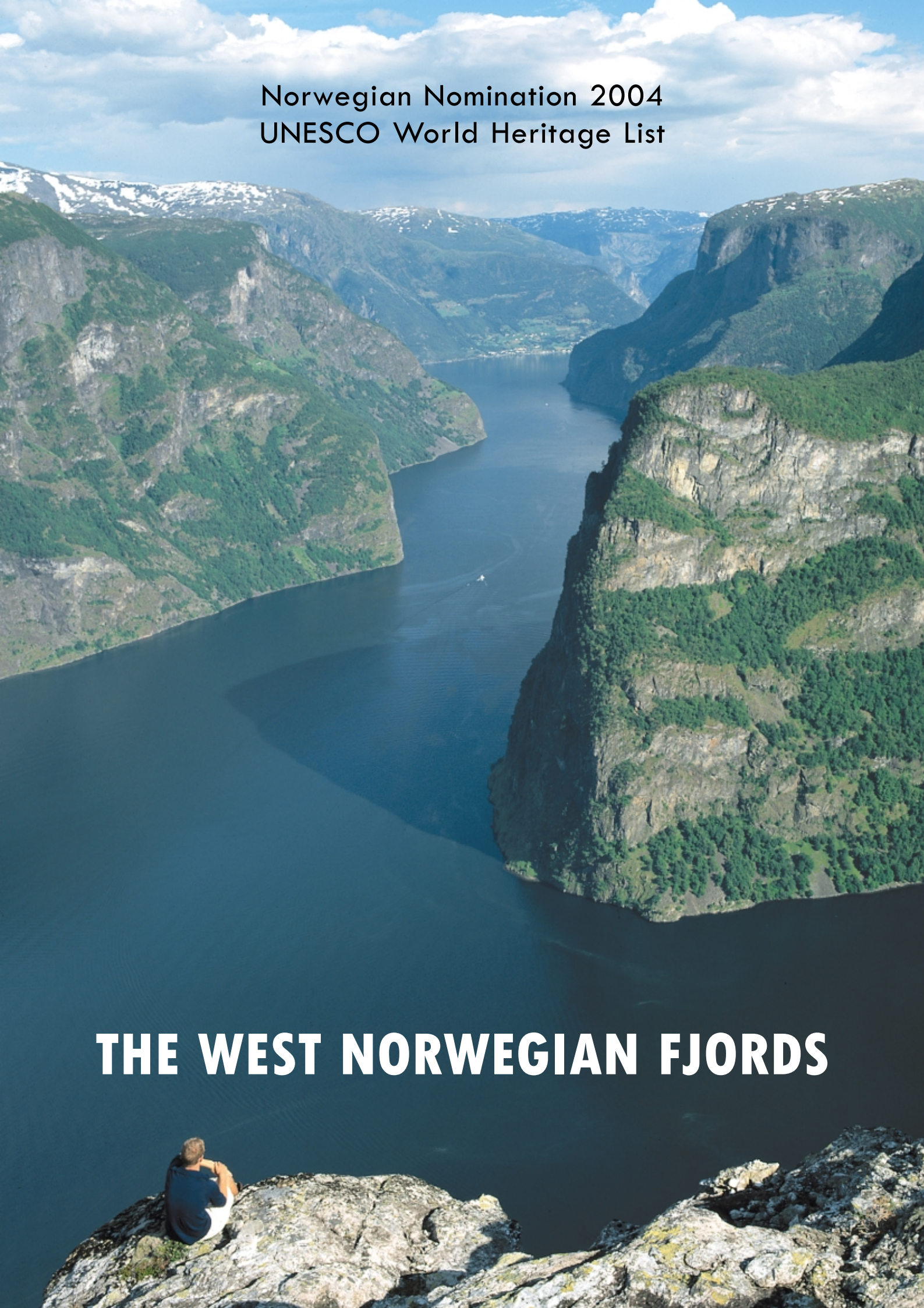
Norwegian Nomination 2004
UNESCO World Heritage List



THE WEST NORWEGIAN FJORDS

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CONTENTS

Introduction

In 2005, the kingdom of Norway is celebrating its centenary as an independent nation. In the international world of tourism this nation is synonymous with the word “fjords”, a term of Norwegian origin. Norway is truly the Fjordland of the world.

This dossier consists of the nomination and documentation of the West Norwegian Fjords, among the most unique fjord landscapes of the world. The nomination is a follow-up of a Nordic project that was organised by the Nordic Council of Ministers in 1994-96.

This was a joint, interdisciplinary project to seek new objects and areas that could be appropriate to receive World Heritage status. The work culminated in a number of recommendations that were put forward in a report entitled ”Nordisk Verdensarv/Nordic World Heritage” (NORD 1996:30/31) and these were underlined in a subsequent seminar in 1997 (TemaNord 1997:621). This work was supported by the UNESCO World Heritage Centre, which also part-funded the publication. In a letter to the General Secretary of the Nordic Council of Ministers, dated 4th February 1997, the UNESCO World Heritage Centre wrote:

” This project is exemplary for its integration approach to the identification and assessment of both cultural and natural world heritage.”

The objective of this work was to raise our eyes above the national sphere and view the natural and cultural values as a whole in a region that has much in common (the five Nordic nations). Particular emphasis was placed on evaluating areas of open countryside (natural heritage areas) with and without cultural content, cultural landscapes and ”mixed sites”, since at that time no such sites in the Nordic region were inscribed on the World Heritage List; it just held a number of sites and monuments of purely cultural value. Several new, potential cultural heritage sites and monuments were also evaluated.

