and ever since the Sorsele pastorship was established in 1821, Sorsele has served as the regional centre of the parish. From the end of the 1800s, forestry companies have established forestry offices and living accommodation for personnel here. With the extension of the inland line to Sorsele in 1929, the parish town continued to grow and became a municipality in the mid-1930s. At that time, the main buildings were in Sorseleholmen near the river, with a school house, infirmary, combined business and living accommodation, boarding house, rectory, housing for assistant rectors and the church from 1859, which still remains. The community later expanded towards the southern side of the river. The existing buildings in Sorsele mainly date back to the mid-1900s, with few older features.

Vindeln, the largest community in the River Vindelälven Valley, was previously named Degerfors and has been known as a village since the 1500s. Degerfors (part of the urban centre Vindeln) is an area of national importance for cultural environmental conservation (AC 23). Degerfors became a kapellförsamling (place of church assembly) in 1768 and a market centre in the 1820s. The locality has borne the hallmarks of the forest industry since the mid-1800s. The village has several older buildings from both the 1700s and 1800s; for example, Åströmska gården and the courts from the 1800s, both of which are protected as listed buildings. Hembygdsgården (the heritage museum) is one of the county's largest rural estates, with a very rich content of artefacts, including buildings from the later 1700s. The influence of the forest industry on the local environment can be seen in the form of houses originally built for hunt masters and forest administrators. Vindeln has a particularly well-established cultural environmental feature in the form of the county's first residential adult education college from 1905, which until the 1960s was successively expanded with teacher and pupil accommodation, etc. By the river are prominent timber flotation facilities made from stone, as well as a large water-powered mill with accommodation for the mill operator. Kronlund, 15 km upstream from Vindeln, is the site of Hällnäs, a former forest school which was opened in 1905 for the education of state-employed forest rangers, foresters and charcoal burners.

The larger communities feature larger and more lavish houses, often with brightly painted architectural panels. Almost invariably, however, the buildings are traditionally on a small scale and rarely have more than two storeys. This is also the case for more public buildings, such as town halls, rectories, post offices, infirmaries, school houses and chapels, as well as buildings associated with craft- and service-related industries; for example, small shops, slaughterhouses, tanneries, joineries, shoemakers and cafés. As with the villages, most of the buildings in the larger communities have their background in the period before the Second World War when local master builders were employed, which meant that craft skills were handed down and knowledge of how houses should be built and how they should look was acquired through working practice. After the 1940s, the communities began a slow transformation into modern urban centres in response to new influences and central development.

The cultural environments of churches in the Vindelälven Valley are most often high above the shoreline, well protected from the river's high water floods. Along the River Vindelälven are churches with burial sites in Ammarnäs, Sorsele, Gargnäs, Björksele, Åmsele and Vindeln; all are protected by cultural environmental laws. It is noteworthy that, apart from the newer church in Vindeln, all the churches are built from timber and with unique styles of construction. These buildings date back to around 1770-1930. In the coastal area churches have subsequently been constructed at Holmsund, Obbola, Teg, Grisbacka, Tavelsjö and Åmsele, as have several district churches in Umeå. There is more on church buildings under the heading Religious Values (10.6.6).

Despite being awarded city status in 1621, Umeå only grew slowly. The number of recorded residents in 1644 was only 158. The city did not start to grow more quickly until the end of the 1700s. However, Umeå's buildings mainly date from the end of the 1800s onwards. Prior to this date, many of the buildings were destroyed by a number of fires. These included an attack by the Russians on the coast of Västerbotten in 1714, after which the city lay in ruins. The last fire that destroyed the city was in 1888. Only a few buildings remain from the time before this last fire. Most private owners of vacant plots did not have substantial resources, so new houses were built from wood. The centre became characterized by low-rise buildings, usually with just two storeys. Following the last fire, streets were constructed with walkways made from birch in order to prevent fires from spreading in such a devastating manner. After the fire, some important buildings such as the church and courts were built in stone, but the new city buildings were predominantly made from wood. The city was still small and surrounded by nearby agricultural land.

At the end of the 1800s, Umeå became connected to the rail network. This helped industries to begin establishing themselves in the area, so that population growth increased and the city expanded. At the turn of the last century, the population totalled 4000. Population growth further accelerated from the 1950s, when the education system grew and led to the establishment of Umeå University in 1965, followed by a faculty of forestry sciences at SLU in 1977. During this period the city population increased from barely 50,000 to over 100,000. A large part of the good-quality agricultural land around the city has been set aside for modern housing development.



Image 21. Backen church, Umeå



Image 22. St. Anna's underground church, Kristineberg. Photo: Thea Holmqvist, Gold of Lapland

10.6.4 The Mining Industry and Hydroelectric Power

The mining environment in the mountain region at Nasafjäll and the smelter environment at Adolfström bear witness to the ambitions in the Swedish Great Power Period (1611-1718) to become self-sufficient in valuable metals and to exploit resources in Lappmarken/ the Sami district. The mining environments at Laisvall and Kristineberg are more recent; at Kristineberg it is still a living environment.

The River Vindelälven with the River Laisälven and the lower River Umeälven also have cultural significance in so far as the energy of the flowing water needed to be managed, locally in the first instance and later nationally. As early as the 1500s, a water-powered saw mill was constructed at Klabböle. This was followed by several saw mills and also homespun textile mills, planing mills, grinding mills, etc. In the larger villages, the mills were sometimes developed into larger shared mills with permanently employed millers. One example is the mill at Renforsen in Vindelns, where construction was begun in 1889 by a farmer-owned limited milling company. This was first powered by a turbine and later by electricity. The mill in Vindelns was in operation until 1958 and is now an exhibition centre and café. There is also a water-powered homespun textile mill there for the manufacture of strong textiles from wool. Outside Sorsele is a preserved water-powered bone mill for manufacturing bone meal, which is a valuable fertiliser.

In 1899, Västerbotten county's first hydroelectric plant was built at Klabböle to supply Umeå city with electricity for street lighting, etc. Power plants were then built during the first half of the 1900s in many smaller watercourses, for example, at Bissanbäcken in Ammarnäs, to supply energy locally. Stornorrfors on the River Umeälven is the only large power plant in Vindelälven-Juhtatdahka; it was commissioned in 1958 and is Sweden's second largest hydroelectric power plant.

10.6.5 Conflict over the River Vindelälven

The River Vindelälven became well-known during the 1960s when the government-owned power company, Vattenfall, planned to build a hydroelectric power plant and reservoirs, including the major Gauto reservoir which would dam water to a depth of 46 m above Lake Gautojaure's mean water surface level and flood a populated river valley. Tjulträskan and Granselet would also be significantly dammed, to depths of 17 and 24 metres, respectively. The plans which Vattenfall presented to the public were a very superficial and simplified description of a major and extensive project. The facilities were accounted for so summarily that it was difficult to grasp their potential impact on the lives of people along the river. Representatives of some companies, trade unions and landowners from the area spread the idea that the majority of residents in the villages were strong advocates of expansion, a claim which the press also propagated. However, an acrimonious debate arose between proponents of the expansion and those who wanted to preserve the river, amongst both political representatives and the population. But the people in upper Laisdalen, which the expansion would have completely submerged, were of one opinion. The opposition is said to have been so strong that politicians feared a riot.

In 1969, the Vindelådalen action group was formed in Vindelns. They had the support of sympathisers from well-outside the county's boundaries and the situation was extensively covered in the newspapers. The action group believed that support for the expansion was not as strong as was claimed. They produced a questionnaire which they sent to all landowners and were able to show that there was only a small majority of protagonists in favour of the expansion. A strong lobby in favour of conserving the river and doubts over the likely profitability of the project as a whole finally led to the plan being abandoned. In 1970, the government decided not to put the issue of the expansion of the River Vindelälven to the vote in parliament. This proved to be the beginning of the end for the Swedish era of hydroelectric power expansion. However, the River Vindelälven once again came under pressure from the hydroelectric power lobby in the form of the so-called Laisvall project which was presented in the 1990s. This aimed to divert water from the River Laisälven to the River Skellefte, to dry up parts of Storlaison, at the same time allowing the mining of ore at the Laisvall mine to continue for several years. This project too was abandoned. The River Vindelälven subsequently gained iconic status amongst Sweden's watercourses and over time was granted increasingly stronger protection. Residents in the valley are nowadays proud of having won their battle against the state and that the river remains free-flowing and has the status of a national river.

10.6.6 Religious values

Pre-Christian belief amongst the Sami involved religious practices that were closely associated with nature. There were therefore many places of religious significance in the pre-Christian landscape, of which most have been forgotten, but some are still known. Animals and valuable items were often offered as sacrifices at centres of religious cults. According to one source from the 1600s, each family had its own special sacrificial mound. One such sacrificial mound is Altarliden which has a stone circle where, until the end of the 1800s, there stood a wooden figure, almost the height of a man, surrounded by several smaller figures.

Sami sacrificial sites were not only located on mountains. In 1938, near the river in the Vindelgransele area, reindeer antlers and bones were found, along with a large number of metal artefacts, lying on a bed of densely packed stones, covering around seven square metres. About a hundred items were removed for protection in the 1940s, but by then the site had been plundered. This place dates back to the 900s to 1300s. A similar find was made in the Björksele area. This was a quantity of bronze objects from the 11th century or the beginning of the 12th century, but there were no definite signs of sacrifice. At the start of the 1600s, the church began missionary work in Lappmarken/ the Sami district and under coercion and threats the Sami abandoned their rites, religious objects and shamans.

The first time that the area of the river Vindelälven is named in a historical document (1314), which recorded that Umeå had one of the country's most northerly Christian congregations. Backen was probably the first church site where, at the start of the 1500s, a stone church was built which still remains, after extensive restoration following fires in 1893 and 1986.

Backen (se figure 5) was for a long time an important religious and cultural centre for the entire area. A church village is a village that is directly located around the church, with a number of simple cottages where families from the parish's more outlying villages could stay when coming to attend church services. Church villages are distinctive cultural-historical phenomena in the counties of Västerbotten and Norrbotten. They developed as a result of the ecclesiastical law which required the attendance of parishioners regardless of how far away they lived. Around Christmas and New Year, the Sami arrived to both attend church and conduct trading in the market, but when Lycksele became the site of a church in 1606, Backen lost its importance for the inhabitants of Lappmarken/ the Sami district. In 1646, building work was begun on a new church further to the east in the newly established town of Umeå, but Backen remained a site of church activities for the majority of the rural congregation.

To begin with, Lappmarken/ the Sami district in the Lycksele area constituted a solitary church congregation, but at the end of the 1670s a new church parish was established in Sorsele. The first priest in Sorsele, Henrik Svensson Lyckselius (active from 1674 to 1692), was one of the first Sami priests in Sweden. Several of his successors were also Sami. The best known was Anders Fjellner from Härjedalen, who served in Sorsele from 1842 to 1876. Inspired by the Finnish epic folklore poem Kalevala, Anders Fjellner wrote the Sami epic poem Solens söner (Sons of the sun) from songs and sagas which he recorded himself.

In the summer, services were conducted nearer the mountain region where the mountain Sami were busy tending their reindeer. From the mid-1700s, congregations met at Gillesnuole, and the church town was subsequently built around it. When settlers arrived in greater numbers during the first half of the 1800s, the mountain Sami increasingly began to use summer grazing lands nearer the Norwegian border and Ammarnäs then became the new church parish in the mountain region. As a result of this, the chapel at Gillesnuole was abandoned. The church building was sold at auction and was used as a lodge in a neighbouring village until 1937, when it was reconstructed on its original site. On this same site, which is an area of national importance for cultural environmental conservation (AC 29), there is also a small cemetery, a belfry, a Sami njalla (wooden store house built above ground on a sawn-off tree trunk), and a number of Sami huts or tents. In 1979, a chapel was completed at Laisvall on the river Laisälven. The church village at Ammarnäs, the so-called Lapplatsen, consists of sheds which in part were moved there from Gillesnuole. Lapplatsen and the surrounding ecclesiastical presence lie within an area of national importance for cultural environmental conservation (AC 30). Church villages have previously also been

found at Gillesnuole, Sorsele, Degerfors (Vindeln) and Umeå (at Backen's church, see above).

As far as is known, only one church in the area was founded as a result of a religious revelation. Following an explosion at the Kristineberg mine in 1946, an impression appeared on a rock face which was interpreted as an image of Christ. This impression gradually disappeared as a result of mining operations, but in 1990 a church was inaugurated in the mine, with a copy of the Christ image painted on the wall. The church is ecumenical and has been given the name Sankta Anna underjordskyrka (Saint Anna's underground church) after the mine workers' patron saint.

During the 1800s, there was a growth in religious revival and free church congregations gained a strong foothold in many villages along the river around the turn of the century. Chapels in the villages bear witness to their presence. Evangeliska Fosterlandsstiftelsen, EFS (Evangelical Fosterland Foundation) has its strongest base in the rural areas of the Västerbotten municipality, but Pingstkyrkan (The Swedish Pentecostal Movement) is also well-established.

10.6.7 The Significance of Craftwork

Slöjdhandverk har betydelse både inom kulturområdet och för sysselsättningen. Kunskaperna var nödvändiga i det äldre samhälle och visar på ett tydligt sätt vilken förmåga en människa har att åstadkomma både bruksföremål och konst. Slöjdföremålen är än idag uppskattade men betydelsen av slöjdade bruksföremål minskar. Den samiska slöjden /doudji (nordsamiska)/duöjjie (umesamiska) har symbolvärde för samisk identitet och har ett starkt samband med levnadssätt och livsstil. Denna slöjdtradition går fortfarande i arv mellan generationer, men förmedlas idag även via utbildning som till exempel på Samernas utbildningscentrum i Jokkmokk. Allt slöjdtradition påverkas och utvecklas av samhällsförändringar och idag har slöjdhandverk även blivit ett sätt att ta ställning för till exempel ett hållbart samhälle.



Image 23. Sami craft, doudji/duöjjie. Forestry museum, Lycksele. Photo: Cecilia Wallinder

10.6.8 Modern culture and its establishments

Music, theatre, craftwork and dance are important elements of the area's rich cultural life. The important cultural institutions include:

The coastal region:

- *NorrlandsOperan* was founded in 1974 and is a performing arts centre with regional commissions to produce, promote, and develop stage performances and artistic works, and to organise the Umeå Jazz Festival. *NorrlandsOperan* includes a symphony orchestra and sections for opera, dance, and music, as well as a room for contemporary arts. As well as its own productions, every season it hosts touring guest performances.

- *Väven* is a large cultural centre which provides a platform for cultural activities and experiences where people and ideas are woven together. It offers culture in its broadest sense: from music to food, from lectures to entertainment, spontaneous or planned, and is available for use by either private individuals or local businesses. The building houses Umeå's city library, the Museum of Women's History, several creative workshops, film theatres, rooms for art, etc. Rooms can be hired by or lent to the public. The building is an architectural landmark of the highest international standing.
- *Västerbotten's museum* is responsible for the county's entire cultural historical legacy and is tasked with conserving, maintaining and bringing alive the cultural legacy for both present and future generations. The museum has rooms for both permanent and touring exhibitions, as well as an outdoor museum with old buildings and examples of three different Sami dwelling places. The museum collaborates with different players in the municipality within a structured framework. It has almost 200,000 visitors per year.
- *Bildmuseet* in Umeå is part of Umeå University and is one of Sweden's largest and most famous art centres for international contemporary art. Exhibitions are organised in collaboration with artists, museums and universities throughout the world and are often publicised nationally and internationally.
- *The Museum of Women's History* was inaugurated in 2014 and is the first museum of women's history in Sweden. The museum aims to fill a historical vacuum by placing women at the centre and by offering a new perspective on history in both the present and the future.
- *Hamnmagasinet* houses a cultural centre for children and young people and is run by the Umeå local authority. It is a creative meeting place for families, children and young people, with a stage, a meeting room and exhibition walls, sewing machines, image editing programmes, perler bead pegboards, music rooms and DJ rooms.
- *Guitars - the Museum* houses one of the world's finest, privately owned guitar collections.
- *Arboretum norr* in Baggböle, Umeå, is one of the world's northernmost collections of trees. It was founded in the 1980s and now houses over 2500 trees and shrubs belonging to almost 400 different genera from around the world.
- *Slöjdarnas hus* at Vännäsby has, besides a café, a shopping and exhibition area, with crafts produced by local craftspeople.

The Forest Region:

- *Skogsmuseet* in Lycksele focuses on the history of forestry. The exhibitions illustrate not only the development of forestry work and technology – from axes, saws and chain saws to large forwarders and harvesters – but also the people who work in forestry: loggers, cooks, timber floaters, Sami, goat herders (often children, who tended animals in the forest), and machine operators. Besides forestry objects, films and photographs, the museum's archive has a unique Sami collection and a large insect collection. In Barnens lek hörna (the childrens' play area), the focus is on learning through play and discovery.
- *Hotell Lappland* at Lycksele holds several entertainment events each month, with the emphasis on music, dance and shows.
- *Saga-bio* in Åmsele is an active cinema which won the film industry's campaign prize in 1998.
- *Heritage areas.* A number of villages in Vindelälven-Juhtatdahka have local heritage museums with a variety of activities. Ammarnäs, Sorsele (both part of the mountain region), Vormsele and Vindeln have heritage areas with collections of old buildings.
- *Hemslöjdmässan* (the Craft Fair) in Vormsele started in 1969 and grew rapidly, so the heritage museum was expanded to accommodate craft items and visitors. A museum with buildings and artefacts was

also constructed. Since then Hemslöjdsmässan has been held every year in July. In the nearly 50 years since it started, there has been a decline in typically male wood craftwork whereas there are still many practitioners of typically female textile craftwork.

- *Konst i kvarn* (art in the mill) is a summer exhibition which has been organised for the last 25 years in the old mill at Renforsen, Vindeln. Local and regional artists exhibit their work over a period of six weeks. 10,000-15,000 visitors have been attracted to the mill in recent years.
- *Naturcentrum* in Vindeln has an exhibition featuring the River Vindelälven: nature, culture and landscape as they unfold along the undisturbed river. In the summer, activities and guided walks are offered.

The Mountain Region:

- *Silvermuseet* in Arjeplog relates the history, the cultural landscape and population of the mountain region. Research is also conducted at the museum.
- *Naturrum* in Ammarnäs houses an exhibition featuring the Vindelfjällen Nature Reserve, looking at everything from the formation of the mountains to Vindelfjällen's plant and animal life. This also includes the area's rich cultural history from the prehistoric age to the present day. Temporary exhibitions are also held here. An exhibition is presently being planned at this venue for the Vindelälven-Juhtatdahka biosphere reserve.

10.6.9 Food

The entire planned biosphere reserve, between coast and mountains, has a unique larder of raw materials. A lot of what was found in the historical larder (see 9.1) is still being eaten today. Reindeer meat, Arctic char, grouse, elk meat, mushrooms and berries can all be found in the area. The raw materials are used daily in many home kitchens and restaurants in the area. Brännlands Iscider, a new dessert wine which nowadays is sold throughout the world, and Vindelrökta skinkan (Vindel-smoked ham) are examples of the area's refined products which have proved successful. Smoked, dried reindeer meat is a highly sought-after food product, the demand for which outstrips supply in many parts of the area.

This food heritage goes hand in hand with the valuable natural and cultural environments in the area. They neither can nor should be considered as separate from each other. By eating food from this area one may partake of the dishes, traditions and atmosphere that have been part of life here for many generations.

The planned biosphere reserve has major potential for developing everything from the refining of raw materials to marketing and sustainable forms of transport. One of the trends in food is for consumers to become increasingly aware and to begin applying this awareness more and more to their choice of goods. The interest in locally produced goods, and not least in food produced locally, has never been greater than it is now. Vindelälven-Juhtatdahka has examples of farm shops which sell meat produced on their own or neighbouring farms, farm cafés which sell their own home-made ice cream and/or cakes/pastries ("fika" – with coffee), local bakeries, wild game suppliers who sell directly to customers, and herb and vegetable growers who deliver directly to customers. Interest in these suppliers has increased over the years. Moreover, people are working to find simpler ways for local shops and restaurants to begin selling goods which come from the surrounding area. There are also dreams and ambitions to develop food as a local "total countryside experience". In Vindelälven-Juhtatdahka, there is an added dimension to locally produced food as it adds value to the raw materials that form part of the landscape. Forest berries and plants, as well as wild game and fish, already attract many restaurateurs and shops, but the potential far exceeds current sales. There is a major potential for the planned biosphere reserve to become a venue and an instrument for supporting locally produced goods in the area. A preliminary study is underway to ascertain the need for sustainable transportation of, for example, foodstuffs, perhaps combined with public transport, along with possible ways of achieving this. Vindelälven-Juhtatdahka is a remote area which in part is sparsely populated, making public transport a major challenge.

The project Route Gastronomique has been a major inspiration for many in the food and tourist sectors

in Vindelälven-Juhtatdahka. The project took place between 2012 and 2014 with the aim of contributing to the development of food tourism along and around the river Vindelälven, so as to preserve a living rural area and to open it up to work opportunities. The expertise of cooks, catering staff and food producers was developed and producers, restaurants and shops were mapped out. The homepage for the Vindelälven-Juhtatdahka biosphere reserve (www.vindelalvenjuhtatdahka.se) contains information on these food-related businesses. The originators of the project are now seeking EU funds for project 'Lapland, a Culinary Region', which encompasses an area larger than the Vindelälven Valley, but which still includes large parts of the valley. The aim is to help increase expertise, particularly in the areas of product development and food tourism. An extensive geographical area was chosen to include a large number of restaurants and food shops which are potential purveyors of locally produced food, while in turn these outlets will have a wider range of products to choose from and more secure deliveries. All participants are sharing in the funding in order to obtain co-financing and to increase involvement and participation. The positive response to the question of co-funding shows there is major interest in developing work involving locally produced food and in enticing visitors into the countryside.



Image 24. Gurpi, smoked sami sausage. Photo: Ola Jennersten



Image 25. Lunch break in Ammarnäs. Photo: Ola Jennersten

10.7 Specify the number of spoken and written languages (including ethnic, minority and endangered languages) in the biosphere reserve. (Refer, for instance, to the UNESCO Atlas of Endangered languages (<http://www.unesco.org/culture/languages-atlas/index.php>)).

There are five national minorities in Sweden: Jews, Roma, Sami, sverigefinnar (Swedes who have migrated from Finland or whose family roots are in Finland) and tornedalingar (Swedes in the far north of the country who are ethnically Finnish). National minorities are groups with a noticeably different ethnic and/or linguistic background to that of the general population, and which have populated Sweden for a long period of time and have their own language or cultural affinity as well as a desire to retain their identity. According to the National Minorities and Minority Languages Act (2009:724), which was introduced to implement the European Charter for Regional or Minority Languages, all school pupils who belong to any of Sweden's minorities have the right to education in their mother language, even if they do not speak this at home. This law aims to give protection to national minorities, to enhance the possibilities for minorities to wield influence, and to support historical minority languages so that they remain living languages. The law also promotes the possibilities for national minorities to retain and develop their culture in Sweden. In particular, the development of a cultural identity, and use of their own minority language by children should be promoted; local authorities receive state support for fulfilling this obligation. As well as being a minority population, the Sami are also Europe's only indigenous people. This means that they have lived in the same place in northern Scandinavia since long before the area was colonised and national borders between countries were established.

Swedish is nowadays the main language in Vindelälven-Juhtatdahka. However, up to and including the 1700s, Saami was the dominant language in the entire interior region. Saami is a Finno-Ugrian language with three main groups: Eastern Saami, Central Saami, and Southern Saami. Throughout most of Vindelälven-Juhtatdahka, Ume Saami was traditionally spoken; this has elements of both Southern Saami and Central Saami. Moreover, Northern and Southern Saami variations are spoken in the area, as well as

Pite/Arjeplog Saami and Lule Saami. UNESCO's Atlas of the World's Languages in Danger shows that Ume Saami is in critical danger, with only about 20 speakers.

The Saami language comes under the National Minorities and Minority Languages Act (2009:724). According to the Act, there are special administrative areas for Finnish, Meänkieli and Saami. In Vindelälven-Juhtatdahka, the Umeå, Lycksele, Sorsele and Arjeplog municipalities are Sami-administrative local authorities, which means that individuals have the right to use Saami in interactions with the administrative authority. The municipality is also obliged to offer wholly or partly preschool activities/care for the elderly in Saami for those who request it. The neighbouring Malå municipality is also a Sami-administrative authority and nowadays collaborates significantly in Saami with the administrative authorities in the planned biosphere reserve. The Vindeln and Vännäs municipalities are not Sami-administrative areas, but Vindeln has applied to become one. These municipalities have Saami-speaking residents as well as people who wish to learn Saami, but as long as they are not Sami-administrative authorities they will not receive state administrative funding. The Umeå municipality is also part of an administrative area for Finnish and there is a desire to also include Meänkieli in the future.

Saami for children and the elderly in Sami-administrative municipalities

In 2017, ten people in Arjeplog municipality participated in activities for the elderly in Pite Saami and Northern Saami. In school (in the range from six years of age up to and including upper secondary school), two pupils received education in Pite Saami, three in Southern Saami and ten in Northern Saami. At preschools, care givers have demanded support for education in the Saami mother tongue for 12 children, in Northern Saami, Pite Saami and Ume Saami.

In the Sorsele municipality in 2017, four people asked for care for the elderly to be provided in Ume Saami and Southern Saami. The Sorsele Sami administrative local authority also organises Sami activities for the elderly involving district names, food and language, and arranges excursions in collaboration with other administrative local authorities. Ammarnäs' Sami association runs children's activities once a month, in collaboration with Sorsele which is the Sami administrative local authority. At preschool and primary school, nine pupils received education in their mother tongue, five in Northern Saami, one in Southern Saami and three in Ume Saami. All teaching is conducted as distance learning because of a shortage of teachers. The local authority also organises courses for adults in Southern, Ume and Northern Saami. The Saami language, in this case Ume Saami, should be understandable in the Sorsele municipality. The local authority is working to introduce the Saami language into place names in brochures, signs on public buildings, signposts, etc.

In Lycksele municipality, there were no requests for any Saami language variants in the area of care for the elderly. In schools (in the range from six years of age up to and including upper secondary school), three pupils received education in Northern Saami, eight in Southern Saami, and eleven in Ume Saami. In preschool, one child received education in Northern Saami, four in Southern Saami and four in Ume Saami.

In Umeå municipality, no elderly people requested care for the elderly in Saami, but ca. 10 to 15 people participated actively in Sami activities organised on one afternoon per week, with the focus on Sami senior citizens. Sami project coordinators in Umeå municipality coordinated activities in collaboration with the Umeå Sami association. 15 pupils in the school received education in their mother tongues of Southern Saami or Northern Saami. Two pupils had requested education in their mother tongue of Lule Sami, but the local authority was unable to provide a teacher. Six children in preschool received education in Southern Saami. Parents requested education in Ume Saami for three children, but the local authority was unable to provide a teacher.

In recent history, there has been a large influx of refugees and immigrants into the area. The most common languages introduced by these new arrivals were Arabic and Dari.

11. BIOPHYSICAL CHARACTERISTICS

11.1 General description of site characteristics and topography of area: (Briefly describe the major topographic features (wetlands, marshes, mountain ranges, dunes etc.) which most typically characterize the landscape of the area).

The proposed boundary of the Vindelälven-Juhtatdahka biosphere reserve extends from the drainage basin of the River Vindelälven, the River Laisälven and the lower River Umeälven, except for the 1077 hectares that are in Norwegian territory. The area also includes the villages of Taveljö and Hissjö which lie on the River Vindelälven's old glacial deposits, though nowadays the area drains into the River Tavelån rather than into the River Vindelälven. These two villages lie along the road "Vindelälsvägen 363" and their residents very much regard the region as part of the Vindelälven Valley. Having the drainage basin of the River Vindelälven, the River Laisälven and the lower River Umeälven as a boundary seems very natural; it is a boundary which is already used in several other contexts (e.g., the Leader Fishing sector of the Vindelälven area for managing the European Fisheries Fund, the Ume-Vindelälven Fisheries Council, and the River Vindelälven Fishing Foundation). The boundaries of the river valley as described are therefore both natural and accepted.

The proposed biosphere reserve has undergone several glaciations which have given the landscape its characteristic appearance. The mountain region in the west, which is a part of the ancient Scandinavian mountain range, has been substantially eroded, giving it a gentler profile. East of the mountain region, the landscape changes into lower mountains, and nearer the coast into undulating hills, both characterised by thick moraine layers and fluvial sediment.

The River Vindelälven, the southernmost of Sweden's four national rivers, drains the landscape and traverses two biogeographical regions, the Alpine and the Boreal. In the mountains, it runs via two main channels which join immediately below the edge of the mountains, forming the large main channel, the River Vindelälven, which passes through the boreal region down towards the coast. About 40 km from the Bottenviken coast, the River Vindelälven merges with the River Umeälven. The planned biosphere reserve stretches a little farther out into Bottenviken.

The mountain range's fluctuating bedrock, peaks and microclimates provide the conditions for a diversity of ecosystems which range from high alpine environments and glaciers to more extensive low, flat fells with heaths, interspersed with wetlands farther to the east. The alpine environments of the barren uplands give way to mountain birch woodland at an altitude of ca. 800 m above sea level and then to mountain coniferous forest. The mountain streams which transport meltwater and rainwater down from the mountains carry sediment which is deposited, creating a unique mountain delta with luxuriant wetlands amongst the watercourses. Below the subalpine zone lies the taiga, boreal forests dominated by coniferous trees, which stretches all the way down to the coast. A large number of lakes of different size and shape, small watercourses and various types of wetlands, primarily nutrient-poor blandmyrar (bogs with a patchwork of alternating swampy and mossy elements), are also distributed throughout the entire area. The lakes and watercourses are usually nutrient-poor, oligotrophic and, in forested land, humic and dystrophic.

During the last melting of the inland ice sheet, enormous amounts of meltwater discharged into the rivers. These carried loose material which was sorted and deposited in the form of ridges, sand heaths, etc., along the River Vindelälven as the water flowed towards the coast. Where the river flowed into calmer water, the transported material sank to the bottom, creating huge river deltas. The weight of the inland ice sheet pressed the land mass down substantially. When the ice melted 8000-10,000 years ago, the land around Vindelän was in the form of an undulating archipelago landscape with deeply scoured bays, islands and skerries. This former coast (which is at the maximum historical coastline level) now lies ca. 240 metres above today's sea level because of isostatic land rebound which is still going on at a rate of ca. 0.9 cm per year. The ongoing land elevation is one of the most important geological characteristics in Fenno-Scandinavia. The sediment that is transported via the River Vindelälven and the River Umeälven goes into creating the delta at the mouth of the river in Bottenviken near Umeå. The delta has high nature value in the form of unique environments [marine and elevated land (isostatic

rebound]], nutrient-rich coastal forests and its unique importance to bird life. Land elevation accelerates delta formation and also creates unique marine habitats. The part of the proposed biosphere reserve which extends beyond the delta has a maximum sea depth of ca. 25 metres off Holmsund, ca. 800 metres north of the Storbränningen lighthouse.

The free-flowing River Vindelälven is characterised by major seasonal variations in volumetric flow rate, depending on whether the winter precipitation is stored as snow. In late winter, the flow rate in the lower section of the river can be as low as 15 m³/sec, and when the snow in the mountains melts in mid-June, the flow rate can be hundreds of times higher. In the record year of 1995, the river had a flow rate of ca. 2000 m³/sec at Vindelö on 12 June. These major fluctuations create natural disturbances and diverse conditions along the coastline.

The River Vindelälven and the River Umeälven conjoin ca. 40 km upstream from the coast. In the final stretch before it flows into the Baltic Sea the river is regulated by the Stornorrfors power plant. After Stornorrfors, the elevation drop is smaller and the water flow rate decreases.

11.2 Altitudinal range:

11.2.1 Highest elevation above sea level: ___1641___ metres

11.2.2 Lowest elevation above sea level: ___0___ metres

11.2.3 For coastal/marine areas, maximum depth below mean sea level: 25 metres

11.3 Climate

(Briefly describe the climate of the area, you may wish to use the regional climate classification by Köppen as suggested by WMO (http://www.wmo.int/pages/themes/climate/understanding_climate.php)).

The climate of the area is classified as Dfc in accordance with Köppen's climate classification. The Köppen system is based on the idea that native plants and vegetation are the best indicators of climate, so the boundaries of climate zones have been established by observing the distribution of five different types of vegetation: tropical rain forest, hot desert flora, temperate deciduous forests, boreal forests, and tundra.

11.3.1 Average temperature of the warmest month: Umeå: 15.7°C; Lycksele: 15.6°C; Hemavan (outside the area but the measuring station represents the climate of the mountain region): 10.6 °C.

11.3.2 Average temperature of the coldest month: Umeå: -7.8°C; Lycksele: -10.1°C; Hemavan: -8.3 °C.

11.3.3 Mean annual precipitation: 523 mm, recorded in Lycksele, at an elevation of 210 metres.

11.3.4 Is there a meteorological station in or near the proposed biosphere reserve? If so, what is its name and location and how long has it been operating?

Table 7. Meteorological stations in the area and in its vicinity.

Station	Latitude	Longitude	Height above sea level (m)	Commissioned
Umeå airport	63.7947	20.2918	14	1965
Lycksele A	64.5492	18.7169	210	1996
Hemavan-Giertvarto A	65.7832	15.0645	793	1990

11.4 Geology, geomorphology, soils: (Briefly describe important formations and conditions, including bedrock geology, sedimentary deposits, and important soil types).

The structure and character of the Vindelälven Valley have been influenced by the original bedrock and by several glaciations. Sweden's most common soil type is moraine, and landforms are created by these glacial sediments. Examples of unique landforms sculptured by meltwater rivers include Blattnick moraine, special land formations around Sorsele, and Sundkammen, a massive ridge at Åmträsket. As a result of the last glaciation, the Vindelälven Valley is still being affected by land elevation today. Undisturbed glacial sediment is found above the maximum coastline elevation; finer sediment dominates below this level as it has lain under the surface of the sea and become part of the delta area.

The bedrock comprises mountain ranges of Cambro-Silurian rocks, roughly as far down the river valley as Storvindeln, below which the area is dominated by Precambrian rocks 1.8 to 2.2 billion years old. The bedrock is part of the northwestern section of the Eurasian tectonic plate. Below the perimeter of the mountain region and almost the entire way to the coastal region, the area is dominated by different types of granite; gneiss is more common close to the confluence of the River Vindelälven and the River Umeälven.

As in the rest of the Nordic region, the bedrock's morphology in valleys has been affected by several glaciations. The course of the River Vindelälven and the River Laisälven has been strongly influenced by the original large-scale tectonics in the bedrock.

The upper part of the planned biosphere reserve is traversed by the so-called Gulmlinjen (Gold Line), which is one of Europe's most interesting gold mineralisations. It comprises a range of gold deposits from northwestern Västerbotten, through the municipalities of Sorsele, Storuman, Lycksele and farther towards Bottenhavet (the Bothnian Sea) in the south east.

Farthest upstream, the River Vindelälven emerges on a high plateau between the mountain region Jällektjåkkå and Sarvestjåkkå in Norrbotten county (figure 6). North of this plateau, water drains towards the River Laisälven, which has its sources at Nasafjället near the Norwegian border and which later flows into the River Vindelälven. The course of the River Vindelälven then continues towards the southwest, down to Vindelkroken where the river turns sharply towards the southeast and passes through the actual Vindel Valley along the northern side of Ammarfjället. At Ammarnäs, the River Vindelälven has deposited sediment in a number of small areas of calm water, creating meanders with levees and river embankments, before flowing into the River Vindelälven's first lake, Gautsträsket. Tjulån, which drains the southern side of Ammarfjället, flows into the western section of this lake. Together, these watercourses form a large sedimentary delta, which has been used for haymaking for a long time. Downstream of Gautsträsket the River Vindelälven is forced into a series of rapids. Further downstream is Storvindeln, a 40-km-long fjord lake, dammed by a rock sill at the rapids Bräskaforsen. Downstream from Bräskaforsen, the river flows into Nedre Gautsträsket (figure 6). This is where the River Laisälven enters from the north. At this point, the River Laisälven is almost as large as the River Vindelälven. Along its course are features that are similar in many ways to those of the River Vindelälven, including small lakes in the inner regions of the coniferous forest, the elongated lake Storlaisan, which is reminiscent of Storvindeln, and long sections with stretches of calm water alternating with rapids. At Märkberget, between Gautosjön and Storlaisan, the river flows through a gorge. Before the confluence with the River Vindelälven, the River Laisälven has developed a mile-wide sandur (outwash plain) of gravel and sand.

From the mountain region, the landscape downstream from Sorsele transforms into bergkullslätt (tableland punctuated by peaks of Precambrian rock). The area around Olsselet, after the long rapids Stensundforsen, is characterised by sandy meltwater river deposits, including a sand plain with well-developed shifting sand dunes. There are also huge meltwater river deposits containing sand in a swathe from Blattniksele to Sandsjön. From Råstrand to Vindelgransele, the river has its most concentrated stretch of rapids, with a sequence of eight and a total drop of 40 m.

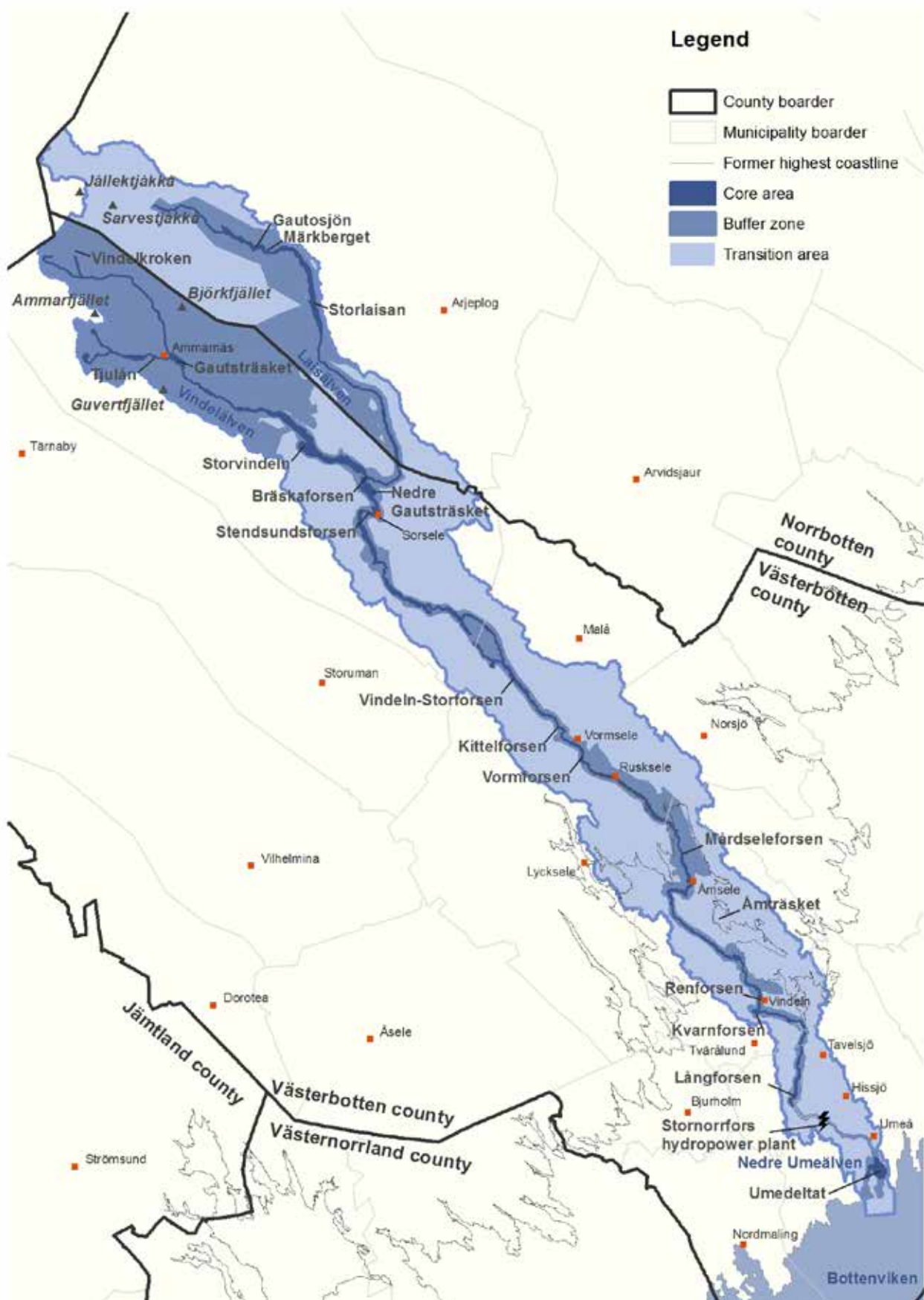


Figure 6 . Map of the planned biosphere reserve with some mountains and lakes marked

The rapids Storforsen, which are located downstream from the section of calm water at Vindelgransele, split into small rapids, passing over firm slabs of rock of volcanic origin. Further downstream, the river forms a mile-long stretch of calm water interspersed with rapids or bottlenecks. While many rapids are flat and stony, the rapids Vormforsen are powerful rapids which pass over coarse-grained Revsund granite that is partly broken up into large boulders. A swathe of meltwater river material, partly in the form of ridges and hillocks but mostly as level fields, follows the river, with some discontinuities, from Björksele to the Vormsele region where it passes through the outer delta Ruskträskfältet at the highest coastline level. At the rapids Kittelforsen downstream from Björksele is a glacial deposit with high terraces, a clear section with ridges and a prominent drainage channel. Terraces also feature at many points downstream from Vindelgransele. The ridges are often bordered by long stretches of ridge ditches. There are abundant amounts of sandy and fine sandy materials which have formed wide flood plains that have been extensively used for haymaking. There are good examples of such floodplain meadows at Vindelgransele and Björksele.

Downstream from the highest coastline level, *bergkullslätt* (tableland punctuated by peaks of Precambrian rock) continues towards Åmsele and Ekorrsele where it is replaced by an undulating hilly terrain characterised by hillocks arranged in clusters, with no intervening flat surfaces. Parts of the river valley have substantial soil covering. Moraine is common, but the amounts of glacial and postglacial sediment increase downstream. There are several stretches of meltwater river with pebble ridges. In particular, there are complex meltwater river formations at Mårdsele and Hällnäs. At the abandoned airfield in Åmsele, sandy sediments have been deposited by the wind and formed a large dune field with mainly transverse dunes. Also, at other sites, there are substantial shifting sand dunes, for example, upstream from Siksele, at Ekorrsele, and in the Hällnäs area. The sediment cover gradually changes in character farther downstream. The older delta plain becomes broader, the material more fine-grained with sand, fine sand and also silt, and terraces at a variety of levels become more common. The landscape of steep, sandy river banks broadens out.

This landscape is at its most pronounced around Hällnäs and at Vindel-Degerfors, with precipices and ravines. The material is made up of sand and fine sand, and open erosion scars can be seen at various points. As in previous sections of the river, stretches of calm water alternate with sections of rapids. The sharpest drops in elevation are at the rapids Mårdseleforsen, Renforsen, Kvarnforsen and Långforsen. The rapids Mårdseleforsen branch as they flow over a rock sill and have created erosions in the solid rock. Free meanders are not present in the River Vindelälven, but the river has a tendency to form meander curves. On stretches of calm water there are fairly extensive flood plains with flood meadows, for example, at Åmsele, Strycksele, and Mesele.

11.5 Bioclimatic zone:

(Indicate the bioclimatic region in which the proposed biosphere reserve is located. Refer to the table below and tick the appropriate box for each area of the biosphere reserve).

Table 8: Relative humidity calculated using P/PET
 Mean annual precipitation (P) / Mean annual potential evapotranspiration (PET)

Bioclimatic zone	Mean annual precipitation (mm)	Relative humidity Penman	Relative humidity (UNEP index)	Core area(s)	Buffer zone(s)	Transition area(s)
Hyper-arid	P < 100	< 0.05	< 0.05			
Arid	100–400	0.05-0.28	0.05-0.20			
Semi-arid	400-600	0.28-0.43	0.21-0.50			
Dry sub-humid	600-800	0.43-0.60	0.51-0.65	X	X	X
Moist sub-humid	800-1200	0.60-0.90	> 0.65	X	X	X
Perhumid	P > 1200	> 0.90				

As the area is so large, relative humidity varies from one part to another. According to Köppen's climate classification, Vindelälven-Juhtatdahka belongs to climate zone Dfc: a climate characterised by long, normally cold winters with short and chilly-mild summers. These distinct seasons, in which the land is often covered with snow throughout winter and up until the warmth and greenness of summer's return, are separated by the transition phases of spring and autumn. There is a clear climate gradient from the coast up to the mountain region, with a significantly milder climate along the coast and very short summers and long winters in the mountain region. Spring therefore arrives later and autumn comes earlier in the mountains. From March to June, the snow gradually melts and deciduous trees come into leaf. From August to November, the trees lose their leaves and the snow returns.

11.6 Biological characteristics

List main habitat types (e.g. tropical evergreen forest, savanna woodland, alpine tundra, coral reef, kelp beds) and land cover types (e.g. residential areas, agricultural land, pastoral land, cultivated areas, rangeland).

For each type, indicate:

- REGIONAL if the habitat or land cover type is widely distributed within the biogeographical region within which the proposed biosphere reserve is located, to assess the habitat's or land cover type's representativeness;
- LOCAL if the habitat or land cover type is of limited distribution within the proposed biosphere reserve, to assess the habitat's or land cover type's uniqueness.

For each habitat or land cover type, list characteristic species and describe important natural processes (e.g. tides, sedimentation, glacial retreat, natural fire) or human impacts (e.g. grazing, selective cutting, agricultural practices) affecting the system. As appropriate, refer to the vegetation or land cover map provided as supporting documentation.

Table 9 shows 11 ecosystems, based on a classification according to the continuous ecosystem mapping of protected areas; similar ecosystems are merged into large, combined categories, e.g., forest habitat and wetlands.

Table 9. The types of ecosystem and land utilisation identified in the biosphere reserve together with the size of each ecosystem area and these areas as a percentage of the whole. Regionally and locally occurring ecosystems and types of land uses are marked with (R) and (L), respectively.

Ecosystem	Area size (ha)	Percentage (%)
Mountain heath (R)	242 488	18.24 %
Glaciers (L)	2 122	0.16 %
Mountain birch woodland (R)	111 372	8.38 %
Boulder and substrate terrain (L)	671	0.05 %
Wetlands (R)	157 661	11.86 %
Forest and scrubland (R)	535 106	52.02 %
Agricultural land (L)	22 120	1.66 %
Settled land (L)	7 214	0.54 %
Lakes and watercourses (R)	84 974	6.39 %
Estuaries (L)	1 334	0.10 %
Marine habitat (L)	7 708	0.58 %
TOTAL	1 329 086	100 %

In the text below some examples are given of characteristic species.

11.6.1 Mountain heath (Regionally occurring ecosystem)

Mountain heath is characteristically in alpine terrain over ca. 800 m above sea level, where forest-forming mountain birch can no longer survive in the harsh climate. This is a distinctive barren environment which extends towards the northwest up to the Norwegian border.

Characteristic species

The vegetation is characterised by large spruce (*Hylocomiastrum pyrenaicum*), Blytt's rock moss (*Andreaea blyttii*), ragged snow (*Cetraria nivalis*) in the underlying layer, and moss heather (*Cassiope hypnoides*), creeping azalea (*Loiseleuria procumbens*), alpine bearberry (*Arctostaphylos alpinus*), crowberry (*Empetrum nigrum*), Bigelow's sedge (*Carex bigelowii*), highland rush (*Juncus trifidus*) and dwarf birch (*Betula nana*) in the field layer. Mountain avens (*Dryas octopetala*) grows where the mountain heath is dry and rich in

limestone. Many of the plants have adapted to the short summer. Some flower early, such as glacier buttercups (*Ranunculus glacialis*). Characteristic animal species include the Norway lemming (*Lemmus lemmus*) and the reindeer (*Rangifer tarandus*). Common bird species include willow grouse (*Lagopus lagopus*), rock ptarmigan (*Lagopus muta*), golden plover (*Pluvalis apricaria*) and the short-eared owl (*Asio flammeus*), while butterflies include mountain fritillary (*Boloria napaea*), Lapland fritillary (*Euphydryas iduna*) and Scotch burnet (*Zygaena exulans*).

Natural processes and human impact

The most important naturally occurring processes include the effects of reindeer grazing and of variations in the thickness of snow cover. Intensive reindeer grazing contributes to keeping down tree and scrub vegetation. A variety of ecosystems are created thanks to the fact that snow accumulates in thick layers in sheltered areas and lies there for long periods, whereas areas exposed to wind have only a thin layer of snow. A well-developed subnival space can be formed under deep snow, giving the Norway lemming access to protection and food during the long winter. The Norway lemming is an important prey for species such as the short-eared owl and the Arctic fox. The rare nomadic snowy owl (*Bubo scandiacus*) can also be found here in lemming years, when there is a surge in the lemming population. The tree line is dynamic and has migrated up and down mountainsides both locally, over a short time scale (due to weather, grasing etc) and in larger areas over longer time scales (e.g. millennia, due to changes in climate). Bog turf and mountain heath have yielded the remains of trees from a time when parts of the mountain regions were covered in various conifers. With global warming, it is expected that forests will once again migrate up onto mountain heaths which could eventually force out those species which have adapted to life on the open mountain heath. Human impact is relatively small, apart from certain effects from reindeer herding which have mainly been restricted to special migration routes that have long been in use.

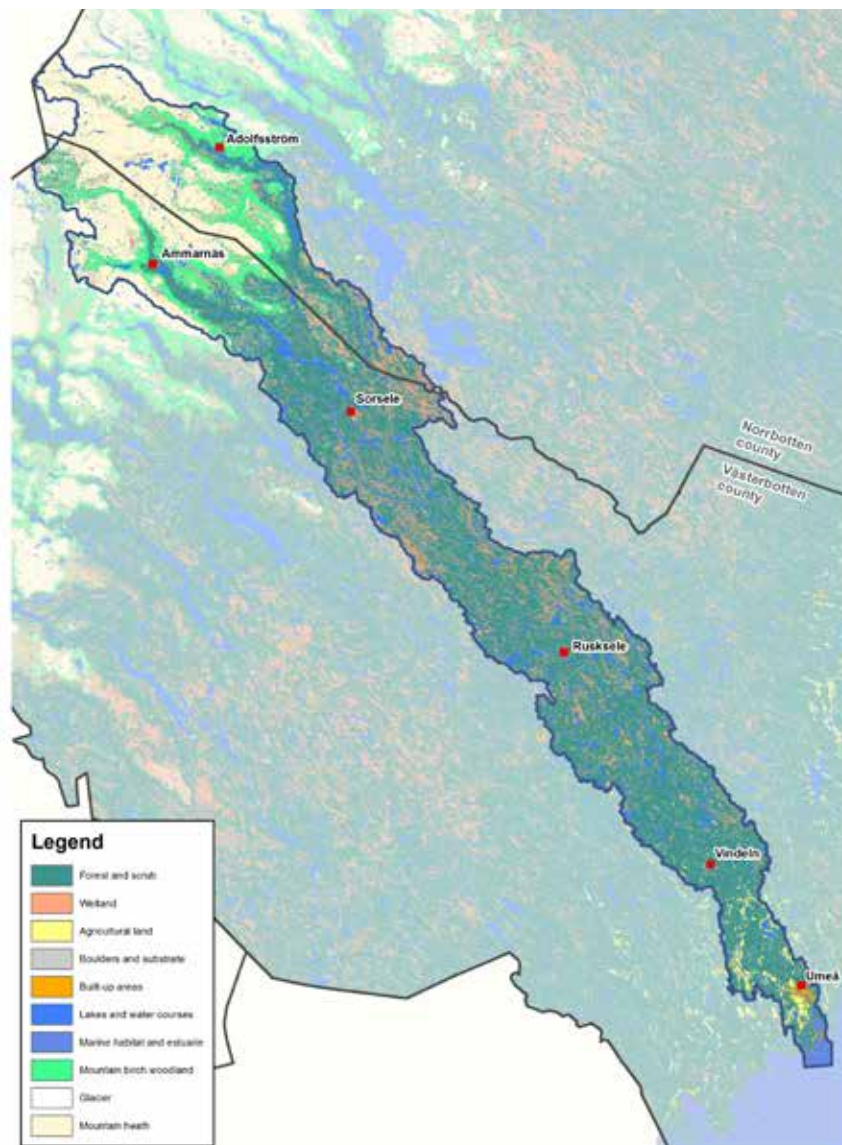


Figure 7. Land covers in the planned biosphere reserve

A warmer climate could produce a tangible change in the alpine vegetation. As well as raising the temperature, climate change is shortening the duration of snow cover while extending the period of water runoff during the summer. It is expected that these changes will be accompanied by ecosystems being displaced to higher altitudes along mountain slopes, with a reduction of 75 % or more in the area of barren upland over the next one hundred years. For example, over the last hundred years the tree line has advanced uphill by an average of 70-90 metres in Jämtlandsfjällen south of Vindelälvsfjällen. Many species are starting to expand upwards, and species which are currently associated with the highest and most barren environments could find their territory shrinking and be overwhelmed by the other species. In winter, it is expected that the snow cover will become more compacted and icy, which could have negative consequences for animals that are unable to access food and for plants that are covered in ice. Diversity could increase at the expense of losses of vulnerable species, such as the Norway lemming, rock ptarmigan and Arctic fox, as well as many vulnerable bee species.

11.6.2 Glaciers (locally occurring ecosystem)

The alpine area contains three small glaciers or residual ice, all of which are located far to the west. The largest glacier is a 0.42 km² plateau glacier, Årjep Fierrasjekna, north of the River Laisälven. At Tsangatjåhkka, south of the River Laisälven, are a 0.05 km² plateau glacier and a 0.06 km² niche glacier.

Characteristic species

The green alga (*Chlamydomonas nivalis*), which grows in snow (watermelon snow or pink snow), can colour the surface of the glaciers red. No known species of higher organisms live on glaciers.

Natural processes and human impact

The natural processes consist of glacier growth in colder climatic periods and glacier shrinkage when the temperature increases. Today, the glaciers are generally reducing in size and many have already disappeared. In a warmer climate, small glaciers in the area will probably melt and disappear. Human impact is small compared with the effects of climate change.



Image 26. Alpine bearberry, (*Arctostaphylos alpinus*).
Photo: Ola Jennersten



Image 27. European golden plover, (*Pluvialis apricaria*).
Photo: Ola Jennersten

11.6.3 Mountain birch forest (Regionally occurring ecosystem)

On a global level, deciduous forests which form tree lines are fairly unique. In most alpine areas, conifers form the tree lines. The ecosystem extends more or less as a narrow boundary between the lower sections of barren mountain heaths and the upper limits of coniferous forests. Despite the limited extent of mountain birch forest at high elevations, this belt stretches the entire length of the mountain range and therefore constitutes a relatively large and widespread forest ecosystem, which is well represented in the proposed biosphere reserve.

Characteristic species

Mountain birch (*Betula pubescens ssp. czerepanovii*) is the dominant tree type. Plants in the field layer include northern wolf's bane (*Aconitum lycoctonum ssp. septentrionale*), Norwegian angelica (*Angelica archangelica ssp. archangelica*), alpine sow-thistle (*Cicerbita alpina*) typically on moist ground, whereas

bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum nigrum ssp. hermaphroditum*), dwarf cornel (*Cornus suecica*), northern oak fern (*Gymnocarpium dryopteris*) and stone bramble (*Rubus saxatilis*) are common in moorland birch forests. Textured lung lichen (*Lobaria scrobiculata*) commonly occurs in mountain birch forests, but otherwise mostly grows on old willow trees. The bumble bee *Bombus consobrinus* is common and has a special association with northern wolf's bane. Characteristic birds include the common redpoll (*Carduelis flammea*), willow ptarmigan (*Lagopus lagopus*), brambling (*Fringilla montifringilla*), meadow pipit (*Anthus pratensis*), yellow wagtail (*Motacilla flava*) and merlin (*Falco columbarius*). A mushroom which has become important for harvesting is the chantarelle (*Cantharellus cibarius*). For many years, attempts have been made to re-establish the rare lesser white-fronted goose (*Anser erythropus*) in the Arjeplog mountains. Stopover sites for these birds are being created both here and west of Adolfström, in Båtsjaur.

Natural processes and human impact

The majority of mountain birch forests are natural or ancient forests which are only affected by natural dynamics and where avalanches, reindeer grazing and insect outbreaks, particularly the autumnal moth, are important structuring factors. There may be local areas of tree felling, but large-scale forestry is not conducted in mountain birch forests.



Image 28. Above. Golden Eagle (*Aquila chrysaetos*). Photo: Ola Jennersten



Image 29. Right. Northern wolfsbane (*Aconitum lycoctonum*). Photo: Ola Jennersten

11.6.4 Boulder and substrate terrain (locally occurring)

A variety of moraines make up the dominant soil types in the proposed biosphere reserve. They vary from clay and largely fine-grained soils to large boulder type terrains. Certain locations have boulder and substrate terrains, often associated with precipices and steep slopes. Rough moraines like these often create areas that are difficult to negotiate. These ecosystems are common in the mountain regions, but are also found locally in the interior and along the coast, often in association with cliffs. Light conditions and heat radiation are more advantageous on south-facing screes.

Characteristic species

Important groups of species include lichen, mosses and sometimes also bracken species. In areas where boulders and stones are rich in limestone, one can find various members of the Cruciferae family (*Draba spp.*), saxifrages (*Saxifraga spp.*), and orange lichens (*Caloplaca spp.*). Boulder terrains at the foot of some south-facing mountain precipices or steep slopes are home to a distinctive flora, with more thermophilic species than is normal for the region.

Natural processes and human impact

The most common natural disturbance in cliff ecosystems is boulders introduced by landslides and

land slippages. These could temporarily result in major changes, but at the same time a natural part of the subsequent development and processes provides more substrate for, for example, lichen, which is positive. Human impact on these environments is limited. Some cliffs are destinations for rock climbers, with the risk of wear and tear on vegetation.

11.6.5 Wetlands (Regionally occurring ecosystem)

The numerous wetlands represent a noticeable landscape feature and are valuable in preserving the area's character. The wetlands are dominated by open peat bogs which are not substantially affected by lakes, sea or watercourses. Open and scrub-covered wetlands in the mountain regions also belong to this category. Large undisturbed wetlands with a natural dynamic are mainly located in the interior and in the mountain regions.

Characteristic species

The bogs are generally formed from sphagnum mosses. Amongst the characteristic species are brown and red sphagnum mosses (*Sphagnum subfulvum*, *Sphagnum subnitens*), the purple sphagnum moss, Warnstorff's bog-moss (*Sphagnum warnstorffii*) and the pale sphagnum moss, Aongstroem's sphagnum (*Sphagnum aongstroemii*). Characteristic vascular plants include slender sedge (*Carex lasiocarpa*), Hudson Bay sedge (*Carex heleonastes*) and bottle sedge (*Carex rostrata*), as well as various species of the genus *Eriophorum*, e.g., hare's-tail cottongrass (*Eriophorum vaginatum*). Richer environments contain orchids, such as heath-spotted orchid (*Dactylorhiza maculata ssp. maculata*), early marsh orchid (*Dactylorhiza incarnata ssp. incarnata*) and the rarer fragrant orchid (*Gymnadenia conopsea*). Characteristic bird species include the ruff (*Philomachus pugnax*), whimbrel (*Numenius phaeopus*) and European golden plover (*Pluvialis apricaria*). The red-throated diver (*Gavia stellata*) and Slavonian grebe (*Podiceps auritus*) are rare breeding birds in small fishless tarns. The hen harrier (*Circus cyaneus*) is one of the few birds of prey which breed on open bogs.

Natural processes and human impact

Natural processes in this ecosystem include peat formation which is dependent on hydrology and temperature. The conditions are often nutrient-poor with low pH. Human impact mainly consists of ditch digging to improve drainage and increase forest production. Such operations have provided limited economic benefit and have had a negative effect on wetlands and the species associated with these environments. Peat is also cut to be burned for heat production, but only to a limited extent, and only small areas are used for this purpose.

11.6.6 Forest and scrubland (Regionally occurring ecosystem)

The area is largely covered with boreal forest and is part of the world's largest terrestrial biome, the taiga. The tree-bearing zones in the proposed biosphere reserve are mainly populated by Scots pine (*Pinus sylvestris*) and/or Norway spruce (*Picea abies*). There are also mixed bog woodlands and, to a lesser extent, predominantly deciduous forests. (Mountain birch forest is mentioned above in 11.6.3.)

Characteristic species

Typical large mammals include elk (*Alces alces*), reindeer (*Rangifer tarandus*) and the brown bear (*Ursus arctos*). The boreal forests are also home to typical smaller mammals such as the mountain hare (*Lepus timidus*), roe deer (*Capreolus capreolus*) and Eurasian lynx (*Lynx lynx*), as well as the large mustelid, the wolverine (*Gulo gulo*), and several of its smaller relatives (*Mustelidae spp.*). Characteristic bird species include the golden eagle (*Aquila chrysaetos*) and Siberian jay (*Perisoreus infantus*). Vascular plants, apart from tree species, include brushwood such as lingonberry (*Vaccinium vitis-idaea*), bilberry (*Vaccinium myrtillus*), crowberry (*Empetrum spp.*) and ling (*Calluna vulgaris*), as well as ferns and herbaceous plants such as red campion (*Silene dioica*), rosebay willowherb (*Chamerion angustifolium*), common oak fern (*Gymnocarpium dryopteris*) and various dandelions (*Taraxacum spp.*), plus many grass species (*Poaceae spp.*) and sedges (*Cyperaceae spp.*). Amongst the more common species are orchids such as creeping lady's tresses (*Goodyera repens*), lesser twayblade (*Listera cordata*), frog orchid (*Coeloglossum viride*), ghost orchid (*Epipogium aphyllum*) and lady's-slipper orchid (*Cypripedium calceolus*), as well as species such as baneberry (*Actaea spicata*) and herb paris (*Paris quadrifolia*). Many of the species on the red list are

fungi which live on and in dead wood. Many of these are amongst the most characteristic species in the Swedish forest ecosystem. They include the white-rot fungus *Phellinus nigrolimitatus*, the poroid crust fungus *Skeletocutis odora*, *Antrodia infirma*, *Antrodia crassa*, the tooth fungus *Phellodon secretus* and many lichens and mosses. Characteristic species include wood-dwelling insects such as black fir sawyer beetle (*Monochamus urussovii*), *Peltis grossa*, *Xyletinus tremulicola* and *Nothorhina muricata*.

Natural processes and human impact

The natural processes in coniferous forests include podzolisation, i.e., soil formation where water-soluble organic acids percolate down from a surface layer, resulting in a layered, relatively acidic soil. A natural forest contains trees of different ages as well as dead trees at various stages of decay, which create habitats for a rich diversity of tree-dwelling or wood-decaying species of, for example, insects and fungi. In some areas, historically recurring fires have affected the structure of forests. Trees and forest remaining from that time, still bear traces of these events. The fires release nutrients and minerals which promote the re-establishment of more relatively uncompetitive vascular plants and trees. During the 1400s and 1500s, fires spread over large areas of 10,000-30,000 ha. Towards the start of the 1800s, while the size of fires decreased, the number of individual fires increased drastically because of slash-and-burn agriculture and the expansion of settlements. At the start of the 1900s, both the size and the number of fires decreased thanks to enhanced fire control and rapid fire fighting intervention. However, controlled burning was carried out over large areas with the aim of preparing/improving the soil. Towards the second half of the 1900s, only small areas were subjected to burning. However, as nature conservation has become a priority in some areas, some sites are subjected to control burning.

Other natural processes are small-scale and more continuous. These include self-thinning and windblow which create small gaps in forests, providing the conditions for an alternative mixture of species, compared with what would be expected in a closed, undisturbed area. Brief flooding along watercourses is an important factor which contributes to productive, leafy environments where dead wood is created. Insect infestations and storms can cause major disturbances and unwanted damage, but also create new environments with dead wood and released nutrients.

Tree clearance has had the greatest direct effect on the biological diversity of forests. Organised forestry has been conducted in the boreal region since the mid-1800s. Forestry was initially carried out on a small scale before becoming a large-scale activity at the start of the 1900s. At that time, the largest trees were selectively harvested over extensive areas, which over time created open forests. During this period, the timber was floated down watercourses which needed to be cleared and channelled. When the transition occurred from selective tree felling to large-scale cyclical forestry at the beginning of the 1950s, timber flotation gave way to the benefits of truck transportation, which meant a marked expansion of the road network for forestry vehicles.

Present-day sustainable cyclical forestry means that a new generation of trees is simultaneously established in the areas that have recently been logged. Forest management follows a cyclical course with different phases, as in agriculture, though in the forest this involves a replanting phase, a young forest phase, the removal of smaller growth, and finally tree harvesting, when large areas are completely felled. When large areas are exposed, this has a negative impact on many species and ecosystem services associated with the forest. After the final tree felling, the area is replanted with spruce or pine, depending on the soil type. Sometimes it is planted with the rapidly growing lodgepole pine (*Pinus contorta*). This is not an indigenous species, but has been introduced from North America. At the moment, it is not certain what this species' long-term effect is on biological diversity, but it is clear that the country's lodgepole pine forests have fewer lichen and insects than normal pine forests. As reindeer are dependent on lichen-rich forests, replanting with lodgepole pine have a negative impact on reindeer husbandry.

Table 10. Area (ha) of dominant tree species in the planned biosphere reserve, calculated for productive forest land (data from Riksskogstaxeringen, SLU)

Pine	Lodgepole pine	Spruce	Coniferous-dominated forest	Mixed forest	Deciduous forest	Total
346 810	11 687	96 889	80 475	37 690	27 103	600 654

Because there are few natural upheavals in the current forest landscape, methods are being developed to recreate or simulate them. Controlled forest burning helps to promote diversity, even in landscapes that are being exploited. To reduce the differences between utilised forest

11.6.7 Agricultural lands (Locally occurring ecosystem)

The entire length of the River Vindelälven's valley all the way to the sea is characterised by large areas of small-scale cultivation. When these were established, so were buildings and settlements associated with agriculture and, even if the agricultural land covers only a small part of the total area, it is often an important part of the environment of settlements. Agricultural land, with arable fields, grazing pasture and coastal haymaking fields, is mainly on soils built up from river sediment and, in the lower stretch of the river near the confluence with the River Umeälven, on the broad coastal plain. This expands further, near the River Umeälven's outlet to the sea, into one of the largest continuous arable areas north of Dalälven. The arable area is extended by a broad area of wet natural grazing land in the River Umeälven delta. Upstream along the river, the cultivated landscape narrows and begins to comprise islands of cultivated land in a forest landscape before ending at Ammarnäs in a large, cultivated delta area. Over the last 60 years, large areas have been left uncultivated because of decreasing agricultural activity; land continues to be taken out of use. Fallow land is being rapidly colonised by various deciduous trees.

In former times, hay was grown on bogs and the shores of rivers and streams, while grazing was mainly confined to the forests. The agricultural landscape is connected in this way to forest and bog lands. Housing was often established at sites where there were good possibilities for obtaining winter feed. Nowadays, there are few traditionally managed haymaking meadows along the River Vindelälven, but much of the plant and animal life that was associated with these environments can still be found on road verges and in fallow fields, areas around farmhouses, and natural grasslands.

Characteristic species

A wide range of wild plants benefit from agriculture. Arctic bramble (*Rubus arcticus*) commonly occurs on ditch banks and wet meadowlands. Alpine bistort (*Bistorta vivipara*), harebell (*Campanula rotundifolia*), melancholy thistle (*Cirsium heterophyllum*), and red campion (*Silene dioica*) commonly occur on haylands and other natural grasslands. Plants which otherwise commonly inhabit the mountain regions are often found in parts of the area's interior. Several of these have decreased in number or disappeared entirely below the mountain range as cultivation has diminished; for example, the intensely blue snow gentian (*Gentiana nivalis*). On the other hand, several moonwort species (*Botrychium spp.*) are fairly common on grasslands. The Eurasian curlew (*Numenius arquata*) and ortolan bunting (*Emberiza hortulana*) are characteristic bird species which are mainly found in northern Sweden's agricultural districts, though populations of both species have decreased. Other species that are still common are northern lapwing (*Vanellus vanellus*), yellowhammer (*Emberiza citrinella*), and whinchat (*Saxicola rubetra*). The Eurasian tree sparrow (*Passer montanus*) is new to the area. Arable lands are important as stopover sites for passing migratory birds. Large flocks of geese, swans and cranes stop over at the River Umeälven delta and Brånsjön on the flight northwards to their breeding grounds in northernmost Sweden, Finland, and northern Norway. The haylands in the delta areas at Ammarnäs and Adolfström are well-known sites where upland birds reside if there is snow on their breeding grounds in the mountain regions. There can also be a rich butterfly fauna in these regions, with various heliconians (*Heliconiinae*), satyrines (*Satyrinae*) and Polyommata; e.g., the relatively locally widespread turquoise butterfly, silvery argus (*Aricia nicias*).

Natural processes and human impact

As creations of human culture, agricultural lands depend on people for their conservation. Ploughing, cultivation, fertilisation, harvesting, haymaking and grazing all contribute to preserving the environments and the diversity. Maintaining ditches and controlling harmful organisms also have an effect on agricultural landscapes. When farming activity ceases, a natural succession takes over which, in the boreal region, leads over time to a forest ecosystem. Several stages of this process can be seen in the landscape; for example, in the form of tussocky meadowlands in the first instance, followed by deciduous saplings with deciduous brushwood, and then ageing deciduous forests where conifers from the undergrowth gradually take over. Modern agriculture and natural regrowth on abandoned agricultural land have had a negative impact on many species that were once associated with older agricultural landscapes.

11.6.8 Settled land (Locally occurring ecosystem)

This type of land utilisation includes settlements, industries, harbours, major roads, railways, as well as sports stadia, golf courses, ski resorts and camping sites. There are generally more settled areas along the coast than in the interior.

Characteristic species

Cities and smaller localities often have green areas and parks with significant numbers of planted deciduous trees. Native birch trees (*Betula spp.*), rowan (*Sorbus aucuparia*) and aspen (*Populus tremula*) are common. Fruit trees such as apple (*Malus domestica*) and wild cherry (*Prunus avium*) are often seen in gardens. Norway maple (*Acer platanoides*), various poplars (*Populus spp.*) and willows (*Salix spp.*) in particular have been planted in larger localities. One can also find introduced tree species such as Swiss stone pine (*Pinus cembra*), Colorado blue spruce (*Picea pungens*) and European silver fir (*Abies alba*), as well as thuja (*Thuja spp.*). The most commonly occurring bird species include the common chaffinch (*Fringilla coelebs*), willow warbler (*Phylloscopus trochilus*), fieldfare (*Turdus pilaris*) and the three corvids Eurasian Jackdaw (*Corvus monedula*), common magpie (*Pica pica*) and hooded crow (*Corvus cornix*). One occasionally sees the Eurasian sparrowhawk (*Accipiter nisus*) hunt small passerines such as the great tit (*Parus major*) and Eurasian blue tit (*Cyanistes caeruleus*). Mammals include the Eurasian red squirrel (*Sciurus vulgaris*) and European hedgehog (*Erinaceus europaeus*). In smaller localities, European roe deer (*Capreolus capreolus*) and sometimes also reindeer (*Rangifer tarandus*) and elk (*Alces alces*) are occasionally seen.

Natural processes and human impact

As the vegetation in urban centres is largely planted and managed by human hand, the effects of natural processes are not so obvious. Settlements located near watercourses can, however, sometimes be hit by flooding. Heavy downfalls can even cause flooding in urban centres.



Image 30. The Eurasian curlew (*Numenius arquata*)
Photo: Ola Jennersten



Image 31. Spawning brown trout (*Salmo trutta*)
Photo: Stefan Ågren

11.6.9 Lakes and watercourses (Regionally occurring ecosystem)

The area contains a large number of lakes and watercourses which contribute to the landscape's unique multi-faceted character. The lakes can be divided into three different nutritional categories: dystrophic (nutrient-poor and humus-rich) water; oligotrophic (nutrient-poor, clear) lakes; and mesotrophic (more nutrient-rich) water. Dystrophic water is predominant in large parts of northern Sweden. However, in the mountain regions oligotrophic lakes are the most common. There are few naturally mesotrophic lakes. Bog lakes are the most commonly occurring type of dystrophic lake. This group also includes many of the lakes with solid shorelines that are located on moraine land in the forest terrain. The largest lakes are Storvindeln and Storlisan, both situated in the mountain regions. Storvindeln, a fjord lake with a high amplitude of water level fluctuation, was formed over thousands of years by the migration of valley glaciers. Because of the large water level fluctuations, there is a broad shoreline zone with several distinct

plant zonations. Storlisan can also be included in the fjord lake category, but does not have the same amplitude of water level fluctuation as Storvindeln. The River Vindelälven is the largest watercourse and River Laisälven is its largest tributary. It is 450 km long and has its sources in the mountain region. The area also has large numbers of small brooks and streams. The water in these streams and brooks is usually brown because of humic substances, whereas watercourses which originate in the mountain region contain clear water.

Characteristic species

Flowing watercourses often contain salmonids such as brown trout (*Salmo trutta*), Atlantic salmon (*Salmo salar*) and grayling (*Thymallus thymallus*), and various salmon species (*Coregonus spp.*). The lakes contain the characteristic species northern pike (*Esox lucius*), European perch (*Perca fluviatilis*), common roach (*Rutilus rutilus*), common bream (*Abramis brama*) and common bleak (*Alburnus alburnus*). Less common are the European river lamprey (*Lampetra fluviatilis*), common minnow (*Phoxinus phoxinus*), common dace (*Leuciscus leuciscus*) and ide (*Leuciscus idus*). The freshwater pearl mussel (*Margaritifera margaritifera*) is another uncommon species, the conservation of which requires major resources. There are three species of water lilies: the European white water lily (*Nymphaea alba*), yellow water lily (*Nuphar lutea*) and least waterlily (*N. pumila*), as well as hybrids of the latter two species. Other common aquatic plants include broad-leaved pondweed (*Potamogeton natans*), clasping-leaved pondweed (*Potamogeton perfoliatus*) and common reed (*Phragmites australis*). River banks are typically inhabited by the American water-awlwort (*Subularia aquatica*), creeping spearwort (*Ranunculus reptans*), shortawn foxtail (*Alopecurus aequalis*), different species of sedges, particularly *Carex spp.*, and grasses (*Poaceae*), stone bramble (*Rubus saxatilis*), and false lily of the valley (*Maianthemum bifolium*). Finally, there is often a zone with willow (*Salix spp.*) farther up from the water. Western species such as moor-king lousewort (*Pedicularis sceptrum-carolinum*) are found along river banks in forested areas. In spring, the common toad (*Bufo bufo*) and common frog (*Rana temporaria*) begin croaking in pools, lake creeks and other bodies of standing water. Characteristic bird species include the mallard (*Anas platyrhynchos*), common goldeneye (*Bucephala clangula*), goosander (*Mergus merganser*), tufted duck (*Aythya fuligula*) and whooper swan (*Cygnus cygnus*). Less common birds include the red-breasted merganser (*Mergus serrator*), black-throated diver (*Gavia arctica*), red-throated diver (*Gavia stellata*), Slavonian grebe (*Podiceps auritus*), red-necked grebe (*Podiceps grisegena*), smew (*Mergellus albellus*) and osprey (*Pandion haliaetus*). Mammals include the Eurasian beaver (*Castor fiber*) and Eurasian otter (*Lutra lutra*).

Natural processes and human impact

With its natural fluctuations in flow rate, the river creates the conditions for much of the area's biological diversity. The dissemination of seeds along the river and watercourses promotes a very rich flora. As a result, plants from the mountain region, such as moor-king lousewort, are found at many sites far to the east, a considerable distance downstream from their main habitat area. The river's increased flow due to melting snow in spring is important in the creation of perennially open river bank environments where various plants find suitable places in which to grow. The river is also an important flight path for birds and certain rare bat species (*Chiroptera*). The salmon ladder at Stornorrfors allows salmon and brown trout to migrate upstream, which is necessary for their reproduction, while also creating job opportunities in recreational fishing and tourism. Higher water flow rates during the autumn rain help, for example, the anadromous brown trout (*Salmo trutta*), which migrates upstream and spawns in the smaller watercourses. In very cold winters, when icy conditions predominate, the bottoms of smaller watercourses can freeze and fish stocks can be subjected to local extinction. The beaver (*Castor fiber*) was rare in the 1800s and became extinct at the turn of the last century. It was reintroduced in the 1920s and is now once again established in the area. By building dams from tree branches, the beaver creates new aquatic environments which provide suitable habitats for fish and various aquatic animals. Beaver dams can also create barriers to the natural migration of fish.

Lakes and watercourses have many natural parameters (water temperature, pH value, water flow rate and water level, ice formation, ice cover and ice thawing). In running water, sediment transportation and erosion are important processes which alter morphology and the supply of nutrients to the water.

The watercourses and their lakes have at various times been used for hydroelectric power generation

and transportation, which are still influencing factors. The most extensive human impact in the area was timber flotation, which was carried out between the wars and up until the 1950s. Large sections of watercourses were cleared to facilitate the transportation of timber. Boulders and stones were removed and dams were built. In some places, the natural routes of watercourses were moved, and many watercourses were straightened out. The effects of these projects still remain and now characterise many of the watercourses. These changes have had a particularly negative impact on salmonids (*Salmo* spp.), disturbing their spawning beds and cutting off their migration routes. Species that are dependent on these fish have also been affected. Amongst these are the freshwater pearl mussel (*Margaritifera margaritifera*) and the otter (*Lutra lutra*). Tree felling in forestry also contributes to the gradual accumulation of methyl mercury in the lakes, primarily from peatland, via ditches and small watercourses. Generally, the level of mercury in fish is higher than the estimated natural levels. This is true for most parts of Sweden. However, most of the mercury comes from faraway sources of air pollution.

11.6.10 Estuaries (Locally occurring ecosystem)

The River Umeälven delta is one of Northern Europe's major delta areas. It has been built up from huge amounts of sediment from the two mountain rivers, Umeälven and Vindelälven. Upper Norrland's largest agricultural areas, Degernässlätten and Röbbäcksslätten, are located around the delta. These also have been built up from silt which has been transported here by the rivers. The area comprises riverside meadows, wetlands and bands of grey alder which border on spruce forests. This mosaic of vegetation provides an important stopover site for migratory birds.

Characteristic species

These environments are to a large extent inhabited by the same species found in and on lakes and other large watercourses. Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) pass through the Umeälven delta, to migrate farther up into the River Vindelälven. Northern pike (*Esox lucius*) and perch (*Perca fluviatilis*) thrive in the shallow water. Salmonids (*Coregonus* sp.) and the three-spined stickleback (*Gasterosteus aculeatus*) are also characteristic fish species. The estuary is used as a resting site by large numbers of waterfowl (*Anseriformes*), including whooper swans (*Cygnus cygnus*), geese, cranes (*Grus grus*) and waders. Shoreline shrubs provide habitat for species such as the long-tailed tit (*Aegithalos caudatus*) and common reed bunting (*Emberiza schoeniclus*). As well as the Anatidae (ducks, geese and swans) mentioned in the description of lakes and watercourses, there are also more uncommon species such as the smew (*Mergellus albellus*), garganey (*Anas querquedula*) and gadwall (*Anas strepera*). Common waders include the common sandpiper (*Actitis hypoleucos*), wood sandpiper (*Tringa glareola*), common redshank (*Tringa totanus*), common greenshank (*Tringa nebularia*) and spotted redshank (*Tringa erythropus*). The birds of prey osprey (*Pandion haliaetus*) and white-tailed eagle (*Haliaeetus albicilla*) hunt in the area.

Natural processes and human impact

The area has a natural dynamic which is shaped by land elevation and by the mud that is supplied naturally via the rivers and eventually builds up banks which, over time, become low-lying forested islands. The greatest impact on the area is in the form of alterations in the water regime caused by the power plant at Stornorrfors and the modifications made to allow boat traffic in the area. Passenger transport on pleasure craft and water scooters can cause disturbance to bird life.

11.6.11 Marine habitat (Locally occurring ecosystem)

The marine habitat is situated at the mouth of the River Umeälven outside Holmsund and Obbola in the municipality of Umeå. In the shallow water where salinity varies between 4 and 5 ‰, an interesting aquatic environment is created where typical freshwater species are able to live in the brackish water. There are several islands, small skerries and islets of different ages. These are of major value for breeding sea birds, with Obbolastenarna in particular having high protective value. In general, the water is shallow with a stony bottom.

Characteristic species

Exposed hard bottoms are home to thread algae, e.g., the green algae *Cladophora glomerata*, the freshwater macroalgae *Aegagropila linnaei*, *Battersia arctica* and the red algae *Ceramium tenuicorne*. The freshwater sponge *Ephydatia fluviatilis* is typically found on exposed stones. One can also find the coastal

dwelling grayling (*Thymallus thymallus*), the only grayling population in the world known to spawn in a marine environment. The shallow water, where salinity is low, is inhabited by Atlantic herring (*Clupea harengus*), the European sprat (*Sprattus sprattus*), the viviparous eelpout (*Zoarces viviparus*), the fourhorn sculpin (*Myoxocephalus quadricornis*), etc. The area is also home to the grey seal (*Halichoerus grypus*) and ringed seal (*Pusa hispida*). Examples of typical fresh water species which live in the brackish water are the European smelt (*Osmerus eperlanus*), vendace (*Coregonus albula*), perch (*Perca fluviatilis*) and Eurasian ruff (*Gymnocephalus cernuus*). Atlantic salmon (*Salmo salar*) and brown trout (*Salmo trutta*) also migrate through the area on the way to their spawning grounds in the River Vindelälven. Amongst breeding birds, there is a significant presence of tufted duck (*Aythya fuligula*), red-breasted merganser (*Mergus serrator*) and the common gull (*Larus canus*), as well as a large colony of black guillemots (*Cephus grylle*).

Natural processes and human impact

There is a natural dynamic in the area, where land elevation is constantly creating new environments, both in water and on land, which are colonised by various species and are subject to continuing change due to ongoing ecological succession. Boat journeys around the harbour at Holmsund can constitute a risk of, for example, oil spillage. Pleasure craft and water scooters can cause disturbance to, for example, bird life.

Sweden's northern coasts have for a considerable time been the site of many major industries which have historically discharged environmental toxins. Such toxins have also been transported northwards by currents from the southern Baltic Sea. Tertiary consumers, such as the grey seal and white-tailed eagle, have been hit hard by the discharge of PCB and DDT. These discharges have decreased substantially since the 1970s and numbers of tertiary consumers have largely recovered. However, oily fish from, for example, the Baltic Sea and Bottenviken still have high concentrations of dioxins and mercury which exceed the EU's maximum permitted levels for human consumption. Since 2002 Sweden has been granted temporary exemptions from the EU's maximum permitted levels for dioxins and PCB; in 2012 these exemptions became permanent. The Swedish National Food Agency gives specific recommendations for the consumption by children and women of childbearing age regarding consumption of fish containing high levels of dioxins, mercury and PCB.

12. ECOSYSTEM SERVICES

12.1 If possible, identify the ecosystem services provided by each ecosystem of the biosphere reserve and the beneficiaries of these services.

(Please refer to the Millennium Ecosystem Assessment Framework and The Economics of Ecosystems and Biodiversity (TEEB) Framework (<http://millenniumassessment.org/en/Framework.html> and <http://www.teebweb.org/publications/teeb-study-reports/foundations/>)).

In accordance with *Millennium Ecosystem Assessment Framework* (MEA) and *The Economics of Ecosystems and Biodiversity* (TEEB), ecosystem services can be divided into the following four categories

1. Provisioning services

Products obtained from the ecosystem. They include both naturally occurring and cultivated products (e.g., foods such as berries, mushrooms, meat from reindeer and wild game, wood raw materials from forests, agricultural products and fish).

2. Regulating services

Benefits gained from regulating natural processes (e.g., insect pollination, carbon capture and storage, nutrient turnover). These are often, but not always, indirect or transitional.

3. Supporting services

Natural basic prerequisites for other ecosystem services (photosynthesis, nutrient recycling or soil formation).

4. Cultural services

Intangible factors which provide physical and intellectual benefits, as well as spiritual wellbeing (e.g.,

psychological and physical health, recreation, outdoor life).

Ecosystem services are the contributions of ecosystems to human wellbeing and are used to clarify and evaluate the benefit which ecosystems and ecosystem processes offer to humans.

The mountain and forest landscapes of the planned biosphere reserve contribute a multitude of different ecosystem services. The benefits which they generate and the activities which they facilitate, e.g., food, the refining of raw materials, rambling, fishing or hunting, create conditions for wellbeing and constitute the basis for a diversity of socially important functions which are dependent on preserving nature in a pristine condition and, both historically and in the present, land utilisation and culture. To sum up, the ecosystem services in a particular area often constitute the basis for the area's appeal, which persuades people to continue living there, encourages others to join them, and draws in visitors. A great number of ecosystem services create jobs and contribute to incomes, both directly (e.g., forestry production, berry picking, reindeer meat and beef) and indirectly (e.g., tourism, guided fishing trips, and guided nature tours).

In order to evaluate ecosystem services, one first needs to classify the types of service, and map where each service is produced and where it is supplied, which are not necessarily the same place. Also, there needs to be an understanding of how each service is affected and controlled through the derivation of what are locally perceived as benefits, value and wellbeing. Relevant evaluation and monitoring require indicators or other functional measurements which can give an overall picture of quality of life as a whole, and of what groups and individuals think is important in nature, in the landscape, and in the ecosystem's products and requirements. Moreover, clarification is required of links to the basic ecosystem processes and of how anthropogenic and natural influencing factors can alter and control the preconditions for ecosystem services. For more information on concepts and definitions, see Annex 8.

Every ecosystem can contribute several different types of ecosystem services which can be defined as final, intermediate, or having context-dependent benefit. The presence of humans and their impacts on ecosystems have dictated, and continue to dictate, the collective resources of available ecosystem services. Land use and culture are thus built into the concept and can contribute to an expansion or shrinkage of the ecosystem services resource. There are remains in mountain and forest areas of a rich cultural history, often associated with Sami culture, hill farming, and other historical and present-day land use. These have affected the structure and species abundance of ecosystems, e.g., in haymaking meadows, thereby giving rise to ecosystem services which would not otherwise have appeared.

Many ecosystem services are found generally throughout the entire area (Table 11). The forest industry provides the dominant provisioning ecosystem services and therefore wood, as a raw material, is a dominant type of ecosystem service. Forests also offer ecosystem services which form the basis for a growing tourist industry that attracts and establishes women. This brings a new perspective to the utilisation of forests which has otherwise often been seen as male-dominated. With regard to other areas of business, reindeer husbandry is the main contributor, which itself is dependent on a wide range of different ecosystem services.

From the historical perspective, reindeer husbandry, fishing, hunting, and berry and mushroom picking have provided the most important means of obtaining food in the area. Provisioning ecosystem services such as reindeer and the abundantly occurring wild game, fish, berries and mushrooms still make up a substantial part of food provision in many households – i.e., provisioning ecosystem services. These raw materials, as well as the attractive landscapes, are also important for local, national and international outdoor life and tourism in the area – i.e., cultural ecosystem services.

Clean drinking water which has undergone natural purification is an important local resource, which means that natural shoreline zones with functioning ecological filtration and buffering against mass flows are important regulating and supporting ecosystem services. Nature reserves and other nature conservation measures are in themselves a form of land use which contributes a large variety of ecosystem services. Within the planned biosphere reserve, 32 % of the land area is formally protected, mainly in the mountain region and the montane area (Table 15). The cultural ecosystem services are,

to a greater extent than other categories, associated with the entire area rather than with individual ecosystems, particularly in the mountain region, but also in the forest area with its bogs, rocky terrain, watercourses and lakes.

12.1.1. Mountain and montane regions

Mountain and montane regions refer to the alpine region and the alpine tree line, with mountain birch forests and mountain coniferous forests. In the biosphere reserve this covers ca. 150,000 ha.

Ecosystems in the mountain region are dependent on, amongst other things, reindeer grazing, which is very important for both species composition and biological diversity. The mountain region is perceived by many to be Europe's final wilderness, but to a much greater extent it is seen as a utilised area and to a large extent as part of the Sami cultural environment. Humans have lived in the mountain region for several thousand years and for much of this time have been directly dependent on the ecosystem services which nature supplies. Reindeer herding and the Sami culture throughout northern Sweden's mountain, forest and coastal areas are, and have been historically, directly dependent on local ecosystem services and are therefore sensitive to other land uses which affect these services.

In the mountain region, the conditions necessary for human "wellbeing" are especially obvious as the cultural ecosystem services, to a greater extent than in other categories, are associated with the entire landscape. The marks of previous and present-day land use found in vegetation and habitats can be regarded as cultural ecosystem services if they are directly associated with the underlying ecosystem functions, processes and structures. Examples of this include traces of *barktäkt* (areas on the lower part of pine trees where the inner bark has been scraped away and used to bake bread) and the remains of dairy pastures where long-standing, enclosed grazing and nature management have resulted in grasslands which remain resistant to the encroachment of scrub for long periods of time. In addition, meadows subjected to repeated haymaking over an extended period have developed a greater abundance of species and increased biological diversity. It is important to emphasise that hill farming and mountain agriculture, which are not exclusive to Sami culture, have also made a substantial contribution to the character and ecosystem services of the mountain region.

Reindeer grazing pressure is key to maintaining the magnificent open mountain terrain. Traditional knowledge, language, local food traditions and an unrelenting utilisation of nature's resources in the Sami culture are especially important for ecosystem services in the mountain and montane regions. In Sweden, ancient forests mainly persist in the mountain regions as, for the most part, forestry has not taken place to the same extent as it has farther to the east. The montane coniferous forests, which have existed for thousands of years, provide the condition for a unique flora and fauna, not least fungi, lichen and wood-dwelling insects. Therefore, for the most part, the mountain forests have considerable natural value. Their pristine nature and sheer size make these forests unique, and of value even outside Sweden and Scandinavia.

Along the entire mountain range are large nature reserves and other formal protections and designations, e.g., areas of national importance for outdoor life and nature conservation, as well as Natura 2000. Vindelfjällen, one of Europe's largest nature reserves with a unique natural mountain environment, is home to many of Europe's alpine bee species which are essential for the pollination of many mountain plants. The immense natural landscape in the mountain region provides a high-value environment for outdoor activities.

12.1.2. The Forest Landscape

The boreal forest landscape comprises a large number of different habitats which create the basic conditions for biological diversity and ecological processes and functions. The natural variations, with different landforms, open boulder-and-substrate lands and wetlands, richer and sparser habitats, and different mixtures of tree species, mean that conditions are in place for providing a significant range of ecosystem services. This natural variation also means that there is a clear landscape perspective, particularly for regulating, supporting and cultural ecosystem services. Transitional zones between different types of lands are important niches for biodiversity and serve as movement pathways for

animals and as propagation routes for plants. The alluvial deciduous forests and coastal forests have important regulating, filtering and buffering properties. Special characteristics, such as large trees and old forests (Figure 8), are particularly valuable for biological diversity and ecosystem services.

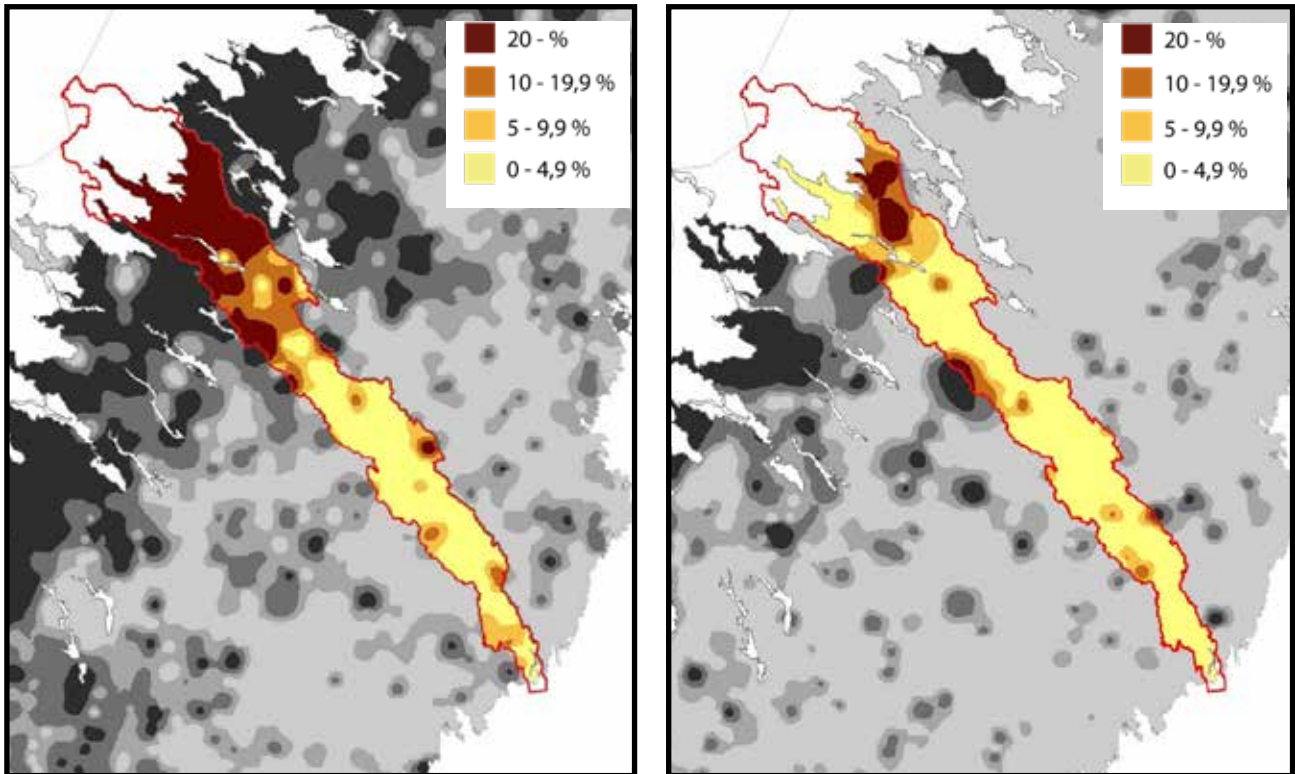


Figure 8. The map on the left shows the estimated location of old forests (140 years and older), and the map on the right that of old deciduous forests, in the planned biosphere reserve and its immediate vicinity. Data from Riksskogstaxeringen, SLU, for the inventory period 2012-2016. The percentage in the legend refers to the proportion of productive forest

The forests offer the functional and structural preconditions for wood raw material, berries, mushrooms, wild game for hunting, reindeer, natural purification of water, nutrient turnover, and carbon capture and storage, for all categories of ecosystem services. The forest industry contributes the economically important raw material – wood – which constitutes a major part of the basis for the area's industry. Success has meant that the forest industry affects almost all forest land, which in turn affects all the ecosystem services that the forests provide. In particular, over time, the formerly open landscape has been transformed into a landscape entirely dominated by forests. For example, the forest industry has affected the ground lichen, which is a prerequisite for reindeer herding in the area.

The availability of forests and their functions for education, research, and recreation are examples of the social value of forests and of a prerequisite for cultural ecosystem services. To these can be added the remains of charcoal kilns, tar production and hedges/fencing/stone walls. Birch bark, roots, burls (rounded, knotty growths on trees) and other products are raw materials for carvings.

The forest landscape contains large areas of open and semi-open wetlands which fulfil important functions such as carbon sinks, flood regulation and water purification, but also provide resources for the small cranberry, cloudberry, flowering herbaceous plants, brushwood and scrub which are dependent on pollination. Large areas of wetland have been drained and converted to agricultural land and forest land. This drainage has had a negative impact on a number of ecosystem services, but has also contributed to the increased production of forests and crops. Many wetlands bear the traces of earlier traditions in the form of hay-storage racks, barns and arable fields which provided the conditions for cultural ecosystem services.

Table 11. Examples of ecosystem services as well as the users and the utilisation of ecosystem services in the planned biosphere reserve

Category	Examples of ecosystem services		Examples of the utilisation and of users of ecosystem services	
	Local residents	Visitors	Local residents	Businesses
Provisioning	Wood raw materials, woodworking raw materials, mushrooms, reindeer meat and other reindeer products, wild game meat, fish, wood, mountain water, clean water, herbs, berries, fruit, cultivated arable crops, meat and milk from domestic cattle.	Timber, pulp wood, and wood from private properties, food for household needs in the form of natural and cultivated plants, food for household needs from reindeer, wild game, fish, antlers, bone and skin for craftwork, potable water, natural medicines for household use.	Berries and mushrooms for picking, potable surface water, firewood for fires, wild game for hunting, and fish.	Timber raw materials and woodworking raw materials for further processing, reindeer in reindeer herding, berries and mushrooms for industrial harvesting, hunting and fishing tourism, agriculture
Regulating and Supporting	Intact ecosystems with natural flora and fauna, natural wetlands with peat formation, woody vegetation, intact ground vegetation and ground cover, flowering herbaceous plants and trees, growing forests, natural border zones adjoining water and between areas of different land class use, natural forest perimeters with flowering and fruiting vegetation, raised shorelines with primary succession	Wind breaks. Natural buffering of flood water, stabilisation of erosion, avalanches and other mass flows, access to lands for grazing and cultivation. Possibilities for cultivation for household needs in the form of berries, fruit, honey, etc. Natural purification of private drinking water. Functional ecosystems and habitats.	Wind breaks, stabilisation of mass flow for growth of trees. Nutrient turnover in ecosystems for growing vegetation	Stabilisation of mass flow for growth of trees. Nutrient turnover in ecosystems for growing vegetation
Cultural	Reindeer and wild animals, open and grazed mountain environments, habitat diversity, cultural remains from Sami culture and mountain agriculture, intact ecosystems, open areas for grazing and cultivation in forest terrain, large and old trees, suitable conditions for recreation, green spaces in urban environments, biocultural heritage	Access to nature and landscape for household needs, with the conservation of culture and land to create a sense of place and belonging, access to bathing places, bird watching	Access to distinctive environments with natural variations and character, culture and landscapes to enjoy, a sense of primeval simplicity, picnic areas, trails and paths, access to bathing spots, bird watching	Access to the distinctive flora and fauna of the landscape, culture and landscape for education, environmental monitoring and research

12.1.3. The Coastal Landscape

The coastal landscape is densely populated and has well developed infrastructure. Permanent settlements and holiday homes can be found along lakes, watercourses and sea shorelines. All the major settlements are situated alongside water. There is therefore a significant burden on natural ecosystems as well as a very significant need for recreational opportunities with regard to exercise, berry picking, etc. The well developed infrastructure permits greater access to ecosystem services here than in other parts of the planned biosphere reserve. The balance must be maintained between exploitation for settlements, where certain ecosystem services are prioritised, and for conservation, where other ecosystem services are given preference. Coastal forests and other habitats adjacent to water are particularly important as buffers and resources for many regulating and supporting ecosystem services.

On settled land, green areas have important functions and create a link with the neighbouring natural environment. They also provide regulating ecosystem services, contributing to a favourable local climate, with shrubs and trees creating shade, increasing atmospheric humidity and removing airborne particles. They also provide cultural ecosystem services such as health, recreation, and cultural heritage in the form of parks, churchyards and heritage areas. Nature reserves and cultural reserves in close proximity to settlements and infrastructure fulfil important functions by providing provisioning, regulating and supporting ecosystem services, as well as cultural ecosystem services in the form of values related to recreation, health and wellbeing. They also fulfil important informational, educational and communicational functions with regard to the multifunctional benefits of ecosystems, the landscape and nature.

The rate of land elevation due to isostatic rebound in the coastal area is ca. 8.5 mm per year, which is close to the greatest ongoing land elevation in both the Gulf of Bothnia and the entire world. In just a short period of time, land elevation creates new land surfaces which plant life can colonise. The remains of old boat houses, bridges, etc., can be found at higher land elevations. In many places, the area close to the shoreline is commonly owned land which has not been extensively exploited. Several hundred years of succession from open shoreline to coniferous forests, with characteristics of ancient woodland, have been documented.

The coastal strip provides fishing, with the shallow bottoms lying under borders of deciduous growth on alluvial soil, offering important breeding and nursery sites for many fish species. Structures on the bottom, in the form of drumlins overlaid with terminal moraines from the Ice Age, serve as erosion buffers.

Even though the coastal landscape consists largely of forest land, there is nevertheless a significant presence of open or tree-covered boglands. There are also open and semi-open rocky terrain and hills with lichen-covered ground which are important in establishing the appearance of the landscape and for biological diversity, and also for reindeer herding as they are important grazing and living environments for reindeer. These provide multifunctionality, special assets and ecosystem services. Existing agricultural land is to a large extent situated on previously drained boglands. During the last 50 years, the area of agricultural land has been halved in the Västerbotten municipality, which affects the entire appearance of the landscape and also the biological diversity that is associated with these environments.

12.1.4. The River Landscape

The River Vindelälven and the lower River Umeälven form a natural infrastructure in Vindelälven-Juhtatdahka. It is along the river valley where people travel, work and live. In the first half of the 1900s, the forest industry gradually expanded north westwards from the coast along the river valleys, away from the river, and up towards the watersheds. Almost all watercourses have been straightened out and cleared to facilitate timber flotation. Relics from this epoch contribute to cultural values. At the same time, timber flotation has had a highly negative impact on watercourse ecosystems. Therefore, many watercourses in the drainage basin are now being restored in order to re-establish breeding grounds and nurseries for fish, to recreate natural meanders, to link aquatic and terrestrial ecosystems, etc. These restorations, which are carried out in close association with research, provide ecosystem services of all categories.

Floodplain meadows and other wet meadows and flood plains serve as natural biological filters. Flooding, which occurs naturally in free-flowing rivers, supplies nutrients to terrestrial ecosystems. Transitional zones between land and water generally have a high biodiversity. Intact habitats serve as a protection against erosion and other mass flow.

The river with its tributaries serves as a natural propagation route, e.g., for mountain species that can be found well to the east within the area, and for limnetic species in general. The River Vindelälven ridge also extends through the river landscape and is an important groundwater-channelling land formation, supplying Vindeln and Umeå with one of Sweden's cleanest and most palatable drinking waters.

The lower River Umeälven flows into the Umeälven delta and Bottenviken. The delta is a Ramsar site and a Natura 2000 site, in part because of its special values as, for example, a stopover site for migratory birds, and is therefore a world-class site for bird watching. The delta has long been an important agricultural area and remains an open landscape thanks to grazing by cattle.

12.2 Specify whether indicators of ecosystem services are used to evaluate the three functions (conservation, development and logistic) of biosphere reserves. If yes, which ones and give details.

Possible indicators and other measurable parameters for status assessment and monitoring of ecosystem services are presented in the two tables below (Table 12, 13). For a number of these, the data are in the form of maps and estimates, as in Figure 8, 9 and the factbox for forest, forest land and forestry.

Table 12. Ecosystem services in relation to the three functions of Biosphere Reserves

Ecosystem services	Conservation	Development	Support
Provisioning	Reservations and other forms of protection from exploitation. Natural boglands, intact land and vegetation near watercourses and water catchment areas. Strategic trade off of land utilisation interests.	Information, paths, guides, picnic sites, accommodation, etc., infrastructure which permits access to ecosystem services. Sustainability-based land use planning. Adaptive forestry.	Environmental monitoring of the mountain region, forest, alpine tree line, watercourses, open lands, wetlands, reindeer, wild fish.
Regulating and Supporting	Reservations and other forms of protection against exploitation, including bans on tourism and off-road driving during critical periods. Natural alluvial forests and wetlands which buffer against high water flow rates and nutrient leaching. Sufficiently high grazing pressure in the mountain regions. Maintaining open lands.	Multi-use planning to cater for a number of land use interests on the same site, at the same time or different times.	Environmental monitoring and research.
Cultural	Maintaining cultural reserves and areas of national importance for cultural environment conservation and infrastructure for accessibility and information.	Expansion of infrastructure for accessibility and information on nature and culture.	Inventory of valuable cultural environments and archaeological remains. Designation of cultural reservations and auditing of areas of national importance for cultural environment conservation. Comprehensive information on public right of access.

Table 13. Proposals for indicators and other measurable parameters for status assessment and monitoring of ecosystem services

Ecosystem services	Indicators and measurable parameters
Provisioning	Berry production; Shooting of wild animals; Agricultural production; Growth of forests; Number of reindeer; Amount of harvested bioenergy; Volume of drinking water from natural sources; Fish caught
Regulating and Supporting	Area of nature reserves and other formally protected sites; Area of alternative designated sites (areas of national importance, voluntary protection); Density of forest edges, Density/length of ditches; Registered Natura 2000 habitat types; Registered red-listed species; Length of renovated watercourses; Volume of wind-blown forest; Number of landslides, avalanches and other mass flows; Functional green infrastructure; Area of valuable wetlands in wetland inventory; Flow rates of watercourses; Chemical and physical properties of water
Cultural	Area of open land; Number/density of large trees; Density of trails, paths, forestry tracks and farm tracks; Number of picnic sites, windbreaks, established fishing sites, etc.; Number of research projects in the area

12.3 Describe biodiversity involved in the provision of ecosystem services in the biosphere reserve (e.g. species or groups of species involved).

There is a clear association between biological diversity and the ecosystems' long-term ability to maintain important ecosystem services. Biological diversity therefore plays a central role in the concept of ecosystem services but is not usually defined as an ecosystem service in itself.

Multifunctionality in ecosystems is central to the ecosystem services concept. In order to evaluate and establish a balance between different types of ecosystem services and benefits, it is important to view things holistically and contextually within a landscape perspective, and also to look at how ecosystem services and benefits are used and valued over time and space within a social perspective.

Vindelälven-Juhtatdahka has large areas of natural environments, with high nature value, which merit protection. Nature reserves and other designated areas of forest land make up ca. 20 % of the total land area, but the protected sites are mainly in the mountain and montane regions and little of the land in the interior and coastal regions is protected. The continued protection of forest land is necessary to create the conditions for a functioning green infrastructure and the maintenance of ecosystem services. Forest lands that have undergone rebound elevation (due to land elevation) and show no signs of tree felling are of particular interest because of the primary successions from open, exposed shoreline to natural forests. These areas have clear scientific value and moreover represent a Natura 2000 habitat type which in Sweden has a specially designated conservation value. There are also large areas which have been affected by long-term land use and have high cultural value, yet where the biological diversity has been impacted and provides value. Haymaking meadows, dairy pastures and haymaking boglands have a wealth of species, more indeed than areas that are in a natural condition. This contributes to a large total resource of ecosystem services. As forest cultivation increases and the rate of forest growth rises, it is particularly important that conservation measures are applied to those nature- and cultural values that are associated with open landscapes.

Long term grazing by reindeer has resulted in magnificent, open mountain landscapes with high conservation value. A sufficiently large stock of reindeer is necessary to maintain the distinctive character and biodiversity. Sustainable reindeer husbandry and the maintenance of Sami culture are therefore of the greatest importance

12.4 Specify whether any ecosystem services assessment has been done for the proposed biosphere reserve. If yes, is this assessment used to develop the management plan?

No overall analysis has been carried out of ecosystem services in the planned biosphere reserve though an initial quantitative assessment of ecosystem services from forests has been done and the results are presented in the factbox below. Also, extensive research and environmental monitoring

is being conducted at SLU and Umeå University to assess the ecosystem services in the area. For example, models which are applicable to the whole, or parts of, the planned biosphere reserve have been developed for the occurrence and density of habitats for grouse (mountains), berries (forests) and ground lichen (forests) (example in figure 9). The method developed for this purpose is based on available environmental monitoring data combined with map data and other biophysical data and can be used to estimate the resource value of different ecosystem services and/or the conditions required for ecosystem services. Data from Riksskogstaxeringen (SLU) can be used to estimate certain properties directly, but the resolution is not sufficient for the precision and accuracy required for quantitative or qualitative evaluation and monitoring. However, these data establish a starting point for the further development of comprehensive models.

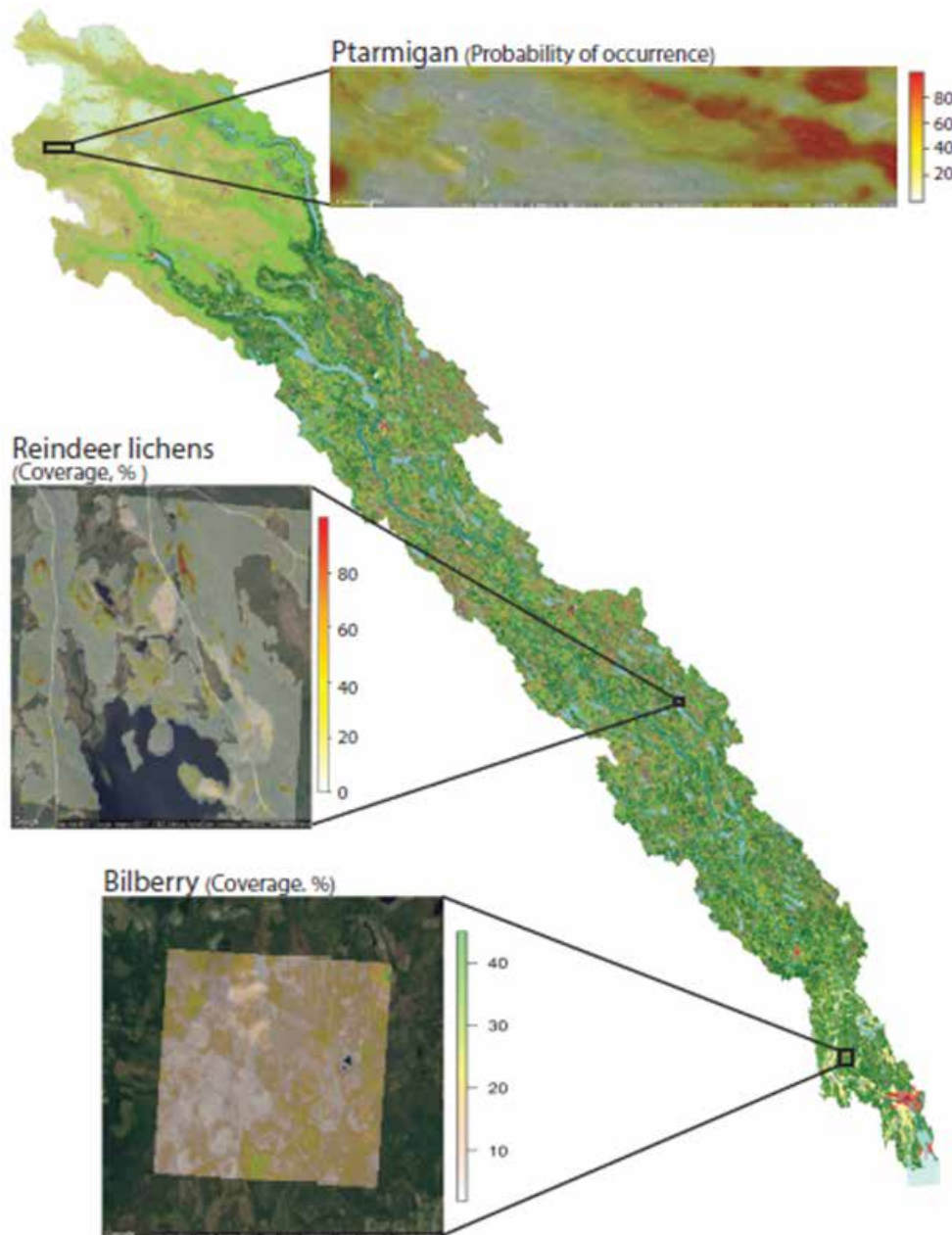


Figure 9. The figure shows Vindelälven-Juhtatdaha with examples of predictive mapping and assessments of ecosystem services in mountain and forest regions; habitat for grouse (regulating); reindeer moss (provisioning/regulating) and bilberries (provisioning). Environmental monitoring data [from NILS – Nationell Inventering av Landskapet i Sverige (National Inventory of Landscapes in Sweden) and Riksskogstaxeringen (The Swedish National Forest Inventory), SLU] combined with comprehensive landscape data (Swedish land cover data; Metria) have been used to produce comprehensive maps. For the grouse model, data from Artportalen (reporting system for plants, animals and fungi) has been used in combination with habitat models based on data from NILS, MOTH (Monitoring of Terrestrial Habitats, SLU) and THUF (Terrester Habitatuppföljning, SLU) as well as other comprehensive landscape data such as climate data and laser data for tree crown cover and tree height. The models are computed by SLU, department of landscape analysis at the institute of forest resources management

FACTBOX

Data in this factbox has been produced by Riksskogstaxeringen, SLU, and was calculated for the inventory period 2012-2016. Riksskogstaxeringen involves statistical inventory sampling which includes all areas of different land class use and provides the most extensive inventories of productive forest land. In all candidate areas, sampling is small scale, hence errors in calculation can occur. Riksskogstaxeringen is a part of Sweden's official statistics, with its main objective being to determine the state of Sweden's forests and to assess how the picture is changing. The statistics are used, for example, for monitoring and evaluating current forest-, environment- and energy-policy.

Analysis of ecosystem services from forest, forest land and forestry in the Vindelälven-Juhtatdahka candidate area

Younger forests grow faster than older forest. Growing forests contribute to regulating and supporting ecosystem services such as carbon capture and storage, etc.; as habitats, older forests contribute to various provisioning, regulating, supporting and cultural ecosystem services; whereas forests that are being felled contribute to provisioning ecosystem services. Of 530 685 ha of productive forest land, 23 662 ha (4.5%) are barren ground cleared of trees; 120 699 ha (23%) are seedling forests, thinned sapling forests and young forests; 214 055 ha (40.5%) are thinned forests that are approaching maturity; and 17 269 (32.5%) ha are older, mature forests which have reached the age for final total tree felling.

The timber supply amounts to ca. 54 million m³ for all forest land, of which ca. 51.5 million m³ is on productive forest land. Wood biomass, as a provisioning ecosystem service, amounts to ca. 21 786 000, 7 636 000 and 10 042 000 tonnes of dry material calculated for trunks and bark, branches and needles, and stumps and roots, respectively, on forest land that is in production. When calculated for all forest lands, including those with constraints, it is somewhat larger: 42 863 000 compared with 39 465 000 tonnes.

A variety of tree species provide character, diversity and to some extent different ecosystem services or different collections of ecosystem services. The area is dominated by pine with 346 810 ha (65.5%) followed by spruce with 97 889 ha (18.5%), conifer-dominated mixed forests with 80 475 ha (15%), mixed forests with 37 690 ha (7%) and deciduous forests with 27 103 ha (5%). The introduced lodgepole pine is planted on 11 687 ha (2%). These areas and sites are counted as productive forest land.

Old forests have high biological diversity and provide many different ecosystem services. There is a total of 64 042 ha of old forest (older than 140 years) in the area. This is equivalent to 12% of the productive forest land. The area of Old forests rich in deciduous trees totally covers 11 093 (21%) ha in the area.

Large trees offer special benefits, providing niche habitats for birds, insects and other species. They can also contribute cultural historical values and cultural ecosystem services. On productive forest land, the average number of large trees per ha is 1 (0.96), usually spruce (0.55) or pine (0.34) but more rarely deciduous trees (0.09). On all forest lands including those with constraints, the number per ha is smaller. Large trees are trees with a diameter of over 45 cm (1.3 m above the ground).

Dead wood is an important substrate for many species and an important factor for biological diversity. On productive forest land, there are ca. 4 326 000 m³ dead wood, distributed roughly equally between hard dead wood and decomposed dead wood. This is equivalent to ca 8.2 m³ per ha. On forest land as a whole the volume is somewhat greater (4 702 000 m³).

Digging ditches on forest land contributes to tree growth and therefore to many ecosystem services. Ditching also has negative effects on ecosystem services, such as increased runoff from forest land, nutrient leaching, and impacts on the physical and chemical conditions in watercourses. Of the 530 685 ha of productive forest land, 54 969 ha (10.5%) have been drained, mainly (48 753 ha; 9%) by ditches that are still functioning.

Sparse forests on drier and more barren habitats are often open, with many clearings. These forest environments have special values as well as ecosystem services. Forests such as these act as a network of damper and drier grounds, providing good grazing on hanging lichen and ground lichen, and are therefore very valuable environments for sedentary or migrating reindeer. Access to these lands for winter grazing is a critical factor in determining the size of reindeer herds as well as for many supporting/regulating ecosystem services associated with reindeer herding and the Sami culture. On productive forest land, these areas total 21 819 ha (4%), while on forest land with rich (lichen cover >50% of the ground) or good (>25% ground coverage) grazing resources they total 25 929 ha (5%).

Forest land contributes the conditions for many different ecosystem services of all categories. Berry picking is a common recreational activity and there is also industrial berry picking. The annual productions of the provisioning ecosystem services bilberries and lingonberries are estimated at 24 000 and ca. 13 700 tonnes, respectively.

13. MAIN OBJECTIVES FOR THE BIOSPHERE RESERVE'S DESIGNATION

13.1 Describe the main objectives of the proposed biosphere reserve, integrating the three functions (conservation, development and logistic), presented below (sections 14 to 16), including components of biological and cultural diversity. Please specify the indirect pressures and/or organizational issues.

The vision for Vindelälven-Juhtatdahka

Untamed, scenic and world-renowned.

A sparkling adventure from mountain to sea, with the diversity of nature and culture as a source of development, experiences and quality of life!

The overall goal for the planned biosphere reserve is:

To work together to develop, preserve and support rich and unique nature, culture, and people's quality of life in Vindelälven-Juhtatdahka so that everyone can live, grow and thrive in towns as well as the countryside, today as well as in the future.

DEVELOP

The goal is to promote economic and social development in ways that are ecologically and socially sustainable.

PRESERVE

The goal is to contribute to the preservation of the area's rich and unique natural and cultural heritage, and promote both the restoration of elements of that heritage that have been damaged, and the sustainable use of ecosystem services.

SUPPORT

The goal is to support research and practice and to serve as a bridge between scientific findings and local knowledge, promoting their application, and to contribute to shared learning for people who live, work and visit the area.

Organisational challenges

Two major, and interrelated, challenges for the planned biosphere reserve are its size and the biosphere organisation's relatively limited personnel resources. This could be managed in part by creating innovative digital communities to which everyone has access, irrespective of where they live in the area. Another priority will be to find further financing solutions, in addition to the existing one, in order to obtain more resources for the administrative office and for financing sustainable projects.

A further challenge is the reality that many Sami, primarily within reindeer herding, have difficulties prioritising work related to the biosphere reserve, since they already have to devote a lot of time to urgent problems such as guarding the reindeer herds against large predators and limiting the effects of, for example, road and rail traffic. There is a widespread lack of knowledge about reindeer herding among the general public in the area, and conflicts between different stakeholders are not uncommon.

Among activities that have proved productive in increasing the interest of Sami to become involved in work to do with the planned biosphere reserve are international exchanges with other indigenous peoples and Sami participation at national and international MAB meetings. There are good chances that a biosphere reserve can contribute to greater understanding and pride in Sami culture and for the unique activity that the modern form of reindeer herding is. This is not something that will 'be completed' at a certain point; instead it will continue to be an important part of the work once Vindelälven-Juhtatdahka becomes a biosphere reserve. Sami culture has its own concept of time when it comes to trust and friendship, which has to be respected.

As with other biosphere reserves in Sweden, locally the term biosphere RESERVE will not be used; rather, the area will be referred to as a Biosphere Area. Information and communication are almost always a

challenge. Since biosphere reserves/area are relatively new in Sweden, not that many people in the area know what it implies. People today often have very busy daily lives, and few prioritise devoting further time to absorbing information (digitally or physically) they have little previous knowledge of and that they cannot see any immediate benefit from. In order to communicate even more widely and clearly with the message about what a biosphere reserve is and what it isn't, additional open meetings were held during the final phase of the application process (see 4.6.2). In the future it will be important to continue meeting people and to listen to their views, but also to seek new ways of reaching more people in the area.

13.2 Describe the sustainable development objectives of the biosphere reserve.

(If appropriate, please refer to Agenda 21, Rio+20 and SDG post 2015).

The global action plan (LAP: Lima Action Plan, 2016 - 2025) calls for biosphere reserves to be models for the fulfilment of the UN's global goals and the implementation of the 2030 Agenda. The plan aims to unite engagement and action in the biosphere reserves in order to achieve sustainable development.

Sweden's ambition is to be a leading actor in the efforts to implement the 2030 Agenda and reach the UN's sustainable development goals, and conditions for that are favourable. Sweden has a long tradition of sustainability work, not least in the environmental area. Furthermore, Sweden's regions, county administrative boards and municipalities have their own plans for sustainable development which are more or less in line with the 2030 Agenda. "The Swedish delegation for the 2030 Agenda" is an independent committee with the aim of promoting, facilitating and stimulating the implementation of the 2030 Agenda for Sustainable Development. In its analysis of the ability of the country to fulfil the goals, the committee noted that the current system is divided between many sectors, and that conflicts between goals can easily arise. The planned biosphere reserve's cross-sectoral efforts to reach jointly formulated goals thus looks likely to be a significant tool in the work to achieve sustainable development and to implement parts of the 2030 Agenda, including the global goals.

Thus, since a biosphere reserve is to contribute to the attainment of global goals/sustainability goals locally, nationally and internationally, goal formulation for biosphere work in Vindelälven-Juhtatdahka is based on LAP. All goals, effect targets and examples of projects and strategies to achieve the goals will be described in the development plan that is being drawn up for the biosphere reserve (see 17.4.4). Effect targets are SMART, or Specific, Measureable, Achievable, Relevant and Time-bound.

The four main goals for the planned biosphere reserve, and their respective effect targets, are listed below. How these goals are measured is described in LAP and in the development plan for Vindelälven-Juhtatdahka. The time frame for goal fulfilment is 2018 - 2024.

Goal 1: An effectively functioning model for sustainable development

1.1 The Biosphere Reserve (BR) contributes to the implementation of Sustainable Development Goals (SDGs) and Multilateral Environmental Agreements (MEAs). The results can be replicated and scaled up. The results are communicated (corresponds to A1.1 & A1.2 in Lima Action Plan, LAP).

1.2 The BR establishes local, national and international collaborations to design and implement projects that add knowledge about sustainable development for benefits to local and indigenous people (LAP A1.3, LAP A4.5).

1.3 The BR is used to provide priority sites and as observatories for ecosystem-based climate change action (LAP A1.4).

1.4 The BR contributes to the work of communicating, visualizing, and mapping ecosystem services characteristic for Vindelälven-Juhtatdahka (LAP A7.1).

1.5 The BR's activities and actions are strengthened by research, learning and practical knowledge development. This means establishing partnerships with universities/research institutions to undertake

research, education and training that lead to knowledge development for the BR's actors (LAP A4.1 & A4.2).

1.6 The BR's activities and actions are strengthened by collaborations with entrepreneurs, companies and other actors through education and cross-sectoral collaborations across municipal boundaries (LAP A1.3, C6.1 & C6.2).

1.7 People in the BR create products and offer services developed in accordance with the BR's values (LAP A1.5).

1.8 The BR's values are integrated into local strategies such as territorial planning, sustainability plans, collaboration plans, climate strategies etc. (LAP A3.1).

1.9 The BR's management takes local knowledge and traditions, including Sami heritage and participation, into account (LAP A2.3).

1.10 The biosphere organization applies adaptive management which is based on development and learning processes through collaboration (LAP A6.2)

1.11 The BR is developed on the basis of an annual activity/business plan developed by the biosphere organization (LAP A5.1 & A5.2).



Image 32. National biosphere meeting, 2016.
Photo: Ola Jennersten



Image 33. Two curious Borela owls (*Aegolius funereus*)
Photo: Grahame Soden

Goal 2: The Biosphere reserve as part of the national and international network

2.1 The Biosphere Reserve (BR) is an active member of the World Network of Biosphere Reserves (LAP B6.1).

2.2 The biosphere organization enables actors in the BR to participate in workshops, education and other activities (LAP B1.1 & B1.2).

2.3 People from the area should be able to take part of and learn from sustainable development in practice in other BRs, nationally and internationally (LAP B1.1, LAP B6.1 & B1.2).

2.4 The biosphere organization contributes with good examples of actions for sustainable development, including research, to the MAB network's communication channels (LAP B5.1).

Goal 3: Effective external partnerships and sufficient and sustainable funding

3.1 The biosphere organization ensures stable and long-term financing by raising its own revenues. Resources are mobilized through external funds and through collaborations with actors that can contribute to the BR's objectives (LAP C3.2).

3.2 The biosphere organization creates opportunities for transparent and long-term partnerships between the BR and the private sector (LAP C4.2).

3.3 The BR is part of projects and activities funded by national and regional funding agencies (LAP C5.1).

3.4 The BR brand is used in marketing of goods and services in line with national guidelines (LAP C7.2).

Goal 4: Comprehensive, modern, open, and transparent communication, information and data sharing

4.1 The biosphere organization disseminates good practices for sustainable development from the BR (LAP A4.4).

4.2 The BR implements open access to documents, data and other material by making these available on e.g. the project website (LAP D1.1).

4.3 The BR has a communication strategy and communicates in an easy-to-understand manner (LAP A2.4, D2.2 & D3.1).

4.4 The BR uses social media and other novel information and communication technologies (LAP D3.1).

In order to stimulate efforts to find local solutions to global challenges, work on achieving the first goal, 'a model area for sustainable development', has been divided into six focal areas of clear local relevance. Focal areas can make it easier to overview the work and its priorities, while also providing a clearer way of communicating what is being done in the biosphere reserve. The six focal areas and the ambitions for each one are shown in table 14.

Table 14. The six focus areas of the planned biosphere reserve.

Focal area	We want to
1. Living landscapes	contribute to ecologically, socially and economically sustainable cultivation and processing of the area's natural resources, at the same time as allowing for the preservation, development and restoration of unique natural environments.
2. Fishing in flourishing lakes, watercourses and seas	support the work to achieve healthy waters by good management of the area's fishing resources, for the benefit and pleasure of locals and visitors.
3. Tourist industry and outdoor life for everyone	contribute to the development of Vindelälven-Juhtatdahka into a sustainable destination with a variety of accessible experiences and outdoor opportunities based on the area's unique natural and cultural values, in urban as well as rural settings.
4. Thriving reindeer husbandry	contribute to the preservation of profitable and optimistic reindeer herding, support foresightful development of the reindeer sector, and promote reindeer herding research and training.
5. Development of local communities	support local businesses, non-profit organisations and civil society initiatives for developing local communities.
6. Diversity of cultural expressions	contribute to preserving and developing the area's cultural heritage, and to support and develop contemporary expressions of creativity and culture.



Image 34. Flyfishing in river Vindelälven. Photo: Ola Jennersten



Image 35. A future farmer? Photo: Erika Larsson

These focal areas were formulated on the basis of regional cooperation actions (see 3.2) and projects that have received support from Vindelälven-Juhtatdahka (see 15.1) in different ways, as well as from ongoing dialogue with the biosphere reserve's stakeholders. The ambitions for each focus area are based on a compilation and synthesis of the conditions, challenges and priorities that have been identified in existing regional and local sustainability strategies. Prospective activities within the focal areas will in turn be based partly on results of the nomination process: from workshops and meetings with organisations and local residents during the preliminary study and during the candidacy. It is worth pointing out that the boundaries between the focal areas are flexible; often they overlap, and there are many synergies and connections between them. Several of the actions and projects carried out in different focal areas will, directly and/or indirectly, contribute to the same goal fulfilment. Similarly, work within one focus area may contribute to the fulfilment of several goals at once. The selected focal areas reflect what is most current, and may be changed as new challenges arise. A flexible working method and the possibility of revising short-term plans allows the biosphere organisation to be prepared for changes and to act on the initiatives that they occasion. Basing the goal formulations on the Lima Action Plan has ensured a broad holistic perspective with clear connections between global, regional and local efforts for sustainable development.



Image 36. The delta in Ammarnäs. Photo: Johanna Gardeström

13.3 Indicate the main stakeholders involved in the management of the biosphere reserve.

There are a large number of national and regional authorities that hold the formal responsibility for different parts of a sustainable management of the lands comprising Vindelälven-Juhtatdahka. The six municipalities within Vindelälven-Juhtatdahka also have far-reaching responsibilities for sustainable planning and management of the landscape. Other stakeholders include the large number of business organisations and interest groups whose working policies are also based on sustainable development.

The board of Vindelälven-Juhtatdahka has the ultimate responsibility for managing the work necessary to implement the biosphere reserve. Below is a list of all the stakeholders represented on the board. The distribution of this representation is specified in 17.1.17.

- The six municipalities: Arjeplog, Sorsele, Lycksele, VindelIn, Vännäs and Umeå
- The county administrative board
- Region Västerbotten
- The World Wide Fund for Nature (WWF)
- Three *samebys*
- Five villages
- The Swedish Forest Agency
- Sveaskog (forestry company)
- The Federation of Swedish Farmers (LRF)
- Ume- och Vindelälvens fiskeråd (Fishery Advisory Board)
- Fjällhästen (tourism company)
- Gold of Lapland (tourism company)
- Swedish Tourist Association (non-profit organisation)
- Swedish Society for Nature Conservation (non-profit organisation)
- Umeå University
- Swedish University of Agricultural Sciences

One problem that sometimes arises when many stakeholders and policies are involved is a strong division into sectors, meaning that each authority, municipality and interest group focuses on its sector and task, ignoring the whole. The planned biosphere reserve can contribute to identifying shared goals and finding synergies by linking different initiatives and strategies. The broad representation on the board makes this kind of cross-sector collaboration possible, which will be necessary for achieving the UN's global goals. Thus Vindelälven-Juhtatdahka is not formally a manager of the area (even if the board includes representatives from the administration); rather, its role and concept involves being a neutral arena and a driver of sustainable development throughout the area. The means to this work is cooperation.

13.4 What consultation procedure was used for designing the biosphere reserve?

The consultation process has included open meetings, meetings with the board of Vindelälven-Juhtatdahka, participation in the meetings of the municipal executive boards, and meetings with individual stakeholders. In December 2012, the Vindelälven municipalities, the Västerbotten county administrative board and the World Wide Fund for Nature commissioned a consultancy, Man & Nature, to carry out an initial study of the conditions for the creation of a biosphere reserve along the River Vindelälven. An introductory meeting was held in May 2013 with 53 participants from various authorities, municipalities, villages, *samebys*, interest groups, associations, businesses, universities and other biosphere reserves. The purpose of the meeting was to inform the participants about what a biosphere reserve is and what it might mean for the Vindelälven valley, and to discuss the strategy for future nominations.

Between August 2013 and December 2014, a preliminary study was carried out, with the aim of establishing the conditions of the Vindelälven area becoming one of UNESCO's biosphere reserves. During this period, eleven open biosphere workshops were held in villages along the River Vindelälven. A well-attended project fair with a 'future workshop' was held on 20-21 February 2014. The *samebys* in the river valley were also invited, on two occasions, to workshops focused on important Sami issues in a future biosphere reserve. A large number of meetings with organisations, businesses and researchers were

held during the same period. The purpose of these meetings was to provide information about UNESCO's Man and the Biosphere programme and an overview of the activities currently ongoing in the river valley, to prepare for the subsequent step in which possibilities for cooperation, synergy, and development could be identified. Information collected during the preliminary study was compiled in a report that was sent for consideration to a broadly-composed reference group. Additionally, all those interested were given the opportunity to present their opinions which, following the referral, were incorporated into the report that was then sent as an application for Vindelälven-Juhtatdahka's candidacy. The report has also served as a compilation of points raised by those who live and work in the river valley. It has furthermore been the basis of formulating what sustainable development might include in the Vindelälven valley, and how a future biosphere reserve could contribute to sustainable development in the longer term. The report has thus been an important supporting document for the organisation and working focus of the biosphere reserve.

Vindelälven-Juhtatdahka's biosphere candidacy was approved on 6 February 2015. It is the National MAB Committee who examines the preparatory study and evaluates if the region has a good potential to become a biosphere reserve. The evaluation is based on the criteria of biosphere reserves. If the MAB committee approves, the committee acknowledges the biosphere reserve initiative as a biosphere candidate. During the candidacy, the biosphere reserve initiative starts to develop the biosphere reserve, include relevant stake holders, develop zonation, organization, funding mechanisms etc, and prepare the nomination form. It was a priority throughout the candidacy to spread information about the ongoing biosphere work – that it was based on local initiatives and cooperation – and to collect the views and opinions of local residents and different stakeholders in the area. Between 2015 and 2017, the coordinator and other members of the biosphere organisation took part in more than 160 external meetings with researchers, students, villages, associations, farmers, business people, Sami, local heritage associations, municipal executive boards and authorities in the area. Information meetings included Nationalälvens dag (National River Day), the Sami Week in Ammarnäs, further training for teachers in Umeå, Dagar i Laisdalen (Lais River Valley Days), the annual Sustainability Week and the annual Biosphere Day. Around the end of 2016 and the beginning of 2017, four major dialogue meetings were held with various stakeholders in order to gather opinions about the working focus of the planned biosphere reserve and what should be included in the planned training programme for biosphere ambassadors. During the candidacy, the six municipalities each held at least one biosphere event a year. The planned biosphere reserve furthermore had a successful collaboration with Naturskolan, which in 2016-17 trained teachers and pupils from the planned biosphere reserve area in sustainable development and what a biosphere area is (16.2.1).

The application that was the basis of the nomination was circulated for consideration by municipalities, *samebys*, Sami associations, associations, regional and national authorities, universities, interest groups, businesses and other biosphere reserves. The application was then revised on the basis of the comments received.

Image 37. Left. Board meeting in Vindeln



Image 38. Right. Village meeting in Vormsele 2015



Image 39. Left. Conversations during the sustainability week 2016. Photo: Johanna Gardeström



Image 40. Right. Meeting in Åmsele. Photo: Robert Karlström



13.5 How will stakeholder involvement in implementing and managing the biosphere reserve be fostered?

Achieving sustainable development requires radical changes in society. Sweden's regions, county administrative boards and municipalities all have their own sustainable development plans which are more or less in line with the 2030 Agenda, but cooperation is needed if complete success is to be achieved. The fact that Vindelälven-Juhtatdahka can serve as a platform for cooperation is a strong incentive for authorities and municipalities to participate and be active in the implementation and management of the biosphere reserve.

For other stakeholders, it will be necessary to demonstrate benefits ('What's in it for me?') in order to elicit active participation. One element of such benefits is secure financing and a well-functioning organisation that includes broad representation and acts for the entire planned biosphere reserve, to make it more attractive for those who live and work here, as well as for visitors. The fact that so many people have been involved in drawing up the strategies and ensuring that they conform with the strategies of the participating organisations is another strength. Being a member of the biosphere reserve's non-profit organisation provides an opportunity to become directly involved in this work. A board with broad representation and local support is an important means to building trust. Board members are responsible for contacts with local networks in order to reach out with information, and also to promote local engagement. Most of the board members will also have some responsibility for action on the six focal areas defined during the nomination process. Being able to show examples of initiatives, including successful biosphere projects, within these focal areas is a way to get more people to see the opportunities inherent in the biosphere work, and thus to encourage greater participation and engagement.

The planned biosphere reserve is large, and work will begin later on to set up branches of the central office in the reserve. As a first step in these efforts, work is now underway to identify potential 'biosphere embassies' where residents and visitors can get information about current activities in Vindelälven-Juhtatdahka and how to get involved. Possible biosphere embassies include service facilities in the area, such as supermarkets, petrol stations, tourist offices and nature information centres. The size of the reserve also makes it necessary to provide regularly updated digital information. A lot of time and effort was therefore spent during the candidacy on building and updating the reserve's website and spreading information on social media (Facebook and Instagram).

13.6 What are the expected main sources of resources (financial, material and human) to implement the objectives of the biosphere reserve and projects within it? (Please provide formal commitments and engagements.)

More detailed information about the planned biosphere reserve can be found under 17.4.11. Core support for the biosphere reserve is provided by the Swedish Agency for Marine and Water Management (Havs- och Vattenmyndigheten, HaV). The six municipalities of the river valley and the county administrative boards of Västerbotten and Norrbotten also provide financial contributions on an annual basis. The World Wide Fund for Nature, WWF, provided financing in the form of core support and ready funds during the candidacy period, and it is hoped that the organisation will choose to continue supporting the planned biosphere reserve for a further few years. The ambition is to increase the budget following the nomination, in order to be able to initiate more sustainability projects and link up with other sustainability work being done in the area. This includes an expansion of the biosphere central office with more staff to be distributed geographically. Possible financial backers include the EU's Northern Periphery and Arctic Programme (NPA), EU-Life and Interreg Nord.

The board is an important resource in the work to build networks and cooperation within the reserve area. The municipal working group ensures that municipalities' interests are considered in the biosphere process and that support for it is garnered in the municipalities. Many of the representatives on the board, and all of the members of the working group, are financed by the respective organisations, authorities and municipalities. It is primarily self-employed board members who request compensation for participating in the board's work, due to loss of income.

One important task and challenge for the biosphere organisation is to 'get the ball rolling' and be able

to demonstrate good examples, so that more people see the benefits of the biosphere process and therefore get involved, without demanding financial compensation.

14. CONSERVATION FUNCTION:

14.1. At the level of landscapes and ecosystems (including soils, water and climate):

14.1.1 Describe and give the location of ecosystems and/or land cover types of the biosphere reserve.

Below are descriptions of habitats based on the continuous habitat mapping of protected areas system (Kontinuerlig naturtypskartering av skyddade områden, or KNAS), but in which similar habitats have been grouped into bigger, compound categories, such as forest habitats and wetlands. The KNAS classification of habitats comprises 32 different habitats. Annex 7 lists the reserve's Natura 2000 habitat types.

14.1.1.1 Mountain heaths

This habitat occurs at the source of the River Vindelälven. Around Ammarnäs are the high mountain areas of Guvertfjället, Ammarfjället and Björkfjället (see Figure 6) which extend northwards towards Laisälven's river valley. Above the tree line are extensive natural mountain heaths dominated by stunted and creeping shrubs and brushwood. The soils are usually deficient in lime, but lime-rich areas with occurrences of various lime-loving and unusual vascular plants can also be found. Mountain heaths are important pasturing areas for reindeer, and the vegetation has often been affected by and become dependent on long-term reindeer pasturing. Other grazing animals, e.g. rodents such as Norway lemmings, also affect the structure of the vegetation.

14.1.1.2 Glaciers

A few small glaciers or occurrences of residual ice altogether cover an area of 0.5 km² in the mountain region.

14.1.1.3 Mountain birch forest

Mountain birch forests extend like a narrow frontier zone between the lower reaches of the bare mountain heaths and the upper limits of the coniferous forest. Downy birch (*Betula pubescens ssp. czerepanovii*) dominates the tree layer. In the lower areas close to the coniferous forest, there is often also low Norway spruce (*Picea abies*) and juniper (*Juniperus communis*). Woodland areas are divided into moorland birch forest, whose field layer is dominated by brush and low herbs, and downy birch forest, dominated by tall herbs. Important structuring factors in mountain birch forest include grazing cloven-hoofed animals and rodents, and the autumnal moth. As a rule, these forests are not affected by forestry, but are instead undisturbed or primeval forests.

14.1.1.4 Boulder and substrate terrain

These areas are characterised by large boulders and usually more or less impassable steep slopes. This habitat is common in mountain regions, but also occurs to some extent in the interior and among the hills and rocky terrain of the coastline. The terrain is characterised by a thin litter layer and thus fairly meagre and low-growing vegetation. Boulder terrain at the foot of some south-facing mountain slopes or cliffs is home to a differing flora, with more thermophilic species than is normal for the region.

14.1.1.5 Wetlands

Bogs are characterised by large open areas where sphagnum mosses proliferate. They can be made up of different types of bogs, along with other connected habitats. Aapa mires are the dominant type of bog in the reserve. String bogs or 'flark bogs' are common, where wet areas alternate with clearly distinguishable, raised, drier ridges, or strings. In areas of richer soil, with occurrences of lime-rich bedrock, are rich fens, with a special flora and fauna (especially molluscs). Some bogs have small springs, sometimes known as *källkupoler*, where groundwater wells up. These stable habitats with particular conditions are home to a number of plants and mosses that are specific to them.

The largest continuous wetland (10 km²) lies between Sorsele and Slagnäs. The area also includes the

Lässejaure Bird Protection Area, where large numbers of wetland breeding birds congregate, and the Lycksamyran Nature Reserve. Sikmyran in Lycksele municipality is a good example of a varied bog with large numbers of breeding waders and good wetland habitats. The primeval mountain forests in Vindelfjällen and Laisdalen nature reserves also contain large continuous bogs with a high natural value. Smaller bogs exist throughout the planned biosphere reserve. Open bogs used to be more common near the coast, but many have been drained to create more farmland as well as increase forest production.

14.1.1.6 Forest and scrubland

Most of the planned biosphere reserve is characterised by woodland. Forests extend from the edge of the mountains down to the coast. The most common are pine and spruce-dominated commercial stands. Occurring within these forests are often deciduous trees including birch (*Betula pubescens* and *B. pendula*), aspen (*Populus tremula*), sallow (*Salix caprea*) and mountain ash (*Sorbus aucuparia*). To a lesser extent, there are also stands dominated by deciduous trees (see Figure 8 in Chapter 12). Areas of undisturbed, virtually primeval boreal forest exist in various types of reserves and in the mountains. The big forestry companies set aside woodland for development.

Forestry is the most common land use in this habitat. A large share of the woodland is therefore made up of commercial stands at different stages, from recently cleared to sown or planted woods of various ages. Commercial forests end up with a species structure that differs in part from self-rejuvenating undisturbed forests. About 20 % of the forests have never been subjected to clear cutting, and less than 1 % are primeval forests that have never been affected by any form of forestry. Land owners who have FSC-certified their forests are obliged to protect at least 5 % of productive land for nature conservation, including key biotopes and other protection-designated forest (read more under 15.4.4). Overall, more original forest remains in the montane areas, while the coastal region has a longer history of cultivation (see Figure 8 in Chapter 12).



Image 41. Farmer in Saxnäs. Photo: Ola Jennersten



Image 42. Farmer at Leva farm. Photo: Ola Jennersten

14.1.1.7 Agricultural land

Agricultural lands have been used as fields for crops, hay meadows for winter fodder, or pastureland. They are generally located near areas with sedimentary soils – river sediment, or snowmelt sediment – by former coastlines. The sedimentary soils along the river's lower course, near the confluence with the River Umeälven, form a wide coastal plain. This widens further near where the River Umeälven flows into the sea, forming one of the biggest continuous areas of arable land north of the River Dalälven. This arable land stretches further out into the Umeälven delta as an expanse of wet semi-natural pastureland. The cultivated landscape narrows further upstream along the river, eventually forming islands in a forest landscape before ending in Ammarnäs in a large, grazed delta area.

Agricultural lands are used above all for ley, grain and root crop farming, as well as pasturage. The largest areas of agricultural land lie close to the coast, principally around Umeå and Vännäs. Major agricultural acreage is also found around the Vindelälven localities of Vindelö and Hällnäs, as well as around Rödåsel

and the surrounding smaller villages. Upstream from Hällnäs there are scattered agricultural lands in e.g. Strycksele, Åmsele and Gargnäs, as well as Sorsele. Many villages and individual farms are scattered throughout the area, frequently far from main roads and occasionally without passable roads, though the latter are usually abandoned. There are also older settlements in the mountain areas, often surrounded by the remnants of fine hay-making meadows. Closer to the edge of the mountains is the Ammarnäs delta in the Gautsträsk area, with recently restored semi-natural pastures.

14.1.1.8 Settled land

Larger built-up areas can mainly be found along the coast, particularly around Umeå and Vännäs. There are smaller population centres and villages along the River Vindelälven, including Vindeln, Hällnäs, Åmsele, Rusksele and Sorsele. Higher up, on the edge of the mountains, the scenic mountain village of Ammarnäs, with a history going back to the 17th century, is located. In the upper reaches of the Laisälven river valley is Adolfström, which was originally a silver-mining community, but which has recently become a popular tourist destination. Settlements in the agricultural areas are divided into smaller groups.

14.1.1.9 Lakes and watercourses

The free-flowing River Vindelälven is the longest watercourse in the reserve, at 450 km. A large number of tributaries flow into it, of which the River Laisälven is the biggest. Other tributaries include the River Krycklan and the River Arvån. Vindelälven in turn is a tributary of the slightly bigger River Umeälven. Major lakes in the reserve include, for example, Lake Stor-Tjulträsket, Lake Storvindeln and Lake Storlisan, above which is a system of three more or less contiguous lakes – Gautosjön, Tavelsjön and Stöcksjön. Most waters in the planned biosphere reserve are oligotrophic, with a low level of primary production in the waters themselves and a generally sparse vascular flora. Nymphaeaceae (water lilies) and macrophytes border the shores, on which a low meadow vegetation grows. For more information on the flora and fauna of lakes and watercourses, see 11.6.9. Many lakes have swamps in close proximity to the water.

Variety is greater in the larger watercourses, with rapids edged by barren, lichen-covered rocky or boulder banks, and stretches of smooth water with wide, sediment-rich shore areas where rich meadow vegetation grows in distinct zones. Aquatic vegetation is similar to that in lakes. Shoreline zones are characterised by herbs and grasses at lower levels, with a willow-dominated shrub zone higher up towards the coastal forests. These shore areas are among the country's most species-rich habitats.

The watercourses and their lakes have been used for hydropower purposes and as transport routes during different epochs (see 9.1).

14.1.1.10 Estuaries

The River Umeälven's approximately 1,300-hectare delta, with the Österfjärden and Västerfjärden distributaries, is a representative example of a large, moderately impacted estuary with a valuable diversity of habitats and rich, varied flora and fauna. It is a changeable area whose sediment transport, combined with land elevation, deposits sediment in a shallow delta of channels and islets. Depth and flow speed vary depending on the river's flow rate and the sea level. The area is dominated by sedimentary soils with sand in the upper part, and fine sediment in the delta front and the distributaries. The lower parts of the distributaries are edged by moraine soils, and in a couple of places by rock outcrops. The area is surrounded by forest and agricultural land. A particular feature of the area, due to land elevation, is successional stages, e.g. from sand banks without any vegetation, via vegetation-rich coastal meadows to willow thickets, stands of grey alder, and finally to spruce and pine forests. The delta itself is characterised by riparian broadleaved forests, wet meadows, fens and sandy beaches with perennial vegetation and shallow water habitats. Rich plant and animal communities, home to several red-listed species, are found here. There are valuable spawning areas in the delta.

14.1.1.11 Marine habitats

The marine habitats outside Holmsund and Obbola in Umeå municipality consist of a fairly shallow archipelago rising at approximately 10 mm per year due to glacial rebound. There are shallows, rock islets that have recently risen above the water level, and small, wooded skerries here, forming a varied

and valuable habitat. Among the larger islands are Tarv and Bredskär. These rock islets, skerries and islands have significant value for breeding sea birds, out of the reach of nest-raiding minks. Thread algae of various kinds grow on exposed sea beds and are an important food for amphipods. More exposed stones are home to sponges, while more protected sea beds are covered in helophytes and charophyceae, forming a vegetation that offers good protection for fry. Offshore shallows can be valuable for spawning fish. The area is used primarily for fishing and outdoor recreation.

14.1.2 Describe the state and trends of the ecosystems and/or land cover types described above and the natural and human drivers of the trends.

14.1.2.1 Mountain heaths

The status of the mountain heaths within the reserve is currently good. Many of them make up the principal area for reindeer husbandry; reindeer grazing is deemed important for biological diversity as long as overgrazing does not occur. There is concern that as the climate warms, the tree range will extend to higher altitudes at the expense of mountain heaths.

14.1.2.2 Glaciers

Just about all Swedish glaciers have been generally reduced in size as a result of the warming climate; it is likely that this also applies to those glaciers which are within the biosphere reserve. Shorter winters are expected in the future, but in this area increased precipitation is also expected. This may lead to glaciers initially increasing in size, but then, as temperatures get even higher, to their shrinking and eventually disappearing.

14.1.2.3 Mountain birch forest

The natural dynamic of the mountain birch forest is governed above all by avalanches, reindeer grazing and local insect outbreaks – mainly autumnal moths that kill the birch. The forest recovers quickly, however, with new stands of birch growing where old ones stood. Climate change is expected to allow mountain birch forests to expand up the mountain slopes, while the lower parts of their range are expected to turn gradually into spruce and pine forest. This change is expected to proceed slowly, however.

14.1.2.4 Boulder and substrate terrain

Due to its inaccessibility, this terrain often forms stable habitats where impact has generally been, and will continue to be, limited. Still, if a cliff becomes a popular destination for climbers, this will imply a risk of vegetation wear. So far the extent of this development is likely to be limited.

14.1.2.5 Wetlands

A large proportion of the wetlands in the reserve is affected by draining. The greatest impact is in the wetlands closest to the coast, where draining by means of ditches has been done to create farmland as well as to increase forest production. Today, many drained wetlands become overgrown by trees and shrubs, but these are often drained again as it is legal to clear ditches, but not to dig new ones without a permit. Higher temperatures will increase evaporation from bogs during the summer, which could cause the bogs to become drier. Increased precipitation could compensate for this effect. Higher temperatures could also cause the species structure of bogs to change. Should evaporation be greater than precipitation, bogs would become drier and decomposition increase as oxygen penetrates the peat.

14.1.2.6 Forest and scrubland

Undisturbed forests are sparsely distributed, with the largest areas in montane regions. A recovery process is still underway in these forests, where more or less impacted woodland is slowly returning to conditions more like those that prevailed before the advent of forestry.

Extensive forestry has been carried out in the planned biosphere reserve for a long time (see 9.1). This history stretches back about 150 years, with a long period of selective harvesting, in which the very largest trees were felled. Forestry changed with the introduction of cyclical forestry around the middle of the 20th century. Almost 80 % of felling since 1950 has used this method. Land is reforested through sowing or plantation, sometimes with species not indigenous to Sweden (see 11.6.6). The impact is greatest near

the coast, where the history of forestry is longest, and diminishes towards the mountain regions.

In 2016, 2 % of potentially tree-bearing areas in Västerbotten consisted of clear-felled land and up to two-year-old stands. This represents a felling rate of about 1 % of the productive areas per year. 63 % of the areas have 3 to 80-year-old stands.

Forestry impacts forests in many ways. The share of mixed forests and forests with trees of varying age is small; old trees and dead wood occur in different phases of decay and are often in short supply. Conditions have thus worsened for species tied to these habitats, and as a result a number of species are currently listed as threatened to varying degrees. Since these problems were raised, the forestry industry has worked to develop ways of increasing the amount of dead wood in production forests with the aim, among others, of improving habitats for red-listed species. One ambition is to establish several different forestry methods in addition to cyclical forestry. In FSC-certified forests, landowners are furthermore obliged to protect at least 5 % of productive land for nature conservation (see 15.4.4). This includes key biotopes and other protection-designated forest. A forest's water can be affected if the strip of surrounding forest, the border zone, is too narrow or non-existent. The border zones preserve important soil chemistry processes, provide shade for the watercourse – which guarantees a stable temperature – and contribute nutrients to the watercourse in the form of organic material.

Today the forest impact analyses (skoglīga konsekvensanalyser, SKA), carried out by the Swedish Forest Agency and the Swedish University of Agricultural Sciences, of current and expected future timber balance in various parts of the country, do not just include the economic impacts, but also ecological and social consequences. These analyses result in evaluations of different scenarios in which both sustainability and vulnerability are considered. Productive forest areas are divided into four categories: reserves, voluntary allocations, consideration areas and timber production land. The impact analyses are intended to provide decision guidance for strategic considerations and decisions on management and use of forest resources.

Climate changes, including higher temperatures, will affect forests in several different ways. Warmer summers, milder winters, shorter periods with snow cover and occasionally snowless winters, increased precipitation, and consequences for the characteristics of the snow cover are all factors. Changes to species communities will include species with a southerly distribution migrating northwards and specialised northerly species being forced out. The dynamic among the populations of small rodents will change, which will affect their predators. The risk of outbreaks of insect pests will increase and, if summers become warmer, the increased frequency of forest fires will favour insects and plants associated with burnt terrain. The growth of biomass may increase, which would be positive for forestry.

14.1.2.7 Agricultural lands

Today there are large, open expanses of agricultural land around Umeå and Vännäs. There is also agricultural land around most of the villages that extend like a string of beads along the Vindelälven river valley. Much of this is former agricultural land, however, and currently fallow. In general, agriculture in the lower parts of the reserve area – along the lower course of the River Vindelälven and along the River Umeälven – has become more intensive, with larger drained fields and fewer open ditches. In the Ammarnäs delta and also farther down along the river, in e.g. Övre Saxnäs, Åmsele and in the Rödå area, there is excellent semi-natural pastureland (see 15.3.1 and 15.3.2) with free-range cattle keeping the terrain open. With the cessation of cultivation in many places, however, much of the area's former agricultural land is becoming overgrown. Deciduous brushwood and more or less broadleaf-dominated forest have invaded these lands. Modern agriculture methods and the overgrowth of abandoned agricultural land have reduced the viability of species associated with older agricultural methods. However, some of these plant species are able to find living space along road verges. Climate changes could mean that new crops can be grown in the area. Wild species that are of a more southerly provenance and are favoured by agriculture could also spread northwards to the reserve area.

14.1.2.8 Settled land

The densely populated areas around Umeå, Vännäs and Vännäsby are still expanding. In many of the inland villages, however, populations are declining. The spread of settlements is governed to a considerable degree by the availability of jobs. Many of the settlements that were established after the 19th century relied on agriculture and forestry. Conditions for agriculture changed after the 1930s and 1940s, and forestry was made more efficient in the 1950s, with the result that fewer people were able to make a living from these activities. Since then, migration to regional centres and cities has continued. Particularly over the last two decades, abandoned farms have become an increasingly common sight.

14.1.2.9 Lakes and watercourses

The River Vindelälven is protected from hydroelectric power development. In the lower River Umeälven, however, downstream from Stornorrforss power station (see Figure 5), is an approximately 7-km-long stretch of the river that is almost completely dry during certain times of the year. In the period from May to September, when the salmon migrate upriver to spawn, water is diverted to the old river channel in order for the fish to be able to reach the dam and the fish ladder that is there. There are also a number of smaller hydropower stations in tributaries of the River Vindelälven, including one in Rödån, two in Åman and one in Giertsbäcken. The demolition of the lower power station in Åman is planned for June 2018 in order to restore the aquatic habitats.

Many of the river's rapids also have remnants from the log-floating era. The devices that remain today have a limited effect on the life of the river. Extensive restorations have been carried out in tributaries in order to promote the diversity of their aquatic life. Between 2010 and 2015, the Vindelä River Life project involved the restoration of 25 tributaries over a total distance of 60 km. Most lakes and watercourses in the planned biosphere reserve have a good high ecological status with respect to hydromorphology and water chemistry. Due to international atmospheric fallout, however, the limit values for mercury are exceeded in almost all Swedish waters, which means that the chemical status does not reach a 'good' level. Eutrophication of lakes is not a major problem in this area, but local instances of polluted and badly constructed drains can contribute to over-fertilisation. Incorrectly placed road drains, and the introduction of non-native fish species can also cause problems for life in the watercourses. Most lakes and watercourses in the area are classified as having a good status with respect to acidification.

Research indicates that a changed climate will have extensive effects on freshwater animals and plants. Thinner ice, shorter ice seasons, increased runoff as a result of increased precipitation, altered water flows, more precipitation as rain instead of snow, and earlier snow melts are all important factors that affect the rivers. In lakes, water levels, temperatures and stratification will be affected. The number of species in lakes and watercourses, of both plants and animals, is expected to decline. Riparian forests and willow thickets, which are the most species-rich habitats along rivers, will decline in extent. Species tied to cold waters risk disappearing, and species that tolerate warming may take over. The species composition of waters' ecosystems will thus change, which in turn will affect fish-eating birds, for example.

14.1.2.10 Estuaries

One of the most important factors for the formation of the delta at the mouth of the River Umeälven is the sediment transported there and the build-up of new shallows and islets, where land elevation contributes as well. As a result of the major dam at Stornorrforss, sediment transport is somewhat limited, which will affect the estuary's natural development in the long term. Rising sea levels due to a warming climate may also have an effect on the estuary's development. Canadian waterweed (*Elodea canadensis*), an invasive species, is present in the estuary, and in Österfjärden the New Zealand mud snail (*Potamopyrgus antipodarum*) has been observed. Österfjärden, which is part of the Ume delta, has been affected to some extent by dredging in the main river channel as well as along the shores. Västerfjärden has been less affected by dredging, but also has areas with modified shore habitats.

The government gave the Swedish Rail Administration permission to build the Bothnia Line through the Natura 2000 area, and the railway overlaps it for about two kilometres. To compensate for this, five compensation areas were set up as stopover sites for birds, with good results. These areas are part of a nature reserve along with most of the delta.

14.1.2.11 Marine habitats

This habitat type is represented by a band, barely a kilometre wide, outside Holmsund and the Obbola peninsula. One of the most important geological characteristics of Fennoscandia is the continuing land elevation, which makes this area gradually shallower. The waters outside the Obbola quay area are crossed by a sea lane much used by ferry and freight traffic. There are problems with non-native species, mainly Canadian waterweed (*Elodea canadensis*), competing successfully with native species. Mink (*Mustela vison*), too, is a threat as a nest predator of breeding sea birds. The impact is smaller outside of the Obbola peninsula and to the west of it, and here the ecological status is good.

14.1.3 What kind of protection regimes (including customary and traditional) exist for the core area(s) and the buffer zone(s)?

A biosphere reserve implies no new restrictions regarding ownership rights, exploitation rights or user rights. Neither does the zonation of the planned Vindelälven-Juhtatdahka biosphere reserve imply any new legislation; instead the zonation ideas are supported by existing environmental legislation (Miljöbalken, or the Environmental Code).

Within Vindelälven-Juhtatdahka, 430,676 ha or about 32 % of the total area is formally protected (34 % when voluntary allocations are included, see Figure 10). Nature protection areas in the various zones are presented in Table 15.

Table 15. Nature protection areas (in hectares) in core, buffer and transition areas

	<i>Core area</i>	<i>Buffer</i>	<i>Transition</i>	<i>Total</i>
Protected	1595	107,458	766,358	875,411
Formally protected*	19,253	293,252	118,171	430,676
Voluntary allocations	17	1997	21,017	23,031
Total	20,865	402,707	905,546	1,329,118

*Includes nature reserves, landscape protection agreements, landscape protection areas, natural monuments, biotope protection, specific animal and plant protection areas, the Natura 2000 Habitats Directive (SCI), the Natura 2000 Birds Directive (SPA).

The boundaries of the zones have been set on the basis of existing protection as regulated in Miljöbalken, MB (the Environmental Code, (see 9.3):

Core areas

- Nature reserve (Delta of the River Umeälven, MB Ch 7, Sections 4-8)
- Natura 2000 (River Vindelälven, MB Ch 7, Section 28 a)
- National river (River Vindelälven, MB Ch 4, Section 6)

Buffer areas

- National interest – landscape protection, cultural heritage protection, outdoor recreation (all MB Ch 3, Section 6), and reindeer husbandry (MB Ch 3, Section 5).
- Shore protection (surrounding lower Umeälven, MB Ch 7, Section 14)
- Nature reserve (MB Ch 7, Sections 4-8)

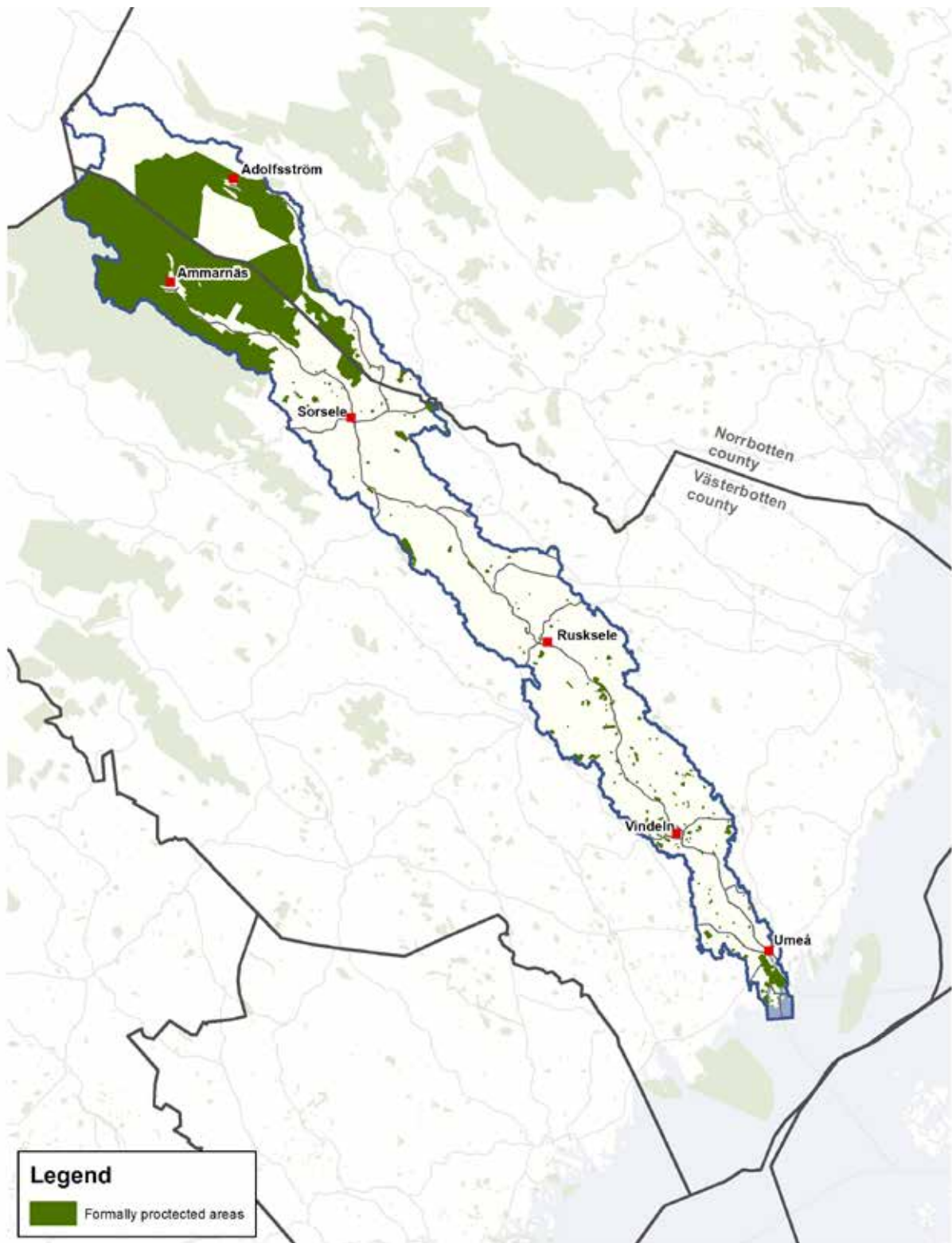


Figure 10. Formally protected nature within the planned biosphere reserve

14.1.4 Which indicators or data are used to assess the efficiency of the actions/strategy used?

Sweden's parliament has defined 16 national environmental quality objectives for environmental policy and work. They describe, in qualitative terms, the result that environmental work is to achieve, and milestone targets to serve as steps along the way. In the proposed biosphere reserve, work towards the Flourishing Lakes and Watercourses, Thriving Wetlands, Sustainable Forests, A Varied Agricultural Landscape, A Magnificent Mountain Landscape quality objectives is prominent in terms of conservation of the various habitat types. A number of Swedish authorities are involved in different measures that have to be followed up and reported annually to the government, but much work remains in order for the objectives to be achieved.

The Swedish Environmental Protection Agency has drawn up guidelines for how protected areas should be planned and implemented. There are defined goal indicators for each designated habitat and species which are regularly followed up. These follow-ups are done at intervals of three, six or twelve years. For designated lands, waters, and species within the proposed biosphere reserve, follow-ups are carried out in accordance with *Manual för uppföljning i fjäll- och substratmiljöer i skyddade områden* ('Manual for follow-ups in mountain and substrate environments in protected areas' published by the Swedish Environmental Protection Agency in 2010) and with Västerbotten and Norrbotten counties' plans for following up protected areas. A detailed list of the goal indicators and variables that are used for follow-ups of protected areas within the proposed biosphere reserve is shown in Table 16. The results of follow-ups are also used at the national level of implementation of environmental quality objectives.

Table 16. Goal indicators for the eight different habitat types. Unless otherwise specified, the follow-up for each habitat type is carried out by the county administrative boards in Västerbotten and Norrbotten.

Habitat type	Goal indicators
Estuaries	<ul style="list-style-type: none"> – Area – Hydrology – Development – Barriers to fish migration (Partly followed up by county administrative boards, but also by the Ume-Vindelälven fishing council) – Typical bird species (Partly followed up by county administrative boards, but also by other, smaller stakeholders)
Mountain birch forest	<ul style="list-style-type: none"> – Aerial survey
Glaciers	<ul style="list-style-type: none"> – Aerial survey
Marine habitats	<ul style="list-style-type: none"> – Area – Development – Turbidity
Natural heathland	<ul style="list-style-type: none"> – Off-road driving damage
Lakes and watercourses	<ul style="list-style-type: none"> – Area – Development – Hydrology – Water chemistry (Swedish Agency for Marine and Water Management) – Barriers to fish migration, <i>Vandringshinder</i> (Partly followed up by county administrative boards, but also by the Ume-Vindelälven fishing council) – Regeneration of freshwater pearl mussel – Regeneration of salmon
Forest and scrubland	<ul style="list-style-type: none"> – Area – Tree species distribution (Riksskogstaxeringen, the national forest survey, SLU) – Hydrology – Area of fire-damaged forest – Logging and reforestation (Swedish Forest Agency) – Dead wood (Riksskogstaxeringen, the national forest survey, SLU) – Typical bird species – Typical fungi/lichen – Occurrence of orchids and other less common vascular plants
Wetlands	<ul style="list-style-type: none"> – Area – Draining ditches – Typical bird species (Partly followed up by county administrative boards, but also by other, smaller stakeholders)

14.2 At the level of species and ecosystem diversity:

14.2.1 Identify main groups of species or species of particular interest for the conservation objectives, especially those that are endemic to this biosphere reserve, and provide a brief description of the communities in which they occur.

The Vindelälven river valley is a large and species-rich area. An extract from Artportalen (the Species Portal) of those species which have been placed on the national red-list in Artdatabanken (the Swedish Species Information Centre) shows that there are as many as 488 red-listed species identified for the area

(see Annex 12). Categories in the national red list are e.g., CR (Critically endangered), EN (Endangered), VU (Vulnerable), NT (Near threatened), LC (Least concern).

Reindeer and elk, cloven-hoofed animals that have lived and moved along the river since time immemorial, and which have been an important source of food for the human population, are today important for humans as well as for the ecosystem as a whole along the river valley. All five big predators – bear, wolf, wolverine, lynx and the golden eagle – are present in Vindelälven-Juhtatdahka.

14.2.1.1 Mountain heaths

The mountains are home to a characteristic flora and fauna, with species well-adapted to the specific conditions there. Snowy owl (*Bubo scandiacus* CR), horned lark (*Eremophila alpestris* VU) and Arctic fox (*Vulpes lagopus* EN) are species strongly associated with the open mountain heaths, while lesser white-fronted goose (*Anser erythropus* CR) thrive by the lakes and bogs of the mountain heaths. Polaris fritillary (*Boloria polaris* EN) is an endangered species well-adapted to mountain heaths. The Arctic fox is an example of an endangered mountain species that still survives and occasionally manages to regenerate within the planned biosphere reserve. Its success is strongly linked to lemming and vole cycles, monitored by means of vole inventories of the mountain regions. In good years for small rodents, the Vindelfjällen mountains have had the highest concentration of Arctic fox dens in the entire mountain chain. Populations of lesser white-fronted geese are declining globally. The planned biosphere reserve includes a central area for this species of goose by the source of the River Laisälven. The population there has grown as a result of a restocking project, and appears to have become stable.

14.2.1.2 Mountain birch forest

A large proportion of mountain birch forests is classified as primeval, which means that there are minimal traces of human impact. These areas are home to beetle species such as *Thymalus oblongus* VU and *Laemophloeus muticus* VU, both of which are dependent on a good supply of dead birch wood. The lichens *Evernia mesomorpha* VU, *Lobaria scrobiculata* NT and *Calcarius lapponicus* VU are all species that thrive in this leafy habitat near the edge of the mountains.

14.2.1.3 Wetlands

Hudson Bay sedge (*Carex heleonastes* EN) grows primarily in wet and lime-rich areas, but also along the shores of streams. In rich fens, the whorl snail (*Vertigo geyeri* NT) can also be found. Taiga bean goose (*Anser fabalis* NT), along with a variety of waders and ducks, breed and stop over in the large wetland habitats.

14.2.1.4 Forest and scrubland

The reserve is home to just over 200 endangered (categories CR, EN, VU) fungi, lichen, mosses and insects. Most are endangered due to a lack of suitable structures and habitats, e.g. *Antrodia crassa* (CR), lung moss (*Lobaria hallii* CR) and black fir sawyer beetle (*Monochamus urussovii* EN), which are all uncommon in the area. The woodlands are also home to three protected orchids: the fairy slipper (*Calypso bulbosa* NT), the ghost orchid (*Epipogium aphyllum* NT) and the lady's slipper (*Cypripedium calceolus* LC).

14.2.1.5 Agricultural land

The old cultivated grasslands of the river valley are home to species associated with traditional farming, but which are endangered due to the closure of farms and the resulting reduction in cultivation. Along the entire stretch from coast to mountains, there are endangered species of fern in many localities such as the lanceleaf grapefern (*Botrychium lanceolatum* VU) and the northern moonwort (*Botrychium boreale* NT), which are associated with drier grasslands. In the area around Umeå, there are several valuable dry meadows on the slope towards the River Umeälven, with unusually northerly habitats for species, such as woodland draba (*Draba nemorosa* EN), thymeleaf sandwort (*Arenaria serpyllifolia*) and strict forget-me-not (*Myosotis stricta*). Snow gentian (*Gentiana nivalis*), wild strawberry (*Fragaria vesca*) and cat's-foot (*Antennaria dioica*) are also species threatened by the cessation of farming. The agricultural land in the coastal landscape is important from a national perspective for several breeding bird species, including curlew (*Numenius arquata* NT), ortolan bunting (*Emberiza hortulana* VU) and corncrake (*Crex crex* NT). The curlew is globally red-listed due to a continuing rapid decline in its worldwide population. During the

spring, the flat lands around Umeå and Vännäs are also nationally important stopover sites for migrating species including bean geese.

14.2.1.6 Lakes and watercourses

In its studies of the River Vindelälven's banks, Umeå University has estimated that they are home to almost 400 different vascular plants. This means that these banks are among the most species-rich habitats in the country. The river creates heterogeneous habitats that provide opportunities for many different species, and it also serves as a propagation corridor for plants. Mountain plants can spread far eastwards with the help of the river – an example of this is the moor-king lousewort (*Pedicularis sceptrum-carolinum*), also known as King Charles' sceptre in Sweden, the official provincial flower of Västerbotten. Aquatic vegetation, with plants such as the *Elatine orthosperma* (VU) waterwort, the *Persicaria foliosa* (NT) knotweed and water mudwort (*Limosella aquatica* NT), is uniquely well developed on some of the river banks. This is possible because there is still a natural water regime and disturbance dynamic. A variety of tufted hairgrass (*Deschampsia cespitosa* subsp. *glauca*) that occurs mainly on river banks in northern Sweden can also be found here. The freshwater pearl mussel (*Margaritifera margaritifera* EN) is an endangered species that used to be widespread until more or less industrial-scale pearl fishing was allowed. Today, the species is protected and survives in a few small brooks and streams that still have a good ecological function, or have undergone restoration. European crayfish (*Astacus astacus* CR) and otter (*Lutra lutra* NT) are other protected species that occur along the watercourses. Mayfly (*Brachycercus harrisella* VU) is another. *Persicaria foliosa* (NT) is an unusual species of knotweed that grows along muddy, periodically flooded river banks and stretches of shallow water. The Jämtland dandelion (*Taraxacum crocodes* VU) is endemic and currently has its main distribution in the River Vindelälven system, particularly along the River Laisälven.

Many of the 25 fish species in the planned biosphere reserve are important for angling as well as for household needs. Each river has its own stock of salmon (*Salmo salar* LC), and the River Vindelälven has significant potential for salmon production. Trout (*Salmo trutta*) occur in moving waters as well as in lakes at high altitudes, where there are no pike. In the higher Vindelälven area, there is a local stock of large, so-called Ammarnäs trout, capable of reaching weights close to 8 kg. Arctic char (*Salvelinus alpinus*) live in cold, clear waters, such as deep mountain lakes, where the main distribution can be found, but they also occur in montane forest lakes. Whitefish (*Coregonus lavaretus*) occur in several inland lakes. In Lake Storvindeln in the Vindeälven area are four ecotypes of whitefish, the peled (or storskallesik, an ecotype specific to Lake Storvindeln), large whitefish or storsik, sand whitefish or sandsik and plankton whitefish or planktonsik. The river banks and deltas are important stopover sites for many birds. For example, many lesser white-fronted geese (*Anser erythropus* CR) stop over by the Ammarnäs delta.

14.2.1.7 Estuaries

The *Elatine orthosperma* (VU) waterwort is an uncommon plant that occurs in the planned biosphere reserve. It is usually found along muddy shores with bare clay soil thinly covered with silt. Siberian lettuce (*Mulgedium sibiricum*) is a rare plant that occurs on flooded land along the River Vindelälven. The species lesser white-fronted goose (*Anser erythropus* CR), garganey (*Anas querquedula* VU), northern pintail (*Anas acuta* VU) and greater scaup (*Aythya marila* VU) stop over on the wetlands in the reserve on their migration, as does the lesser white-fronted goose, though it is unusual. The godwit (*Limosa* CR) is unusual and can be seen sporadically during the migration periods, while the bar-tailed godwit (*Limosa lapponica* VU) is often seen in large flocks during migration. The ruff (*Calidris pugnax* VU) remains a fairly common wader that breeds along wet sedge and grass meadows, as well as on bogs.

14.2.1.8 Marine habitats

Sea-lekking Grayling (*Thymallus thymallus*) is a species whose population and distribution has declined alarmingly. It is the only grayling population for which marine spawning has been established. Protected birds that breed on the area's islets, skerries and islands include greater scaup (*Aythya marila* VU), common eider (*Somateria mollissima* VU), ruddy turnstone (*Arenaria interpres* VU), lesser black-backed gull (*Larus fuscus* NT), Arctic tern (*Sterna paradisaea* LC), Caspian tern (*Sterna caspia* NT) and black guillemot (*Cephus grylle* NT). Two species of seal, grey seal (*Halichoerus grypus*) and ringed seal (*Pusa hispida*), are also found here.

14.2.2 What are the pressures on key species

In other words: what are the threats (example unsustainable management of forest), their immediate causes (drivers of change like forest change or habitat change), their underlying causes (example overgrazing, fire, pollution), and the main driving forces (example: economic, political, social, external, etc.) and the area(s) concerned?

In the large and heterogeneous area that constitutes Vindelälven-Juhtatdahka, many key species are endangered in different ways. The biggest threats are described below.

The greatest pressure by far on montane plants and animals comes from ongoing climate change, and it is crucial that this is kept to a minimum. Already the red fox has encroached on the Arctic fox, expanding its range up the mountain heaths, probably as a result of increased temperatures. Norway lemming, which several species are dependent upon, has also declined as a consequence of warming. If warming continues, it is likely that several montane species will find it difficult to survive.

Forest wetlands are threatened above all by road building and off-road driving. These can alter the hydrology, which in turn can have consequences for the species composition of plants, such as mosses, as well as animals, such as birds that stop over or breed in the area. If peat extraction for energy production ever becomes a reality, the wetlands would be completely destroyed.

Threats against woodland are mainly in the form of altered forest habitats. The principal factor behind such change is forestry, which affects both the structure of the forest and the availability of vital resources for many species. For example, there are markedly fewer tree hollows in which birds can nest in commercial forests than in undisturbed forests. In new growth and cleared areas, the amount of dead wood, needed by woodpeckers among other species, is low. The incidence of deciduous trees has also declined in commercial forests, particularly because of a high elk density increasing the feeding pressure on leaf-forming trees, such as mountain ash, aspen and willow. This affects beavers, which only eat wood and bark from deciduous trees and therefore find it harder to become established in areas where these are limited.

In the reserve's watercourses, threats against aquatic species are primarily in the form of effects of climate change. The M74 disease, which infects Baltic salmon and is considered to be environment-related, is another threat. The salmon have furthermore presented new, virus-like symptoms as they enter the river mouths. For reasons hitherto unknown, the Ume-Vindelälven rivers appear to be one of the hardest-hit water systems in the country. For fish, there are additional threats in the form of barriers to migration – principally the hydropower dam at Stornorrfors, remaining timber flotation structures and road drains – and to some extent overfishing. However, the threats from migration barriers and overfishing have been reduced over the last decade following effective measures by a number of stakeholders, from the EU level down to owners of individual waters. It is hard to predict the effects of climate change (and the associated rise in water temperatures), but it can safely be assumed that species that depend on cold water, such as the Arctic char, will face more difficult living conditions.

In agricultural areas, changed methods of cultivation constitute a threat to key species and diversity, particularly in meadowland and semi-natural pastureland. Various types of wetland are also affected here. Modern mowing equipment, early mowing and manuring are disadvantageous for a large number of species. Meadow flora, once rich in species such as oxeye daisy, is now often limited to road verges. Forest planting and natural overgrowth of abandoned farmland also constitute threats to species diversity. Among the species at a disadvantage on such land are ferns.

Non-native, invasive species are a threat in several habitats. For example, the lupine spreads quickly, pushing out native meadow plants and also altering the soil through its nitrogen fixation capacity. Dogwood is propagating along watercourses. In the estuary and the marine area by the mouth of the River Umeälven, Canadian waterweed and New Zealand mud snail constitute threats to native species, including key species.

Toxic pollutants are a danger in the port area of Holmsund, where the ecosystem is sensitive because

many species here are living close to the limit of their tolerance level in the brackish water.

14.2.3 What kind of measures and indicators are currently used, or planned to be used to assess both species groups and the pressures on them? Who undertakes this work, or will do so in the future?

A number of measures are underway, initiated and led by authorities as well as non-profit organisations. Methods for assessing the status of a species depend to a large extent on what species or group of species is being assessed. Examples are presented in Table 17.

Table 17. Various follow-ups, with indicators and entity responsible/provider.

Activity/Project	Measures/Indicators for assessment of pressure	Entity responsible/Provider
<i>Natura 2000, EU</i>	Monitor status of designated species.	County Administrative Board
Svensk Fågeltaxering (Swedish Bird Survey) The LUVRE project	Annual inventory of bird populations along standard routes. Inventory of breeding birds, ringing of breeding birds, registration of insects on birches, the flower of birches in mountain birch forests and mountain heaths in Ammarnäs.	County Administrative Board Lunds University, County Administrative Board
Migratory bird inventory	Counting of geese, swans and cranes that stop over in the Umeälven delta and surrounding flatlands.	Stiftelsen för naturvård i nedre Umeälven, Västerbottens ornitologiska förening County Administrative Board
Territory charting, birds	Bird inventory, Lake Brånsjön. Ortolan bunting, Umeälven delta. Birds that breed on bogs.	County Administrative Board
Species monitoring, willow ptarmigan Species monitoring, golden eagle	Monitor variations in population, including Ammarnäs. Inventory of known territories, number of young in nests counted.	County Administrative Board
Predator inventories	Annual occurrence of lynx, wolverine, bear, and wolf if any are present in the area. Observations of individuals, dens, tracks of different kinds (in snow), droppings and cull statistics as well as DNA analyses. Regeneration in <i>samebys</i> (basis for calculating compensation sums).	County Administrative Board
Species monitoring, Arctic fox	Use of and regeneration in dens.	County administrative boards, Stockholm University, Norwegian Environment Agency and NINA (Norwegian Institute for Nature Research)
Elk management	Elk density, forage access, occurrence of big predators (see above).	County Administrative Board, Swedish Forest Agency, elk management groups
Species monitoring, small mammals	Annual inventory using traps, Vindelö and Ammarnäs.	County Administrative Board, Swedish University of Agricultural Sciences
Species monitoring, freshwater pearl mussel Species monitoring, otter National monitoring programme, fish Grip on LIFE	Number of mussels, size, distribution, habitat. Droppings inventory. Regeneration of salmon and trout (electrical pulse fishing). Follow-up of restoration (electrical pulse fishing), the Vindelälven water system.	County Administrative Board County Administrative Board National LIFE project with the Swedish Forest Agency, county administrative boards and universities around the country Fish conservation areas
Development and management of fishing	Electrical pulse fishing	Fish conservation areas

Fish migration possibilities	Radiometry and tagging of fish.	Swedish University of Agricultural Sciences (Vattenfall, Leader Fishing Area Vindelälven, Stiftelsen Vindelälvsfiske)
EM map, monitoring of salmon and trout stocks	Numbers of broodfish migrating upstream, density of parr in nursery areas, migrating smolt that pass Stornorrfors power station.	Swedish University of Agricultural Sciences, Swedish Agency for Marine and Water Management, County Administrative Board
Metals and toxic pollutants in fish	Trends are studied in annual analyses of pike and char. The Stor-Tjulträsket marsh, Lake Storvindeln in Vindelälven.	County Administrative Board
Monitoring of biological diversity in Swedish landscapes	Changes in landscape composition and structure, inventories of e.g. butterflies, bumblebees, vascular plants.	NILS, nationell inventering av landskapet i Sverige (National Inventory of the Landscape in Sweden)
Designated species in protected areas	Aim as specified in management plan.	County Administrative Board
Vegetation monitoring in the mountains	Species composition, coverage degree.	County Administrative Board
Flora of Västerbotten	Survey of all vascular plants in the county.	Västerbottens botaniska förening (botanic society)

Aside from those in NILS (National Inventory of the Landscape in Sweden), no major coordinated insect inventories are made, but annual searches for particular species such as violet copper are carried out. For many insects, inventories are only made following targeted management. For example, inventories of the beetle fauna favoured by fires are only made after controlled burns – and this type of follow-up is intended as much to check the effects of the measure as to examine the population status of the species.

14.2.4 What actions are currently undertaken to reduce these pressures?

The Swedish Environmental Protection Agency carries out an annual follow-up of the Rich Diversity of Plant and Animal Life environmental quality objective. Nearly 30 Swedish authorities are involved in the work to attain the environmental quality objectives in their respective areas of activity. There are, for example, action programmes for a number of endangered species, and work is underway on a strategy for preserving biological diversity in cultivated landscapes. Measures have also been proposed to prevent crimes against species protection.

In protected areas, most of the follow-up is based on the goals defined for e.g. nature reserves, national parks, and Natura 2000 areas. There are specific goals for the various habitats in each protected area.

Protection of woodland, and other habitats, with a high nature value is actively ongoing throughout the biosphere reserve area. Existing nature reserves and other protected areas are managed in accordance with adopted management plans with the aim of preserving and developing nature value. A landscape perspective is increasingly being applied in this work, in recent years with growing consideration of species' ability to spread and move between different areas in what is known as a green infrastructure. Forestry companies and other landowners take nature value into account on the basis of legislation and requirements in environmental certifications, and there are significant areas of voluntarily allocated woodland.

County administrative boards work to protect certain species designated as particularly endangered within the framework of special action programmes for endangered species. These efforts are financed by the Swedish Environmental Protection Agency and the Swedish Agency for Marine and Water Management.

In agriculture, the EU's environmental aid is much used in order to be able to manage cultivated land. However, for a large proportion of grasslands with a high nature value associated e.g. with moonworts (i.e. ferns of the genus *Botrychium sp.*), environmental aid is not used. For this reason, an information campaign was carried out in the summer of 2017, aimed at all landowners below the cultivation limit, in

order to find out where habitats remained in which any of the moonworts might exist. Agricultural aid contributes to slowing the pace of farm closures and overgrowth of agricultural land. The Vindelälven Natural Pastures project restored pastureland along the River Vindelälven (see 15.3.1 and 15.3.2). Most farmers involved in this are still active, and there are plans to continue collaborating to maintain semi-natural pastureland.

Much has been done over the past decade to reduce the pressure on plants and animals in the watercourses. For example, most of the River Vindelälven's tributaries have been restored and a number of timber flotation dams have been demolished and replaced by rapids (in the Vindel River LIFE project, for example); the fish ladder past Stornorrfor's power station has also been improved for the benefit of salmon and sea trout. Together with limits imposed on sea fishing, the fish ladder has contributed significantly to the salmon population beginning to recover. A remaining problem, however, is that adult fish as well as smolt pass through the power station on their downstream migration, with significant mortality as a result. The Ume/Vindelälven Fishery Advisory Board, among other entities, continues to work to improve fish habitats by creating spawning beds and nurseries for trout. The Fishery Advisory Board is also working alongside researchers in the Retrout project with stocking of roe from sea trout, collected by Stornorrfor's power station, in some of the tributaries that had dwindling trout numbers or no trout at all prior to restoration. By stocking these tributaries with roe, they hope to speed up the otherwise slow recuperation process.

Stiftelsen Vindelälvsfiske (the Vindelälven Fishing Foundation) and Leader Fishing Area Vindelälven support and finance measures that contribute to long-term sustainable fish stocks, including strengthening management as well as research and follow-ups of this. The recipe for success in fish management of the Ammarnäs area has been collaboration between businesses and fishing rights holders, and rules for fishing.

In the conservation efforts for the severely endangered species Arctic fox and lesser white-fronted goose, the county administrative boards in Västerbotten and Norrbotten have been responsible for management of red fox in the mountain region. These efforts have now been intensified by means of the EU Interreg-financed Arctic Fox Together project, which began in 2016 and is run by the Norrbotten County Administrative Board. The project is a collaboration between Sweden, Norway and Finland. Efforts to protect the Arctic fox are also being made in the Felles Arctic Fox project, which is also receiving funds from EU Interreg until 2019.

Conservation measures are also being carried out in watercourses adjacent to the planned biosphere reserve. The ReMiBar project, financed by EU-LIFE, removes or adapts migration barriers, such as dams and road drains in order to create open migration routes that benefit aquatic animals.

14.2.5 What actions do you intend to take to reduce these pressures?

In recent years, various directives from the EU (the Water Directive) and the Swedish government (the environmental quality objectives and global goals) have had an increasing impact on water management. There is a strong commitment to achieving these goals. Backed up by directives and environmental objectives, entities including Leader Fishing Area Vindelälven and Stiftelsen Vindelälvsfiske (the foundation Vindelälven fishing) will contribute funds for measures that benefit the water habitats and sustainable fishing.

Action programmes for endangered species are continuously being developed and implemented in the counties and within the planned biosphere reserve. These are actions to protect species whose existence cannot be guaranteed under existing area protection measures. The implementation of action programmes is very dependent on understanding, cooperation and outreach work by administrators at the county administrative boards. This type of collaboration at the landscape level can serve to reinforce conservation value throughout the landscape. An example of this is how Västerbotten County Administrative Board, together with landowners (Holmen skog, Sveaskog, individual landowners, SCA, the Church of Sweden, Vindelns municipality and the Swedish Environmental Protection Agency), has

produced proposals for how deciduous forest habitats can be protected and developed in Vindeln municipality.

A national action plan for green infrastructure is being drawn up, and is due to be ready in the autumn of 2018. Västerbotten County Administrative Board is part of the national group of authorities overseeing this work (read more under 14.3.4).

A strategy for achieving the environmental quality objectives throughout Sweden's mountain regions has been drawn up by the Swedish Environmental Protection Agency on commission from the government. The planned measures include mapping different stakeholders' needs and claims in respect of land and water, supporting *samebys'* consultations and further development of reindeer pasturing plans, creating analysis tools for reindeers' needs and their significance for nature value and biological diversity, as well as an adaptation of off-road driving.

Several new nature reserves are in the process of being established in the planned biosphere reserve, which will be significant for a number of sensitive species.

Non-profit organisations, such as the Swedish Society for Nature Conservation, are willing to contribute in various ways to strengthen nature conservation in the planned biosphere reserve. This might include inventories of nature value and participating in spreading knowledge about such things as the value of ecological sustainability, ecosystem services and nature consideration in forestry, through training programmes, workshops and activities for interested forest owners, businesses and the general public.

14.3. At the level of genetic diversity:

14.3.1 Indicate species or varieties that are of importance (e.g. for conservation, medicine, food production, agrobiodiversity, cultural practices etc).

Section 14.2.1 describes species that are important from a conservation perspective. As mentioned earlier, 488 species on the national red list have been observed in the proposed biosphere reserve. A further number of species are referred to in the EU Habitats Directive.

With respect to species associated with agriculture, there may have been many breeds and types through the ages, but not that many remain in this area. The mountain breed of cattle (*Bos taurus*), with its origins in northern Sweden, was close to extinction during the rationalisation of farming in the 1950s and 60s. A cross-breeding programme saved the breed, and conservation efforts continue. In Vindelälven-Juhtatdahka, there is a herd of mountain cattle in the district of Vindeln. Another example is the Mandel (almond) potato (*Solanum tuberosum*), which is a type specially adapted to the cold conditions of Norrland.



Image 43. The reindeer is important for the Sami.
Photo: Ola Jennersten



Image 44. Almond potatoe from the potatoe hill in Ammarnäs. Photo: Ola Jennersten

In Sami culture, one of the most important endemic plants has historically been Norwegian angelica, or wild celery (*Angelica archangelica*), which grows in birch forests and has a high vitamin C content. One of its uses was as a preservative in reindeer milk (which was called gompa – the Sami name for wild celery), and the roots are still used for medicinal purposes.

The reindeer is of course essential for the Sami. In Sweden today there are only domestic reindeer (*Rangifer tarandus tarandus*). Reindeer herders historically had good access to reindeer, and made use of every part of the animal – fur, meat, blood and bones.

14.3.2 What ecological, economic or social pressures or changes may threaten these species or varieties?

The main threats to fish stocks are overfishing, pollutants and climate change. Fish populations at the edge of their range may be threatened by changes in the climate – not least by extreme weather situations, such as drought and high water temperatures.

The Stornorrfors power station area has been and continues to be a limiting factor for the development of commercially viable fishing. The limitations to fish migration in the area also mean that the environmental goals set by the EU and the Swedish parliament cannot be achieved without the application of further measures. In order for the important downstream migration to function satisfactorily, future measures are required. Today, the mortality rate among smolt migrating downstream is around 25 %, while for adult fish it is almost 75 %, as the fish have to pass through the power station's turbines.

Salmon (*Salmo salar*): faces many threats that are difficult to assess, e.g. diseases, genetic erosion and climate change. Problems for the upstream as well as downstream migration of salmon persist at Stornorrfors power station.

Trout (*Salmo trutta*), and in particular Ammarnäs trout, are exposed to several potential threats. One of these is competition over spawning areas with salmon, which in recent years have expanded their range upstream, and lake char (*Salvelinus namaycush*) introduced into Stortjulträsket, which are expanding downstream. Sea trout are exposed to the same problems as salmon. The problematic upstream as well as downstream passage through Stornorrfors power station is currently the biggest threat.

Arctic char (*Salvelinus alpinus*) are severely threatened by ongoing climate change, as warmer waters mean that other species get access to their habitats and may force them out.

The freshwater pearl mussel (*Margaritifera margaritifera*) is threatened by silting up of river beds and habitat deterioration caused by forestry, fragmentation of dams, water regulation and incorrectly placed road drains. The species is dependent on migratory fish for its rejuvenation and distribution; the threats against trout above all, but also against salmon, are therefore relevant for the freshwater pearl mussel as well.

The lesser white-fronted goose (*Anser erythropus*) has declined in numbers, primarily as a result of hunting during its migration and changes in land use. Other threats include the risk of genetic admixture with the closely related greater white-fronted goose, and predation on breeding grounds. Predators of the lesser white-fronted goose include fox and white-tailed eagle. The geese are particularly exposed during the moulting period, since the moulting process makes them unable to fly. They prefer to spend this period in the vicinity of water, where predatory pressure is lower.

The Arctic fox (*Vulpes lagopus*) is threatened by food shortages, which reduce litter size and kit survival rates, particularly during bad lemming years. The decline in numbers of predators such as wolverine and wolf has also led to a reduction in the number of cadavers, which are an important source of food for Arctic foxes. Both golden eagles and red foxes (whose numbers in the mountain regions and across the Arctic have increased) hunt Arctic foxes, and the latter is also a competitor over food. The declining population has led to inbreeding and genetic erosion, and also means that individuals have difficulties finding each other to mate. Sarcoptic mange (or scabies), probably spread by red foxes, and in some

locations rabies, are other threats.

Domestic reindeer, or reindeer (*Rangifer tarandus tarandus*) are dependent on functioning herding practices. Climate change and competing land uses, which make conditions for reindeer worse, may contribute to declining profitability in reindeer husbandry, which is a serious threat.

Other plants and animals

With respect to plants, potential threats include changes in grazing intensity, cessation of cultivation, climate change and invasive non-native species. Farming profitability can be difficult to achieve in the interior. Fjäll Mountain cattle and Mandel potatoes, both associated with such farming, may be directly impacted if farms close.

14.3.3 What indicators, at the level of the species, are used, or will be used, to assess the evolution of population status and associated use?

Indicators for assessing the status of populations are shown in Table 18. Information about fish catches are meant to be provided by those who obtain fishing permits, but this is not complied with to a degree that makes statistics reliable.

Table 18. Indicators for the assessment of the status of populations and traditions

Species	Indicator
Salmon	Counting of: <ul style="list-style-type: none"> -numbers, with the help of annual electrical pulse fishing. -salmon that ascend the river via the fish ladder at Stornorrfors prior to the spawning season. -fry survival rates. -salmon smolt that migrate with the help of a smolt trap.
Trout	Counting of: <ul style="list-style-type: none"> -numbers, with the help of annual electrical pulse fishing. -number of ascending trout that use the fish ladder at Stornorrfors prior to the spawning season. -fry survival rates. -trout smolt that migrate with the help of a smolt trap.
Arctic char	No national or regional monitoring at the moment, but research is ongoing at Umeå University that includes test fishing with nets in a number of lakes in the Vindelfjällen nature reserve.
Grayling	A lack of good measuring methods and knowledge limit the possibilities of an assessment.
Freshwater pearl mussel	Counting the number of individuals. Measuring mussel sizes to assess regeneration.
Arctic fox	Population size and individuals' survival through winter is calculated with the help of: <ul style="list-style-type: none"> -annual inventories. -camera surveillance of dens. -collection of droppings for DNA traces.
Lesser white-fronted goose	Counting of numbers at the stopover site in the Ammarnäs delta during migration.
Jämtland dandelion	Inventory of localities along the River Vindelälven.
Domestic reindeer	Mapping of pastureland, surveys of reindeer grazing and external factors.

14.3.4 What measures will be used to conserve genetic diversity and practices associated with their conservation?

Green infrastructure (14.2.4) is a prerequisite for genetic exchange within species. From the autumn of 2018, green infrastructure will be included in planning and priorities at all levels of public decision-making. County administrative boards will present regional action plans which will serve as planning guidance for concrete nature conservation measures to enable species to spread and move between different areas.

The planned biosphere reserve is well-organised, with 26 fish conservation areas and seven community associations for fishing grouped under the umbrella of the Ume/Vindelälven Fishery Advisory Board, which coordinates their work. Good information about where you can fish, what rules apply and about other fishing-related issues are an important part of their work, which may contribute to conservation of the genetic diversity of various species of fish.

During the period from 2016 to 2020, Leader Fishing Area Vindelälven is producing management plans for fish in the entire Vindelälven basin. This work includes coordinating future measures for fishing with power station owners, researchers, fishing rights holders and authorities. Additionally, Västerbotten County Administrative Board is working together with other county administrative boards in the country and the Swedish Agency for Marine and Water Management to draw up river-specific salmon management plans. Sustainable fishing requires knowledge about production and taxation of salmon and sea trout, rules for taxation, improved supervision, and compliance with fishing rules.

Svenska Jägareförbundet, the Swedish association of hunters, is mapping the moulting sites of the lesser white-fronted goose in order to try to protect the birds from predators while they are unable to fly.

The Swedish Environmental Protection Agency's programme of measures for the Arctic fox includes preventing the birth of hybrids with farm foxes (bred for fur), which are genetically distinct from the Scandinavian population of Arctic foxes. By collecting droppings for genetic analysis, and putting down escaped farm foxes and hybrids, the process can be controlled. In the future, individuals may also be moved to populations that have become too isolated in order to increase genetic diversity.

The FAMNA project (Förvaltning av amerikansk mink, or management of American mink) is a collaboration between several organisations in Sweden, Finland and Norway to reduce the number of mink, which were introduced into Scandinavia and severely decimate the stocks of ground-nesting birds. Some traps will be set out in the lower River Umeälven, within Vindelälven-Juhtatdahka. The project will run until 2020 and is intended to lead to a detailed working plan that administrative authorities can take over once the project is completed. The goal is for the measures to contribute to increasing breeding success among ground-nesting birds, and increased biological diversity within the project area.

15. DEVELOPMENT FUNCTION

15.1. Potential for fostering economic and human development which is socio-culturally and ecologically sustainable:

15.1.1 Describe how and why the area has potential to serve as a site of excellence/model region for promoting sustainable development.

An integrated landscape with much going on

Vindelälven-Juhtatdahka is a geographical area of considerable dimensions, extending across six municipalities and two counties. Conditions vary greatly between life in inland and mountain communities and that in the coastal region. A unified biosphere reserve as an arena for the creation of shared objectives for sustainable development can help build an increased sense of community across the region, as well as increasing the attractiveness of living, working and spending time there.

The strong engagement that people feel for the river valley's nature, culture and development has meant

that activities to promote the sustainable development of the area have been carried out for a long time. The Vindelälven river valley, from the mountains to the coast, is used as an arena for recreation and sports in annual events such as:

- *Kungsledenrännnet* in the Vindelfjällen mountains, a cross-country skiing race in high mountain terrain.
- *Vännforsrodden*, a relay rowing race and competition between the villages along the lower River Vindelälven.
- *Vindelälvsdraget*, a sled-dog race on winter trails along the river.
- *Vindelälvsloppet*, a running and cycling relay race.
- *Glassbonden Gravel Challenge*, a 60-kilometre mountain bike race that begins and ends at Glassbonden in Selet, in the lower river valley.
- *Laisälvenloppet*, a long distance run that is part of Dagar i Laisdalen (“Lais Valley Days”).
- *Gamla Malmvägslloppet*, a cycle race that is part of Dagar i Laisdalen (“Lais Valley Days”).

There is a broad range of businesses in the area. Entrepreneurship and business are among the most important factors for growth as they contribute, among other things, jobs, tax revenue and services. Civic society, including numerous club activities in the area, also take on a lot of the responsibility for local services and infrastructure. Clubs and associations also contribute creativity, diversity, community and knowledge.

The establishment of quality broadband access throughout Vindelälven-Juhtatdahka puts the area in an international leadership position. This digital infrastructure enables the development of new markets and networks, and allows distance management of service providers.

Sustainability challenges may differ between coastal and mountain municipalities, for example, but there are also plenty of shared concerns as all six municipalities are implementing the Swedish environmental objectives system, which has evident links to Agenda 2030 and the global sustainability goals.

Research and education are strong presences in the reserve area, partly due to its two major universities, an institute for sub-Arctic landscape research (INSARC), a number of secondary and upper secondary schools, as well as more specialised schools. The planned biosphere reserve is also home to Naturum (Ammarnäs) and a nature centre (Vindeln), both of which serve as information centres with exhibitions about the area’s nature and culture.

LEADER coordinates the activities of local action groups (LAGs) in the Swedish countryside whose task is to stimulate local development projects in priority areas. Three of these involve Vindelälven-Juhtatdahka: Leader Fishing Area Vindelälven, Leader Lappland 2020 and Leader URnära.



Image 45. The national sled-dog race Vindelälvsdraget



Image 46. Smokehouse in Rusksele. Photo: Robert Karlström

One biosphere reserve – one cooperation area

The role of the planned biosphere reserve, in accordance with the Lima Action Plan, will be as a consolidating and driving force in the efforts to achieve the UN’s Global Goals, and to help national, regional and local entities achieve their sustainability goals.

As has been described above, impressive development work is already going on in many of the river valley's communities. What could be added to this is an overall view of development, extending across the whole reserve area.

Better connections between communities, businesses and non-profit organisations can lead to cross-sectoral cooperation, networks and opportunities. There are shared challenges in social development in the countryside, for example, that can be dealt with across municipal boundaries via the platform provided by the biosphere reserve. Cross-municipal collaboration could, for instance, facilitate work to improve communication and transport possibilities in the river valley. The same applies to investments in and priorities for various hiking and cycling trails in the area. Efforts to realise the biosphere reserve are standing on the shoulders of all the good examples that are already going on, and supporting, strengthening and further developing them, while at the same time welcoming new initiatives. Because this work is being carried out on the basis of existing regional and local strategies, action plans and policies for sustainable development – linked to the Lima Action Plan and the UN's Global Goals – Vindelälven-Juhtatdahka will contribute to creating a broader, more complete and more holistic picture of development in the area.

By bringing together different stakeholders and creating cooperation, many different stakeholders' perspectives will be integrated into various issues. The interim board of the biosphere candidate reserve includes representatives of a number of interests (see 13.3), allowing traditional, often one-dimensional collaboration to develop into cross-sector collaboration. This is necessary in order to manage various conflicts of aims and to identify synergies, which are fundamental to achieving the UN's Global Goals. The non-profit organisation Biosphere Reserve Vindelälven-Juhtatdahka will be formed in 2019 and will serve as a further forum for those who live and work in the area. With 193 countries around the world having adopted Agenda 2030 and the Global Goals, the knowledge, instruments and methods for participation processes obtained as a result of Vindelälven-Juhtatdahka can serve as inspiration and support for people everywhere.

One question that comes up in all work on the planned biosphere reserve is "What is sustainable development for us?" The planned reserve includes reindeer pasturing areas of seven *samebys*, extensive forestry activities, a growing hospitality industry, farms, many businesses and associations, energy extraction, ongoing mining and prospecting activities. It is also a recreation area with activities including hiking, hunting, skiing, fishing, and berry and mushroom picking. Those participating in all of these diverse activities must be invited to and included in a dialogue about the area's future in order for development to be sustainable. The planned Vindelälven-Juhtatdahka biosphere reserve possesses all the conditions for becoming precisely the shared arena, the instrument and the support that will make this possible.

International knowledge exchanges are also necessary for achieving local solutions to global problems. During the work on the nomination, Vindelälven-Juhtatdahka had three exchanges with the Manicouagan-Uapishka biosphere reserve in Canada (16.3.1). On two of these, residents of the Grans *sameby* travelled to the Pessamit Innu Community, where the indigenous population of the Manicouagan-Uapishka biosphere reserve lives. All those who went have spoken warmly about their experiences, about the people they met with and the knowledge they gained. In 2014, representatives from Manicouagan-Uapishka visited Vindelälven-Juhtatdahka, which was also a very rewarding experience for hosts as well as guests. In the same year, the planned biosphere area hosted the Swedish national biosphere meeting. Throughout the work on the nomination, Vindelälven-Juhtatdahka has received support from people in other biosphere reserves in Sweden and abroad – not least by means of constructive dialogues at national and international MAB (Man and the Biosphere) meetings. As a biosphere reserve, Vindelälven-Juhtatdahka will be committed to continuing international knowledge exchanges and to supporting planned biosphere reserves in their nomination work.

The model reserve – a workshop for sustainable development

Vindelälven-Juhtatdahka is also involved in learning and practical advancement of knowledge. With the establishment of the biosphere ambassador training programme and the work on Naturskolan (see 16.2.1), initiatives for sustainable development in the area are strengthened. Several bachelors

and masters theses were written during the period of the preliminary study, three of which are about managing the biosphere reserve. Researchers have also been contacted in order to begin to work out collaboration forms for research in the area, and the Arcum research centre at Umeå University is currently checking interest in and possibilities for it to function as a centre of research into the planned biosphere reserve (3.3). During the candidacy, we have also worked on testing and finding new ways by contributing guidance, financial support and networking to various sustainability projects (Table 19). This is our workshop for exploring new sustainable solutions!

Table 19: The Vindelälven-Juhtatdahka sustainability workshop: Projects that Vindelälven-Juhtatdahka has contributed funds to or participated in during 2016-2017.

Project	Aim
Route Gastronomique website	To contribute to the development of food tourism in Vindelälven-Juhtatdahka, to maintain a vibrant countryside and open landscapes, and to create more jobs.
Study circle about locally-produced food	To spread knowledge about shops, producers and restaurants in order to highlight the value of local produce and to inspire work opportunities.
Participation at MAB's food fair	To meet experts, food producers and foodies from several of the world's biosphere reserves, to learn and pick up tips for Vindelälven-Juhtatdahka.
The Vindelälven-Juhtatdahka Node	To develop a node for the Vindelälven-Juhtatdahka biosphere reserve at Naturum in Ammarnäs, offering experiences of nature and culture as well as the area's reindeer husbandry. Visits will be made to the Norra Karelen biosphere reserve in order to learn from their experiences of outdoor recreation activities and information initiatives.
The Kullar och Klang Festival	To contribute to the creation of a place where people can meet to exchange experiences, new ideas, and find new ways to sustainable development. The festival must also be accessible to recently arrived immigrants and children.
Dagar i Laisdalen (Lais Valley Days)	To inform about nature and culture in Laisdalen by means of talks, guided walks, exhibitions etc.
Hemvändar- och kulturdag (Returnees' and Culture Day) – How the village once was	To increase interest in the history of the village and its people, and to gain new contacts from a historical perspective. The day is intended for reliving memories and stories, to resume collaborations and to increase the understanding between Rusksele's inhabitants and reindeer herders who historically have kept, and who continue to keep, their reindeer in the area.
International knowledge exchange	To organise exchanges between Sami from Vindelälven-Juhtatdahka and the Pessamit Innu Community, the indigenous population of the Manicouagan-Uapishka biosphere reserve in Canada. The exchanges were financed by the Nordic Council of Ministers.
Study visit to Finland	To visit a company that combines carcass provisioning for predators with fauna tourism, in order to look at whether this type of activity can reduce predator injuries.
Internal event in the Ran <i>sameby</i>	To increase knowledge about what a biosphere reserve can mean for reindeer husbandry.
Sustainable forestry from the reindeers' perspective	Inhabitants of the Gran <i>sameby</i> have begun a dialogue with Sveaskog, together with the biosphere central office and the WWF, on the subject of sustainable forestry from the reindeers' perspective.
Nationalälvens dag (National River Day)	To advertise the event and to inform about the biosphere work at the mill area in Vindel and Slöjdarnas Hus (Craftsmen's House) in Vännäsby, and to invite local residents and stakeholders in the area to discussions.
Preliminary study about transports on Road 363	To study the area's needs and possible solutions regarding the transportation of people and goods. Carried out by Sweco on commission from the Swedish Association of Local Authorities and Regions.
Naturskolan's activities in all 6 municipalities	To teach children and train teachers about sustainable development and biosphere reserves so that they understand these concepts and what opportunities they offer. To create an awareness among children and teachers about their native district: about its unique nature and culture, and the opportunities they offer.
To the source of the River Vindelälven	Schoolchildren from Ammarnäs commute 160 km every school day, to and from Sorsele. The project involved them inviting Year 4 in Sorsele to Ammarnäs in order to spend two days experiencing life in the village, with fishing, eating Sami Gurpi by the fire, learning about reindeer husbandry and about the river – in order for the children to gain an affinity for their native district so that they can preserve and protect it and we can work together for sustainable development.

The wanderings of a blogging ambassador	To draw the general public's attention to life, nature and people along the river, as well as to the ongoing biosphere efforts, and to attract people to the website so that they learn about the ongoing biosphere project. Conceived and carried out by Fredrik Hansson.
Sommarföretaget (Summer Business) - Ruskesele district	Training day for Ruskesele youth between the ages of 15 and 18, who were given the opportunity in the summer of 2016 to try running their own business under local needs and circumstances, from a sustainability perspective.
ARENA Vindelälven	To survey, produce network contacts and an activity and resource plan as a basis for work on various sports events.
Ecological sustainability and ecosystem services	To increase knowledge about the value of ecological sustainability and about ecosystem services in the local area. Managed and run by the Swedish Society for Nature Conservation.
PR plan for Vindelälven-Juhtatdahka	To develop a smart way of communicating what the biosphere project is about, in order to make the biosphere concept easy to understand and to encourage people to become involved.
Sjungaregården: An evening in the spirit of Vindelälven	To create an interesting and relaxing event Together with musicians focusing on the River Vindelälven, the biosphere project and watercourse restoration.

Throughout the project, all work towards the planned biosphere reserve will be transparent. Documents, data, information and other material are already fully accessible on the reserve's website (www.vindelalvenjuhtatdahka.se).

15.1.2 How do you assess changes and successes (which objectives and by which indicator)?

The goals of the biosphere project are described in Chapter 13. They are divided into four main goals and several measurable effect targets. The development plan and annual activity plans specify what is to be measured. Evaluations of the project's goal fulfilment are carried out in connection with the annual activity reports, on completion of each development plan, and at ten-year intervals in accordance with the Statutory Framework of the World Network of Biosphere Reserves. Evaluations of the work on sustainable development for the area as a whole are carried out by businesses, various authorities and other organisations. For example, periodic follow-ups are carried out of population, jobs, business and visitor numbers in Region Västerbotten.

Sweden's parliament has adopted objectives for environmental quality in 16 areas. These can be said to be roughly tangential to the global goals for environmental sustainability. The environmental quality objectives specify what qualities the environment is to have in 2020. National authorities are responsible for following up and evaluating the objectives, and county administrative boards have an overall, coordinating role in these efforts by carrying out regional environment surveillance with the aim of describing the status of the environment in each county and monitoring changes that occur.

Vindelälven-Juhtatdahka has already begun collaborating with many organisations in the reserve area and will produce a global picture of changes and successes in the area on the basis of these assessments.

15.2. If tourism is a major activity:

15.2.1 Describe the type(s) of tourism and the touristic facilities available. Summarize the main touristic attractions in the proposed biosphere reserve and their location(s).

The development of the Vindelälven river valley for tourism and recreation began following the decision to maintain the river's free flow. In 1975, Vindelälven was designated as one of the country's 25 so-called primary recreation areas. The wish to further develop the river valley as a tourist and recreational area has been alive ever since.

The tourism and service trades in the area are today directly dependent on functioning and active businesses and industries, as these quite simply create a demand for various types of service, overnight stays and restaurants. The tourism and service sectors have considerable growth potential through strengthened marketing of the area's rich natural environment as a basis for experiences. Some of the

area's unique attractions are the River Vindelälven and its tributaries, the mountains with one of the biggest nature reserves in Europe, the magnificent woods, and the coast along the Gulf of Bothnia.

The area has a big network of trails, both summer and winter trails. Vindelälvsleden, the 400-kilometre winter trail that runs on and alongside the river's ice between Ammarnäs and Vännäsby, has considerable significance for mobile recreational life (snowmobiles, skiers, dog sledding and winter cyclists), for the tourism industry and for winter events, such as the national sled-dog race Vindelälvsdraget. Vindelälven's summer trail comprises a marked cycle trail from Ammarnäs to Vännäsby, along smaller gravel roads and paved country roads. Kungsleden passes through the mountain region. A biosphere reserve would provide great potential for further strengthening of the area's outdoor recreation profile, from the mountains to the coast. It could help coordinate, for example, the efforts for the renewal, development, prioritisation and commercialisation of trails that can be used by both local residents and visitors. This kind of work would need to be done together with associations, local village groups, the Leader fishing area in Vindelälven, Arbetsförmedlingen (Swedish Employment Agency), the Swedish Forest Agency, county administrative boards and tourist organisations.

There is also an interest in visiting cultural heritage sites, as exemplified by Skogsmuseet (the Forest Museum) in Lycksele, which in 2015 had more than 44,000 visitors to its exhibitions of Sami as well as settler culture. By connecting cultural sites to the development of the area's trails, the former can be turned into attractive visitor destinations in Vindelälven-Juhtatdahka.

Food tourism is seen by many as a promising business – it is growing strongly in Sweden as well as internationally. The EU project “Lapland – a culinary region”, which was officially launched in January 2018, sees producers, restaurants and shops from the planned biosphere reserve work together to improve the conditions for food tourism in the area (see 10.6.9).

Allemansrätten, or the right of public access, which is a statutory right, is of considerable significance in the area. It allows hikers, skiers, fishermen, berry pickers etc. to pitch their tents throughout the area – to some extent even on private land – and practice their recreational pursuits. The right also comes with obligations to show consideration and caution towards nature and animal life, towards landowners and other people – these are restrictions that will become even more important if tourism in the area increases. Fishing is not included in the right of public access. Angling has always been practised in the area; it is usually relatively inexpensive and includes many fishing opportunities.

Globalisation has increased people's awareness of the importance of a sustainable tourism industry. We have gone from visitors who were prepared to pay more for a sustainable product to visitors who take it for granted that products are sustainable. This puts higher demands on businesses, but the increased awareness about e.g. one's own environmental impact also constitutes a considerable competitive advantage, as Sweden is far ahead of many other destinations on these issues. Today the tourism industry's various stakeholders have considerable awareness of these matters.

The visitor's experience can be anything from a traditional night in an urban hotel to unique nature and culture experiences in protected areas. Experience-based tourism in nature is usually called ecotourism in an international context. In Sweden there is an established quality label, Naturens Bästa/Nature's Best, that takes the entire context – business, economy, nature and culture – into consideration. This label was launched during the UN's international year of ecotourism in 2002. In the spring of 2017 there were six businesses in Vindelälven-Juhtatdahka that had the Nature's Best label (see Table 20). Four of these quality-certified businesses are located in the Vindelfjällen Nature Reserve. Two Nature's Best businesses in Ammarnäs have also received the Grand Travel Award, which can be seen as the Oscar of the Swedish travel industry. Additionally, one of companies has been awarded the prestigious WWF Arctic Award for its work to unite sustainable development with nature and culture tourism in the Arctic.

Table 20. Companies with the Nature's Best quality label, their location, activities and awards.

Company	Location	Activities	Awards
Geunja Samisk Fjällgård	Ammarnäs	Lapland safari: Conveying the Sami cultural heritage and its conservation value.	WWF Artic Award Grand Travel Awards' Ecotourism Award
Ammarnäsfjällens islandshästar	Ammarnäs	Horse riding	
Fjällhästen	Ammarnäs	Horse riding. Conveying the Sami cultural heritage and its conservation value.	
Fish Your Dream (Ammarnäs Wårdshus)	Ammarnäs	Angling: FishYourDream	Grand Travel Awards' Ecotourism Award
Aurora Borealis Adventure	Ekorrsele	Dog sledding, canoeing, fishing	Certificate of Excellence
Granö Beckasin	Granö	Tree hotel. Activities in nature	Certificate of Excellence

The mountain region

The mountains have year-round tourism: hiking, cross-country skiing, downhill skiing, riding, Sami culture experiences, fishing, dog sledding, snowmobile safaris, and guided nature and culture tours. A large proportion of foreign entrepreneurs dominates during the winter and grow in number with the addition of fishing and hiking in the summer. A number of these entrepreneurs employ subcontractors in their activities. These businesses also represent a large share of non-Swedes hotel night. The companies additionally possess special knowledge of their home markets, e.g. Great Britain, Germany, The Netherlands and Switzerland, which also means they open the door to Europe. Car makers/car testing companies have set up business in Sorsele and Arjeplog, using roads and lakes in the winter to test cars' winter road handling characteristics. A certain amount of specialised tourism has grown out of this, and activity companies have also become subcontractors.

In addition to the river, the mountains and the forests, specific points of visitor interest include a Naturum visitor centre in Ammarnäs and the Silver Museum (Silvermuseet) in Arjeplog (see 10.6.7). Quite a few visitors arrive by rail on the Inland Line, which extends from the south to the north of Sweden. The Inland Line has a platform in Sorsele, in the planned biosphere reserve. It also has a museum in Sorsele, the Inland Line Museum (Inlandsbanemuseet), which shows how the Inland Line and various bridges across the River Vindelälven were built.

Accommodation: Hotels, holiday villages, campsites, airbnb and other private cottage rentals. Hotels are few in number and relatively small; most stays are in one of the other forms of accommodation.

The forest region

The forest region down to Umeå municipality is dominated by summer tourism, with the exception of dog-sledding tourism which takes place in winter. A small number of activity companies are established here, but they are often subcontractors of hotels in Umeå and Lycksele. Activities in the forest region include dog sledding, fishing, riding, whitewater rafting, kayaking/canoeing, guided nature tours, hunting, wildlife observation, staying on farms, hiking, cycling, snowmobile safaris, and local gastronomy experiences. There are fine set trails for cross-country skiing, and a downhill station in Vindeln.

In addition to the river and the forests, specific points of visitor interest include the Forest Museum (Skogsmuseet) and Hotel Lappland in Lycksele, the Saga cinema in Åmsele and Art in the Mill (Konst i Kvarn) in Vindeln (see 10.6.7).

Accommodation: Hotels in Lycksele (two) and Vindeln (two), holiday villages, campsites, airbnb, staying on farms and other private cottage rentals.

The coastal region

The coastal region has shopping, culture (museums, theatre, opera, music), recreational activities including riding, mountain biking, hiking, fishing, kayaking etc., all easily accessible from urban areas.

Near the sea, nature offers sun and swimming, kayaking etc. in the summer, and long-distance skating during the less snowbound months in winter. Both Umeå and Vännäs municipalities have many fine set cross-country skiing trails, as well as slalom skiing. Two lakes in Umeå are ploughed in winter to allow for ice skating. The centre of Umeå has several big hotels, but the connection of trying to get hotel guests to visit the Vindelälven area is rarely made. The proposed biosphere reserve is planning to create links with hotels that maintain a sustainability profile.

In addition to the river, the sea and the forests, specific points of visitor interest include the Västerbotten Museum, Guitars – the Museum, NorrlandsOperan, the Väven cultural centre and the Craftsmen’s House (Slöjdarnas hus), (see 10.6.7).

Accommodation: Hotels in Umeå (15) and Vännäs (one), youth hostels, holiday villages and campsites, airbnb and other private cottage rentals.

In Sweden statistics are not collected on accommodation in places offering fewer than eight beds, meaning that the number of overnight stays in the area is understated. In the mountain and forest regions, most accommodation available to tourists is in smaller places.

15.2.2 How many visitors come to the proposed biosphere reserve each year? (Distinguish between single-day visitors and overnight guests, visitors only visiting the proposed biosphere reserve or only passing on the way to another place). Is there an upward or downward trend, or a particular target?

The right of public access allows people to move relatively freely through Sweden’s nature landscapes, and many of the sights are unmanned, which means that statistics on visitors are not collected according to the parameters specified above. The number of visitors and overnight stays in the planned biosphere reserve are shown in Table 21. Statistics over totals indicate an increase in the number of visitors staying overnight during the period from 2014 to 2016. The biggest number of visits with overnight stays is in the coastal region (within Umeå and Vännäs municipalities). The number of guests reaches a few hundred thousand, with a 15 % increase over the past three years. In the forest region (within Lycksele and Vännäs municipalities) the number of visitors is a few thousand, with an increase of 14 %. In the mountain region (within Sorsele and Arjeplog municipalities) the number of visitors is nearing 30,000 after an 18 % increase over the past three years. The share of foreign visitors is twice as high in the mountain and forest regions as in the coastal region. For the current season (2017) there are indications that Swedish Lapland, which includes parts of the planned biosphere reserve, is heading towards a doubling of its turnover since the destination was formed in 2010. No statistics are available on day visits and travellers passing through the area.



Image 47. Fredrik Hansson hiked and blogged along the river during the summer of 2016



Image 48. Participants in the project “To the beginning of river Vindelälven” rolling down the potatoe hill in Ammarnäs

Table 21. Visitors staying at/in hotels, youth hostels, holiday villages and campsites in 2014-2016. Camping outside of campsites is not included, meaning that the figures are understated. Data from Statistics Sweden (Statistiska Centralbyrån, SCB).

	Year	Guests checked in (share of foreigners)	Number of overnight stays (share by foreigners)
Coast	2014	306 157 (15 %)	538 332 (16 %)
	2015	313 859 (15 %)	569 576 (15 %)
	2016	354 748 (16 %)	633 369 (16 %)
Inland	2014	5 816 (33 %)	13 501 (35 %)
	2015	6 399 (28 %)	16 796 (37 %)
	2016	7 422 (31 %)	15 251 (34 %)
Mountains	2014	24 388 (30 %)	66 915 (33 %)
	2015	26 241 (30 %)	70 303 (30 %)
	2016	29 645 (31 %)	77 489 (30 %)

The compilation from Statistics Sweden shows that the biggest inflow of guests staying overnight in the planned biosphere reserve is during the month of July, and that the lowest overnight guest numbers are in December. In the forest region, virtually all visits take place between June and August.

Broken down by nationality, the data shows that almost 70 % of the overnight visitors in 2014-2016 were Swedes, while around 13 % were from the other Nordic countries. The majority of the remaining visitors was from other European countries, of which Germany was the biggest, accounting for between 4.6 % and 6.6 % of the total number of visitors over the past three years (Statistics Sweden).

15.2.3 How are tourism activities currently managed?

Within Vindelälven-Juhtatdahka there are currently four main so-called destination companies that function as regional organisations for the tourism industry. Sorsele municipality is part of Swedish Lapland. Businesses in Malå, Norsjö, Lycksele and Sorsele are part of the Gold of Lapland cooperative. VisitUmeå is the destination company for the coastal region, active in Umeå as well as in the surrounding municipalities of Vindeln and Vännäs, and also in Bjurholm, Nordmaling and Robertsfors. In addition to the local destination companies there are a number of tourist offices providing information about tourism and collaborating in different ways with the destination companies. In the westernmost and interior parts of the area there are also smaller tourist information centres linked to other activities. All the destinations referred to have ongoing EU projects, and all have a commitment to sustainable development of tourism. Västerbottens Turism, a department of Region Västerbotten, has a coordinating and knowledge transferring role in these efforts that includes carrying out sustainability analyses of the work done by the destination companies. This means that the destinations learn to work on sustainability in their organisation, and that tourism businesses are given programmes of measures adapted to their circumstances and specifying areas in which improvement is needed, a package of measures with priorities, and examples of existing good practice.

Commercial tourism activities often require various permits in the area. Examples of this include dog sledding, hunting, fishing, the establishment of touristic buildings, and cooking in the field. Region Västerbotten examines how well the area's destination companies and businesses follow the regulations by means of what are known as GSTC (Global Sustainable Tourism Council) analyses, which also include proposals for measures. The method, which was developed at the initiative of the UN, also uses criteria to grade how well businesses and destinations live up to sustainability. The intention is for the region and local tourist destinations to be able to identify areas for improvement within their sustainability efforts, and to implement sustainability measures. The GSTC methodology indicates what needs to be measured, and how frequently, regarding environmental impact, local community involvement, climate change adaptation, safety, accessibility for the functionally impaired, the local economy, employment effects, fish conservation, cooperation with complimentary industries, and impacts on nature, culture and local communities.

Region Västerbotten, with Västerbottens Turism, have made the decision to strive towards the goal of placing Västerbotten at the very highest international level among sustainable tourist destinations. Much of the work this involves will be done within the framework of the planned biosphere reserve.

Vindelälven-Juhtatdahka will bring together the businesses and destinations in the area that are part of the GSTC work described above. This will ensure that tourism development in the entire area will undergo sustainability measures within the framework of existing organisations.

15.2.4 Indicate possible positive and/or negative impacts of tourism at present or foreseen and how they will be assessed (linked to section 14)?

The tourism industry is one of the fastest-growing industries in Sweden, and *Tourism industry and outdoor life for everyone* is one of the planned biosphere reserve's six focal areas. The area's unique natural and cultural values provide good prospects for a multitude of accessible experiences to attract visitors. Throughout Vindelälven-Juhtatdahka there are good opportunities for new jobs in the tourism industry and in industries linked to it, e.g. accommodation, retail trade and services. The tourism industry can thus contribute to economic growth in other industries, too. Another advantage of the tourism industry is that it can help increase local residents' awareness of the area's uniquely rich natural and cultural values through contact with visitors. Which in turn gives cause to hope for a strong increase in the will and commitment to work to preserve the area's unique values and restore impacted natural and cultural assets.

Snowmobile tourism is a big activity especially in the mountain region, but also in the inland forest region. Snowmobiles can be a simple way to get out into nature, but they can also be perceived as noisy and disruptive by those who have ventured out by different means, for example on skis. They can also cause infringement/damage to ongoing business activities, such as reindeer herding and forestry. Snowmobile tourism provides important income for many people in the mountain region, including vehicle rentals, accommodation and guiding. Similarly, recreational overfishing may threaten fish stocks and cause conflicts with the local anglers.

Car testing activities have emerged in the mountain region over the last few decades. They benefit the hotel business and other services. Car testing companies are furthermore important as employers of the local population.

The development of tourism creates opportunities for the Sami too. More and more Sami tourist businesses are being established and are developing. Sami tourism is not a product, but rather an approach intended to build knowledge and understanding of Sami culture, livelihoods and living environment. The foundations for this are Sami values and the Sami way of life, which is to say tourism under Sami management and with Sami content. Many tourists who visit the area are interested in Sami culture, and Sami food has become gourmet fare. There is also considerable interest in buying Sami products, not least among foreign visitors, but the supply and availability of such products is very limited in large parts of the area.

Today, reindeer husbandry in Sweden and in Vindelälven-Juhtatdahka is squeezed by many competing land uses and activities in the area (see 15.4). Many people regard reindeer as exotic animals, and coming across them in nature can be a positive experience, but if visitors encroach on areas where there are reindeer, the animals' grazing or calving may be disturbed. In combination with other factors, an individual disturbance of that kind may be amplified beyond what the individual tourist can imagine.

A fundamental prerequisite of sustainable development is mutual respect between all businesses and interests that exist in the area. By means of early dialogue and understanding of one another's interests, better conditions are created for visiting, working and growing together in the planned biosphere reserve. In order to avoid conflicts of interest between businesses, and instead find balanced forms of cooperating, it is important to learn from other areas and industries that have found solutions to similar challenges. The planned biosphere reserve wants to work for a sustainable, qualitative tourism industry in the area, with considerable development potential. The candidacy is part of a wider project application

within Botnia Atlantica, intended to address precisely these issues. In order to achieve a profile as a sustainable destination, sustainability work based on the GSTC method will be developed further in the area. The project will also contribute cross-sector lessons and exchanges: offering our experiences from our work on the planned biosphere reserve candidacy (Norway is very interested in this) and learning from experiences that the Norwegians have of e.g. management of very popular sights and destinations.

15.2.5 How will these impacts be managed, and by whom?

The effects of tourism represent a responsibility that is shared by a number of different stakeholders, depending on the activity in question and on where and when it is carried out. Swedish legislation and public administration nationally, regionally and locally bear much of this responsibility. Businesses and citizens also have their responsibility to show consideration and follow rules.

Within the framework of GSTC, Västerbottens Turism ensures that sustainability is achieved in practice. This means that the effects of tourism will be made clear. One of the cornerstones of this work is to convene all affected stakeholders around specific issues and then, in groups, solve problems which are otherwise referred back and forth between authorities. Public administration, businesses, the local population and interest groups all take part in this collaboration.

Designation as a biosphere reserve will highlight Vindelälven-Juhtatdahka as a sustainable destination – not just in Sweden, but also internationally. In order for reindeer herding not to be disturbed by visitors, representatives of the planned biosphere reserve need to meet with entrepreneurs and municipalities concerned to take an active role in steering visitors to those parts of the reserve where there are no reindeer at different times of year. The planned biosphere reserve should also serve as a point of contact where tourism entrepreneurs can receive information and advice on how to offer the best possible experience to their visitors while at the same time allowing reindeer herding and other livelihoods to thrive undisturbed.



Image 49. Experience river Vindelälven. Photo: Forsknäckarna



Image 50. Cross-country skiing on the mountain. Photo: Ola Jennersten



Image 51. Natures pantry. Photo: Cecilia Wallinder

15.3. Agricultural (including grazing) and other activities (including traditional and customary):

15.3.1 Describe the type of agricultural (including grazing) and other activities, area concerned and people involved (including men and women).

The Vindelälven river valley, with its extension to the sea, is characterised by agricultural landscapes throughout. When settlements and permanent buildings were established, they were tied to farming activities that were part of the population's livelihood. Even if cultivated land only makes up a small proportion of the total area, it is an important element of the environment and landscape around the communities that line the river.

A short growing season, with snow cover for six months of the year, limits the choice of crops. The main crop is grass for ensilage. Grain, in particular barley, can be sown in the second half of May and be harvested around the middle of September, before the frost arrives. It is grown to a limited extent in the more favourable lower part of the planned biosphere reserve, but not at all in the upper part. The harsh climate brings the advantage that the need for, and use of, pesticides is small or non-existent. The grazing season extends over four or at best five months.

Some of the arable land is used to pasture animals during the summer months, partly as a consequence of Swedish animal husbandry legislation's pasturing requirements and partly because farmers want the best for their livestock. The share of semi-natural pastureland that is not subjected to cultivation measures is small, but has grown in recent years on the back of extensive EU-financed restoration projects. These have allowed natural forage land along the river and a swathe of pastureland in the river delta by the sea to be restored. This land is managed by means of grazing cattle and sheep, shows considerable biodiversity for the area, and is strongly influenced in its natural development by recurrent flooding, particularly during the spring flood.

The mountain village of Ammarnäs is surrounded by a well-managed cultivated landscape with an extensive, grazed delta landscape in high terrain – completely unique in Sweden. When the first new settlements were approved in 1803, the hayfields of the delta, along with woodland pasture, were the mainstays of farming in the area. In the Yraft delta by the River Laisälven, hayfields are still being cultivated that were first used in the 19th century. A distinctive example of how farmers in former times adapted to the natural circumstances is the potato slope, a tall south-facing moraine slope where potatoes could be grown, protected from frost.

Farming along the river is based on livestock production of primarily milk and beef. There are about ten dairy farmers in the river valley, all of average size or bigger for the county, that pursue viable business. Most of these are located in the lower reaches of the river valley, which are more favourable to agriculture. There is, however, a recently established major dairy farm in the upper reaches, which is developing well despite the adverse conditions. It has been a long-standing tendency for the number of dairy farmers to halve every decade, with the remaining ones growing ever larger. In this way, the quantity of milk produced has remained constant in Västerbotten County. The dairy farmers are complemented by cattle businesses for meat production. A handful of farmers pursue sheep production on a large scale, while about thirty others keep smaller numbers of sheep. A couple of farmers also pursue small-scale commercial pig production. Of the people employed in farming and animal husbandry in the planned biosphere reserve 30 % are women (data from Region Västerbotten). Hällnäs is home to Sweden's biggest market garden with organic cultivation of herbs, lettuces and flowers.

The unfavourable conditions for agriculture, except for in the lower parts of the river valley, limit the possibilities for farming businesses to achieve profitability and grow, despite public measures in the form of farm payments, compensatory aid, agri-environmental payments and national aid. Many farmers have therefore sought new opportunities for charging higher prices for their products, with beef, pork and lamb producers selling directly to customers – private individuals as well as restaurants and the tourism industry. In connection with Vindelälvens natural pastures, an EU project that restored pastureland along the river, an organisation was formed to coordinate the marketing of quality meat produced on natural pastureland. The project was initiated by Sorsele municipality together with the World Wide Fund for Nature, WWF. Today this work is being continued by the Vindelälvens natural pastures cooperative. A dialogue has already begun with its members about how a future biosphere reserve might help Vindelälvens natural pastures in its work. However, the area's harsh conditions are also what make its agriculture distinctive, and a living heritage of the generations who cultivated the land before our era.

Small-scale processing can also be a route to profitability. An example of this is "Glassbonden" (the Ice Cream Farmer), who processes milk from his own mountain cattle into ice cream he sells in his own ice cream parlour as well as through farm shops and retail outlets. In Ammarnäs, the extensive semi-natural pasturelands have provided the basis for nature conservation businesses. Agri-environmental payments through EU programmes are an important source of income, and allow businesses that pasture sheep and cattle to be optimised for both agricultural production and environmental benefit. Most farmers in the area have a good overview of potential agri-environmental payment schemes. The planned biosphere reserve, with board members from county administrative boards, municipalities and Region Västerbotten, is well placed to be able in future to guide interested businesses to several alternative project support schemes.

15.3.2 Indicate the possible positive and/or negative impacts of these activities on biosphere reserve objectives.

In many ways, agriculture makes positive contributions to the planned biosphere reserve's goals, and is therefore part of the work on Living landscapes, one of the focal areas for Vindelälven-Juhtatdahka. An active agriculture creates job opportunities and growth in the agricultural sector. It also improves the prospects of other services, such as supermarkets, retailers, and petrol stations – and it justifies a well-functioning infrastructure which in turn can benefit other businesses as well as residents.

The coordinating organisation of Vindelälvens natural pastures is crucial in maintaining the land along the river that has been converted from overgrown meadows into semi-natural pastureland. The farmers involved receive compensation for their work through the EU's Rural Development Programme. Nowadays more than 500 animals graze these pastures. The concept prescribes that no ploughing, manuring, liming, irrigation or chemical mulching may be done, which promotes ecological sustainability. The animals are not given any growth hormones or antibiotics for preventive purposes, and routine deworming is not allowed, further increasing environmental values. Grazing has even created new stopover sites for migratory birds and species that breed on open ground. The flora, too, is enriched. The landscape becomes more open and alive, and farmers are furthermore given a new, important role as nature conservationists. The semi-natural pasturing in the area thus contributes to the conservation of biological diversity, open landscapes and sound meat production. The project has even had a spill-over effect in that it has inspired similar measures in other parts of the county.

Today, the economic conditions are very tough for many dairy and pig farmers due to their reduced competitiveness vis-à-vis imported produce. In Sweden and in Vindelälven-Juhtatdahka people are keen to know more about the origins of the food they buy and eat. More and more people are choosing to eat food that is as natural as possible (with few additives), produced with the greatest possible concern for the environment and for animal welfare, and increasingly, food that is produced locally and organically. This kind of food is available in Vindelälven-Juhtatdahka in the form of lamb, beef and reindeer meat. A continued reduction in the number of farms would mean that producers would be unable to meet demand. Moreover, many agri-environmental payments are currently delayed due to the development of IT and administrative tasks at the Swedish Board of Agriculture. This has delivered a severe financial blow to individual farmers.

The preservation and development of agricultural land is important for biological diversity. Agriculture provides a varied landscape with different biotopes that generate species diversity, both locally and in the landscape as a whole. Many species that are dependent on traditional small-scale farming become threatened when farming declines. The agricultural landscape provides food as well as breeding and stopover sites for many species of bird. The restoration of hay meadows and pastureland creates space for those plant species that are favoured by cultivation, and also benefits other species associated with these plants and with open land. An example of this are the restoration and compensation initiatives in the Ume Delta and its plains, which have created an oasis for birds. At the end of April, thousands of geese often alight in the waters and fields, alongside large flocks of cranes and whooper swans, for a break on their westward journey.

15.3.3 Which indicators are, or will be used to assess the state and its trends?

Several of the Swedish environmental quality objectives are linked via agriculture to food production. In June 2017 the Swedish Riksdag (parliament) adopted the government's proposed action plan: "A food strategy for Sweden – more jobs and sustainable growth throughout the country". The action plan includes concrete initiatives to achieve the strategy's targets in the form of measures and tasks. In the spring of 2017, Region Västerbotten decided to draw up a regional food strategy for Västerbotten, which includes the greater part of Vindelälven-Juhtatdahka. Its aim is to create sustainable growth in the food industry and to work towards a greater degree of national self-sufficiency. A large number of stakeholders from the entire food production chain – primary producers, processors, traders and consumers, restaurants and the public sector – will take part in the formulating of the strategy.

More general indicators include the area under cultivation, production figures for various products (e.g.

milk) and the number of animals of different kinds. The Swedish Board of Agriculture is responsible for and provides statistics in this area. The county administrative boards of Västerbotten and Norrbotten are the authorities answerable for agricultural land in protected areas, such as Natura 2000.

15.3.4 What actions are currently undertaken, and which measures will be applied to strengthen positive impacts or reduce negative impacts on the biosphere reserve objectives?

The Rural Development Programme (RDP, 2014-2020) is a powerful tool in the important work to achieve relevant environmental objectives, increase organic production and strengthen the competitiveness of the food sector. Within the framework of the RDP, the County Administrative Board is providing guidance and skills development in areas, such as plant nutrient management, efficient manuring, energy efficiency measures and conversion to organic cultivation. The Federation of Swedish Farmers (Lantbrukarnas Riksförbund, LRF) is represented on the board of Vindelälven-Juhtatdahka. Its representatives are actively involved with rural development and with supporting farmers in the area. Within the framework of the biosphere project, a collaboration with reindeer herders has begun in the area, with the aim of creating a dialogue between reindeer herders and farmers and reducing the problem of reindeer on tilled land. The reindeer herders receive reports from the farmers about where different types of crops are being grown and which lands are particularly sensitive, allowing them to plan their winter pasturing accordingly. A dialogue is also ongoing with the Vindelälvens natural pastures cooperative (15.3.1) about future challenges and opportunities in maintaining the landscapes along the River Vindelälven open.

Vindelälven-Juhtatdahka can help create venues, tools, and forms of support for encouraging and spreading interest in buying local produce, such as beef, dairy products, grains, and vegetables. The planned biosphere reserve can also assist in the marketing of this local produce and in efforts to find sustainable transport solutions.



Image 52. Two generations of reindeer herders in Rans *sameby*. Photo: Ola Jennersten



Image 53. A harvester in the woods. Photo: Anders Esselin



Image 54. Natural pastures.

15.4 Other types of activities positively or negatively contributing to local sustainable development, including impact/influence of the biosphere reserve outside its boundaries.

Throughout the planned biosphere reserve, and in Sweden as a whole, public activities are important for sustainable local development. This includes municipal services, such as preschool and compulsory school, elder and individual care, culture and leisure activities, and technical services, such as energy provision, water and sewage, and waste management. It also involves other public activities within the county council and administrative board, as well as other national services, such as health and medical centres, the police, refugee accommodation centres etc. The Swedish welfare system provides a solid foundation for the development of e.g. civic society, businesses, visitor destinations and recreational activities, as well as for people's opportunities to live and work in various places within the planned

biosphere reserve.

Everyone who lives and works within the planned biosphere reserve is affected by various types of public services in one way or another. The big municipal education sectors – preschools and compulsory schools – employ primarily women, and these workplaces can amount to a substantial share of all locally available jobs.

15.4.1 Describe the type of activities, area concerned and people involved (including men and women).

Reindeer husbandry

The area is one of the last remaining in the world where indigenous people are still able, to a great extent, to practice traditional, seasonal reindeer herding. The reindeer move throughout the area, and graze in different habitats during different seasons. The only exception is densely built-up areas, but even these lie within the various *samebys*' reindeer herding areas. Reindeer husbandry is a Sami livelihood and a strong upholder of culture for the Sami people. The exclusive right of the Sami people to practice reindeer husbandry is enshrined in the Swedish Constitution, and the right to herd reindeer is based on ancient custom. Under the Reindeer Husbandry Act, reindeer husbandry may only be practiced by a member of a *sameby*, which is a cooperative and administrative association charged with managing, in the best common interest of its members, reindeer herding in a specific geographical area. Both women and men participate in reindeer herding, even if the latter dominate the practical aspects of it in the field. Reindeer herding is based on free, rough grazing over large areas, and is essentially carried out the same way today as it was a hundred years ago – even if it has been mechanised and rationalised in parts over the last few decades. Vast tracts of pastureland are necessary as the reindeer are moved between different pastures in order to find forage during different seasons. It is also important to be able to alternate between different pastures from year to year, on the basis of current snow and climate conditions, in order to avoid overgrazing.

Migrations between summer pasturing in the mountains and winter pasturing in the woodlands and by the coast are carried out along ancient trails, where this is still possible. The animals are also moved through villages along minor roads, across agricultural land and through commercial forests. The free-flowing River Vindelälven has always been a vital part of this migratory trail. Climate change has altered ice conditions on the river so that the river ice will not always hold the weight of the herds, and during some periods and along some stretches cannot be used as a trail at all. This means that further migration trails on land need to be restored.

Seven *samebys* have grazing areas within Vindelälven-Juhtatdahka (see Figure 4):

Gran, Ran, Malå, Svaipa, Semisjaur-Njarg, Maskare and Ubmeje Tjeälddie. Woodland *samebys*, such as Malå, have smaller reindeer grazing areas at their disposal and are therefore faced with big challenges in making compromises over land use (e.g. hunting, see 17.2.1).

Forestry

Forestry is practiced on a large scale by the private corporations Holmen and SCA, and by the state-run Sveaskog. The National Property Board of Sweden and Sorsele Övre Allmänningsskog have forestry activities in the montane region. Many private landowners are members of the Norra Skogsägarna (Northern Forest Owners') association. The ownership structure among small private forest owners is changing as the older generation of forest owners hand over or sell their forest properties to younger generations. The new owners bring different values and aims to forestry. Today fewer forest owners live on their forest properties, and the share of owner-logged properties is shrinking. It also happens that major forest properties are acquired by investors with no roots of their own in the area. The upshot is that more and more felling and silviculture is carried out by contractors. From having been almost totally dominated by men, forestry companies have strived in recent years to employ women, and Norra Skogsägarna is actively promoting women's involvement in forestry. The number of women doing MScs in Forestry at the Swedish University of Agricultural Sciences in Umeå has increased. The share of women forest owners is also growing, and across Sweden they now make up 38 %.

There are a number of companies in the area that process the primary product. Examples include Baseco in Sorsele (which supplied the wooden floor for the Vasa Museum in Stockholm) and SCA's factory in Obbola, which makes paper packaging.

Today the trade-off between protecting and extracting the forest is managed by means of a forestry policy that balances production goals (forests must provide a good timber yield) and environmental goals (biological diversity must be preserved and other interests such as cultural values, reindeer husbandry and recreational life, e.g. hiking trails, provided for). Forestry is regulated in the Forestry Act (Skogsvårdslagen), while much of the conservation is governed by the Environmental Code (Miljöbalken, MB). In practice, responsibility for protecting forests is divided between the State, through the County Administrative Board and the Swedish Forest Agency, responsible for formal area protection, and the forestry industry itself, which has a commitment to exercise general consideration and to make voluntary allocations for nature conservation purposes. Environmental considerations when felling forest have increased since the 1990s, while more forest is now also protected in reserves and by other forms of protection. The effects of environmental considerations are examined on a continuous basis, and methods improved upon.

Fishing

The Vindelälven and Laisälven rivers are strongly associated with various types of fishing. The lower section of the River Umeälven also offers a range of fishing opportunities. Commercial fishing, mainly for salmon, herring and whitefish, has played a major role along the area's stretch of coast, and farther up the river fishing has been an important element of self-sufficiency, while in the mountains it has been a source of income for the Sami. Today there are only five licensed commercial fishermen (all of them men) along the coast. Two to three of these can make a living from fishing because they process their catch themselves and sell it in a local market.

In the inland and the mountains, the Sami and other holders of fishing rights do a certain amount of fishing for household needs. Angling and angling-related tourism is big in the area and provides some employment for both women and men. The mountains are where angling-related tourism is most active, providing a few businesses there with their main source of income.

Outdoor recreation

From the mountains to the coast, the area offers fantastic opportunities for outdoor recreation experiences, and there is no shortage of interest from outside. The Vindelälven valley is known nationally as a great region for outdoor recreation. Along the entire length of the river there is a wealth of scenic natural and cultural sites. There are also ample opportunities for fishing, hunting, white-water rafting, skiing, mountain biking and hiking. A number of skiing resorts also exist in the area.

The primeval mountain forests of the Vindelfjällen and Laisdalen nature reserves offer opportunities for fishing, birdwatching, riding, mountain biking, hiking, skiing and snowmobile rides along trails. The well-known Kungsleden hiking trail crosses both reserves. Just over 400 kilometres in length, the Kungsleden trail was created by the Swedish Tourist Association (Svenska Turistföreningen, STF) at the beginning of the 20th century. Hikers from all over the world have walked it. In both nature reserves, but particularly in Vindelfjällen, efforts have long been made to provide accessible outdoor recreation. Today there is an extensive network of trails, bridges, cottages, Naturum visitor centres, and a research station. Ever since the Vindelfjällen nature reserve was created in the 1970s, and the State became responsible for recreational trails as well as cottages, STF has been an important representative of public interest in outdoor recreation.

The River Vindelälven itself draws visitors with its rapids and sites of cultural interest, and there is a large number of hiking and biking trails in the area, e.g. in Vännfors, Taveljö, Blattnicksele, Gargnäs and Åmsele, to name but a few. Among the best-known trails are Isälvsleden, Taveljöleden, Kammen, Nasaleden and the previously mentioned Kungsleden. Vindelälvsleden, on the river itself, offers wintertime opportunities for skiing, snowmobile riding and dog-sledding. Vindelälvsdraget, a major national sled-dog race, is held here.

There is also considerable interest in hunting within the planned biosphere reserve. Hunting in Sweden requires a national hunting permit, and landowners have the right to hunt on their land. Hunting rights can also be transferred or granted to third parties. Special rules apply for members of *samebys*. Different species are hunted at different times of the year, with the exception of a certain amount of nuisance wildlife management. Hunting is recreational, but also for the meat, as many in the local population remain fairly self-sufficient in terms of meat, fish, berries and mushrooms. Hunting is also part of the tourism industry, with hunters visiting from near and far to experience hunting in the area.

Berry and mushroom picking are also common. While they used to be done almost exclusively for household needs, there are now many pickers who do it recreationally or as a source of income.

Outdoor recreation has developed and become more complex. Hikers, for example, used to be categorised as one group with one set of needs and interests. Today it is clear that there are several different sets of needs and interests within each recreation category. There are hikers who walk long distances, who do not stop in the communities they pass along the way, and who sleep in tents in the wild. Then there are other hikers who prefer to walk shorter distances in order to also have access to good food and comfortable accommodation. An increase in the number of local trails has created new possibilities both for the hiker, who can stay in a community and use the services available there, and for the local community that earns income and gets job opportunities.

Coupled with a strong commitment to the river valley's nature, culture and development, the breadth of priorities in outdoor recreation – within as well as between different recreation interests – creates favourable conditions for further development of outdoor recreation and of business linked to it.



Image 55. Café Granströms, Mårdsele. Photo: Robert Karlström



Image 56. Stable in Ammarnäs. Photo: Oswald Jonsson

Civic society

The area today has a rich variety of associations for most interests, including sports associations, political associations, religious and cultural associations. The voluntary sector is of great significance in Vindelälven-Juhtatdahka, with women involved to the same extent as men. Still, the success of any association is very much a matter of individual commitment. One type of sport may be popular in one community where there are active and committed leaders, while there might be hardly anyone participating in that sport in the next community. This has long been a reality, and is likely to remain so. In general terms, in Sweden voluntary club and association activities are more common in rural areas than in towns and cities. Religious congregations and communities are the most common type of association, irrespective of location.

Ammarnäs' population is civic-minded, thus there are thriving associations, such as a Sami association, a sports association, a fish conservation area association, an association of guides, a local heritage society and a snowmobile club, to name but a few. In Sorsele, around 15 associations have joined together to

form Sorsele United, which coordinates resources and takes care of member associations' administrative matters so that they can focus on their activities. In addition to Sorsele United there are many associations and clubs for hunting and fishing, culture, sports, music and dance, and much else. Blattnicksele, too, is home to several associations and businesses, of which most collaborate successfully. Blattnicksele Intresseförening (interest association) has been very successful in making the village attractive to young people and families with young children. By organising all the inhabitants into work groups, everybody has become involved and everything from maintenance of sports facilities to moving-in services and marketing gets taken care of. The village has become so popular that all its houses, holiday homes and flats are taken. In the villages along the River Laisälven, in Norrbotten County, you find the majority of the associations involved in maintaining trails and sports facilities, as well as active culture associations, fishing conservation area associations and village councils.

Rusksele also has a very active civic society with several volunteer and religious associations. The local heritage society organises several cultural events every year. In collaboration with Vindelälven-Juhtadahka, among others, everyone with a connection to Rusksele was invited to a Returnees/Culture weekend in August 2017. A special invitation was directed to Sami guests, who have historically stayed with Rusksele residents during the reindeer migration, in order to re-establish contacts and acceptance between villagers and reindeer herders in the area. The neighbouring village of Vormsele is also home to strong civic society, with the local heritage society at its head. There are several sports and culture associations in Åmsele, one of which runs the only cinema in Vindelns municipality. Vindelns has a large number of sports associations, religious associations, local village councils, one nature conservation society and a very active local heritage society that looks after the beautiful community centre, made up of around 15 buildings near Brånet. Most of the smaller villages with an active community life are nearer the coast, such as Västra Spöland, Vännfors and Nedre Vännfors in Vännäs municipality. Tavelsjö, in Umeå municipality, has received lots of attention in recent years because of its many good examples of development work, in many cases carried out by associations. Umeå also has a large voluntary sector and variety of associations in many different areas.

Other businesses

The area's business community includes everything from the processing of primary products to high tech. Business and entrepreneurship are prerequisites of sustainable development, not least in rural communities. Some businesses are active mostly in a local market, while others are completely dependent on export. In mountain municipalities activities may be seasonal, as in tourism and car testing. Businesses are fewer in the central parts of the area, with the exception of Rusksele (see below). But from Vindelns and on down to the coast, a variety of businesses dot the landscape – many are in the engineering and manufacturing industry, in forestry, tourism, services and retail. By the coast, particularly in Umeå, the private sector has grown strongly over the past ten years. One reason for this is the close collaboration that goes on between the municipality, businesses, universities and other actors. There are also large export companies here, and a growing service sector with cutting-edge companies in IT and biotech.

More and more companies are emerging which are based on what nature provides. This can be in the form of experiences or by harvesting and marketing natural produce. In fishing/eco-tourism, a number of new businesses are established every year with the River Vindelälven as their resource. From an international perspective, the section of the river between Sorsele and Ammarnäs is a Mecca for fly fishing.

Berries are used to produce jams and cordials, among other foods. Berries are also increasingly being exported to bioextraction companies in Europe and Asia that use them to make natural medicines and dietary supplements. Interest in mushroom picking and sales has grown in recent years. Svamp i Norr (Northern Mushrooms) is a cooperative based in Vindelns and Umeå, among other places, that buys, processes and sells mushrooms and other edibles picked or gathered in the wild in Norrland.

The villages of Ammarnäs and Blattnicksele are good examples of how many people set up small business activities to create the circumstances in which they can live and work in rural areas far from the cities. This applies equally to the villages along the River Laisälven, in Norrbotten County, which are known for

their strong spirit of entrepreneurship. Many of these businesses service the tourism industry.

Rusksele, a village with 270 inhabitants in Lycksele municipality, is often cited as a good example due to its thriving business community. It is home to around 15 companies that provide jobs even for people from nearby population centres and villages. In Åmsele there is a supermarket which is very important, not just in Åmsele, but for the entire northern part of Vindelns municipality. Vindelns has a business association, Företagarna Vindelns, that promotes collaboration between different companies in the district on a wide range of issues. Its members include Rototilt, Indexator Rotator Systems and Cranab AB which, aside from being the district's three biggest private-sector employers, have put Vindelns on the world map with their unique products in the engineering industry, including automated forestry equipment and rotating equipment for excavators. Other big employers in the municipality include Hällnäs handelsträdgård (market garden), Tectel and Martinssons såg (timber processing).

In most of the smaller villages closer to the coast, including Västra Spöland, Vännfors and Nedre Vännfors, in Vännäs municipality, there are several agricultural businesses. Tavelsjö and Hissjö in Umeå municipality are two other examples of villages with a strong entrepreneurial spirit located close to urban centres. Umeå is the biggest city in northern Sweden, and home to big export companies as well as a growing service sector with cutting-edge companies in IT and biotech.

Energy production and mining

Stornorrfors power station, downstream from the River Vindelälven's confluence with the River Umeälven, produces a large part of Sweden's hydropower, but is also an obstacle for migrating organisms (see 14.1.2, 14.3.1, 14.3.4). However, a relatively recent fish ladder, along with other measures in the old river channel, has improved migration opportunities for salmon and trout primarily. In this way the power station's impact on the core areas of Vindelälven and Laisälven, as well as on the buffer zone in the lower reaches of Umeälven, can be mitigated. Three of Vindelälven's tributaries also retain older power stations, in Rödån, Åman and Giertsbäcken, which were built before the river became protected.

Today there are three wind farms in the area: one in Holmsund, one in Risliden in Vindelns municipality and one on Hornberget, north of Kristineberg. There are also wind farms just beyond the boundaries of Vindelälven-Juhtatdahka, e.g. in Åmliden and Blaiken, which are visible from within the proposed biosphere reserve. A further number of areas within Vindelälven-Juhtatdahka have been indicated in municipal wind power plans as potential wind farms. There are plans, for example, for a 100-turbine wind farm on the Sandsjöhöjderna heights in Sorsele municipality.

Within Vindelälven-Juhtatdahka there are ongoing mining activities, as well as former and planned new ones. Mining is currently carried out by Boliden Mineral AB in Kristineberg. At Vindelgransele there are advanced plans for several small-scale gold mines, according to Botnia Exploration AB, a company involved. The areas around Kristineberg, by Tjålmträsk south of Sorsele and along the River Dellikälven, are also subject to prospecting and are granted exploration permits. Increased global demand, with rising prices, is the single biggest factor behind investments in prospecting and mining in the area.

Both the energy and raw materials sectors are happy to employ women, but remain dominated by men.

15.4.2 Indicate the possible positive and/or negative impacts of these activities on biosphere reserve objectives. Have some results already been achieved?

Reindeer husbandry

Reindeer husbandry is an important livelihood and culture heritage in the area, and *Thriving reindeer husbandry* is one of six focal areas in Vindelälven-Juhtatdahka (13.2), so reindeer husbandry is a fundamental consideration in all biosphere-related work. The long migrations of the reindeer herds, *juhtat*, is unique. Reindeer husbandry plays a central and significant role in Sami society, and is a vehicle for Sami tradition and culture as well as a source of income for the reindeer herders. Creating the conditions for viable and sustainable reindeer husbandry is thus also about creating conditions for the upholding of Sami identity. The activity leads to many positive effects in the planned biosphere reserve, and there is considerable

potential for further positive developments and outcomes. Among these are the opportunities offered by further processing of reindeer meat, which would increase income from the product and in turn benefit individual producers, local food production, food tourism and local communities.

Other positive effects of reindeer husbandry include those highlighted by research showing that reindeer grazing contributes to biological diversity in the mountain regions since reindeer, like other grazing animals, play an important role in structuring vegetation. It has been shown recently, for example, that reindeer grazing helps reduce bush overgrowth of more nutrient-rich mountain slopes. This means that increasing grazing intensity can be a way of mitigating some of the unwanted effects of a warmer climate. The traditional ecological knowledge that reindeer herders possess thanks to generations of land use has been recognised as valuable not just to the Sami themselves, but to society as a whole, both in dealing with climate change (IPCC) and for the conservation of biological diversity (IPBES). Negative effects include damage caused by four-wheeled and two-wheeled vehicles used by reindeer herders, though efforts are underway to limit this damage. Intensive grazing can lead to regrowth problems in sensitive areas. There are also conflicts of interest between reindeer herders and other stakeholders in e.g. forestry and agriculture (see 17.2.1). A problem for reindeer husbandry is that available grazing land is shrinking due to encroachment by wind farms, mines, tourism and other competing land uses. Climate change is also a major problem seriously affecting reindeer husbandry, as natural grazing cannot be used and costly feeding becomes necessary.

High predator pressure causes considerable negative effects to reindeer husbandry. Predators affect production as well as herding. Wolves, lynxes, wolverines, bears and eagles all occur within the planned biosphere reserve, and reindeer are important prey for all of them. Under normal circumstances there are no stationary wolves in the reserve area; those that do appear are migrating, either northwards or southwards. If a wolf stops in an area where reindeer graze, it can cause great damage to the affected *sameby*. The greatest losses occur in the period from calving until the "autumn separation", when the reindeer herd is divided into groups for the migration to winter pasture. Predators kill many pregnant does, which impacts regeneration and the age structure of the herd, and also kill many calves.

Forestry

Forestry has a considerable significance for the economy in Vindelälven-Juhtatdahka as well as in the country as a whole. For example, the forest industry in Sweden represents 10-12 % of production value, added value and employment in all of Swedish industry. The forest industry moreover has a low proportion of external input, meaning that it is the largest single net exporter in Swedish industry. A large share of the county's businesses use primary products from forestry as the basis of their activity, and Västerbotten County has a particularly prominent position in the production and processing of timber and forestry technology products. Forestry is included in the *Living landscapes* focus area (13.2) and has many positive effects in the planned biosphere area, not least as the employer of, and source of income for many residents.

Forestry is moreover expected to be fundamental for the development of a bio-economy in the country – among other things, by substituting products made of renewable forestry raw material for fossil fuels, which would reduce climate impact. Forestry climate benefits also include carbon capture by growing trees. At the same time, climate change has considerable significance for forest growth. Forests are predicted to grow faster, meaning they can be harvested at earlier stages than they are today.

Forestry affects woodland as well as other habitats in the forest landscape. Forests which are excepted from forestry will continue to age. If forests of different succession stages are not maintained, this can lead to an age gap in relation to commercial forests, which will impact reindeer husbandry negatively as well as affecting the social value of the forest and other important ecosystem services. Clear-cut forestry produces effects on species composition and biodiversity, and leads to landscape fragmentation. The use of forestry vehicles impacts the land, which in some cases may damage stands, soils, water and protected cultural remains.

Fishing

Fishing in flourishing lakes, watercourses and seas is another of the focal areas for the planned biosphere reserve. Irrespective of whether fishing is for commercial or recreational ends, it is an important activity for many who live in or visit the area. One goal of biosphere-related work is to contribute to long-term sustainable use of our natural resources, and this goal is well on the way to being met when it comes to fishing. A good example of this is that salmon have returned to the river. From having been on the brink of extinction, the population is now big enough that it can be fished along the coast as well as the river. Still, salmon fishing remains to some extent beset by the opposing interests of its practitioners. Commercial fishermen by the mouth of the river want to maximise their catch and their income, while the fishing rights holders along the river want as many salmon as possible to migrate upriver for the benefit of anglers. However, both parties have shown a desire to cooperate that gives reason to hope their conflict will be mitigated (see 15.4.4).

Outdoor life

Tourism industry and outdoor life for everyone is another of the focal areas of biosphere-related work. The area's unique cultural and natural values provide excellent conditions for a multitude of accessible experiences and recreational opportunities within Vindelälven-Juhtatdahka. This has positive effects for public health, social interchange and opportunities for local livelihoods. Outdoor life also influences cultural and social factors, such as identity, quality of life and generation of meaning. Outdoor life has considerable significance for sustainable rural development in Vindelälven-Juhtatdahka, and recreational services businesses could become a new basic industry in the area. Most recreational activities on the waters, in the woods and the mountains impact the environment to a very limited degree. Activities are mainly done on paths and trails. Damage may occur, however, when activities take place away from trails. Snowmobiles used off-trail can damage forest plantations and disrupt reindeer herding, among other things. Hunting is a popular recreational activity with many different values for the practitioner, and with considerable significance for wildlife stocks and conservation in the area. Hunting is also important to farmers and forest owners as it reduces damage caused by wildlife. With organised as well as unorganised outdoor life increasing in scope, and knowledge about how to conduct oneself in nature decreasing, the need to inform about the right of public access and responsible behaviour is greater than ever. Currently certain activities, such as trail and downhill cycling, are growing in popularity, which provides new jobs, but can also cause wear that will require remedial measures along trails, as well as new facilities.

Civic society

Civic society is very significant for the planned biosphere reserve. Civic society brings people joy and community, both as practitioners and spectators, and also contributes to local development within Vindelälven-Juhtatdahka. Associations and clubs can create economic value as well as having an important social function. Besides contributing various activities, non-profit organisations are also valuable employers in rural areas. Civic society brings people together and strengthens the sense of community, and is in many cases a repository of traditional knowledge, as for example in the area's local heritage societies, whose local community centres are often the social heart of the community.

Other businesses

Entrepreneurship and business are two of the most important factors for jobs and growth, and therefore crucial to sustainable development – not least in rural areas. In 2015 there was a total of 11,425 registered companies within the planned biosphere reserve (Region Västerbotten). In 2017, small-business employees made up the largest single source of tax revenue for Sweden's municipalities. In Västerbotten County as a whole, 26 % of tax revenue comes from small businesses – but small business owners represent a larger share of income tax revenue in smaller municipalities than in the bigger ones (39 % in Sorsele, 32 % in Arjeplog and Vindeln, 30 % in Lycksele – compared with 23 % in Umeå).

By looking after their businesses, municipalities receive revenue that allows them to take active measures for sustainable community development. Cooperation between businesses, and between the municipality and businesses, has proven fruitful. For example, the forestry technology industry in Vindeln has been very successful, which has benefited both community and social development.

A general problem for the businesses in the area is that they are far from their markets. Transport costs are high when companies need to get components for their products. Public transport for employees is described as a problem in Vindeln municipality. One of the biggest problems, however, is skills supply. It is difficult to find labour with the right skills, which hampers growth for many businesses. Better freight and public transport solutions would encourage sustainable raw materials transports, relocation to rural areas and increased commuting to work, as well as better skills supply for the public and the private sector in the planned biosphere area. Desirable residential conditions are also a factor in attracting labour to a specific area. There is a major shortage of attractive properties and housing in the five smaller municipalities. In inland regions investment can be hampered by the difficulty of finding financial backers. Two possibilities that tend to work well in the manufacturing industry are to hire people with foreign backgrounds, and to make workplaces more attractive to women.



Image 57. Biking along isälvsleden



Image 58. Fire in the in the bake-house. Photo: Cecilia Wallinder



Image 59. Cross-country skiing in the forest. Photo: Grahame Soden

Energy production and mining

Hydropower is regarded as an environmentally friendly alternative to fossil fuels, and it also generates income and jobs in the area. With the construction of dams and the regulation of water levels, however, hydropower development has caused permanent damage in the natural environment, with considerable effects for e.g. tourism, fishing and outdoor life. Dams and power stations impact the natural migration routes primarily of various salmonid fish. The water flow in part of the river channel diminishes or disappears, and changes to or fluctuations of water levels in river and regulation reservoirs affect plants and animals living along the banks. The banks, between maximum and minimum water levels, lose a large part of their species diversity, which in turn affects the fish. Plants and animals that live in the riparian zone and are dependent on annual flooding are forced out or disappear entirely as there is no spring flood.

Wind power is a renewable energy source that can contribute to meeting future energy needs. However, large-scale wind farms require large land areas and fragment the landscape. When the landscape is altered by roads and wind turbines, animals as well as people are affected. Conditions for reindeer herding can be severely impacted if wind turbines are placed in important reindeer herding areas. Studies have shown that the reindeers' movement patterns are affected during the construction phase of wind farms, and indications are that reindeer will also avoid areas with wind farms. Bird life may also be negatively affected if wind farms are built along migratory bird routes.

Positive effects of mines and mineral extraction include jobs in the mines, as well as indirectly in services and contractor businesses. The establishment of mines can also bring infrastructure investments. But there are many uncertainty factors that influence the outcome, since growth is governed largely by global demand.

Negative effects include the frequently sudden and dramatic fluctuations in the industry, which are an uncertainty factor for jobs, the local economy and the environment. Mines furthermore contribute to

the fragmentation of the landscape, have a strong impact on watercourses – principally in the form of discharges of metals into the water, but also of explosives or residual substances from processing. The work in the mine generates noise. The establishment of mines also has a negative impact on reindeer herding and frequently on tourism.

15.4.3 What indicators are, or will be used to assess the state and its trends?

Reindeer husbandry

Reindeer herding plans (*renbruksplaner*) are a relatively recent planning tool with which *samebys* chart and describe their land use. They are used as a planning and control tool for reindeer herding, but can also be used in discussion and consultation with other land and water-using activities. In this way it contributes to better cooperation with e.g. forestry companies, which serves to improve conditions for reindeer husbandry. A plan includes pastureland division, reindeer pasture inventories and external factors, and since it is updated regularly provides a good overview of the state of the reindeer pasturing landscape and the conditions for reindeer husbandry. Favourable conditions for reindeer grazing do not only benefit the reindeer, but also other species associated with lichen-rich terrain. Reindeer herding plans can be a good indicator of the challenges and opportunities for reindeer husbandry and of the state of land in the area where lichens dominate. As reindeer herding plans are internal documents in *samebys*, their participation and consent is needed for any use of the data they contain.

County administrative boards manage large predators in each county by means of annual predator inventories. In reindeer herding areas, inventories are carried out in collaboration with the affected *samebys*, each of which has a predator officer.

Some municipalities hold annual dialogue meetings with the affected *samebys*. The central office of Vindelälven-Juhtatdahka has also held dialogue meetings with coordinators from the Sami administrative municipalities in the area, and with reindeer husbandry representatives. Västerbotten's Museum has a Sami reference group that contributes knowledge about reindeer herding and Sami culture.

The scope for expansion of reindeer herding diverges widely between the *samebys*. Factors influencing this include the number of reindeer herding members that are already active in the *sameby*, how many reindeer they have, what the overall condition of reindeer pastures is within the *samebys'* lands, and how intense the pressure is from other interests, e.g. wind power, mining, forestry and tourism. The total reindeer holdings of each *sameby* have to be adapted to the availability of pasture within the *sameby's* lands. Research is fundamental for monitoring development trends in reindeer husbandry. Research can also contribute solutions for optimising the availability of pasture. A biosphere reserve could be a hub for collaboration between *samebys* and researchers. Development potential has been identified in the optimisation of herd structures, in surveying conditions that influence metagenesis, and in the general advancement of knowledge in order to create the conditions for reindeer husbandry in a new era.

Indicators for strong and viable reindeer husbandry must be highlighted at several levels, e.g. the evolution of herd sizes in relation to the production of reindeer meat and other reindeer products, how this change affects traditional knowledge and customs within reindeer husbandry, how women as well as men are included, the health of pasturelands and, not least, the psychosocial well-being of reindeer herders.

Forestry

The overall situation and development trends are currently being assessed through national monitoring systems within the framework of the Swedish National Forest Inventory, which has been carried out since 1923. Its principal purpose is to describe the condition of Sweden's forests and any changes that have occurred since the previous inventory. The Swedish Forest Agency and the Swedish University of Agricultural Sciences (Sveriges Lantbruksuniversitet, SLU) carry out regular forest impact analyses (*skogliga konsekvensanalyser*, SKA) in which a number of scenarios featuring different specifications for forest management and environmental efforts illustrate possible future timber supply and future forest health. On the basis of the various scenarios, an assessment is made of the volume of productive forest,

among other things. Most private and public forest owners today have forestry plans that include data about forests, management recommendations for stands and maps with proposed measures. Since these plans are kept updated, they provide a good overview of the state of individual forest properties.

Vindelälven-Juhtatdahka has begun a discussion with researchers at SLU, among other institutions, about possible future forest research in the area. To this end, data from the National Forest Inventory can be used to assess e.g. forest production, biological diversity and berry occurrences (see Chapter 12).

Fishing

Fish are an economic resource for all fishing rights holders, but the value of this resource from a self-sufficiency perspective has diminished over time. Today the fishing rights holders in the area have joined together in Fish Conservation Areas (*Fiskevårdsområden*, FVO) whose task is to manage fishing in a sustainable way. The sale of fishing permits makes it easier for individual fishermen to obtain access to more extensive fishing areas, while the FVOs earn revenue which is primarily invested in fish conservation. Within Vindelälven-Juhtatdahka, FVOs have formed an umbrella organisation, Ume-Vindelälvens fiskeråd (Fishery Advisory Board) that pursues bigger issues regarding the entire river area, including the River Laisälven and the lower River Umeälven. For example, the Fishery Advisory Board is working to improve migration possibilities for salmon and sea trout and to carry out environmental restoration of areas degraded during the log-driving era. The river section from the coast to the mountains is the watercourse with the best monitoring of salmon and trout stocks in Sweden, as all fish migrating upstream are counted at the Norrfors fish ladder, electrical pulse fishing is carried out annually in spawning and nursery areas of the River Vindelälven, and smolt migrating downstream are caught in traps and counted.

Outdoor life

The Swedish Environmental Protection Agency is the national coordinating authority, and county administrative boards lead and coordinate regional work. The area's municipalities play a key role for outdoor life, and their efforts create the conditions for their residents to get out and enjoy themselves in nature. There are national objectives for outdoor life, including access to nature, protected areas, nature close to population centres and outdoor life at school. These are measurable and serve as indicators of development trends in outdoor life. The number of ongoing projects within the local nature conservation initiative (*lokala naturvårdssatsningen*, LONA), which aims to protect nature and make it accessible to people, can also give a sense of how outdoor life is being promoted in the area. Other possible indicators are the number of overnight stays in mountain cottages, the number of trail cards, fishing permits and ski-lift passes sold, and the number of projects focused on outdoor life that receive rural development subsidies.

Civic society

Civic society in Sweden as a whole has many and varied facets, making it difficult to extract meaningful data, and the same constraints apply to civic society within Vindelälven-Juhtatdahka. Non-profit organisations vary in their form as well as in their activities and emphases, so comparing them for the purposes of measurement is not straightforward. There are statistics that show how many associations there are, where they are, and how many members they have. Municipalities have some information about civic society within their boundaries, and information about associations and clubs as workplaces is available in Statistics Sweden's companies database. One way to get a better overview of civic society within the planned biosphere area is by means of questionnaire surveys.

Other businesses

General statistics on the number of companies, employees per company etc. can be obtained from Statistics Sweden. Företagarna, a business organisation, compiles an annual report that specifies how each municipality's income tax revenue is distributed between the various sectors, including small businesses. This analysis is based on statistics from Statistics Sweden and Arbetsförmedlingen (Swedish Employment Agency). Företagarna also publish the annual "Small Business Barometer" report, in collaboration with Sparbankernas Riksförbund (the national federation of savings banks) and Swedbank. The report is an economic cycle survey that looks at how Sweden's small businesses perceive the economic outlook, and their expectations on developments over the next 12 months. The analysis is carried out at national

and county levels and is based on interviews. The county councils and county administrative boards in Norrbotten and Västerbotten present county-specific statistics on development issues in Regionfakta (<http://www.regionfakta.com>).

Energy production and mining

The Swedish Energy Agency and the Swedish Agency for Marine and Water Management have presented a joint strategy for Swedish hydropower. The Swedish Energy Agency is the administrative agency for issues concerning the use and provision of energy. In its annual report of energy indicators, *energiindikatorer*, it follows up several energy policy objectives. Svenskt Vattenkraftcentrum (Swedish centre for hydropower, SVC) brings together training and research in hydropower and tailings dams. Possible indicators of local economic growth include the number of employees. Established inspection programmes are followed in order to assess the environmental impact of the activity.

15.4.4 What actions are currently undertaken, and which measures will be applied to strengthen positive impacts or reducing negative ones on the biosphere reserve objectives?

Reindeer husbandry

The Sami Parliament is officially responsible for ensuring that Sami interests are defended in spatial planning, while Samernas Riksförbund, SSR (the national federation of Swedish Sami people) works more directly to support *samebys* on planning issues. At the regional level, county administrative boards monitor reindeer husbandry as a public interest.

Reindeer herding plans (see 15.4.3) are important tools in consultations with forestry companies and other land users, as they provide a good picture of reindeers' needs and challenges.

Off-road driving plans are drawn up by the *samebys* with the aim of reducing the damage caused by off-road vehicles. Measures include building plank roads or laying out mesh mats to enable driving across sensitive ground.

Samebys receive compensation for losses due to predators (rovdjursersättning), but according to reindeer herders this is not at all proportional to the true losses. Reindeer herders are compensated for the documented occurrence of wolverine, lynx and wolf, and for the number of regeneration of reindeer within the *sameby's* grazing area. For bear and eagle, the compensation is based on the area of the *sameby* on the pastureland. In some years the true loss for a *sameby* can be much higher than the calculated compensation, which can have serious economic consequences for the village in question. The County Administrative Board can decide to carry out nuisance wildlife management (i.e. selective hunting) of the four large predators on the premise of preventing serious damage. Nuisance wildlife management of eagles can only be sanctioned by the Swedish Environmental Protection Agency. In order for meaningful reindeer herding to be viable, the Swedish Riksdag (parliament) has set the maximum acceptable level of losses to predators at 10 % of a *sameby's* winter herd. The goal is for this level to be maintained with the least possible consequences for predators. A calculation model is being devised with which *samebys* will easily be able to demonstrate their losses caused by predators. Many *samebys* are in the process of drawing up a tolerance plan to enable more targeted measures for the reduction of reindeer losses to large predators. This work is based on consultations between county administrative boards and *samebys* to determine how reindeer herding can be maintained locally while also ensuring a favourable conservation status for large predators. The idea is also that this will lead to more efficient administration of and greater legitimacy for decisions that concern management of both predators and reindeer herding.

In order to deal with climate change, the Sami Parliament has drawn up an action plan for Sami livelihoods and Sami culture. Knowledge transmission can be used to safeguard Sami knowledge and the Sami view of the environment. Special disaster protection allocations have been proposed for crisis preparedness, as well as a climate fund and increased cooperation and research on reindeer diseases.

Three of the reserve area's *samebys* (Ran, Gran and Malå) are represented on the board of Vindelälven-Juhtatdahka. These members, then, are representatives of reindeer husbandry in the planned biosphere area, and their involvement has contributed to making reindeer herding a given consideration in various strategies, as well as making it a focus area in Vindelälven-Juhtatdahka.

Insufficient knowledge about the circumstances of reindeer herding often leads to insufficient understanding among non-Sami people and among decision makers. Vindelälven-Juhtatdahka can contribute to creating an overall picture of different types of land use in the area, and to bringing stakeholders together – thus becoming an important arena where the reality and challenges of reindeer herding are seen in a wider perspective, and not just from the narrower perspectives of individual land users. An information effort to this end is ongoing in Vindelälven-Juhtatdahka. The first step has already been taken in the preparation of a training programme for biosphere ambassadors. This will include Sami history, culture, a description of the seasons and tasks of a reindeer herding year, and of the cumulative effects of competing land uses. This part of the programme can serve to increase the understanding and acceptance of, as well as a sense of pride in, the culture and livelihood of Sweden's indigenous people. This will benefit both men and women, young and old people within Sami as well as wider Swedish society. The general public in Sweden knows very little about Sami culture and history. There are also many young Sami who grow up with scant knowledge of their history, which can lead to insecurity and sometimes even a sense of shame. The training programme is intended for anyone in the reserve area who is interested, and for the board of the planned biosphere reserve (see 16.2.1).

There are certain challenges in trying to get reindeer herding families willing and able to become involved in biosphere-related work. Their time may be short, with most of it dedicated to immediate problems, such as guarding their herds against large predators and limiting the effects of e.g. road and railway traffic. The lack of knowledge about reindeer herding among the general public in the area is considerable, and conflicts with other stakeholders over land are not uncommon. Reindeer herders may therefore balk at getting involved in new contexts, at having to explain their customary law, livelihood and culture again and again. Still, reindeer herders are unwilling to have someone from outside explain and inform about reindeer herding, since it is just about impossible for an outsider to understand reindeer herding in its entirety. Work on the planned biosphere reserve has been going on for some time, and relations have developed in a positive direction. Conditions look promising that a biosphere reserve will be able to contribute to an understanding of and a pride in the unique activity that is modern reindeer herding. Such a development would have a big positive effect on reindeer herders' everyday lives, but it must be allowed to take its time. Sami culture has its own perception of time and progress when it comes to trust and friendship; there is no other option but to respect this perception.

Forestry

The forestry industry conserves forests by means of voluntary allocations in the form of e.g. eco-parks, diversity parks and nature conservation forests. The county administrative boards designate nature reserves in order to conserve important habitats typical of older undisturbed forests within the planned biosphere reserve. There are 90 established nature reserves within the planned biosphere reserve, most of which are situated in the area's forests.

As described in 15.4.2, conditions are favourable for forest production in the area. Early thinning makes forests more resistant to damage, and increases their future value as well as the usefulness of the timber. Thinning of forests also benefits reindeer husbandry, partly because it favours the growth of ground lichen, which guarantees the grazing supply for the reindeer, and partly through improved accessibility along migration trails. When planning for a guaranteed timber supply, ecological, economic and social dimensions are today taken into consideration alongside productivity, which has meant that forest impact analyses also have to highlight environmental aspects.

Knowledge about the significance of different forms of conservation (formal protection, voluntary allocations) is developing, and forestry consideration continues to improve. For example, most forest vehicle drivers today have "green cards", which means that they have received training in environmental consideration and water conservation. Their access to this type of training reduces the risk of ground

damage in forestry, so that the water quality in watercourses, for example, does not deteriorate. Additionally, environmental certification of forests is ongoing, contributing to environmentally mindful, socially responsible and economically viable forestry. All the forestry companies in the planned biosphere reserve have been certified by the Forest Stewardship Council (FSC), which lays down guidelines for how forestry should be practiced with due consideration for indigenous people and nature conservation, including that at least 5 % of productive land must be protected. These larger FSC-certified forest owners also undertake to burn an area equivalent to at least 5 % of the regeneration area on dry and healthy land over a five-year period, as many species in the forest landscape are associated with fires. Private forest owners often choose to certify their forests via the Programme for the Endorsement of Forest Certification Schemes (PEFC). Some forest owners are certified by both FSC and PEFC. Environmental certification of forests provides an arena for negotiations between different stakeholders, which is particularly important in the case of the relationship between forestry and reindeer husbandry.

In order to conserve important habitats typical of older undisturbed forests, county administrative boards designate nature reserves. There are 90 established nature reserves within the planned biosphere reserve, most of which are situated in forested areas. The forestry industry also conserves forests by means of voluntary allocations in the form of eco-parks and nature conservation forests, for example.

Sveaskog and the Swedish Forest Agency have representatives on the board of Vindelälven-Juhtatdahka, which has been important for the opening of talks between different stakeholders in the forest landscape. By working towards shared goals, and through long-term planning, many people can enjoy the forest even as environmental and production objectives are attained, which is necessary if the development of the forest landscape is to be sustainable. The planned biosphere reserve is working to open dialogues and begin collaboration projects between some of these stakeholders. This includes an ongoing dialogue, in the context of the reserve area, between reindeer herders and representatives of land-based industries about possible future cooperation projects.

In order to mitigate negative effects on reindeer husbandry, land users must confer with affected *samebys*. However, since forestry is an example of ongoing land use there is no requirement for an environmental impact description (*miljökonsekvensbeskrivning*, MKB).

The Swedish government is working to produce a National Forest Programme in order for a number of instances of value created by and in forests to be made clearer and more important. This applies to value from traditional forestry as well as social and other value. Internationally recognised forest research is carried out in the area, e.g. at the Swedish University of Agricultural Sciences, at Umeå University and SkogForsk.

Examples of collaboration between businesses, organisations and authorities include:

- *Skogsriket Västerbotten* (Forest Realm Västerbotten) is working to develop Västerbotten as a forest county, focusing on increasing forests' contribution to sustainable social development throughout the county, in particular regarding gender equality, integration, tourism and constructing in timber.
- *Skogstekniska klustret* (the Forest Technology Cluster) is a collaboration initiative between businesses and higher education, with the aim of creating and running innovative development projects in the forest sector. The cluster includes three companies based in Vindeln: Indexator, Cranab and Vimek, plus Komatsu from Umeå, whose forestry equipment know-how is unique in the world. According to a recent study carried out by the cluster, more than one in six men in Vindeln is employed by a company in the cluster. The cluster has also participated in devising a strategy for gender equality in the forest sector.
- *Forestry companies, the Swedish Forest Agency, processing companies, universities, upper secondary education, municipalities and interest organisations* are working with gender equality and integration initiatives for adults as well as young people. Knowledge about the forests and their value for society and the individual increases the possibilities for new arrivals, primarily in rural communities and the forest municipalities, to interact with the local population and participate locally and regionally in forest activities and decision-making processes. One of the aims is to provide skilled and gender-balanced labour.
- *The forestry industry, the Swedish University of Agricultural Sciences, the Forest Museum and tourism businesses* have set up *Projekt Innovativa Upplevelser i brukad Skog*, PINUS, (Project for Innovative Experiences in

Commercial Forests) to create innovative ways of combining tourism, forestry and forest research. The aim is to create touristic opportunities in commercial forests in the area, thereby allowing small and medium-sized businesses within the region's tourism industry to grow in the new market on the theme of "knowledge tourism in the woods".

Fishing

There are ongoing efforts to develop the management of many fish stocks towards greater sustainability. Directives from the EU (the Water Framework Directive) and the government (the environmental quality objectives and global goals) set the direction of water management. The directives have contributed to the Leader Fishing Area Vindelälven and Stiftelsen Vindelälvsfiske currently investing considerable funds in measures to promote the water environments and sustainable fishing. As part of this, management plans for fish in the entire catchment basin between 2016 and 2020 are being drawn up (see 14.3.4). Through Leader Fishing Area Vindelälven coordination of a number of activities in the area that affect fish and the environment in some way is ongoing, and which may become more detailed in future biosphere-related work. Conflicts of interest over salmon fishing have existed for a long time (see 15.4.2). By means of several collaboration projects aimed at increasing the mutual understanding between commercial fishermen and fishing rights holders along the river, tensions between the two groups have eased. There are plans to draw up a river-specific salmon management plan in which both groups, together with researchers and authorities, could further improve the management of this resource.

Biotope conservation, restoration of watercourses that have been cleared for log driving, and the removal of migration barriers have all been in progress in the area for some time, and are continuing (14.2.1). Along with good management, they lay the foundations for possibilities of expanding fishing in the area, including angling. The big Retrout cooperation project (see 14.2.4) sows roe from migrating sea trout, which is another example of ongoing work to improve fish stocks in the area. All of these improvements and management measures in the area's watercourses mean that there are favourable conditions for the re-establishment of animal and plant life in their earlier habitats. A condition for the continued success of these efforts, however, is that fishing regulations are followed.

Leader Fishing Area Vindelälven and the Ume and Vindelälven Fish Councils are represented on the planned biosphere reserve's board, and the coordinator for Vindelälven-Juhtatdahka is a member of the board of Leader Fishing Area Vindelälven, which should ensure that fishing will be a central concern of biosphere-related work.

Outdoor life

The government has instructed Sweden's county administrative boards to work towards making outdoor life more accessible to all. This work is being done in collaboration with stakeholders that are in various ways involved in developing outdoor life. Outdoor life is a broad area that extends across several policy areas, including nature conservation policy, regional growth policy, agriculture policy, rural development policy and education and research policy. In Vindelälven-Juhtatdahka the county administrative boards of Norrbotten and Västerbotten have the principal responsibility for these efforts. As part of the work to achieve goals set for outdoor life, cooperation and a strong commitment of municipalities and authorities, but also of local residents and visitors are required. Several of the area's municipalities are in the process of producing strategies for outdoor life. Regular national and regional network meetings also help to expand the interface towards other organisations and activities that are connected with outdoor life. The County Administrative Board's outdoor life brief includes reviewing protected natural assets as a resource for outdoor life and exploring how outdoor life could be part of a green infrastructure in spatial planning, as well as making an inventory of outdoor recreation areas and further developing trails. At the national level, Svenskt Friluftsliv (Swedish Outdoor Life) serves as umbrella organisation for several non-profit outdoor recreation organisations in an effort to improve the status of outdoor life. The Swedish Tourist Association's representative on the board of Vindelälven-Juhtatdahka has already contributed to the launching of many information initiatives on the subject of outdoor life and the area's potential for becoming an even more attractive outdoor activity destination.

Civic society

In addition to their annual membership fees, many associations receive support in the form of public subsidies. Examples include funds from *Lokalt ledd utveckling*/Locally led development (Leader, including Leader Lapland and Leader Fishing Area Vindelälven), LONA funds (see 15.4.3, Outdoor life) and EU funds through e.g. the Rural Development Programme. In some municipalities, associations are also able to apply for other subsidies for investments in buildings, rural community centre grants, energy efficiency improvements, district funds etc.

The planned biosphere reserve will be able to serve as a platform for the exchange of experience and ideas between e.g. different village associations, local heritage societies and sports clubs in the area. The board of Vindelälven-Juhtatdahka includes representatives of businesses and civic society from villages/municipalities in the area. Sorsele United is an example of how associations join together to coordinate resources and administration. Another example is ARENA Vindelälven, which is owned by the Vindelälven municipalities' cooperative (VIKOM). Its aim is to stimulate sustainable rural development in the Vindelälven river valley by developing existing and new keep-fit and outdoor events as well as improving information, product development, cooperation and marketing. Cooperation is already underway between VIKOM and Vindelälven-Juhtatdahka, partly through co-financing by ARENA.

Other businesses

The government has formulated a national strategy for regional growth and attractiveness (2015-2020) to allow all regions to grow and develop according to their particular circumstances. This strategy is intended to be a shared basis of efforts to enable everyone to live, develop and run businesses anywhere in the country. Among other things, it highlights the need for collaboration in a number of different sectors and at all levels of society.

Contacts and networking are central to start new businesses, to develop existing businesses and for entrepreneurial processes. The planned biosphere reserve will be able to serve as the meeting venue for business owners who want to start businesses, for research and innovation, plus municipalities and authorities. Such networking might be about finding collaboration partners in the same line of business, but also partnerships with other stakeholders, mentors, or funding.

The business community in the area is supported by the municipalities' business offices (Näringslivskontor). These offices are a voluntary service by municipalities, however, so they differ quite a lot from one municipality to the next. During periods when budgets are limited, business offices are fairly constrained in what they can do, and activities are often dependent on external project funding. Many of the area's business owners are members of the Företagarna/Entrepreneurs' association, which has local chapters as well as a county section. Two of the area's municipalities, Lycksele and Sorsele, are part of the inland initiative Möjligheternas Region (Region of Opportunities), which is implemented from the business offices of participating municipalities. The initiative offers support to people who want to start their own business or to develop their existing business. Coaching in local product and service development is also offered.

Uminova Innovation in Umeå helps entrepreneurs and innovators test and develop their business ideas, build growing businesses and invest in business concepts and environmental relevance. Uminova also helps researchers and businesses discover each other, as well as international partners. In Umeå there is also a number of incubators for businesses in the start-up phase. Among the tasks of the Business and Society Building (Näringsliv och samhällsbyggnad) department at Region Västerbotten is the strengthening of business and entrepreneurship. Some financial support is also available via the Rural Development Programme. Many other organisations also support businesses, including Almi Företagspartners (Almi Business Partners), Handelskammaren (the Chamber of Commerce), Business Sweden and Coompanion. The large number of business support organisations sometimes leads business owners feeling overwhelmed and unable to have an overview of what help is on offer and from where. There are also many ongoing projects aimed at supporting businesses, and it can again seem difficult to have a comprehensive overview.

In its report to the government, the non-partisan parliamentary rural communities committee (3.2) presented proposals for rural development measures that will strengthen other organisations' remit to work for business development in rural areas. As well as general measures, such as training centres in rural areas, relocation of public jobs and expansion of digital infrastructure, the proposals include possible financing of targeted business policy and growth-promoting measures in rural municipalities. These might include further reductions in payroll taxes and writing off study debts. In the spring of 2018 the government will proceed to lay a bill before the Swedish parliament based on the committee's proposals.

Many business owners in the area are engaged in the issue of transportation. Another important problem to consider is the prospect that computerisation and automation may become necessary in order to guarantee the competitiveness of industrial companies.

A good example of collaboration between schools and businesses from Vindeln is the "Vindeln Business Week". In 2017 Renforsskolan and Vindeln's business community further developed their long-term collaboration. The shared objective is to create increased knowledge, insight and motivation among pupils in preparation for future education and work-life choices. The collaboration is driven by an engaged group of people made up of teachers and the head teacher of Renforsskolan, Vindeln municipality's business guide and employees from several local businesses. Results of the collaboration are already evident, and a number of activities have already been carried out. The collaboration includes having pupils meet the business community in school as well as at the companies themselves.

Energy production and mining

Land users have to consult with the affected *samebys* regarding measures to mitigate negative effects when developments are planned. In the case of new land uses, such as for a mine or a wind farm, an environmental impact description (miljökonsekvensbeskrivning, MKB) is also required which, in addition to indicating any environmental impact, also indicates the consequences for reindeer herding. The person responsible for the MKB must contact the *sameby* or *samebys* affected by the development at an early stage to find out if they have any relevant documentation of their own. Research at the Stockholm Environment Institute has shown that there is often a lack of Sami influence in these consultations, and that it is essentially only a matter of reindeer herders providing the information, without any real mandate to influence decisions. Environmental impact descriptions in general have not taken Sami experience and knowledge into account, nor have they highlighted social or cultural effects of planned activities.

15.5 Benefits of economic activities to local people:

15.5.1 For the activities described above, what income or benefits do local communities (including men and women) derive directly from the site proposed as a biosphere reserve and how?

Benefits of a biosphere reserve for activities in the area

Many of the benefits of the planned biosphere area are described in chapters 3 and 15.1, where the key word is collaboration between stakeholders offering different activities. The planned biosphere reserve will also contribute to spreading knowledge about the various activities described in this chapter, e.g. via the biosphere ambassador training programme (see 16.2.1) and by initiating a dialogue about possible forms of collaboration.

As a biosphere reserve, Vindelälven-Juhtatdahka can also co-finance projects that demonstrate good examples of sustainable development within different businesses and interests, and through collaboration between several of these. Work on the planned biosphere reserve's focal areas offers considerable scope for various advantages, including through engagement, participation, dissemination of information and knowledge, experience exchange and collaboration. Vindelälven-Juhtatdahka will also be able to create meeting venues, tools and support for spreading interest in buying local produce, such as beef and reindeer meat, fish, primary timber products and locally grown crops and vegetables. The

planned biosphere reserve will also be in a position to contribute to the marketing of local products and of the area as a great area to live and work in, as well as an outdoor recreation and tourism area. The planned biosphere reserve will also work towards finding sustainable solutions to transport issues.

Tourism

In Sweden as a whole, women and men are relatively evenly represented within the tourism industry, but men often dominate in leading positions. No data has been collected specifically for the planned biosphere reserve. The industry plays an important role for the development and vitality in rural areas and in areas where industrial activity is low. The tourism industry is also significant for big cities like Umeå, which are an attractive tourist destination and constitute an important gateway to inland regions. The tourism industry creates ripples on the water. If many people visit an area, this often leads to benefits also for businesses not directly linked to the tourism industry, such as owners of supermarkets and petrol stations. Restaurants, accommodation and means of transport often grow and develop in popular tourist destinations, to the benefit of the local population as well. In other words, the opportunities in a well-functioning tourism industry ("sustainable tourism") are numerous.

Agriculture

Agriculture in the area, as in the rest of the country, is dominated by men. The share of women employed in plant cultivation, agriculture and animal husbandry within the planned biosphere reserve is 29 %. Agriculture contributes many important ecosystem services. The production of food, fodder and fibres is perhaps the most obvious. Animals' grazing contributes to a richer flora and to open landscapes, which in turn creates possibilities for recreation and well-being. An active agricultural sector provides jobs for people and increases growth in the sector. This also creates opportunities for other services, including supermarkets, retail outlets and petrol stations. Active agriculture promotes and justifies a well-functioning infrastructure, which in turn is beneficial for other businesses, residents and visitors.

Reindeer husbandry

Reindeer husbandry has considerable significance for the economic and social development of the area since it provides jobs and adds important value to society in other ways. In the mountain area of Vindelälven-Juhtatdahka (in the municipalities of Sorsele and Arjeplog) reindeer husbandry is the second biggest industry, with 28 registered reindeer husbandry companies. As a result of rationalisation and mechanisation in the 1950s and 60s, reindeer husbandry is dominated by men today. The most common situation is that the men are the ones who work full-time in the business. In the traditional manner of practicing reindeer husbandry, the whole family is involved in the work at certain times of the year. Family members and relatives help out e.g. during reindeer relocation, separation, branding of calves and slaughter. Professional skills are usually obtained by means of *árbbiemáhttuo*, or traditional knowledge transfer: the children take part from when they are toddlers, and learn through participation. Traditionally, reindeer herding families have subsisted by means of a "mixed economy" that includes hunting and fishing as well as reindeer herding. Today there is often at least one family member who earns a supplementary income from some other job.

Forestry

The forest industry is an important source of jobs and of economic development in the proposed biosphere reserve, just as it is important for the Swedish economy as a whole. Forest ownership is the biggest industry in the planned biosphere reserve, with 1,020 registered forest owner businesses. But this is a complex industry, and it differs from other industries in the area in that some forest owners may have their properties outside of the area. Similarly, forest owners registered outside of the area may own forest properties within Vindelälven-Juhtatdahka. The economy and profitability of the forest industry is a decisive factor that influences felling rates as well as investments in forest conservation and infrastructure. Income from felling is crucial to the profitability of forestry. Increased forest production leads primarily to increased economic activity and jobs in the post-felling processing chains.

The economic opportunities inherent in an expanded use of the forests' other ecosystem services will be an important area for investment in order to increase job opportunities and the prospect of economic growth in rural areas, as a complement to forest production.

Fishing

Fish and fishing are resources that are relatively poorly utilised today, both as food and as recreation. There is space for more commercial fishing of some species, principally herring. The problem is partly that herring currently contains relatively high levels of dioxin, and partly that it does not have very high status as a food fish any more. The main reason for this is probably that herring is a comparatively small fish with a lot of bones.

As dioxin levels drop and as methods are developed for making new and attractive products from fish, such as herring and whitefish, fishing of these species could grow considerably and provide jobs.

Angling tourism is the fishing business that has the greatest potential of benefitting the local population through the creation of new jobs. As the river becomes restored from damage that occurred during the log-driving era, fish migration routes in Stornorrforas are improved and fish management develops, the importance of fishing for the local population will grow. The planned biosphere reserve can contribute by making fishing accessible to all, including families with children and people with functional impairments as well as hard-core anglers, and by marketing Vindelälven-Juhtatdahka as a fantastic area for outdoor recreation and angling. This would of course be in collaboration with fishing rights holders and business owners in the area.

Outdoor life

Benefits for residents and visitors from outdoor life include improved health and regional development. Outdoor activities often have many positive outcomes in purely physical terms, but also in mental terms, as they can give a sense of well-being. Outdoor life also contributes to an increased sense of community with others who have made the same choice and share the same experiences. Local service providers and entrepreneurs can gain financially from visiting tourists above all, through income from accommodation, food, fuel and guide services – all of which also benefit the local population. Another benefit from outdoor life is that it can engage those involved to become more protective of the fantastic natural and cultural assets that the area possesses. The planned biosphere reserve can contribute by marketing Vindelälven-Juhtatdahka as a great area for outdoor recreation.

Civic society

Civic society contributes a sense of belonging, diversity and creativity. In some cases associations are employers, and as such have a function in society beyond the activities that are the focus of the association or organisation in question. Within the planned biosphere reserve this applies above all to religious communities. For example, in 2012 Sorsele municipality was among those in Sweden with the greatest share of employees in religious communities (the Swedish Board of Agriculture, AOL).

Other businesses

The local population can benefit in many ways from local businesses. Companies are drivers of local development and contribute skills and growth. Besides providing tax revenue to the municipality, they contribute jobs and many service solutions. Business owners and their organisations also often pursue interest issues, such as the electrification of the rail crosslink in the area, that benefit the local population as well. Businesses in the area also contribute processed products and services from location-specific resources, which in turn means that production values remain in the area and can be reinvested. In the medium to long term, this can also lead to creating and retaining jobs. Different industries furthermore benefit from each other. For example, the tourism and service industries in the area are directly dependent on a functioning and active industry and business community since this creates demand for various types of services, overnight stays and restaurants.

Energy production and mining

Hydropower, wind power and the mining industry contribute jobs, which creates circumstances that allow people to live nearby – also indirectly, as jobs are created in the service and contracting industries. For hydropower and in particular wind power, job opportunities increase mainly during the construction period. The big revenue from these activities often ends up in the national purse and with individual companies. Some of the income from hydropower is returned to the districts where it was generated in

the form of tax revenue and district funds. District funds are a court-determined compensation paid to the districts that have been affected by the development of hydropower. These funds can be applied for by municipalities and non-profit associations. The funds are to be used for projects and investments for purposes that promote business or services in the district, or that are otherwise beneficial to it. There are also specially allocated funds for the promotion of reindeer husbandry. The establishment of power stations or mines may also imply infrastructural investments.

15.5.2 What indicators are used to measure such income or other benefits?

General statistics on the state of various business sectors (number of businesses per sector, number of employees per business) can be obtained from Statistics Sweden, which also has tourism statistics covering numbers of overnight stays, number of facilities, number of beds etc. Region Västerbotten collects statistics on business development in all of Västerbotten County, including the tourism industry and the number of GSTC-registered businesses and destination companies. Norrbotten's and Västerbotten's county councils and county administrative boards present county-specific statistics on development-related issues in Regionfakta (<http://www.regionfakta.com>). Other sources of business-specific statistics include various industry organisations and supervisory authorities. For example, the Swedish Board of Agriculture has statistics from agriculture, such as area under cultivation, production of various goods (e.g. milk), and the number of animals of different kinds. The Swedish Forest Agency is responsible for statistics in the areas of production and employment, as well as the environment and social issues in forestry. The Sami Parliament has county-specific statistics of the number of reindeer in winter herds etc. The number of fishing permits sold, and registered catches are available from www.fiske.se and provide a good overview of fishing in the area. In addition to this there are also measurable targets defined in project applications for projects in the activities referred to above, financed by and/or associated with Vindelälven-Juhtatdahka. It is also possible to track the changes in visitor statistics, the number of residents, and demographics after the biosphere reserve has been established.

15.6 Spiritual and cultural values and customary practices: (Provide an overview of values and practices, including cultural diversity).

15.6.1 Describe any cultural and spiritual values and customary practices including languages, rituals, and traditional livelihoods. Are any of these endangered or declining?

Vindelälven-Juhtatdahka is made up to a large extent of rural landscapes. Through the ages, local knowledge and traditions developed that were tied to the use and cultivation of the land. Today the area has a rich culture, with many cultural and customs. It is characterised above all by two cultures – the Sami and the Swedish. Spirituality in different forms has influenced culture as well as tradition. The tradition of spending a lot of time in nature is also strong, and tied to the identity of many people in the area. Cultural and spiritual values, traditions and customs are shown in Table 22, columns A and B.



Image 61. Maypole is dressed and risen. Photo: Cecilia Wallinder



Image 62. Left. Swedish fika, coffee, tea or lemonade often accompanied with a pastry or a sandwich. From award winning Budhas Kaffe och Rosteri in Lycksele. Photo: Cecilia Wallinder



Image 63. Folk dance by Gammlia in Umeå.

Table 22. Descriptions of cultural and spiritual values, traditions and customs, threats to them, if any, and measures to counteract such threats.

Value, custom or tradition	A. Description	B. Threats	C. Measures (15.6.2)
Sami reindeer herding	Nomadic way of life. Requires large expanses of pastureland, well-functioning equipment and logistics. A reindeer herder is not just a businessman, but also the bearer and protector of a cultural heritage.	Competing land uses and disruption by predators. Difficult to make it economically viable in the longer term. Little understanding from mainstream society of its traditional knowledge transfer.	Consultation with MKB (15.4.3). Support from SSR. State subsidies via the Sami Parliament. Information initiatives via the Sami Information Centre (www.samer.se). Nuisance wildlife management of predators.
Sami handicrafts/ <i>duodji/duöjje</i>	Solid handicrafts made by Sami people according to ancient tradition and adapted to new techniques and uses, varying from location to location.	Handicrafts are time-consuming, and it is difficult to make production profitable. Many Sami children don't have the opportunity to learn it at home; instead this responsibility is often passed on to preschools and schools.	The Sami Education Centre trains people in Sami handicrafts. The Sámi duodji foundation gives support in the form of lectures, courses, and counselling. Sami associations often have handicrafts get-togethers. The Forest Museum in Lycksele has an extensive Sami collection of art, objects and books.
Sami gastronomy	Sami gastronomy is characterised by seasonal variations, meaning it is governed by the natural availability of reindeer, elk, fish, fowl and small game, berries, herbs and plants. Traditional Sami knowledge, <i>árbbiemáhttu</i> , is the guiding principle in the development of Sami gastronomy.	Threats against reindeer husbandry could mean that reindeer meat becomes scarcer. Social development could reduce knowledge about traditional dishes.	See reindeer husbandry above. Sami associations often encourage the serving of traditional dishes. Cook books with traditional recipes keep traditions alive.
Sami buildings/homes/settlements	Homes (including peat <i>goahhtis</i>) Farm buildings (e.g. <i>njalla</i> , or bear cache, timbered sheds, drying frames).	Will decay if not used. (Often built from birch, which decays faster than pine). No financial backing for the re-creation of previously removed Sami settlements. Traditional building knowledge is in danger of disappearing.	Many are privately owned and maintained by the owners. The Swedish National Heritage Board is investing funds in the restoration of existing buildings (via county administrative boards). Some Sami buildings have been restored and moved to the Sami settlement by the Forest Museum. New ones have been erected by the Västerbotten Museum's Sami settlements.

Value, custom or tradition		C. Measures (15.6.2)	
A. Description		B. Threats	
Sami languages	The language is linked to customs, the maintenance of Sami culture and the use of nature.	Few people speak Sami (see 10.7). There is a great shortage of teachers in some administrative municipalities.	The National Minorities and Minority Languages Act (2009:724) has reinforced the right to use the Sami language. It is of particular importance to promote learning of the Sami language by children. The administrative areas enjoy enhanced protection in which elder and child care must be provided wholly or partly in minority languages if anyone requests this. Umeå University offers courses in south and north Sami. As of the autumn of 2017, Sami is offered in supplementary teacher training in order to produce more Sami-speaking teachers. There are local language courses in south, north and Ume Sami, frequently supported financially by the administrative municipalities. In many areas place names on road signs are given in both Sami and Swedish. Sami book collections in libraries are growing as more books are published in Sami. The Sami Language Centre is the hub of efforts to make Sami accessible to more people. Sami language apps have been and are being developed.
<i>Koltar</i> (tunics)	The <i>kolt</i> , or tunic, is the traditional Sami costume. It is an important symbol of identity for the Sami and the formal attire often used at ceremonial gatherings. Differs in appearance in different areas, as well as between men and women and depending on marital status. Worn with a traditional belt, shoes and shoelaces and a shawl or collar piece.	The survival of the <i>kolt</i> is hardly threatened as many young Sami proudly wear them. But developments happen quickly, and knowledge about traditional costumes may be lost if it is not carefully documented and preserved.	Many Sami are a great source of textile know-how and knowledge about the families' traditional <i>koltar</i> . The Sami Education Centre offers training in Sami handicrafts, which includes the knowledge and sewing of <i>koltar</i> . Sami associations in the area arrange courses in sewing <i>koltar</i> .
Sami oral traditions, <i>árbediehtu</i> (north Sami)/ <i>árbbiemáhttuo</i> (Ume Sami)	Holistic, adaptive and oral transfer of knowledge. Still transferred between generations through storytelling and participation.	Without active language preservation of words, expressions and the like, <i>árbbiemáhttuo</i> will be weakened and diminished. Many Sami are already in a stressful situation and do not have time to share their knowledge.	Some <i>árbbiemáhttuo</i> is preserved by means of documentation by families, various projects and research institutions. Today's array of communication channels, e.g. film, podcasts and social media, provide increased possibilities of documenting <i>árbbiemáhttuo</i> . Sami associations in the area and Umeå University hold meetings and workshops about <i>árbbiemáhttuo</i> . The Centre for Sami Research, Vaartoe, coordinates and initiates research into and about Sápmi with researchers and postgraduate students from various disciplines at Umeå University. This research is conducted in collaboration with Sami stakeholders, organisations and society. Norrbotten and Västerbotten counties' cultural action plans state specifically that the cultures of the national minorities, including the Sami, must be given a stronger position in the counties. These plans are planning tools, and are used in the dialogue about state appropriations to cultural activities in the regions.

Value, custom or tradition		C. Measures (15.6.2)	
A. Description		B. Threats	
<i>Joik</i>	Sami form of singing with a very long tradition. <i>Joiks</i> can deal with people, places and dramatic events.	Formerly banned, joiking was regarded as witchcraft up to quite recent times. But today young musicians have taken it up and gained popularity even beyond Sami circles.	The Libris database at Sweden's National Library (Kungliga Biblioteket) has a Nordic <i>joik</i> archive where recordings of <i>joiks</i> are collected. <i>Joik</i> courses and contests are held, e.g. in Umeå during the Sami Week. Norrbotten and Västerbotten counties' cultural action plans state specifically that the cultures of the national minorities, including the Sami, must be given a stronger position in the counties. These plans are used in the dialogue about state appropriations for cultural activities. Several well-known Sami musicians are today taking joiking into the future.
Sami faith	Before Christianisation, the Sami had a different faith: that nature has a soul and that humans and nature belong together. There were specific sacred places with cultural objects (<i>sejite</i>), e.g. a remarkable rock. The <i>noaidi</i> (shaman) was the intermediary between humans and the world of the gods, and made prophecies using a special drum. The faith was based on oral tradition.	When the Sami faith was banned, <i>sejitar</i> were destroyed, <i>noaidi</i> were forbidden from practicing their art, and Sami drums were destroyed. A small number of secretly stored Sami drums are still extant. Some <i>sejitar</i> are still known or have been rediscovered.	Certain individuals are identified as <i>noaidi</i> by other Sami. According to the 2011 compulsory school curriculum, teaching in religion to years 4-6 must cover older Sami religion.
Traditional knowledge in farming and forestry	Through the ages, agriculture and forestry have been carried out according to traditional knowledge, which was transferred between generations, and within them, such as the spread of innovations between villages, regions or countries.	Structural changes in society have had an influence, and formalised and institutionalised farming knowledge has emerged. Traditional knowledge transfer decreases as urbanisation increases.	Collection of knowledge via interviews in research reports, e.g. at the Centre for Biological Diversity at SLU. Local heritage societies are involved in protecting and demonstrating local traditions and folk culture. The Forest Museum, the Silver Museum and Västerbotten's Museum are examples of local institutions that keep the knowledge accessible to all by means of archives, collections, publications, exhibitions, programmed activities, counselling, displays and information. The Forest Museum is focused particularly on museum activities and research about the boreal forest and the history, present and future of forestry.
Buildings	Many older buildings are products of local, inherited craftsmanship knowledge, acquired through practice, about how houses should be built and what they should look like. Water-powered village saws, planes and mills. Farms, shops, schools.	Depopulation brings dilapidation of many buildings and abandoned settlements where there is no continuing activity. Several crafts in cultural heritage conservation have been lost and then re-introduced. Innovations in terms of materials and mass production of e.g. tin roofs have changed building methods.	Building knowledge is being documented more today than in the past. The folk high school in Vindeln has courses in the conservation of buildings. Västerbotten's Museum has preserved buildings. A state subsidy known as "antiquarian compensation for churches", intended to preserve the cultural heritage, can be applied for by those congregations belonging to the Church of Sweden that need funds for the renovation of churches. The Church of Sweden provides church building grants for costly work on churches.

C. Measures (15.6.2)	
A. Description	B. Threats
<p>Value, custom or tradition</p> <p>Craftsmanship</p> <p>The term is often associated with manual as opposed to industrial production. Agriculture required craftsmanship skills, and hand-crafted objects made of natural materials are sold today in handicrafts shops and at markets in the river valley.</p>	<p>Crafts work is time-consuming, and it is difficult to make production profitable. Globalisation has created a system in which most of our everyday objects are machine-made. Low demand risks causing a loss of knowledge and quality deterioration. Theoretical education is often regarded as the norm, and the status of manual labour and practical knowledge grows ever lower.</p>
<p>Storytelling</p> <p>There is a strong storytelling tradition in northern Sweden. Until the 19th century people would gather in front of the fireplace on long, dark winter evenings and tell stories. Storytelling is a way of bringing the intangible cultural heritage to life, and is also a method for conveying people's memories, traditions and environments.</p>	<p>Interest in storytelling was low in the 20th century. Film, television, radio and finally the internet replaced storytelling.</p>
<p>Cultural traces in the landscape</p> <p>Tar pits and charcoal kilns in the woods. Log-driving structures in watercourses.</p>	<p>Cultural remains of these activities exist, but are threatened by modern land uses, such as forestry, road building and mining. Log-driving remains have disappeared as a result of watercourse restorations.</p>
	<p>Sweden has ratified the UNESCO Convention for Safeguarding Intangible Cultural Heritage, which constitutes an important tool for dialogue, ideas and transmission of knowledge, as well as increased international exchange and cooperation. At the national level there are organisations, associations and institutions whose task it is to document and convey knowledge of various crafts. The Västerbotten Handicrafts Association organises courses, exhibitions, talks and other non-profit activities to safeguard and develop handicrafts and transmit cultural experiences that stimulate handicrafts as a business. Adult education associations hold courses in different types of crafts.</p>
	<p>Interest in storytelling grew in Sweden in the 1990s. Västerbotten's Museum's mission includes working to bring back and safeguard more stories, applying a clear diversity perspective in the process. Storytelling is to be developed and used as a method for bringing the museum's collections to life and to enrich the museum's teaching and transmission of knowledge. The museum has employed the country's first and only storytelling curator. The museum's school programme also includes storytelling. Adult education associations sometimes have study circles about storytelling. In 2013, storytelling cafés were organised in Sorsele, Lycksele, Vindeln, Vännäs and Umeå in order to collect material for the performance "Flottarna kommer!", or "The log-drivers are coming!" (see "Professional activities in modern cultural life" in this table).</p>
	<p>Professions, such as charcoal burner, tar boiler and log-driver have disappeared, but charcoal burning and tar boiling are sometimes performed for demonstration purposes, e.g. in Rusksele and at the Forest Museum. Watercourse restoration work leaves important cultural artefacts in place and concentrates mainly on migration barriers and blasted rock along the banks. SLU and the Silver Museum are doing research in the area, including documentation of traces in the landscape. Many village associations keep the culture alive through tar boiling, for example. Västerbotten's Museum and the Forest Museum have material and further training programmes for teachers on how they can use the traces in the landscape as a resource when teaching children and young people.</p>

Value, custom or tradition		A. Description		B. Threats		C. Measures (15.6.2)	
Food culture	Traditional local food from nature's larder and local farms.	The more urbanised the population becomes, the less the use of traditional ingredients and the greater the risk that knowledge about traditional cooking will be lost.	Policy determines cultural subsidies. In a recession there is always a risk that cultural activities and jobs in the cultural sector will be cut or made redundant. A small labour market in the cultural sector means that there is a risk that talent will be drained from the counties to bigger cities outside the region.	From grain to cake (<i>Från korn till kaka</i>) – an exhibition at Västerbotten's Museum. There is a greater interest today in where our food comes from and how it is cooked. New cook books are published about traditional cuisine. Local harvest markets, which have attracted great interest in the area, offer insights into where the food comes from.	The counties' cultural action plans state that artistic development must have a particular focus (Norrbotten) and that improved conditions for professional culture workers must be promoted (Västerbotten) in order to guarantee high-quality culture. Several internationally recognised artists attract foreign artists to perform here. Development of the musical scene is mostly driven by non-profit forces. The culture of the Vindelälven area as a whole has received attention through River Story, a series of professional performances, projects and events that were held along the river during 2014, when Umeå was Capital of Culture, directed by NorrlandsOperan (see Cultural institutions below). They included the performance "Flottarna kommer!" with local stories and groups of folk musicians, "Renraiden", a musical performance featuring Katarina Barruk among others, and River Film Stories, with local film screenings that included short films about the significance of the river for the area and the people who have lived there. The book "Med Vingar längs Vindelälven" (On Wings along the River Vindelälven) has also drawn attention to the area's culture and nature.		
Professional activities in modern cultural life	Professional activities in theatre, opera, music and dance, regional and national museums and art. Higher education programmes in design (high in world rankings) and art at Umeå University. Craftsmen, artisans, writers, musicians, dancers and artists live and work in the area.	Fish stocks in the river and its tributaries were affected by log-driving clearances, log-driving dams and by Stornorrfors power station. Clear cutting has a negative impact on bilberry shrubs. Climate change may influence berry occurrence. Long periods of mild weather in the middle of winter may harm berry-bearing plants.	Restoration of watercourses that were cleared for log-driving and the removal of migration barriers have been going on for a long time in the area. Together with ongoing efforts to improve management of fishing, this provides great opportunities for increasing recreational fishing in the River Vindelälven. Hunting in the area is regulated. The right of public access gives everyone access to nature.				
Sense of place	Spending time in nature is a strong tradition, particularly in forest and mountain regions. Many people are active in hunting and fishing, and picking berries for domestic needs is common. These activities are strongly tied to identity.						

Value, custom or tradition	A. Description	B. Threats	C. Measures (15.6.2)
Festivals and events	<p>A large number of festivals and events are held in the area, including Umeå Open, Umefolk, House of Metal, Kulturhatta (<i>The culture night</i>) Jazz festival, the baseball festival, Umeå pride, the MADE-festival, the Backen festival (all in Umeå), regular markets, Sami culture days/weeks/weekends (Lycksele, Umeå, Arjeplog and Ammarnäs), Kullar & Klang (Vännforsbäck), Pårfestivalen (potato festival, Ammarnäs), various fishing festivals (Sorsole), Motor Week (Lycksele), the Handicrafts Fair (Vormsele), National River Day, Days in Laisdalen, Umeå Capital of Culture 2014.</p>	<p>Grant reductions.</p>	<p>Several festivals and events have increased their visitor numbers. Some of these receive municipal and/or state grants, while others are fully financed by ticket sales etc. Sami culture weeks are jointly organised by municipalities, Sami associations and museums. Umeå was appointed Capital of Culture in 2014 thanks to the determination to make the city and northern Sweden more visible in Europe, and to use culture as a driving force of regional development. The Capital of Culture year was divided into eight seasons according to the Sami calendar year. Activities were organised by associations, organisations, cultural institutions and other stakeholders. The initiative was part of a long-term development policy for the city in order to create new networks, international collaboration projects and opportunities. Many of these projects have also continued beyond 2014.</p>
Museums	<p>The three biggest museums in the area are Västerbotten's Museum (Umeå), Bildmuseet (Umeå), the Forest Museum (Lycksele) and the Silver Museum (in Arjeplog, just outside of the area). Other museums include Guitars, Kvinnohistoriska museet (museum of women's history), Västerbottens Medicinhistoriska museum (museum of medical history; all in Umeå), Motor-museum (Vännäs), Inlandsbanamuseet (about the inland railway line, in Sorsole) as well as rural community centres with some museum activities.</p>	<p>The bigger museums are financed by means of state grants. Others may be dependent on private or municipal grants. Reduced grants result in reduced activity.</p>	<p>The bigger museums are part of the counties' cultural action plans and receive state grants. Their teaching activities have high priority, as do activities concerning issues of diversity, gender equality, accessibility, national minorities and the Sami cultural heritage. The museums are always looking for additional sources of financing for their activities.</p>

Value, custom or tradition	A. Description	B. Threats	C. Measures (15.6.2)
Cultural institutions	<p>The area is home to several cultural institutions. In addition to the museums, there is NorrlandsOperan, Sliperiet, Friluftsmuseet Gammalia (open-air museum), Kulturväven (all in Umeå), musikens hus (Vännäs), Kvarnen (Vindeln), Gamlplatsen (Lycksele), Samegården (Ammarnäs), Tråhpie (Umeå), and Slöjdarnas hus (Vännäsby). There are several theatres in the area, most of them in Umeå. All municipalities have a Folkets hus (community centre), libraries, local community centres, parks and cinemas.</p>	<p>State culture grants and municipal grants are crucial for many cultural institutions. Reduced grants result in reduced activity.</p>	<p>One of the main goals in Norrbotten's as well as Västerbotten's cultural action plans is the development of an accessible and gender-equal cultural infrastructure in the region. These plans are used in the dialogue about state appropriations for cultural activities. NorrlandsOperan is also an important employer of cultural workers in the area, whose mission is to produce, promote, strengthen and develop opera, music theatre, music, dance and other stage performances.</p>
New cultures and languages	<p>Representatives of many cultures, including from Germany, the Netherlands and Thailand, live in the area. Increasing numbers of asylum seekers, mainly from Syria and Afghanistan, also bring influences from other cultures and traditions. This is particularly evident in the smaller communities, which have had to take on a great deal of responsibility in the reception of refugees, although the refugees are a minority group.</p>	<p>The xenophobic wind blowing across the western world risk making these cultures rather than segregated. The limited resources of municipalities may reduce the communities' ability to take part in different cultural expressions.</p>	<p>Many municipalities have Vän (Friend) projects which are intended to promote contact between residents and new arrivals. Churches, sports associations and adult education associations in the area also contribute in the form of integration-promoting activities. SFI (Swedish for Immigrants) programmes help immigrants learn and improve their Swedish. In some places the business community offers internships and apprenticeships.</p>
Culture for children and young people	<p>Children and young people partake of culture through schools, theatres, libraries, music schools, local heritage societies, educational associations etc.</p>	<p>Resources are often limited, leading frequently to a "first come, first served" situation. Previously, inland pupils would be taken by bus to the museums in the area, but today there is rarely the money for this activity. Even within Umeå it is difficult to make use of the Culture Bus. The cost of making culture accessible to children in more sparsely populated areas, e.g. through meetings with museum teachers, is very high.</p>	<p>One of the main goals in Norrbotten's as well as Västerbotten's cultural action plans is to promote children's and young people's participation and influence in the development of cultural life. The municipalities' libraries, Naturrum (Ammarnäs) and Naturcentrum (Vindeln) arrange various cultural activities for children at a local level. Västerbotten's Museum works with teachers and pupils all over the county. Activities include "theme packs" for preschools and pupils and a school web with digital material. The Forest and Silver museums also hold activities on site for preschools and schools, including with "theme packs". Umeå municipality has the Culture Bus that can take pupils from schools to museums. The Sami Information Centre has a website with material for teachers and pupils. Sami associations have activities for small children. Umeå municipality has set up a Sami preschool department for Sami children (2 years of age upwards).</p>



Image 60. Reindeer herder with the catch of the day at Bräjära. Photo: Ola Jennersten

15.6.2 Indicate activities aimed at identifying, safeguarding, promoting and/or revitalising such values and practices.

Measures being applied in the planned biosphere reserve are presented in Table 22, column C

15.6.3 How should cultural values be integrated in the development process: elements of identity, traditional knowledge, social organizations, etc.?

The landscape has shaped its inhabitants, just as the inhabitants have shaped the landscape, which is how the cultural sites and settings in Vindelälven-Juhtatdahka have emerged over the millennia. In terms of their dialect and interpersonal relations, the people within the river valley are more closely linked to each other than to people in other river valleys. The cultural environment strengthens our shared identity and enables us to find roots in history, which in turn can increase our understanding of the present. Preserving and making the cultural heritage and cultural sites accessible are therefore at least as important as creating the conditions for contemporary cultural expression (such as music, dance, art and writing).

The area has a rich contemporary Swedish and Sami cultural life. Table 22 (15.6.1) demonstrates how this is made up of a variety of cultural institutions and cultural expressions that are active in the planned biosphere reserve. Craftsmen, artisans, writers, musicians, dancers and artists live and work in the area. The artistic community in Umeå gets together at the new creative venue, Sliperiet – as well as at Bildmuseet, the Umeå Institute of Design, the Academy of Fine Arts, the Umeå School of Architecture and HUMlab, an interdisciplinary digital lab. The intensive work before and during Umeå's year as Capital of Culture in 2014, which included the surrounding region as well as Umeå, contributed to giving cultural issues more political room, with increased collaboration between the local and regional levels. Efforts to preserve, develop and support cultural expression in Vindelälven-Juhtatdahka can also be made through exchanges with other biosphere reserves. Vindelälven-Juhtatdahka has already had exchanges with the Manicouagan-Uapishka biosphere reserve in Canada (see 16.3.1).

15.6.4 Specify whether any indicators are used to evaluate these activities. If yes, which ones and give details.

(Examples of indicators: presence and number of formal and non-formal education programmes that transmit these values and practices, number of revitalisation programmes in place, number of speakers of an endangered or minority language).

It is difficult to express traditions and values as indicators and in figures. It is also difficult to get exact figures for visitors to cultural events, and even to the museums in the area, as many do not charge any

entrance fee and therefore do not register the number of visitors. However, the number of organisations involved with culture and the number of traditional events that are held can be used as an indicator of how vital the region is and in what direction it is developing. The size of the government's appropriations for culture gives some indication of the cultural climate. General statistics on the state of cultural businesses (number of companies per business type, number of employees per company) are available from Statistics Sweden.

Norrbottnen and Västerbotten counties both have their own cultural action plans. These include formulations of cultural policy goals and development areas for various activities. Many of these are formulated as measurable indicators.

Municipalities have data on the number of active cultural associations, which can give some indication of the level of activity. Each association registers its own number of members.

The Sami Parliament and the Stockholm County Administrative Board have a shared national mission to follow up the implementation of national minorities policy. This is carried out on the basis of reporting by the national Public Health Agency, county administrative boards, the Swedish Institute for Language and Folklore, the Sami School Board, the Swedish Schools Inspectorate and the National Board of Health and Welfare. More in-depth follow-ups are also done via questionnaire surveys in the country's municipalities and interviews with senior managers and reference groups. The Sami Language Centre publishes an annual situation report on Sami languages in Sweden. Assessments of the threat level to these languages are made on the basis of UNESCO's nine criteria.

16. LOGISTIC SUPPORT FUNCTION:

16.1 Research and monitoring:

16.1.1 Describe existing and planned research programmes and projects as well as monitoring activities and the area(s) in which they are (will be) undertaken in order to address specific questions related to biosphere reserve management and for the implementation of the management plan (please refer to variables in Annex I).

Habitat

Umeå University has several watercourse-related projects in the planned biosphere reserve, including how watercourse ecosystems recover ecologically following restoration of former log-driving channels, and how abiotic and ecological processes at the local and landscape levels interact in the regulation of biological diversity in watercourses. These primarily include plants, macro-vertebrates and fish. Vindelälven is also used as a reference area for studies of the hydropower-regulated River Umeälven, into how regulating flow for hydropower purposes affects the ecosystem.

Swedish University of Agricultural Sciences (SLU) is carrying out research on plants as well as animals within the planned biosphere reserve. SLU has, since a number of years, ongoing research in 17 brooks within the Krycklan tributary of the River Vindelälven, with research on e.g. how ground-water flows affect plant species diversity along watercourses. The overall aim of the Krycklan research is to understand how land use and climate affect water quality in the landscape.

Salmon migration and reproduction in the river has been monitored for many years. There is a specific problem in this context in that all upriver-migrating salmon have to pass Stornorrfor's power station in order to reach the spawning and nursery areas in Vindelälven. Most of the kelt and smolt, or young salmon, migrating downriver have to pass directly through the power station turbines, which leads to considerable stock decimation, in particular of kelt.

Elk are studied in several different projects, both archaeologically and with a focus on current management of stocks. Examples of areas studied include plant-animal interactions, migrations between summer and

winter areas, grazing, territories, choice of habitat and use of the environment, movement patterns, reproduction and survival, effects of disturbances and climate. SLU also take part in the compilation of reindeer herding plans, in collaboration with *samebys* around the country, including in the planned biosphere reserve. Research into forest production and its effects on the forest ecosystem is being done in several different projects, many of which are located at a couple of field stations in the lower part of the basin.

SLU is also studying the significance of fungi and invertebrates for the decomposition of wood in the forest. Another project which has been going on for a long time is looking at small-rodent dynamics. From previously having had high densities with fairly regular intervals, small rodents appear to have descended into a more continuous period of low densities. The causes may be related to climate change and could have serious consequences for those predators that are dependent on small rodents for their reproduction. Such consequences, for example for the boreal owl, have also been studied for many years. Stockholm University is studying the interaction of the Arctic fox with other species in the ecosystem, as well as its survival, demographics and genetics. The planned biosphere reserve is home to a substantial part of the country's Arctic fox population, which has also become a symbolic species for the Vindelfjällen nature reserve.

Since 1963 the LUVRE project has monitored and studied birds and insects in the Vindelfjällen Nature Reserve. The project is based at Lund University, but has also involved researchers from the universities of Gothenburg and Umeå, Gothenburg's Museum of Natural History, and amateur researchers from across Sweden. The LUVRE inventories provide continuous information about the state of our mountain fauna.

Socioeconomic environment

Umeå University does historical research about Sami culture. An example is the historical relationship between the Sami and the church. Umeå University is also looking into whether the Water Framework Directive's emphasis on collaboration has changed the way that the forestry industry deals with water issues, and if new forms of collaboration in water management have been created. Another object of study is the occurrence of local collaboration in the mountain region, to what extent such initiatives come from below and what role the county administrative boards and the EU play, respectively. The aim is to determine if such collaboration contributes to sustainable development in the mountains and if so, how. Research is also being done into Sami health and medicines in sparsely populated areas. Cerum at Umeå University is running a project with Umeå municipality (Umeå TALKS) about the city's growth, which is anticipated to reach a population of 200,000. Cerum also does research concerning rural development. The Institute for Subarctic Landscape Research, INSARC in Arjeplog, is doing basic research into the connection between human landscape use and ecosystem changes in northern environments. The institute has run a research programme since 2012, "Cultural heritage, landscapes and processes of identity in Fennoscandia", elucidating and illustrating landscape use and social change in northern Norrland's coastal areas during an era when the cultural landscape was shaped by hunters, fishermen, reindeer herders and farmers.

Environmental monitoring:

Environmental monitoring programmes from the area are shown in Table 23. Sweden has a well-developed system for monitoring the country's environmental state, which is documented by Swedish environmental monitoring, coordinated by the Environmental Protection Agency, together with changes in the environment. The lengths of the Swedish measurement series are in many cases unique in the world. Environmental monitoring has a strategic role in developing and following up work on Sweden's environmental quality objectives. Environmental monitoring also plays an important role in the development of environmental quality norms and assessment grounds. At the national level, the Environmental Protection Agency is responsible for eight programme areas (mountains, health-related environmental monitoring, agricultural land, landscapes, air, environmental toxin coordination, forests, wetlands) while the Agency for Marine and Water Management is responsible for coasts, seas and fresh water.

Table 23 Examples of ongoing environmental monitoring programmes, with measures and aims

Monitoring	Measure	Aim
<i>National</i>		
Forests	Random sample inventory of woodlands.	Describe the state of and changes to Sweden's forests. SLU ¹
Landscapes	National Inventory of the Landscape in Sweden, NILS.	Study changes in landscape composition and structure which can affect biological diversity. SLU ¹
Wetlands	Data collection from satellite images every 10 years, and verification inventories in the field.	Discover changes to hydrology and vegetation.
Fresh water:		
Watercourse trends	Includes studies of water chemistry, Measurement series from the 1980s exist.	Describe conditions and large-scale changes in the aquatic environment, provide a basis for assessing threats and propose measures in a selection of watercourses that is representative of the country as a whole, and none of which are affected by pollution or intensive land use. HAV ²
River mouths	Sampling in 47 watercourses that flow into the sea.	Measure and describe the transport of nutrients and other substances to the Baltic and the North Sea. Measurement series going back to 1966. HAV ²
Lake trends	Sampling to establish water chemistry, chlorophyll, phytoplankton, bottom fauna, fish.	Discover changes that may be effects of environmental impacts. Measurement series going back to 1984. HAV ²
Health-related	Environmental monitoring.	Build capacity and create comparable data at the European level.
<i>Regional</i>		
Watercourses:		
-Ume-/ Vindel-älven rivers and the river mouth	Recipient monitoring of water chemistry, aquatic invertebrates, flows and transports.	Provide a good overview of ongoing environmental controls, and form a basis for following up environmental objectives and devising better measures. Measurement series going back to 1977. Ume- och Vindel-älvens vattenvårdsförbund
-Krycklan, tributary	Studies of water quality, hydrology, aquatic ecology and their interrelationships.	Develop methods and models for predicting long-term changes in nature. Svartberget, SLU ¹
Mountains	Inventories of mountain vegetation, birds that breed in the mountains and key species (incl. Arctic fox, small rodents, gerfalcon and wolverine).	Monitoring focused on climate influences. County Administrative Board
Mammals/birds		
-Large predators	Inventory	Monitor population size and distribution for wildlife management and compensation for killed reindeer and domestic animals. County Administrative Board, among others.
-Arctic fox	Examination of dens.	Monitoring of population size and regeneration. County Administrative Boards, Stockholm University, Norwegian Environment Agency, NINA ³ .

-Elk	Inventory	Wildlife management. County Administrative Board, among others.
-Small rodents	Inventory. Measurement series going back to the 1970s.	Monitoring. County Administrative Board, SLU.
Fish		
-Salmon	Electrical pulse fishing.	Regional environmental monitoring. Monitor long and short-term changes to species' reproduction. County Administrative Board.
-Salmon smolt	Counting using a smolt trap by Stornorrfors power station.	Monitoring of survival rates.
-Migrating brood stock	Number passing the fish ladder near Stornorrfors power station. Measurement series since 1980.	Estimates of production and regeneration in the river.
-Various species	Electrical pulse fishing.	Verification/monitoring for e.g. follow-ups of completed watercourse restoration. Continuous or occasional sampling by different providers.
Freshwater pearl mussel	Counting and measuring of individuals in certain tributaries, every six years since 2001.	Long-term monitoring of development. County Administrative Board.

¹Swedish University of Agricultural Sciences

²Swedish Agency for Marine and Water Management

³Norsk institutt for naturforskning, the Norwegian Institute for Nature Research

The cultural heritage in the planned biosphere reserve is not currently being followed up in any coherent way. For this reason, the Swedish National Heritage Board has looked into whether NILS could also include cultural environments

16.1.2 Summarize past research and monitoring activities related to biosphere reserve management (please refer to variables in Annex I).

In 1982 VIKOM began working to support and develop the Vindelälven valley's natural and cultural assets and to initiate various collaboration projects. There was a broad knowledge base available for this work – for example, no other river valley in Sweden has been the subject of so much nature-related research as Vindelälven. Many of the research and environmental monitoring projects that are running have been going on for decades (see Annex 9 for a list of the research literature produced about the planned biosphere reserve). Umeå University has been carrying out research into natural assets in the area for a long time. For example, the area's flora and fauna, not least vascular plants and small rodents, are very well-mapped and recorded. These databases constitute an invaluable basis for the management of lands in the area. SLU has built an extensive knowledge base about how land use and climate affects water quality in the landscape and how forest production can be optimised. Other examples of studies that are valuable for the management of lands and waters include the histories of agriculture, forestry and log driving along the River Vindelälven, and the migration and reproduction of salmon. Umeå and Uppsala universities have done social science research in the planned biosphere reserve, including in connection with the planned national park in the Vindelfjällen mountains, and into conflicts surrounding hydropower. Cerum, the Centre for Regional Science at Umeå University, has deep as well as broad knowledge in social sciences, humanities and technological areas, as they relate to the Vindelälven basin.

Students at the Department of Political Science at Umeå University have studied challenges and opportunities in the management of Vindelälven-Juhtadaha as a biosphere reserve. Students at the University of Gothenburg are doing a master's thesis that examines the participation by local stakeholders in the efforts to establish a biosphere reserve.

16.1.3 Indicate what research infrastructure is available in the proposed biosphere reserve, and what role the biosphere reserve will play in supporting such infrastructure.

The main research infrastructure is found at Umeå University's and SLU's joint campus in Umeå. This includes libraries, data labs, research labs with advanced scientific equipment, design and media

studios, development centres and the meeting venue Sliperiet at the Institute of Design, as well as other facilities. SLU has field stations in Svartberget and Kulbäcksliden, within the planned biosphere reserve. Svartberget is a part of SITES (Swedish Infrastructure for Ecosystem Science) and is also a member of ICOS (Integrated Carbon Observation System). Vindelfjällen's research station, in Ammarnäs, is run by Vindelfjällens forskningsällskap, a research association, in close collaboration with Västerbotten's County Administrative Board. The location of INSARC (in Arjeplog) is of great importance, not least for regional development, since it makes it possible for researchers to both live and work in the mountain region, which is very rare in Sweden.

The universities have a number of research centres, including:

- Cerum, the Centre for Regional Science at Umeå University, has ongoing basic research about regional development. On several occasions the centre has studied the conditions for various forms of development in Västerbotten and its municipalities.
- ARCUM at Umeå University offers an interdisciplinary research environment focused on achieving sustainable development in northerly regions. Since April 2014, ARCUM is the programme host for the Mistra Arctic Sustainable Development (MASD) research project, which will continue until 31 March 2018. Researchers from Umeå University, the Royal Institute of Technology (KTH) and the two environmental and peace institutes, SIPRI and SEI in Stockholm, are all involved in the research programme. ARCUM has expressed an ambition to serve as a platform for developing research in the planned biosphere reserve.
- Vaartoe, the Centre for Sami Research, coordinates and initiates research in and about Sápmi, focusing on Sami and other indigenous people's cultures, societies, histories and languages.
- CERE, the Centre for Environmental and Resource Economics in Umeå, connects groups of researchers at Umeå University and SLU.
- UCGS, the Umeå Centre for Gender Studies at Umeå University, carries out internationally recognised research and training in gender equality.
- The Chemical Biological Centre (KBC) at Umeå University and SLU aims to become a world-leading research and teaching environment, and is already one of the country's strongest research centres in natural sciences and biological medicine.

16.2 Education for sustainable development and public awareness:

16.2.1 Describe existing and planned activities, indicating the target group(s) and numbers of people involved (as "teachers" and "students") and the area concerned.

There is a strong basis within the planned biosphere reserve for environmental education as well as activities that promote awareness and engagement among the general public. This is primarily to do with the presence of two big universities, one research institute and 106 local schools – combined with a high level of general interest in the local environment.

a) Environmental education

The educational infrastructure in the area comprises:

- 106 municipal and private schools (grades 1-9 and upper secondary schools), spread throughout the planned biosphere reserve, but with the emphasis in Umeå.
- Umeå University and SLU, offering several courses, programmes and master's programmes with an environmental focus. Different institutions deal to varying degrees with the management of fishing, hunting, forestry and farming, tourism, and reindeer husbandry.
- The Institute for Subarctic Landscape Research, INSARC, which arranges public lectures about its research.
- Naturskolan, the Nature School in Umeå, whose work involves the education of children and young people, and further training of teachers, in sustainable development and outdoor teaching. Naturskolan has worked with schools in the Vindelälven valley since 2010 in a number of different projects. In 2016-17 it met just over 300 children and 20 teachers on two occasions, teaching them about sustainable development and biosphere reserves.
- Adult education associations and folk high schools, which together make up Länsbildningsförbundet Folkbildning Västerbotten (the county educational federation for popular education in Västerbotten). The federation's task is to spread information and promote coordination and cooperation among the

county's popular education institutions.

- The museums in the area (including the Forest Museum and Västerbotten's Museum), and the Silver Museum just beyond the reserve area, all offer school activities for educational purposes.
- Vindelns folk high school can offer courses for anyone who wants to obtain general eligibility to higher education programmes. Examples of courses include building conservation (about taking care of houses in an ecological and sustainable way), design and colour in interior decoration, health pedagogy, special courses for the partially sighted, study motivation courses and introduction courses for new arrivals.
- Association activities with environmental training (e.g. scouts, the Swedish Society for Nature Conservation, ornithological associations, fish conservation associations).
- Vindelfjällen's Naturum (Ammarnäs) and the nature centre in Vindelns, which are open to the public, adults as well as children, and hold exhibitions, talks, guided walks etc. There are plans for a Naturum in the River Umeälven delta as well.
- The Ume- and Vindelälven Water Council, which contributes local knowledge in the work to give watercourses good ecological status.
- Biosphere ambassador training programme, to be offered in all six municipalities. The programme explains what a biosphere reserve and sustainable development imply, and also has more specific teaching on the planned biosphere reserve's six focal areas (13.2). Anyone who is interested can train to be a biosphere ambassador. The members of the board and the municipal working group for Vindelälven-Juhtatdahka also serve as ambassadors and will therefore attend the programme. The board of Vindelälven-Juhtatdahka and Umeå municipality have already completed parts of the training programme. The programme as a whole will be ready to be offered during the autumn of 2018. The ambassadors will have different backgrounds, but share the desire to be part of developing the planned biosphere reserve into a model area of sustainable development and to serve as communicators with the wider community. They will inform about activities in Vindelälven-Juhtatdahka and give feedback to the central office based on questions they get asked when they meet different people. That way we can pinpoint which areas of interest need further attention.

b) Public awareness and engagement

There are a number of different target groups for environmental information and environmental activities. These include geographical groups (villages, landowners, *samebys*, townspeople, coastal residents etc.), the local population (close to 140,000 people), more temporary inhabitants (including 32,000 university students), and tourists.

16.2.2 What facilities and financial resources are (or will be) available for these activities?

The planned biosphere reserve is actively involved in increasing the value of individual stakeholders' activities by serving as a framework that connects different projects with each other, creating synergies and, where possible, attracting new resources in order to support new and existing activities. Existing institutions will continue to provide environmental training and contribute to activities intended to increase public awareness and engagement, through schools and universities as well as a combination of public and voluntary bodies focused on local engagement. Our expectation is that biosphere-related work will be able to generate many collaborations between businesses and researchers, and also provide research ideas that researchers may want to adopt and finance, in small as well as large projects. We therefore assume that research activities within the planned biosphere reserve will increase significantly over time.

16.3 Contribution to the World Network of Biosphere Reserves:

16.3.1 How will the proposed biosphere reserve contribute to the World Network of Biosphere Reserves, its Regional and Thematic Networks?

The MAB meetings that representatives from the planned biosphere reserve have attended are shown in Table 24.

Table 24: National and international MAB meetings that representatives from the planned biosphere reserve have attended:

National	Vindelälven-Juhtatdahka 2014, Voxnadalen 2015, Östra Vätterbranterna 2016.
International	EuroMAB 2013 in Canada, NordMAB in Sweden (Nedre Dalälven), EuroMAB 2015 in Estonia, NordMAB 2015 in Sweden, EuroMAB 2017 in France.
Other MAB meetings	UNESCO's International Co-ordinating Council for the MAB Programme (ICC), Vätterbranterna 2014, Northern Periphery in the Arctic, NPA, in Norway in 2015, Branding high quality products and gastronomy, Parma, Italy in 2016.

Vindelälven-Juhtatdahka has held exchanges with the Manicouagan-Uapishka biosphere reserve in Canada. Representatives from Vindelälven-Juhtatdahka visited them in 2013 and 2016, and in 2014 representatives from Manicouagan-Uapishka visited the planned biosphere reserve. Vindelälven-Juhtatdahka also hosted the national biosphere meeting in 2014, which was organised as a workshop along the River Vindelälven, with the meeting held partly during the bus ride from the coastal city of Umeå and the mountain village of Ammarnäs. There were 29 participants in all.

With its 1.3-million-hectare landscape, extending from the mountains to the coast and including cities as well as rural areas, Vindelälven-Juhtatdahka has a lot to contribute internationally. Urbanisation, which has affected the area severely, is a global phenomenon. The processes and solutions that are devised and applied in the planned biosphere reserve to make the area more attractive to live and work in, and to visit, will produce knowledge that may be applicable to many other rural areas around the world.

Vindelälven-Juhtatdahka has a large Sami population, many members of which practice the traditional livelihood of reindeer husbandry. They represent several generations' experience of living close to nature. The traditional method for transferring knowledge, *árbbiemáhttu*, is the basis of much learning within the Sami community. Many indigenous peoples around the world share this approach to nature and to learning, and have similar historical experiences of colonisation by the majority community. As mentioned above, Sami representatives from Vindelälven-Juhtatdahka have already exchanged experiences with indigenous people in Canada, and there are great opportunities for continuing this successful exchange with them and with indigenous peoples from other biosphere reserves.

Experiences and results of research in Vindelälven-Juhtatdahka, including the recovery and restoration of ecosystems, forest research etc., will be shared nationally and internationally, with other biosphere reserves, researchers and the general public. It is our ambition that research initiated in Vindelälven-Juhtatdahka, by Umeå University and the Swedish University of Agricultural Sciences together with local people, will serve as a model for other biosphere reserves.

Experiences of the work on the focal areas will also be shared nationally and internationally. Here, too, there is much experience and knowledge to acquire from exchanges with other biosphere reserves. Areas such as the tourism industry and outdoor life, fishing, living landscapes and cultural diversity are not unique to Vindelälven-Juhtatdahka, but equally topical in many of the world's biosphere reserves.

16.3.2 What are the expected benefits of international cooperation for the biosphere reserve?

One of the biggest anticipated advantages of international cooperation is the opportunity to learn interesting and outstanding solutions (also known as benchmarking) from other biosphere reserves in the network, which have faced similar challenges in the beginning. For some issues, international cooperation may be more appropriate than national cooperation. In our case, the exchange with Manicouagan-Uapishka in Canada was decisive for engaging Sami from the *sameby* of Gran. The exchange allowed them to get a picture of how indigenous people can claim their space and be part of the work towards establishing a biosphere reserve. That created an engagement at home and a will to be part of determining the direction of biosphere efforts here. Others who live in the area also have experiences of international cooperation, and many look forward to the opportunity to learn how similar communities in other biosphere reserves have worked to solve problems that they share. As

mentioned above, partnerships in the subject areas that the focal areas constitute could be very useful for Vindelälven-Juhtatdahka, with the possibility of collecting and sharing experiences and knowledge. There are hopes that a biosphere award would lead to more international cooperation, but also to joint applications for the funding of shared projects, e.g. for exchanges with biosphere reserves that have indigenous populations and projects funded by the likes of NPA, EU and Interreg.

16.4 Internal and external communication channels and media used by the biosphere reserve:

16.4.1 Is (will) there (be) a biosphere reserve website? If yes, what is its URL?

Yes: <http://vindalalvenjuhtatdahka.se/>

16.4.2 Is (will) there (be) an electronic newsletter? If yes, how often will it be published?

Yes, an electronic newsletter is published twice per term. Subscriptions to it can be registered via our communication channels: Facebook and the website, <http://vindalalvenjuhtatdahka.se/>.

16.4.3 Does (will) the biosphere reserve belong to a social network (Facebook, Twitter, etc.)?

Facebook <https://www.facebook.com/vindelalvenjuhtatdahka/>

Instagram <https://www.instagram.com/vindelalvenjuhtatdahka/>

17. GOVERNANCE, BIOSPHERE RESERVE MANAGEMENT AND COORDINATION:

[Describe the following characteristics in the prospective that the site is being designated.]

17.1 Förvaltnings- och samordningsstrukturer

17.1.1 Vilken rättslig status har biosfärområdet?

Biosphere reserves have no special legal status under Swedish law. Nor does recognition as a biosphere reserve imply any new restrictions; instead it is intended to serve as an inspiration. Existing resources, policy instruments and agreements are to be focused on shared goals by means of collaboration between different organisations and stakeholders. Different geographical parts of the area are protected in different ways under Swedish law. This arrangement is described for the various zones under 9.3 and 17.1.2.

17.1.2 What is the legal status of the core area(s) and the buffer zone(s)?

The core area of Vindelälven (including Laisälven) is protected under Chapter 4 (national interest water conservation, national river) and Chapter 7 (Natura 2000, EU Habitats Directive) of the Environmental Code. This means that the river is protected against hydropower development and that it has special habitats and species protection, instituted by the EU. The core area of the Ume delta is part of the Natura 2000 network and is furthermore protected as a nature reserve.

The area's buffer zones consist of objects of national interest, Natura 2000 areas, fish protection areas, shore protection and nature reserves. The national interest concerns are nature conservation, reindeer husbandry, recreational outdoor life and cultural interest sites. Objects of national interest affect spatial planning as they are protected from certain types of development. In the lowest-lying parts of the area, the buffer zone is made up of Natura 2000 (land area within the Ume delta), and in the farthest-out part of a fish protection area. The area's westernmost nature reserve, the primeval mountain forest of Vindelfjällen and the Lais valley, are also Natura 2000 areas, which means that they are protected under the Habitats Directive.

17.1.3 Which administrative authorities have competence for each zone of the biosphere reserve (core area(s), buffer zone(s), transition area(s))?

Core areas

Västerbotten's and Norrbotten's county administrative boards are responsible for their management.

Buffer zones

The management of objects of national interest is a matter for both the state and municipalities. The division of responsibilities between different authorities is specified in the Ordinance (SFS 1998:896) on Land and Water Management, etc. The Sami Parliament is the administrative authority for reindeer husbandry matters, and responsible for the Reindeer Husbandry National Interest. The Swedish Environmental Protection Agency is the national authority responsible for the Nature Conservation and Outdoor Life national interests, while the Swedish National Heritage Board is the national authority responsible for the Cultural Heritage Sites National Interest. The lower River Umeälven and its banks are also included in the buffer zone. Umeå and Vännäs municipalities are formally responsible for the Lower Umeälven shore protection area, within their respective municipal boundaries.

Transition areas

There are nature reserves and Natura 2000 areas in the transition areas too, and the division of responsibilities described above applies to them as well. Municipalities' and landowners' control planning and development of most of the transition areas in accordance with laws and regulations is described in 9.3.

17.1.4. Clarify the respective competence of each of these authorities. Make a distinction between each zone if necessary and mention any decentralized authority.

Core areas

The Swedish Agency for Marine and Water Management is the central administrative authority in the environmental area for issues of conservation, restoration and sustainable use of lakes, watercourses and seas. Norrbotten's County Administrative Board is the water authority of the Gulf of Bothnia water district. The water authority has the overall responsibility for the management of water quality (this also applies for the lower River Umeälven and the Gulf of Bothnia). County administrative boards are administrators (maintenance, protection and supervision) of Natura 2000 areas and of nature reserves, where the Environmental Protection Agency has a guiding role.

Buffer zones

Objects of national interest are designated in a process where central state authorities as well as county administrative boards and municipalities participate. The designated objects of national interest are to be dealt with in municipalities' comprehensive plans, and in the work on those it is the county administrative board that represents state interests in a dialogue with municipalities. The division of responsibilities between the different authorities is specified in the Ordinance (SFS 1998:896) on Land and Water Management, etc. A municipality may grant an exemption from shore protection if there are special reasons (Ch 7, Section 18, items c-d of the Environmental Code).

17.1.5 Indicate the main land tenure (ownership) for each zone.

Figure 11 shows the geographical distribution of land ownership, and Tables 25 and 26 sum up ownership per zone.

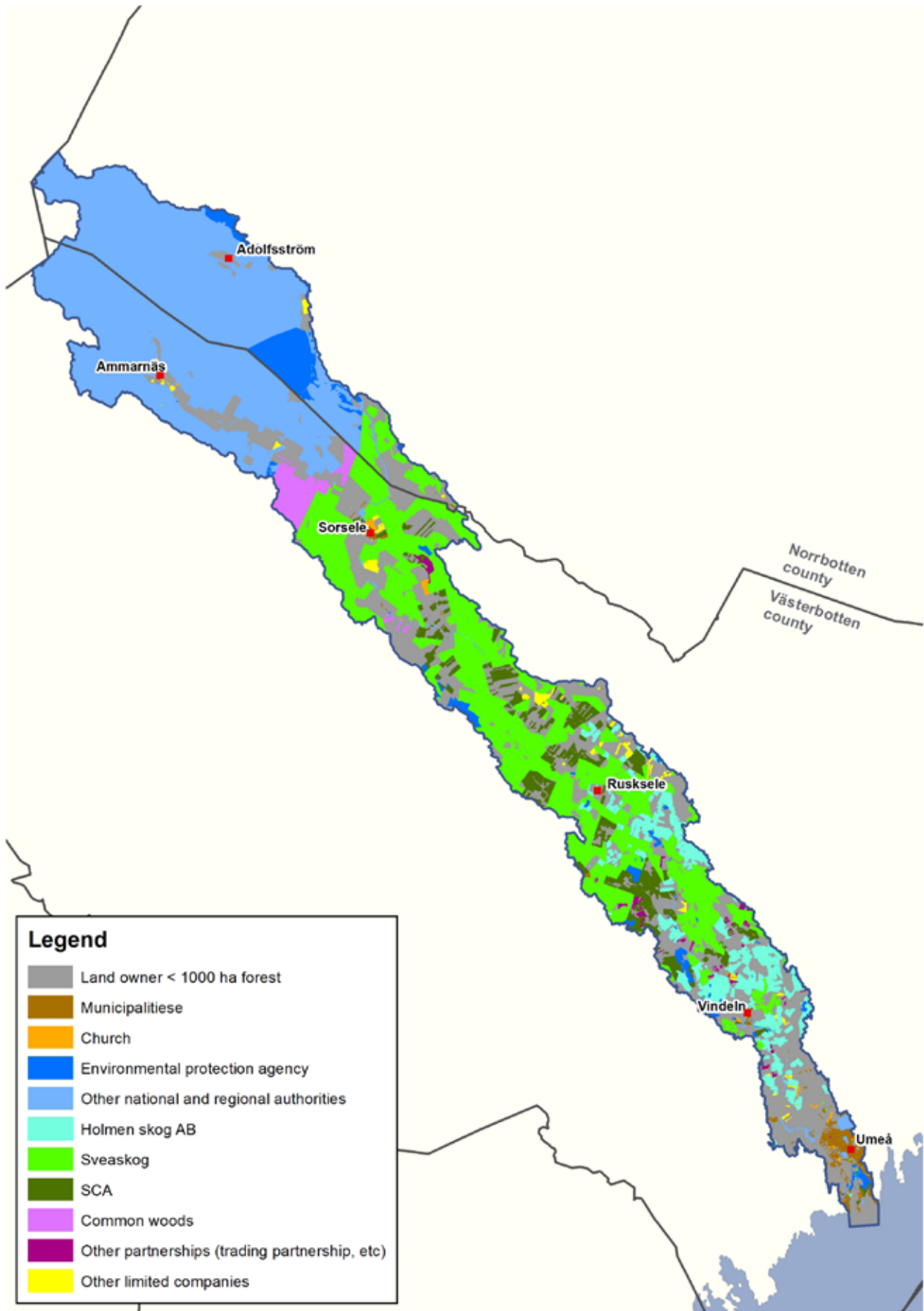


Figure 11. Land ownership structure in the planned biosphere reserve

Table 25. Ownership (land in ha.) in the core area, buffer zone and transition area

	CORE	BUFFER	TRANSITION	TOTAL
Privately owned	13 401	70 888	278 962	363 251
Company-owned	1 495	44 221	405 962	451 678
State-owned	5 968	287 598	220 622	514 189
Total	20 865	402 707	905 546	1 329 118

Table 26. Ownership (%) by owner-category in the core area, buffer zone and transition area

	CORE	BUFFER	TRANSITION
Privately-owned	64 %	18 %	31 %
Company-owned	7 %	11 %	45 %
State-owned	29 %	71 %	24 %
Total	100	100	100

17.1.6 Is there a single manager/coordinator of the biosphere reserve or are several people in charge of managing it?

If one manager/coordinator, who designates and employs him/her (national authorities, environmental administrative agency, local authorities)?

Vindelälven-Juhtatdahka is not the formal administrator of the area (even if the board includes representatives from administration, see 17.1.7); instead the role and idea of the proposed biosphere reserve is about serving as a neutral arena and motor for sustainable development in the entire area. There is currently a coordinator in the proposed biosphere reserve who is employed by Vindeln municipality.

17.1.7 Are there consultative advisory or decision-making bodies (e.g., scientific council, general assembly of inhabitants of the reserve) for each zone or for the whole biosphere reserve?

If yes, describe their composition, role and competence, and the frequency of their meetings.

The interim board of the Vindelälven-Juhtatdahka candidacy decides the direction of work on the biosphere candidacy. The board is an independent body, and each stakeholder elects their own representative. Following a series of presentations about UNESCO's MAB programme and the objectives of the board, the members of the board are up to speed about their task and role. The board comprises a broad representation from the area. During the preliminary study, the steering committee drew up a board structure made up of 17 "interest areas", each represented by one ordinary member and one substitute. The geographical distribution of the reserve area was addressed by means of one representative from each of the three types of municipality – mountain, forest and coastal – and representatives from the villages along the river valley, classified according to the same principle. Initially 15 of a total of 34 members were women; today the distribution is 14 women and 20 men. The board holds 2-4 meetings per year, at different locations within the planned biosphere reserve. The breadth of representation is shown below (ordinary member; substitute).

- Mountain municipality (Sorsole; Arjeplog)
- Forest municipality (Vindeln; Lycksele)
- Coastal municipality (Umeå; Vännäs)
- County administrative board (1 ordinary member, 1 substitute)
- Region Västerbotten (1 ordinary member, 1 substitute)
- World Wide Fund for Nature, WWF (1 ordinary member, 1 substitute)
- Sameby 1 (Ran sameby; Ran sameby)
- Sameby 2 (Gran sameby; Malå sameby)
- Mountain village (Laisvall; Ammarnäs)
- Forest village (Rusksele; Vindelgransele)

- Coastal village (Tavelsjö; Hissjö)
- Forestry industry (Swedish Forest Agency; Sveaskog)
- Land-based industries (1 ordinary member, 1 substitute)
- Fishing (1 ordinary member, 1 substitute)
- Tourism (Fjällhästen; Gold of Lapland)
- Non-profit organisations (Swedish Tourist Association; Swedish Society for Nature Conservation)
- Universities/research (Umeå University; Swedish University of Agricultural Sciences)

Once the organisation has set up the association (June 2019), board members will be elected at the annual meeting following nominations by the election committee. The terms of office of the board members will be differentiated, so that the entire board is not replaced at the same time.

17.1.8 Has a coordination structure been established specifically for the biosphere reserve?

o If yes, describe in detail its functioning, composition and the relative proportion of each group in this structure, its role and competence.

o Is this coordination structure autonomous or is it under the authority of local or central government, or of the manager/coordinator of the biosphere reserve?

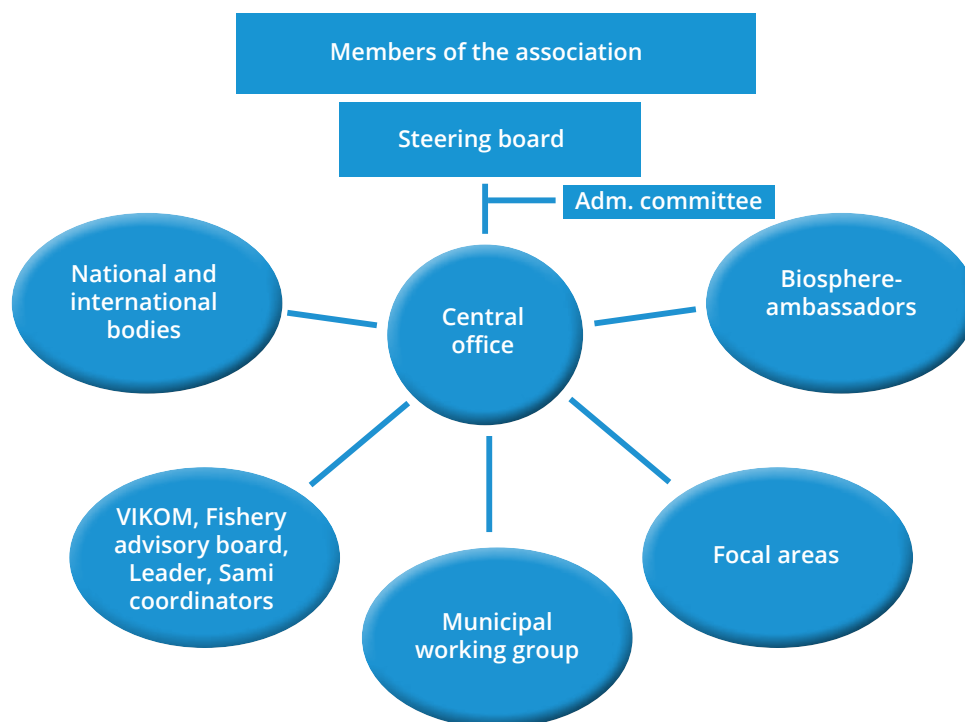


Figure 12. Organisation chart for the planned biosphere reserve Vindelälven-Juhtatdahka

The organisational model for the planned biosphere reserve is illustrated in Figure 12. The interim board serves as a joint coordination structure for the entire planned biosphere reserve (17.1.7). A working committee, comprising the chairperson of the board and the chief executives of Sorsele and Vindeln municipalities, is charged with managing various administrative tasks reducing the burden placed on the board, and with supporting the central office.

The organisation's day-to-day work is run from the biosphere's central office. Since 2015 this work has been led by a coordinator employed by Vindeln municipality, assisted by a communications officer. A fixed municipal working group made up of one representative from each municipality plus one from VIKOM, the Vindelälven municipalities' cooperative, is tied to the central office. In addition to assisting the central office in various tasks, these representatives can also function as local contact persons in the six municipalities (see 4.3.2).

The initiators from VIKOM, and the people that work with development of fishing (e.g. the Ume- and Vindelälven Fishery Advisory Board, FVO) and with rural development are examples of important cooperation partners. The coordinator has also consulted with a group of Sami coordinators from the Sami administrative municipalities of Sorsele, Lycksele, Malå and Umeå. The national as well as international MAB networks are also important sources of support in strategic work.

Biosphere ambassadors (Chapter 16) will also be tied to the future biosphere reserve. These ambassadors will serve as links to local communities, among migrants who have their roots in the river valley and in the municipalities. The members of the board are already acting as biosphere ambassadors and have a considerable responsibility in building support and spreading information within their own networks. Furthermore, a non-profit association will be formed in 2019, which will then elect the board (17.1.7).

17.1.9 How is the management/coordination adapted to the local situation?

The board itself comprises a broad and local representation, with participants from villages, municipalities, *samebys*, universities, tourism, forestry and non-profit organisations from the entire area (see 13.3 and 17.1.7). The municipal working group contributes its various competences and its members serve as local "biosphere ambassadors" in their respective municipalities. The working group is charged with i) keeping the residents of each municipality updated about biosphere-related work; ii) hosting at least one biosphere event every year; iii) internally rotating the hosting of the group's meetings; iv) assisting the central office in preparing the biosphere ambassador training programmes in each municipality; v) providing the coordinator with local documentation in preparation for the organisation's board meetings; and vi) contributing knowledge about municipalities' strategies for ensuring that biosphere efforts are in line with their respective initiatives and strategies.

The planned biosphere reserve's six focal areas (see 13.2) are based partly on the outcomes of workshops and meetings with inhabitants of the planned biosphere reserve. The working group has contributed knowledge about municipalities' strategies for ensuring that the focal areas are in line with their respective initiatives and strategies. Both focal areas and the development plan are adaptive, which means that they may be altered in future on the basis of the wishes and needs of the local population.

Since the area is of considerable geographical size (1.3 million hectares), local representatives known as biosphere ambassadors will be trained and will share knowledge of the Vindelälven-Juhtatdahka biosphere candidate with their contacts and networks, as well as look out for events and activities in their local areas that can be tied in to biosphere efforts (16.2.1).

17.1.10 Is there a procedure for evaluating and monitoring the effectiveness of the management?

Work plans are described in annual activity plans and reported on in annual activity reports. These are sent to all financial backers according to an agreed reporting schedule. Work is followed up at all board meetings. Every year's final board meeting includes an evaluation of the extent to which the work carried out fulfils the activity plan for the past year.

17.2 Conflicts within the biosphere reserve:

17.2.1 Describe any important conflicts regarding the access or the use of natural resources in the area considered (and precise period if accurate). If the biosphere reserve has contributed to preventing or resolving some of these conflicts, explain what has been resolved or prevented, and how this was achieved for each zone.

Within the planned biosphere area there are, just as there are within all large geographical areas, issues that spark conflict. Many of these issues and conflicts originated in events and processes that took place in the distant past, and in many cases they are linked to various rights regarding land use and development. Today major conflicts of this kind in the area are handled by means of various forms of legal reviews as well as extensive consultation procedures. This way of handling conflicts usually works well, provided the

consultation procedure is done with due regard to time allocated and the parties' representation.

There are several areas of legislation and certification that influence cooperation and contribute to reducing conflicts in Vindelälven-Juhtatdahka. Swedish law, EU directives, and international conventions and agreements regulate everything from land ownership, land and water use to hunting and fishing, management of protected areas, and so on. Today certification systems exist for virtually all industries. For forestry the principal ones are PEFC (Programme for the Endorsement of Forest Certification) and FSC (Forest Stewardship Council), see 15.4.4. In agriculture there is KRAV certification, for example, with stringent requirements for animal welfare, health, social responsibility and climate impact. The tourism industry has its own established quality monitoring system, including through Naturens bästa/Nature's Best which looks at the whole picture in a company – economy, nature, culture – and through the criteria and methods of the Global Sustainable Tourism Council, which are used to improve sustainability standards in tourist destinations.

Parts of Vindelälven-Juhtatdahka also have a venerable tradition of cooperation that is important to draw attention to, learn from and build on. Creating trust between different stakeholders is a fundamental factor for resolving conflicts. That is why it is also important to possess knowledge about the origins of the conflicts in order to understand them, and not only focus on resolving them. This can be achieved by means of an early dialogue process.

Land rights

Sweden has not ratified the ILO's Indigenous and Tribal Peoples Convention, no. 169. The matter has been debated in the Swedish Parliament on several occasions, but every time the conclusion has been that Sweden should not ratify the convention. The principal reason for this is that fulfilment of the convention's Article 14, which requires states to recognise indigenous people's ownership and tenure of the lands that they have traditionally had, is deemed difficult to fulfil.

Avvittringen, the formalised allocation of land in Lapland at the end of the 19th century (9.1), generated enduring conflicts in the region. This land allocation regulated the private land that had previously been granted to some settlers, while the Sami were not granted any ownership rights at all to the land that they cultivated. Settlers were allocated small freehold farms for private ownership, and the size of these that has subsequently been questioned by some of these landowners. State-owned land above the limit of cultivation was allocated for the use of reindeer-herding Sami, which gives them greater rights there than in other areas. The Samis' rights to practice reindeer husbandry and to hunt and fish were formalised in the Reindeer Grazing Act of 1886. Rights below the limit of cultivation, in the winter pasturelands, are only vaguely formulated in legislation. Winter pasturing has therefore been the subject of several legal disputes between property owners and *samebys*.

Hunting and fishing

Hunting and fishing are very esteemed recreational pursuits among the population within the planned biosphere reserve. Elk hunting in particular is part of many people's lifestyle, and can also have an economic significance for households. Hunting and fishing rights normally belong to the landowner, and land rights issues in Lapland are complicated.

Above the cultivation limit samebys' members have hunting and fishing rights, not just on state-owned land, but also on privately-owned properties, where they share hunting rights with the landowners. The circumstance that landowners as well as *sameby* members hunt on the same land is usually referred to as double registration. In practice, double registration means that two different hunting parties each receive their elk allocation in the same land area. In many cases consultations are held between the hunting parties in order to prevent and resolve conflicts.

In the grazing area of Malå *sameby*, below the cultivation limit, the *sameby* has waived its right to hunt on private land, in exchange for state or company-owned land, so there is no double registration. Another form of dual rights and the practice of hunting is the one regarding hunting and fishing rights that exists between the *sameby* and the state. As landowner of large areas above the cultivation limit, the

state also has the hunting and fishing rights in these areas. Under the Reindeer Husbandry Act, *samebys'* members have the right to hunt and fish there, but they are not entitled to decide how hunting and fishing rights should be granted to others; that is the prerogative of the county administrative boards. A legal process regarding these issues is ongoing between the state and the *sameby* of Girja, in a case concerning the *sameby's* rights in Norrbotten County. In 2016 the District Court awarded the *sameby* the right to decide about hunting and fishing within the *sameby's* area, which could have consequences in other parts of Sápmi. The court's ruling was appealed by the state, however, and the court of appeal determined in January 2018 that "the *sameby* has greater entitlement than the state to the hunting of small game and to fishing", while the claim that the *sameby* has entire disposal of hunting and fishing rights without the state's consent was rejected. The ruling thus did not imply any change to current rules. It is not clear whether the case will be appealed to the court of final instance.

Elk hunting on state land above the cultivation limit is done in the form of granting the right to hunt to what are known as "local resident hunting parties" (*ortsbojaktlag*). The main purpose of granting this right is to allow elk hunting to be offered to people who are resident and domiciled in the mountain municipalities above the cultivation limit. This granting of hunting rights is enshrined in the Reindeer Husbandry Act, but may only occur to such an extent that it does not imply considerable inconvenience for reindeer herding. It must also be in keeping with good wildlife or fish conservation, and must occur without nuisance-causing encroachment of *sameby* members' rights to hunting or fishing. In 1992 the *Riksdag* adopted a new system for the granting of rights to small game hunting (in practice, grouse hunting) and fishing with a rod *on state-owned land* above the cultivation limit, in order to make it easier for Swedish citizens to get access to *small-game hunting* in the mountains and to remove the possibility of excluding hunters from EU countries. The new system reduced the influence of the *samebys*, which led to widespread protests. In order to mitigate the conflict over small-game hunting in the mountain areas of Vindelälven-Juhtatdahka, a system was introduced in the Ammarnäs area in 2006, in which small-game hunting was coordinated locally, with the municipality in charge. This system amounted in practice to a collaboration about hunting by means of a continuous dialogue between the *samebys*, tourism entrepreneurs, local hunters and other local residents.

Below the cultivation limit conflicts can sometimes arise between landowners and hunters. In simplified terms, this can be described as the forestry companies wanting to reduce grazing damage by elk, and therefore working to reduce elk stocks, while many hunters and private landowners consider elk stocks to be at a good level or even that they should be allowed to increase. To increase collaboration and minimise conflicts between hunters and landowners, a new elk management model was introduced a few years ago. It is based on the idea of dividing the landscape into "elk management areas" that have roughly the same geographical extension as an elk population. Each elk management area has an elk management group made up of representatives of landowners and hunters. This new elk management system has so far worked very well in many places, while in others it has not been completely successful.

Forestry

The issue of whether Swedish forestry is sustainable or not has been a subject of debate for a very long time. However, at the time of writing, in September 2017, the debate is more intense than ever. While representatives of various nature conservation interests claim that Swedish forestry is far from sustainable, and want to make the Forestry Act more stringent, representatives of the forestry industry maintain that the Swedish way of exploiting forests is sustainable in every way and that the current forest policy, which is based on freedom with responsibility, ought to be kept. In Vindelälven-Juhtatdahka just about all woodland outside of the nature reserves is exploited to produce timber. This primary product is harvested primarily by means of felling the majority of the trees across large areas at the same time, which is perceived by many people as a radical and sometimes negative transformation of the landscape. Conflicts can arise when nature conservation representatives draw attention to the fact that a logging area is high in natural value, when residents in the area or tourism businesses want to preserve a forest for social reasons, when cultural sites or ancient remains in the forest are damaged, or when reindeer migration trails are fragmented or valuable reindeer grazing areas are harvested. However, since forestry by definition is "ongoing land use", there is no permit procedure prior to felling. The forest owner is nonetheless obliged to report felling to the Swedish Forest Agency, which supervises

compliance with rules in forest conservation legislation and checks whether there is anything within the area that needs to be protected. If rules are not being followed, or if there is something that needs to be protected within the area, the agency contacts the forest owner. No assessment is made of the intended measures in relation to opposing interests, and there is no possibility of appealing against the felling of a specific area of forest. Consideration for biological diversity and other environmental assets is regulated in the Forestry Act, while consideration for other interests is mainly on a voluntary basis. Montane forests may not be felled without permission. The previously mentioned certification systems (PEFC and FSC) impose nature conservation considerations and social considerations that significantly surpass the requirements in the Forestry Act, and therefore play an important role for lowering the conflict level in the forests. Regarding reindeer husbandry, the Forest Agency's regulations pertaining to the Forestry Act state that forestry companies must consult with the affected *sameby* prior to felling. This applies in particular to forests rich in hanging lichens or located near enclosed reindeer pastures and other permanent installations. Consultations also provide an opportunity for conflict resolution.

Mines and wind power

Sweden's mineral strategy calls for increased competitiveness in the country's mining and minerals industry, which means that more mines are going to be established. As a result, several prospecting permits and a couple of mining licences have been granted within the planned biosphere reserve. The establishment of mines almost always leads to conflicts with reindeer husbandry, which suffers barrier effects. The Sami Parliament has therefore stated that: "*... Until such time as ILO 169 and the Nordic Sami Convention are ratified and implemented in Sweden, the Sami Parliament finds that further mineral exploitation and prospecting of Sápmi must NOT occur.*" Mining can also lead to conflicts with nature conservation interests, above all due to the risks of polluting lakes and watercourses. Within Vindelälven-Juhtatdahka today, mining activities are carried out by Boliden Mineral AB in Kristineberg. According to Botnia Exploration AB, a mining company, there are advanced plans for several small-scale gold mines by Vindelgransele. Prospecting permits have also been granted for the area around Kristineberg, by Tjålmträsk south of Sorsele, and along the River Dellikälven.

Wind is a renewable energy source and thus plays an important part in Sweden's sustainable energy supply. The *Riksdag* has adopted a planning framework for an annual production of 20 TWh of wind-generated electricity on land by 2020. For reindeer herding, however, wind power is highly problematic. Reindeer avoid grazing within sight or earshot of wind turbines, which in effect leads to a reduction in usable pastureland and makes migrations between different areas more difficult. The establishment of wind farms can also clash with nature conservation interests, e.g. in areas with golden eagles or bats. The tourism industry can also be negatively impacted as the large and very visible wind turbines can subtract from the impression of untouched wilderness. Today there are three wind farms in the area: one in Holmsund, one in Risliden in Vindelå municipality and one on Hornberget, north of Kristineberg. There are also wind farms just beyond the boundaries of Vindelälven-Juhtatdahka, e.g. in Åmliden and Blaiken, which are visible from within the planned biosphere reserve. A number of areas within Vindelälven-Juhtatdahka have furthermore been indicated in municipal wind power plans as potential wind farms. There are plans, for example, for a 100-turbine wind farm on the Sandsjöhöjderna heights in Sorsele municipality, beginning in 2022. In the municipality, opinion is divided on wind power. The citizens voted against the proposals in a referendum in 2016. The municipal assembly nevertheless decided to invest more in wind power, with the justification that it creates both jobs and more renewable energy. The matter is currently pending as Västerbotten County Administrative Board prepares an environmental review.

In dealing with conflicts over planned mining activities and wind power development, the environmental review that is carried out prior to each project going ahead attempts a trade-off between the different interests.

Hydropower and watercourse restorations

Today the River Vindelälven is protected against hydropower development, but it is nevertheless affected by the Stornorrfors power station, downstream from the confluence of the Umeälven and Vindelälven rivers (see Figure 5). Three of Vindelälven's tributaries also retain older hydropower stations, built before

the river came under protection – these are in Rödån, Åman and Giertsbäcken. Despite the very good results achieved with fish ladders and other investments, problems persist in leading salmon and trout past Stornorrfors power station in a satisfactory way. Currently the mortality rate is about 25 % for smolt migrating downstream and close to 75 % for adult fish forced to pass through the turbines in the power station. The conflict surrounding Stornorrfors power station and its impact on migrating salmon and sea trout has been going on for several decades. However, an ambitious dialogue and cooperation attempts are today in progress between Vattenfall, fishing rights holders, anglers and research in order to find different ways of reducing the power station's negative impact on the migrating fish.

The River Vindelälven and its tributaries were used for a long time for log driving. In order to facilitate the logs' journey down the watercourses, dams and guide beams were built and large numbers of boulders cleared. The river's structural diversity decreased as water speeds increased, to the detriment of fish as well as many other animals and plants. In order to remedy this, extensive restoration projects have been carried out in several phases, and further restoration is planned. When restoration efforts affect historical remains of considerable cultural value, these projects can come into conflict with the conservation of cultural sites. Many people who live along the river have family members who worked in log driving, or were themselves employed as log drivers. For some of these people, restoration efforts have sparked fears that a cultural heritage will be wiped out. These concerns have been reduced, however, once it has become clear that the purpose of watercourse restoration is to try to create more natural conditions for fish and other aquatic organisms, and that the focus is often on returning rock mass that was shifted onto the banks back into the water – and that many more distinctive log-driving structures, such as guide beams and stone piers will be left in place. To reduce the risk of conflicts around watercourse restorations in the area, local consultations are held with landowners and the local population. The landowner also signs a permit for restoration work before each restoration begins. The principle is that consultations are consensus-oriented, and if a conflict arises over individual objects, these are left in place. These consultations include the cultural site considerations. When objects are particularly large, a separate consultation is held with the County Administrative Board's culture and environment units.

Berry picking

Under Sweden's right of public access, berry picking may be undertaken by anyone, on privately-owned as well as state-owned land. This also applies to berry picking for commercial purposes. Commercial berry picking is mostly carried out by guest workers from other countries, and conflicts sometimes arise when groups of berry pickers set up camp and cause problems for landowners. Within the planned biosphere reserve, commercial berry picking is now mainly undertaken by organised berry pickers who live in specially designated facilities and who are familiar with Swedish regulations. Still, a potential conflict remains as the private landowners' organisation, LRF, is pursuing its contention that commercial berry picking should not be included in the right of public access.

Reindeer husbandry

Modern reindeer herding is motorised, and nature conservation as well as tourism stakeholders have highlighted wear caused to mountain terrain by reindeer herders' use of motorcycles and quads during the summer. However, the areas affected by this are relatively limited and it rarely leads to any major conflicts. Local conflicts may also arise periodically when reindeer occupy private gardens, cultivated fields, illuminated skiing or running trails and such – but these conflicts are usually resolved through dialogue.

17.2.2 If there are any conflicts in competence among the different administrative authorities in the management of the biosphere reserve, describe these.

The remits of various administrative bodies in our area are described in detail in section 17.1 above. No open or intractable conflicts exist between the administrative entities within Vindelälven-Juhtatdahka; instead there are some areas that require relations to be developed over time – particularly when new structures have been created. These include the planned fusion of Region Västerbotten with parts of Västerbotten County Administrative Board into the Västerbotten Regional Municipality (Regionkommun Västerbotten). The new regional municipality will have the overall responsibility for medical care and regional development.

Benefits of a biosphere reserve

The process of developing Vindelälven-Juhtatdahka biosphere reserve has led to an increased recognition of shared interests among groups that do not have a history of working together. We therefore expect the planned biosphere reserve to be able to contribute to the coordination of different missions that the affected organisations have. Administrative entities will thus have a greater incentive to share information and knowledge, and to work towards shared goals than they did before the biosphere reserve award. This also applies to the fact that ideas about local businesses and partnerships are being increasingly emphasised in rural development. By putting the emphasis on community and partnership structures, and on organising coordination and resource allocation, Vindelälven-Juhtatdahka will contribute by identifying key mechanisms for achieving sustainable development goals in practice.

17.2.3 Explain the means used to resolve these conflicts, and their effectiveness.

Because of the long history of the conflicts, their complexity and the fact that conflict management today is largely regulated in statutes, certification systems and by well-established practice, it is difficult within the framework of biosphere-related work to directly influence conflicts towards a positive outcome. However, work within the planned biosphere reserve can have an indirect role by serving as a neutral arena and contribute to a better climate for negotiations and management of difficult issues and conflicts. By means of a broad representation of different interests and types of knowledge on the board and in various biosphere projects, Vindelälven-Juhtatdahka can bring a landscape perspective, stimulate collaboration and knowledge exchange between different stakeholders, create an increased sense of "us" – and, by means of information initiatives, provide a broader and more comprehensive picture of the circumstances and challenges that various livelihoods and stakeholders have, as well as of the potential of and opportunities for the entire area.

17.3 Representation, participation and consultation of local communities:

17.3.1 At what stages in the existence of a biosphere reserve have local people been involved: design of the biosphere reserve, drawing up of the management/cooperation plan, implementation of the plan, day to day management of the biosphere reserve? Give some specific examples.

As described in 13.4, the local population has been involved regularly during the nomination work, including in a large number of workshops and meetings, and at the reference review of the candidacy application. All forms of local sustainable initiatives are encouraged, but it is not always that the local population knows how or what they can contribute. Getting information to reach the right target groups is a challenge. A priority of the biosphere-related work is to find ways to spread information about and engagement with the planned biosphere reserve. Among solutions for disseminating information over large areas, such as Vindelälven-Juhtatdahka, are the use of regularly updated digital information, setting up local branches of the central office, and opening biosphere embassies and engaging biosphere ambassadors.

17.3.2 Describe how the local people (including women and indigenous communities) have been, and/or are represented in the planning and management of the biosphere reserve (e.g., assembly of representatives, consultative groups).

The local population has been involved right from the point at which an initial study was made to explore the conditions for creating a biosphere reserve along the Vindelälven river valley. In order to learn about what had been done previously in terms of research, management and use of the area, possible stakeholders in the area and their motivation to get involved, as well as to have a dialogue about the structure of the organisation, including the location of the central office and the composition of the board, local meetings were held in all six municipalities (see 17.3.1). The population felt that the board should have broad representation, with geographical distribution of representatives from coastal, forest and mountain municipalities and villages, representatives from county administrative boards, the WWF, universities, as well as of businesses/interest organisations and *samebys*, and that it should strive for a gender balance among members. The local population has been represented in the candidacy's board by representatives from their respective municipalities, as well as by village representatives.

The current composition of the board is described in 17.1.7. Three *samebys* are represented (Ran, Gran and Malå), and the share of women on the board is 42 %. Board meetings have been held in the various municipalities in order to distribute travelling evenly, as well as sharing the work involved in preparation and hosting meetings. Meetings are held during the daytime. In order to facilitate the attendance by as many members as possible (including the self-employed), daily allowances and travel compensation are paid. For municipal and state employees, attendance at the meetings is part of normal work.

17.3.3 Describe the specific situation of young people in the proposed biosphere reserve

(e.g., potential impacts of the biosphere reserve on youth, consideration of their interests and needs, incentives to encourage them to participate actively in the governance system of the biosphere reserve).

The creation of a biosphere reserve can have several positive effects for young people in the area. A biosphere reserve will not only encourage cooperation, but will also create incentives for sustainable economic development based on the area's natural and cultural environmental qualities, which in turn can provide new income opportunities for land-based industries (including reindeer husbandry), tourism companies, environmentally-driven business development etc. The very core of biosphere efforts, which is to highlight the area's unique qualities and increase the attractiveness of living and working in the area, also involves making it more attractive to children, young people and young families. A key factor for achieving a positive demographic development in the area is for families with young children to want to settle there.

During the nomination work on Vindelälven-Juhtatdahka, initiatives to involve children and young people were also launched. Since it is their generation that is going to live in and manage the area in the future, it follows that their opinions are valued. As part of the collaboration with Naturskolan, the opinions of schoolchildren throughout the planned biosphere reserve were collected. Together with pupils from years 4 and 5, and their teachers, Naturskolan explored what sustainable development implies locally and what pupils think is necessary in order for their district to develop in a sustainable way. As part of a masters' degree course in political science and a postgraduate course at Umeå University and the Swedish University of Agricultural Sciences, students there also became involved in biosphere-related work. As part of their upper secondary education, a group of young people from the coastal region set up a company, Asalea Unga Företagare, which applied to be a partner in the planned biosphere reserve. The company sells sweets made from organic natural ingredients (berries and honey) sourced from Vindelälven-Juhtatdahka, and puts great effort into highlighting the unique characteristics of the area's nature and culture via its website, social media and public talks.

The higher education programmes offered in the area include those at universities, vocational training centres and folk high schools. These are mostly concentrated near the coast. There are no upper secondary schools in the mountain region, which means that many young people leave these parts of Vindelälven-Juhtatdahka as young as 15. Internet-based higher education programmes could increase the opportunities for young people to return home after upper secondary school, and to receive a higher education there.

17.3.4 What form does this representation take (e.g., companies, associations, environmental associations, trade unions)?

The broad representation on the board of Vindelälven-Juhtatdahka (municipalities, villages, *samebys*, non-profit organisations, land-based industries, tourism, fishing and authorities) is described in 13.3 and 17.1.7 above.

17.3.5 Are there procedures for integrating the representative body of local communities

(e.g., financial, election of representatives, traditional authorities)?

As described in 13.3 and 17.1.7 above, the local population is represented on the board by e.g. their municipal representatives, village representatives, *samebys*, and non-profit organisations. Companies,

associations, organisations and private individuals will be able to become members of the non-profit association which will be formed in connection with the biosphere reserve designation. As described in 17.3.2 and 17.3.3, the opinions of the local population and of young people have also been heard by means of local workshops and training sessions.

17.3.6 How long-lived are consultation mechanisms (permanent assembly, consultation on specific projects)? Make a complete description of this consultation. What are the roles of involved stakeholders compared to the role of the biosphere reserve?

Consultation work around Vindelälven

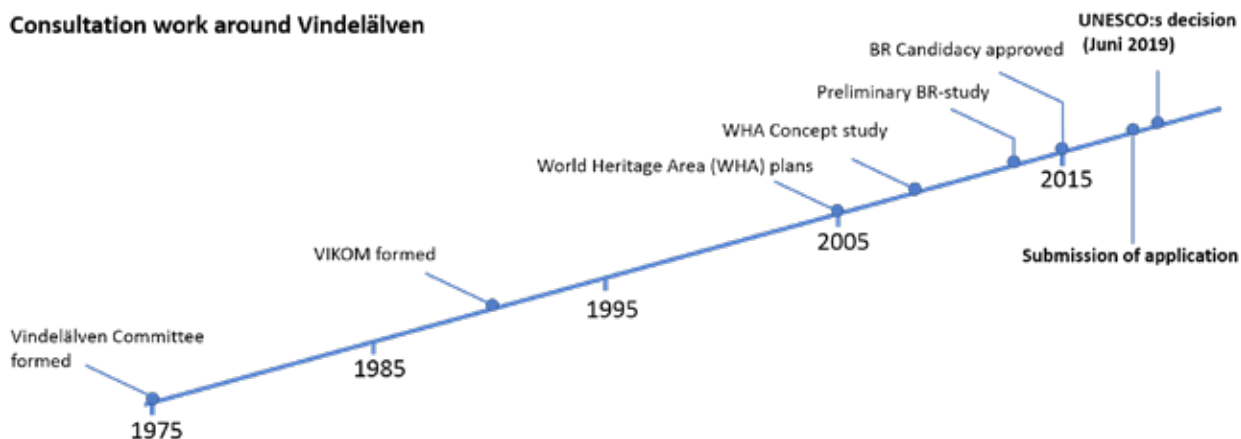


Figure 13. Timeline with important events leading up to this biosphere application.

In 1975, Vindelälven was designated one of the country's 25 primary recreation areas (Figure 12). A forum for cooperation, the Vindelälven Committee, was formed at this time to coordinate various actions for the benefit of Vindelälven. In 1992 the Vindelälven Committee was reorganised as the Vindelälven Municipalities' Cooperative, VIKOM, which was an early advocate for a clear vision and strategy for the river valley's development. In 2005, VIKOM brought up the idea of exploring the Vindelälven river valley's possibilities of being declared a world heritage area by UNESCO. With financial support from the Västerbotten County Administrative Board, VIKOM carried out a concept study which was completed in 2008. It showed that Vindelälven had natural and cultural assets with a bearing on the world heritage criteria, but that it would require more studies and consultations to further elucidate this assessment. In the process, interest became increasingly focused on UNESCO's Man and the Biosphere (MAB) programme. Vindelälven as a biosphere reserve was deemed to be a powerful tool for long-term sustainable development of the river valley.

The first concrete steps in the efforts to turn the Vindelälven river valley into a biosphere reserve were taken in Kronlund on 2 May 2013. A group of 50 people, representing municipalities, businesses, non-profit organisations, research connected with the river valley, and much more, met to discuss what a biosphere reserve could mean for the future of the Vindelälven river valley. There was general agreement that a preliminary study was the logical next step. The Västerbotten County Administrative Board, VIKOM and the World Wide Fund for Nature (WWF) therefore initiated a preliminary study to determine the possibility of Vindelälven becoming one of UNESCO's model areas for sustainable development. During this period (August 2013 until 2014), the Västerbotten County Administrative Board was in charge of the project. A steering group was appointed which included representatives of the municipalities along the river as well as from the WWF and the Västerbotten County Administrative Board. During the same period a working group was established, comprising the project manager and representatives from Lycksele, Sorsele, Umeå, Vindelö and Vännäs municipalities, and from VIKOM. The attendees at the meeting on 2 May 2013 were invited to serve as the reference group for the preliminary study, with the addition of the nature conservation council at Västerbotten's County Administrative Board. The fact that the steering group only consisted of the project principals' group caused a certain amount of friction and suspicion, and it was soon agreed that the candidacy's board would have a broader representation. Between November 2013 and January 2014 (during the preliminary study), evening consultations were held in the villages of Gargnäs, Blattnicksele, Rusksele, Sorsele, Vindelgransele, Vormsele, Åmsele, Vännäsby, Vindelö, Laisvall and Adolfström.

The biosphere candidacy was approved on 6 February 2015. Since that time the board has had the representation described in 13.3 and 17.1.7. Responsibility for personnel was transferred to Vindelns municipality at the start of the candidacy. Financial responsibility currently remains with the Västerbotten County Administrative Board, but will be transferred to the non-profit association that will be created when the project is awarded biosphere status. Consultations have included more than 160 external meetings, including ones with researchers, students, villages, associations, farmers, business owners, Sami, local heritage societies, municipal executive committees and authorities in the area.

The representational composition of the board has remained unchanged throughout the period of work on the nomination, but various members have left/joined during that time. The composition of the board may change following the nomination if this is deemed to be positive for biosphere efforts. The board seeks consensus, but votes on some issues, which has proved a successful approach. A great deal of trust has been built within the board over time, not least in the form of a gradually increasing understanding of each other's differing realities – and the fact that everyone has different expectations to live up to from their respective organisations and interest areas. This has developed over time into very open discussions and good dialogues which in turn have created a positive and enterprising spirit, great engagement and a solid basis for constructive work on the planned biosphere reserve.

17.3.7 What consultation mechanisms have been used, and who has been involved? Are they for specific purposes or long-term? What impacts have they had on decision-making processes (decisional, consultative or merely to inform the population)?

Various types of consultations are described in 13.4 and 17.3.2-17.3.5, and their scheduling in 17.3.6. The planned biosphere reserve's focus areas have started from the ongoing project work within the area and from consultations with municipal representatives, the board and the local population (17.4.2). The board of Vindelälven-Juhtatdahka meets 2-4 times per year. Usually only ordinary board members are called, but at least once a year a board meeting is called for all members and their substitutes. Even when only ordinary members are called, substitutes are nevertheless welcome to attend, albeit without voting rights or financial compensation. Strategic decisions on what efforts to focus on as well as decisions on submitted project applications are taken at board meetings. During the nomination period, the board's work has been long-term, and associated interests have remained the same throughout.

17.3.8 Do women participate in community organizations and decision-making processes? Are their interests and needs given equal consideration? What incentives or programmes are in place to encourage their representation and participation (e.g.: was(were) a "gender impact assessment(s)" carried out)?

Under Swedish law, no one may be given favourable or unfavourable treatment on the basis of their gender. In Sweden, which is one of the most gender-equal countries in the world, it is a norm that the interests and needs of men and women be given the same consideration. During work on the candidacy (from 2015 onwards), the share of women on the board of Vindelälven-Juhtatdahka dropped from 47 % to 42 % (August 2017). Vindelälven-Juhtatdahka works actively to maintain a balance between women and men on the board, and due to the reduction in the share of women, participating stakeholders are encouraged to appoint women to vacant posts in order to obtain an even distribution of women and men. Women are also represented to a considerable extent in local and regional organisations and at authorities.

17.4. The management/cooperation plan/policy:

17.4.1 Is there a management/cooperation plan/policy for the biosphere reserve as a whole?

Work on drawing up a development plan for the area for this purpose is ongoing and is expected to be completed during the spring of 2018.

17.4.2 Which actors are involved in preparing the management/cooperation plan? How are they involved?

The development plan is drawn up following discussions with many stakeholders and with the population of the area. Initially the central office drafted a proposal on the basis of the Lima Action Plan, with suggested focal areas. The focal areas were selected on the basis of the projects that had been financed or otherwise supported by Vindelälven-Juhtatdahka up to that point, and by reviewing other types of ongoing projects in the area. The proposal was presented to the board and to the municipal working group, which made constructive contributions. The municipal working group then had to ensure that the proposal was in line with municipalities' policies by consulting each one's comprehensive plan and strategy. At the end of 2017 the municipal working group presented a reworked proposal for focal areas. The proposal was then presented in letters, meetings and oral presentations to representatives of fishing (Leader Fishing Area Vindelälven, the Ume/Vindelälven Fishery Advisory board, fishing entrepreneurs), farmers (at a board meeting of Vindelälvens natural pastures (Natural Pastures)), to researchers and students, and for those involved in the tourism industry and outdoor recreational life, in nature conservation, forestry, for people active in culture, and for reindeer herders. These groups all had the possibility of submitting suggestions for changes and additions. The board, the working group and other municipal representatives – including a meeting with VIKOM in June 2017 – also contributed proposals for various strategies and possible projects within the different focal areas. It is important to point out that the development plan is not yet fully complete, and that it will be an adaptive document that can be changed on the basis of experiences gained and changed conditions.

17.4.3 Do local authorities formally adopt the management/cooperation plan? Are local authorities making reference to it in other policies and/or plans? If so, please provide details.

Local authorities operate on the basis of their own action plans and strategies. It is not likely that municipalities will adopt the plan formally since biosphere-related work in Sweden is already integrated to a great extent in local strategies, and as these in turn are what underpin many of the biosphere strategies. Much of the work defined in the development plan is thus in line with municipalities' and regions' development work. In the initial biosphere realisation work it will be important to continue to identify and define the role of the biosphere organisation in ongoing social development.

Work on the planned biosphere reserve has already been mentioned and highlighted in several municipalities' reworked comprehensive plans, as well as in Västerbotten County's regional development plan. In the consultation proposal for Arjeplog municipality's comprehensive plan there is an entire section devoted to the significance of the planned biosphere reserve for the development of Laisdalen. The same consultation proposal also includes the planned biosphere reserve in its formulation of targets and development strategy. Vännäs municipality's comprehensive plan from 2017 refers to the development potential of the planned biosphere reserve as an interesting recreational area, in providing tourism industry opportunities, and as an arena for collaboration. Sorsele municipality's consultation version for a new comprehensive plan includes a whole page on the planned biosphere reserve. Västerbotten County's regional development plan (*regional utvecklingsplan, RUS*) describes how the region will promote Sami interests within the planned biosphere reserve.

17.4.4 What is the duration of the management/cooperation plan? How often is it revised or renegotiated?

The development plan for Vindelälven-Juhtatdahka will ordinarily be a 5-year plan, which will be reviewed and updated annually in connection with operational planning for the coming year. However, the first plan will apply from completion (during 2018) until 2024. The second development plan (2024 – 2029) will be revised in connection with UNESCO's 10-year evaluation to apply for a period of 5 years.

17.4.5 Describe the contents of the management/cooperation plan. Does it consist of detailed measures or detailed guidelines? Give some examples of measures or guidelines advocated by the plan? (Enclose a copy).

The development plan for Vindelälven-Juhtatdahka sets out from the Lima Action Plan (LAP) and will apply from 2018 until 2024 (see 17.4.4). The plan aims to unite engagement and initiatives in the planned biosphere reserves in order to achieve sustainable development. Both the development plan and LAP describe overall goals and anticipated effects, as well as specific tasks for the planned biosphere reserves and how results of these are measured. The development plan is a living document and will evolve continuously.

The plan takes the following form: It starts by listing the four main goals and their respective effect targets (see 13.2), and describing how effects are measured (in accordance with LAP). In order to achieve Goal 1, "An effectively functioning model for sustainable development", work in Vindelälven-Juhtatdahka has been divided into six focal areas, which in the plan are described after the list of goals. Listed below are some of the activities proposed for each focal area for the achievement of the first goal.

Focal areas and planned activities

Diversity of cultural expressions

- Contribute to cultural exchanges. E.g. by: collecting and aggregating information about cultural events in the area, taking part in them and creating opportunities for new Swedes to participate in and contribute to cultural exchanges with other biosphere reserves.
- Support efforts to promote the Sami language, principally the severely threatened Ume Sami variety.
- Arrange "biosphere culture events" that flow down the river from the mountains to the coast. These can be physical, stopping in villages, as well as digital, with recordings from different parts of the area.
- Link cultural sites to the work on developing trails (see Tourism and industry and outdoor life for everyone) in order to turn them into attractive tourist destinations.
- Aggregate and facilitate information on settlement sites, ancient remains and older cultivation landscapes in use that may be valuable assets for regional development and tourism.

Tourism industry and outdoor life for everyone

- Coordinate and create meeting venues around the work to renew, develop, prioritise and commercialise selected trails that can be used by the local population as well as by visitors.
- Be an active party to the work on sustainable public transport (road 363) that makes more experiences accessible and creates better transportation for food production in the planned biosphere reserve.
- Work to make the planned biosphere reserve an attractive destination. This includes devising, together with other stakeholders, a strategy for signposting of trails and marketing of the area as a tourist destination.
- Give greater visibility to smaller projects/events that are good examples, e.g. Top of Arjeplog, Top of Taveljö, Vindelälvsdraget, Vindelälvsloppet, FUN events (Sorsele municipality). Make short films and accounts and participate in the planned biosphere reserve's digital network and the national and international MAB networks.
- Participate in the Swedish-Norwegian Bothnia-Atlantica project "Bärkraft" which aims to give the area a profile as a sustainable destination.

Thriving reindeer husbandry

- Collaborate with *samebys*, the Swedish Transport Administration, insurance companies etc. on trialling innovative solutions to reduce traffic accidents with reindeer.
- Collaborate with *samebys*, universities, forestry companies, the Swedish Forest Agency, WWF and non-profit organisations in the creation of lichen-rich stopping areas along herd migration trails.
- Assist in the efforts to spread knowledge about Sami culture and history, and about reindeer husbandry. This includes supporting the production of films and accounts to be shared in the planned biosphere reserve's digital network and the national and international MAB networks.
- Coordinate and create meeting venues for The Federation of Swedish Farmers (LRF), farmers and reindeer herders in order to enable local production of ensilage for reindeer. This will create jobs and open up the landscape while at the same time improving reindeer health.
- Contribute to exchanges between Sami from the area and other indigenous peoples for the purpose of sharing experiences.

Fishing in flourishing lakes, watercourses and seas

- Support efforts to spread information about fishing in the area
- Support the Ume/Vindelälven Fishery Advisory Board in its ambition to attract young people and women interested in fishing and fishing management.
- In collaboration with Naturskolan, the Ume/Vindelälven Fishery Advisory Board, SLU and Leader Fishing Area Vindelälven, spread knowledge to children and young people about the migrations of salmon and sea trout in the River Vindelälven, and about the significance of the fish for the river's ecosystem.
- Together with the Ume/Vindelälven Fishery Advisory Board, Leader Fishing Area Vindelälven, WWF, *samebys* and researchers collate, exchange and share knowledge about the management of fishing grounds in the mountains in a changeable climate situation.
- Support work on developing fishing tourism and the use of fish as food.

Development of the local community

- Call meetings with representatives from municipalities in order to identify shared issues of shared interest. E.g. consolidate shared issues in municipal comprehensive planning.
- Aggregate, facilitate and share good examples of social development work from other Swedish and international biosphere reserves.
- Aggregate, facilitate and share good examples from "model areas" in Vindelälven-Juhtatdahka, e.g. growing communities and villages. Interview new residents about why they chose to move there. Make short films and accounts to be shared in the biosphere reserve's digital network and the national and international MAB networks.
- Create possibilities for geographic exchanges and network building between young people in the biosphere reserve – from cities and the coast to the woods and mountains – in order for them to learn from each other about different challenges and opportunities in achieving sustainable development.
- Develop efforts on digital "info points" (biosphere embassies). Learn about Sorsele's experience and spread this to the rest of the area.

Living landscapes

- Collaborate with researchers, farmers (local knowledge) and LRF in order to explore the development potential of local food growing.
- Aggregate and map information about farming and forestry in the landscape. This includes areas under cultivation (from LRF) and different types of forestry (from the Swedish Forest Agency and SLU). This information is necessary in order to be able to monitor developments over time.
- Collaborate with various stakeholders for the purpose of increasing the total area of cultivated agricultural land, including semi-natural pastureland, in the area.
- Encourage and help the Swedish Forest Agency, LRF, the County Administrative Board, Norra Skogsägarna, forestry companies, businesses and non-profit organisations (e.g. the Swedish Society for Nature Conservation and the Swedish Tourist Association) to aggregate knowledge about different types of land use and about the aims of different landowners that involve their land and their activities (e.g. what exploitation methods different forest owners use/would like to use) – to benefit analyses of ecosystem services, potential jobs, and network building around shared interests.
- Communicate, make visible and map ecosystem services (EST) that are specific to Vindelälven-Juhtatdahka.

Several of the initiatives and projects being carried out in the focal areas (within Goal 1) will directly and/or indirectly contribute to fulfilling several effect targets at the same time. The initiatives and activities carried out by the biosphere organisation extend across all four main goals (see 13.2). Goal fulfilment of these activities affects the organisation directly.

The other half of the plan contains a description of how the organisation will fulfil the remaining three goals as well as horizontal criteria with a central significance for how work is to be done in the Vindelälven-Juhtatdahka biosphere reserve. These are: *Broad collaboration, local involvement and democracy; *Gender equality; *Diversity; *Learning for sustainable development; *Climate. These are not focal areas, but rather principles that should guide and apply in all work. This is followed by a brief presentation of the planned biosphere reserve Vindelälven-Juhtatdahka and its people, and finally there is a description of the biosphere reserve's organisation, concept, vision, principal goals, core values, and its roles and responsibilities. In order to keep the plan concise, it contains references to the website of Vindelälven-Juhtatdahka, the Swedish biosphere programme and UNESCO, where more information is available for anyone who wants to learn more about biosphere reserves.

17.4.6 Indicate how this management/cooperation addresses the objectives of the proposed biosphere reserve (as described in section 13.1).

The Lima Action Plan's goals and local strategies form the basis of the planned biosphere reserve's goals, projects and strategies. Work to be done within the planned biosphere reserve starts from the biosphere reserve's goals. The goals, their effects and connected activities make up the greater part of the development plan.

17.4.7 Is the plan binding? Is it based on a consensus?

The development plan will be adopted by means of a consensus decision by the biosphere reserve's board. The plan is adaptive, meaning that it may be altered as new lessons are learnt. It indicates the focus and direction that activities in the planned biosphere reserve must have in order to be a national and international model area for sustainable development. Material for the annual activity plans can be taken from the development plan.

17.4.8 Which authorities are in charge of the implementation of the plan, especially in the buffer zone(s) and the transition area(s)? Please provide evidence of the role of these authorities.

The board is responsible for the implementation of the plan. The central office is the executive.

17.4.9 Which factors impede or help its implementation (e.g.: reluctance of local people, conflicts between different levels of decision-making).

An annual follow-up of the plan is done in connection with reporting of the annual activity plans, which will be necessary in order to ensure that the plan's various parts have been carried out. It is also of decisive importance that the work is clearly coordinated, that roles and the division of responsibilities are clear, and that responsibility is divided between the biosphere central office and its board members. Most initiatives for activities come from below, which means that those taking the initiative also have a considerable responsibility for their implementation.

Challenges include the various stakeholders' different work loads and situations, which affects their priorities. All businesses generally have financial profit as their first priority. Reindeer herders are already heavily burdened with consultations of various kinds, and have little time to spare for getting involved with matters that do not clearly and directly influence their livelihood.

17.4.10 Is the biosphere reserve integrated in regional/national strategies? Vice versa, how are the local/municipal plans integrated in the planning of the biosphere reserve?

Municipalities' comprehensive plans and regional strategies underpin the six focal areas that have been defined for Vindelälven-Juhtatdahka. As described in 17.4.3, Vindelälven-Juhtatdahka is already included in several municipal comprehensive plans and in Västerbotten County's regional development strategy.

17.4.11 Indicate the main source of the funding and the estimated yearly budget.

Table 27. Annual budget for the biosphere candidate.

Financial backer	Amount (SEK/yr)	Note
Swedish Agency for Marine and Water Management	400 000	Core support
Municipalities involved (6)	425 000	
Västerbotten and Norrbotten county administrative boards	5 - 700 000	Based on finances and needs
World Wide Fund for Nature, WWF	500 000	
Annual budget	1 825 000 - 2 025 000	

The biosphere candidate's budget is shown in Table 27. Support from the Swedish Agency for Marine and Water Management will continue after this period as well, since national co-financing is a subsidy to all Swedish biosphere reserves. The contributions from the WWF, municipalities and county administrative boards may be subject to change depending on their respective financial situations and the biosphere reserve's needs. The annual budget is around SEK 2 million (about 194 000€) and will likely remain at that level for some time. The ambition is subsequently to seek other funding with which to increase the budget so that further sustainable projects can be supported, and to enable larger investments in knowledge and information spreading, in research and in linking up with other efforts towards sustainable development being continued in and beyond the planned biosphere reserve. Possible additional backers include NPA (Northern Periphery Arctic Project), EU-LIFE and Interreg Nord.

17.5. Conclusions:

17.5.1 In your opinion, what will ensure that both the functioning of the biosphere reserve and the structures in place will be satisfactory? Explain why and how, especially regarding the fulfillment of the three functions of biosphere reserves (conservation, development, logistic) and the participation of local communities.

The planned biosphere reserve will help bring together different stakeholders in the area and spread good examples of sustainable development. Secure financing and organisation are required in order to guarantee the activity. The organisation for the planned biosphere reserve includes many important stakeholders in the area. These have participated in drawing up strategies and ensuring that they are in line with the included stakeholders' and organisations' own strategies. At this point the organisation

for Vindelälven-Juhtatdahka has become well-established. Most of the participating organisations also contribute with funding to the planned biosphere reserve. Along with the representation in the biosphere organisation, and the networks of all those representatives, it will be possible to secure future financing. Vindelälven-Juhtatdahka has a central office with a coordinator as well as a consultant in charge of communication. These two together run the day-to-day work.

In order to improve the chance of success with the biosphere undertaking and disseminating the biosphere-related information, it is important that as many different stakeholders as possible feel included and involved to work on biosphere issues, and that they are able to kindle motivation in other stakeholders. If biosphere work can be integrated in and become at least a small part of most people's daily activities, a good foundation will have been laid for the fulfilment and securing of the biosphere reserve functions. The municipal working group contributes to this. Each municipality has appointed one member of this working group, whose task is to contribute to biosphere efforts internally within municipal operations and externally in the wider municipality. The biosphere ambassadors who will be trained in the area will also contribute to drawing attention to biosphere efforts and to its integration into various parts of the community. The non-profit association which is being formed will also serve as a platform for participation. Future biosphere work will put considerable focus on developing different ways of integrating it into the daily activities of increasing numbers of organisations and individuals.

18. SPECIAL DESIGNATIONS:

[Special designations recognize the importance of particular sites in carrying out the functions important in a biosphere reserve, such as conservation, monitoring, experimental research, and environmental education. These designations can help strengthen these functions where they exist or provide opportunities for developing them. Special designations may apply to an entire proposed biosphere reserve or to a site included within. They are therefore complementary and reinforcing of the designation as a biosphere reserve. Check each designation that applies to the proposed biosphere reserve and indicate its name

Name: Biosphere Reserve Vindelälven-Juhtatdahka

UNESCO World Heritage Site

RAMSAR Wetland Convention Site

- o Tjålmejaure-Laisdalen
- o River Vindelälven
- o The Ume River delta

Other international/regional conservation conventions/directives (specify)

- o The Birds Directive connected with Natura 2000: Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds
- o The Habitat Directive connected with Natura 2000: Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

Long term monitoring site (specify)

For a more detailed description see 16.1.1

o Species monitoring of salmon. Vindelälven is one of the country's 16 salmon rivers, and the biggest salmon river in Västerbotten County.

- The river has a number of electrofishing locales which are fished annually.
- Migrating salmonid spawners ascending the river are counted near Stornorrfor's power station.
- Annual smolt counting in smolt traps by Stornorrfor's power station.

o The Agency for Marine and Water Management's Fresh Water sub-programme is a national monitoring programme (NMÖ)

- The Trend Watercourses sub-programme began in the area in 2007, but most of the stations were part of the earlier programme for reference watercourses, and have been sampled with regard to water chemistry since the mid-1980s.

- The River Mouths sub-programme has been going on in the area since the end of the 1960s.
 - The Trend Lakes sub-programme began in the area in 2007, but most of the lakes were previously included in the programme for reference lakes, which started in 1984.
- o The Ume and Vindelälven Water Conservation Society carries out annual recipient tests in the Umeälven and Vindelälven rivers.
 - o National environmental monitoring of small rodents is carried out in the area annually.
 - o Within the Mountain programme area, annual inventories are made of e.g. Arctic fox, small rodents, gyrfalcon and wolverine.
 - o The Swedish National Forest Inventory at SLU is a national random sample inventory in which sample areas are inventoried and form the basis of estimates. Carried out annually.
 - o NILS, the National Inventory of the Landscape in Sweden, is run by SLU and monitors biological diversity in all land environments in Sweden.
 - o Monitoring and research in Vindelälven's tributary, Krycklan, has been carried on since 1920, but with increasing intensity in the past 30 years. Research here is connected with Svartberget, which is an LTER area (see below).
 - o Regional monitoring, RMÖ, of freshwater pearl mussel. Carried out in selected tributaries every 6 years. Began in 2001.
 - o The environmental state of wetlands is monitored via satellite across the country, except in the mountains. Data collection from satellite images is performed every 10 years.

(X) Long Term Ecological Research (LTER site)

- o Svartberget, Vindeln. Svartberget is a hub for forest field research in northern Sweden. Characteristic of Svartberget are the large infrastructures for field research into bog ecosystems, catchment areas and commercial pine and spruce forests. It offers unique opportunities for researchers to study processes and flows, at the ecosystem as well as the landscape level.

(X) Other (specify)

In 2013 the Vindelfjällen mountains, including the River Vindelälven, were selected as *Svensk Pärla* (Swedish Gem, www.wwf.se/svenskparlor) by the World Wide Fund for Nature, WWF.

19. SUPPORTING DOCUMENTS:

The following supporting documents are attached:

- Annex 1. Summary of information for updating MABnet
- Annex 2. Digital material (tables, images and maps in the application, film, other images)
- Annex 3. Zonation maps
- Annex 4. Age distribution of the area's population
- Annex 5. General map of the biosphere reserve
- Annex 6. Number and areas of voluntarily and formally protected areas
- Annex 7. Natura 2000 habitat types
- Annex 8. Terms and definitions for ecosystem services
- Annex 9. List of relevant research literature
- Annex 10. List of legal documents
- Annex 11. List of land use and management plans
- Annex 12. Species list
- Annex 13. List of the most important literature references (published the last 10 years)
- Annex 14. Original Endorsement letters according to paragraph 5
- Annex 15. Letter of recommendations

(1) Location and zonation map with coordinates

[Provide the biosphere reserve's standard geographical coordinates (all projected under WGS 84).

Provide a map on a topographic layer of the precise location and delimitation of the three zones of the biosphere reserve (Map(s) shall be provided in both paper and electronic copies). Shapefiles (also in WGS 84 projection system) used to produce the map

must also be attached to the electronic copy of the form. If applicable, also provide a link to access this map on the internet (e.g. Google map, website).]

Standard coordinates within Vindelälven-Juhtatdahka

Coordinate point	Latitude	Longitude
Most central point	65,35706	17,849247
Northernmost point	65,56483	15,56046
Southernmost point	63,61567	20,2293
Westernmost point	66,2531	15,37727
Easternmost point	63,67642	20,4131

Internet link to map: <https://www.arcgis.com/apps/SimpleViewer/index.html?appid=b28e4effd6a948849dad5b01f79ac442>

- Annex 3. Zonation maps (see also Figure 2)

(2) Vegetation or land use map

[A vegetation map or land cover map showing the principal habitats and land cover types of the proposed biosphere reserve should be provided, if available].

- Land use map: Figure 7
- Map of formally protected nature areas: Figure 10
- Map of land ownership structure: Figure 11

(3) List of legal documents (if possible with English, French or Spanish synthesis of its contents and a translation of its most relevant provisions)

- Annex 10

(4) List of land use and management plans

[List existing land use and management/cooperation plans (with dates and reference numbers) for the administrative area(s) included within the proposed biosphere reserve. Provide a copy of these documents. It is recommended to produce English, French or Spanish synthesis of its contents and a translation of its most relevant provisions]

- Areas of reindeer pasture in the *samebys*. Figure 4.
- Annex 11

(5) Species list

[Provide a list of important species occurring within the proposed biosphere reserve, including common names, wherever possible.]

- Annex 12

(6) List of main bibliographic references

[Provide a list of the main publications and articles of relevance to the proposed biosphere reserve over the past 5-10 years].

- Annex 13

(7) Original Endorsement letters according to paragraph 5

- Annex 14

(8) Further supporting documents.

- Annex 15, Letter of support

20. ADDRESSES:

20.1 Contact address of the proposed biosphere reserve:

[Government agency, organization, or other entity (entities) to serve as the main contact and to whom all correspondence within the World Network of Biosphere Reserves should be addressed.]

Name: Johanna Gardeström
Street or P.O. Box: Kommunhuset 11
City with postal code: 922 81 Vindeln
Country: Sweden
Telephone: (+46)725-594 893
E-mail: johanna@vindalalven.se
Web site: <http://vindalalvenjuhtatdahka.se>

20.2. Administering entity of the core area(s):

For address, phone number and e-mail, se chapter 5.

Name: County Administrative Board Västerbotten
Web site: <http://www.lansstyrelsen.se/Vasterbotten>

Name: County Administrative Board Norrbotten
Web site: <http://www.lansstyrelsen.se/Norrbotten>

Name: The Swedish Forest Agency
Web site: <https://www.skogsstyrelsen.se>

20.3. Administering entity of the buffer zone(s):

For address, phone number and e-mail, se chapter 5.

Name: Umeå municipality
Web site: <https://www.umea.se>

Name: Vännäs municipality
Web site: <https://www.vannas.se>

Name: Vindeln municipality
Web site: <http://vindeln.se>

Name: Lycksele municipality
Web site: <http://www.lycksele.se>

Name: Sorsele municipality
Web site: <https://www.sorsele.se>

Name: Arjeplog municipality
Web site: <http://arjeplog.se>

20.4. Administering entity of the transition area(s):

For address, phone number and e-mail, se chapter 5.

Name: The Swedish Forest Agency

Web site: <https://www.skogsstyrelsen.se>

Name: Umeå municipality

Web site: <https://www.umea.se>

Name: Vännäs municipality

Web site: <https://www.vannas.se>

Name: Vindelns municipality

Web site: <http://vindeln.se>

Name: Lycksele municipality

Web site: <http://www.lycksele.se>

Name: Sorsele municipality

Web site: <https://www.sorsele.se>

Name: Arjeplog municipality

Web site: <http://arjeplog.se>

Annex I of the biosphere reserve application form, January 2013

MABnet's catalogue of biosphere reserves

Description of the biosphere reserve¹

Administrative details

Country: Sweden

Name of the biosphere reserve: Vindelälven-Juhtatdahka Biosphere Reserve

Year designated: (to be filled in by the MAB Secretariat)

Administrative authorities: *Swedish Environmental Protection Agency, Västerbotten County Administrative Board, Norrbotten County Administrative Board, Arjeplog municipality, Sorsele municipality, Lycksele municipality, Vindelns municipality, Vännäs municipality, Umeå municipality*

Name contact: *Johanna Gardeström*

Contact address: *(+46)725-594 893, Vindelns kommun, Kommunalhusvägen 11, 922 81 Vindelns, johanna@vindalalven.se*

External links: <http://vindalalvenjuhtatdahka.se>

Social media: Facebook: <https://www.facebook.com/vindalalvenjuhtatdahka>

Instagram: <https://www.instagram.com/vindalalvenjuhtatdahka>

Description

General description

¹ Information published on MABnet as soon as the application has been accepted. The numbers refer to the corresponding sections in the application form.

The Vindelälven-Juhtatdahka biosphere reserve covers 13 294 km² and comprises the catchment area for the River Vindelälven, with the River Laisälven and the lower River Umeälven. It extends across six municipalities and two counties. The area's qualities are striking. It has a multitude of different biological assets, such as the culture landscapes of the mountain region and primeval forests, the freely flowing River Vindelälven with its species-rich banks, the vast and deep forests, agricultural land, and the coastline with the brackish waters of the Baltic. The area is home to many people with high ambitions and considerable skills. The expanding city of Umeå is located here, as are accessible rural areas and smaller municipalities, and rural communities far away from major towns.

Vindelälven-Juhtatdahka biosphere reserve is also home to seven *samebys* and their reindeer pasturing areas, a growing tourism industry, plus associations and large as well as small businesses in everything from the engineering industry to IT and forestry, farming and reindeer husbandry. There are also mines in operation and ongoing prospecting, as well as energy extraction. The rich natural and cultural environments of the planned biosphere reserve also offer remarkable opportunities for active outdoor pursuits all year round, with hiking trails of varying length, including the summer and winter trail along the River Vindelälven and Kungsleden, which extends across the big nature reserves in the mountains. Vindelälven-Juhtatdahka is also a recreational area for world-class fishing, hunting, skiing, snowmobile driving, and berry and mushroom picking.

The valley is one of the last areas in the world where people – Sweden's indigenous population, the Sami – still practice what continues to be largely traditional, season-based reindeer herding. Herders from the *samebys* lead their reindeer herds along the migration trail, "juhtatdahka", that runs alongside and on the River Vindelälven.

The considerable engagement and interest that exists in the river valley have led to a large number of development projects and internationally-recognised research. By bringing together ongoing sustainability efforts and including the area's various projects, research, interests and stakeholders, the biosphere reserve can be the tool with which, and the arena where, a joint strategy with further initiatives for long-term sustainable development takes shape.

Mayor ecosystem type: Lakes and watercourses: The freely flowing River Vindelälven and its tributaries

Major habitats & land cover types:

Forest and scrubland
Wetlands
Glaciers
Agricultural land
Boulder and substrate terrain
Built-up areas
Mountain birch woodland
Lakes and watercourses
Marine habitat and estuaries
Mountain birch woodland
Glaciers
Mountain heath

Bioclimatic zone: Dfc

Location (latitude & longitude): 65 35' 71 N, 17 89' 25 E

Total area: 1 329 118 ha

Core area(s): 20 865 ha

Buffer zone(s): 402 707 ha

Transition area(s): 905 546 ha

Different existing zoning: -

Altituder range: 0-1 641 metres above sea level

Zonation maps: <https://www.arcgis.com/apps/SimpleViewer/index.html?appid=b28e4effd6a948849dad5b01f79ac442>

The most important goal of the biosphere reserve**Brief description**

The overall goal:

To work together to develop, preserve and support rich and unique nature, culture, and people's quality of life in Vindelälven-Juhtatdahka so that everyone can live, grow and thrive in towns as well as the countryside, today as well as in the future.

Research**Brief description**

Research and education are strong presences in the Vindelälven-Juhtatdahka area, partly due to its two major universities, an institute for sub-Arctic landscape research (INSARC), along with considerable involvement from other universities, including research in the Vindelfjällen mountains, one of Europe's biggest nature reserves. The Arctic Research Centre (ARCUM) at Umeå University has expressed an ambition to serve as a platform for the development of research within the biosphere reserve.

Monitoring**Brief description**

Regional and local environmental monitoring is primarily carried out by the Norrbotten and Västerbotten county administrative boards. Among ongoing monitoring programmes in the area are the national forest inventory, inventories of predator stocks and monitoring of small rodents, breeding birds, arctic fox, freshwater pearl mussel, and salmon and trout stocks. Monitoring is also carried out of various environments, such as lakes, trend watercourses and wetlands.

Specific variables (fill in the table below and tick the relevant parameters)

Abiotic		Biodiversity	
Abiotic factors	X	Afforestation/Reforestation	
Acidic deposition/Atmospheric factors		Algae	X
Air quality		Alien and/or invasive species	X
Air temperature	X	Amphibians	
Climate, climatology	X	Arid and semi-arid systems	
Contaminants	X	Autoecology	
Drought		Beach/soft bottom systems	
Erosion	X	Benthos	
Geology	X	Biodiversity aspects	X
Geomorphology	X	Biogeography	X
Geophysics		Biology	X
Glaciology		Biotechnology	
Global change	X	Birds	X
Groundwater	X	Boreal forest systems	X
Habitat issues	X	Breeding	
Heavy metals	X	Coastal/marine systems	X
Hydrology	X	Community studies	X
Indicators	X	Conservation	X
Meteorology		Coral reefs	
Modeling	X	Degraded areas	X
Monitoring/methodologies	X	Desertification	
Nutrients	X	Dune systems	
Physical oceanography		Ecology	X
Pollution, pollutants	X	Ecosystem assessment	X
Siltation/sedimentation		Ecosystem functioning/structure	X
Soil	X	Ecosystem services	X
Speleology		Ecotones	X
Topography	X	Endemic species	X
Toxicology		Ethology	
UV radiation		Evapotranspiration	X
		Evolutionary studies/Palaeoecology	X
		Fauna	X
		Fires/fire ecology	X
		Fishes	X
		Flora	X
		Forest systems	X
		Freshwater systems	X
		Fungi	X
		Genetic resources	X
		Genetically modified organisms	
		Home gardens	
		Indicators	X
		Invertebrates	X
		Island systems/studies	
		Lagoon systems	
		Lichens	X
		Mammals	X
		Mangrove systems	
		Mediterranean type systems	
		Microorganisms	X
		Migrating populations	X
		Modeling	
		Monitoring/methodologies	X

		Mountain and highland systems	X
		Natural and other resources	X
		Natural medicinal products	
		Perturbations and resilience	X
		Pests/Diseases	
		Phenology	X
		Phytosociology/Succession	X
		Plankton	X
		Plants	X
		Polar systems	
		Pollination	X
		Population genetics/dynamics	X
		Productivity	X
		Rare/Endangered species	X
		Reptiles	
		Restoration/Rehabilitation	X
		Species (re) introduction	X
		Species inventorying	X
		Sub-tropical and temperate rainforest	
		Taxonomy	X
		Temperate forest systems	X
		Temperate grassland systems	
		Tropical dry forest systems	
		Tropical grassland and savannah systems	
		Tropical humid forest systems	
		Tundra systems	X
		Vegetation studies	X
		Volcanic/Geothermal systems	
		Wetland systems	X
		Wildlife	X

Socio-economic		Integrated monitoring	
Agriculture/Other production systems	X	Biogeochemical studies	X
Agroforestry		Carrying capacity	
Anthropological studies		Climate change	X
Aquaculture		Conflict analysis/resolution	
Archaeology		Ecosystem approach	X
Bioprospecting		Education and public awareness	X
Capacity building	X	Environmental changes	X
Cottage (home-based) industry	X	Geographic Information System (GIS)	X
Cultural aspects	X	Impact and risk studies	
Demography	X	Indicators	X
Economic studies	X	Indicators of environmental quality	X
Economically important species	X	Infrastructure development	X
Energy production systems	X	Institutional and legal aspects	
Ethnology/traditional practices/knowledge	X	Integrated studies	X
Firewood cutting	X	Interdisciplinary studies	X
Fishery	X	Land tenure	
Forestry	X	Land use/Land cover	X
Human health	X	Landscape inventorying/monitoring	X
Human migration		Management issues	X
Hunting	X	Mapping	X
Indicators	X	Modelling	
Indicators of sustainability	X	Monitoring/methodologies	X

Indigenous people's issues	X	Planning and zoning measures	
Industry	X	Policy issues	
Livelihood measures	X	Remote sensing	
Livestock and related impacts	X	Rural systems	X
Local participation	X	Sustainable development/use	X
Micro-credits		Transboundary issues/measures	
Mining	X	Urban systems	X
Modelling		Watershed studies/monitoring	X
Monitoring/methodologies	X		
Natural hazards	X		
Non-timber forest products	X		
Pastoralism	X		
People-Nature relations	X		
Poverty			
Quality economies/marketing			
Recreation	X		
Resource use	X		
Role of women			
Sacred sites	X		
Small business initiatives	X		
Social/Socio-economic aspects	X		
Stakeholders' interests	X		
Tourism	X		
Transports	X		



SUSTAINABLE DEVELOPMENT GOALS



United Nations
Educational, Scientific and
Cultural Organization



Man and
the Biosphere
Programme