The work was undertaken by representatives of the national authorities responsible for managing the natural and cultural heritage in the individual nations. Agreement was reached on the recommendations presented. Iceland ratified the Convention as a direct consequence of the work being undertaken in the Nordic project. In the period since the report was published, the various countries have followed up the recommendations to differing extents, amended them, or carried out additional evaluations. Two large areas in Sweden, the High Coast and southern Öland, both in the Baltic Sea region, have been inscribed on the World Heritage List.

Of the areas in Norway proposed in the report, the following four were placed on the official tentative list for Norway submitted on 1st October 2002: 1) the Vega Archipelago, 2) **Geirangerfjord and Nærøyfjord in western Norway (= The West Norwegian Fjords)**, 3) Tysfjord and Hellemobotn, and 4) Lofoten.

The nomination dossier of the Vega Archipelago were formally submitted to UNESCO in Paris on 27th January 2003. The second proposal on the Norwegian tentative list is **The West Norwegian Fjords** that consists of two sub-areas, Geirangerfjord and Nærøyfjord, which are 120 km apart. This serial nomination represents natural heritage of the highest quality and places emphasis on assessing landforms, geological features and the fjord landscape, in particular, in a cultural context.

The West Norwegian Fjords is the first Norwegian Natural Site proposed for inscription on the UNESCO World Heritage List.

Oslo 20th January 2004

MILJØVERNDEPARTEMENTET

Norwegian Ministry of the Environment

1 Identification of the Property

The West Norwegian Fjords consists of two sub-areas which are 120 km apart.

1a. Country

Norway

1b. County, borough

The Geirangerfjord area	County of Møre & Romsdal Boroughs of Norddal and Stranda
The Nærøyfjord area	County of Sogn & Fjordane Boroughs of Aurland, Vik and Lærdal County of Hordaland Borough of Voss

1c. Name of Property

The West Norwegian Fjords – Geirangerfjord and Nærøyfjord

1d. Exact location

The Geirangerfjord area	62° 00' – 62° 17' N 06° 55' – 07° 24' E
The Nærøyfjord area	60° 45' – 61° 09' N 06° 41' – 07° 16' E

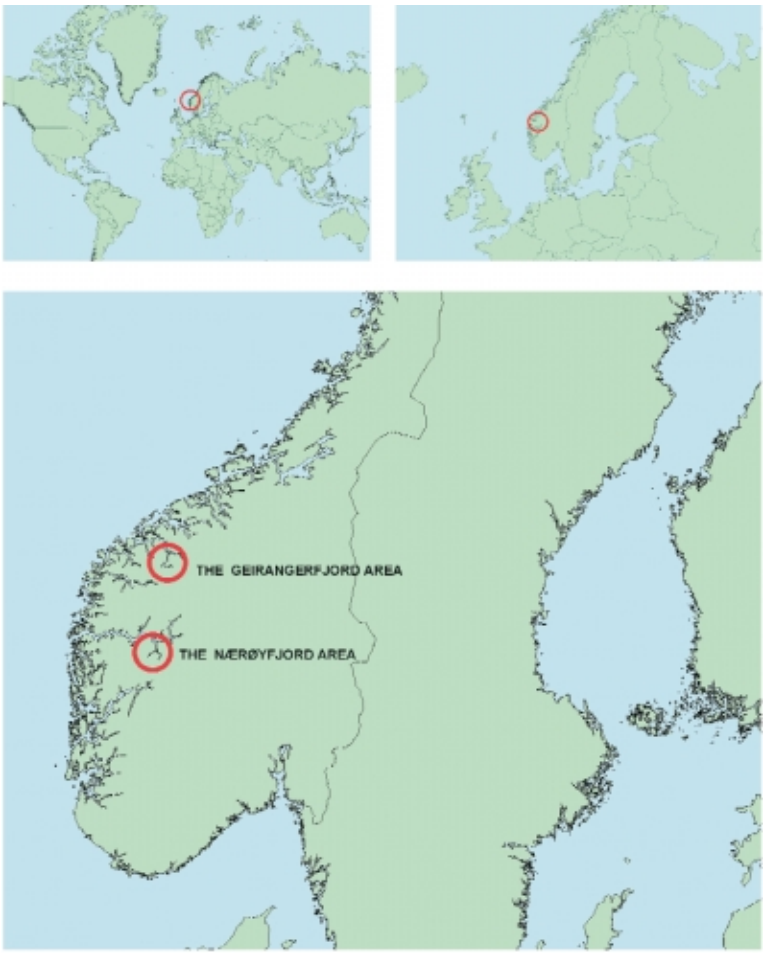

Figure 1. Location of property

1e. Maps

Annex 1

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Nærøyfjord area	Nos. 1316 I, 1317 II, 1416 IV and 1417 III

1f. Areas of property proposed for inscription

Table 1. Areas of property proposed for inscription.

Property	Area of land	Area of sea	Total area
Geirangerfjord area	46 151 ha	5 651 ha	51 802 ha
Nærøyfjord area	65 815 ha	5 095 ha	70 910 ha
The West Norwegian Fjords	**111 966 ha**	**10 746 ha**	**122 712 ha**

Table 2. Area in each borough.

Property	Borough	Area
Geirangerfjord area	Stranda	32 281 ha
	Norddal	19 521 ha
Nærøyfjord area	Aurland	53 794 ha
	Vik	8 283 ha
	Voss	4 797 ha
	Lærdal	4 036 ha
The West Norwegian Fjords		**122 712 ha**

The boundaries of the area exist in digital form, with great precision. The data set can be obtained from the Directorate for Nature Management (*address in section 7d*).

2 Justification for Inscription

2a. Statement on the significance of the property

The Norwegian coastline is more heavily dissected by fjords than that of any other country in the world, and appropriately the term fjord is of Norwegian origin. The West Norwegian fjords are among the most important reference landscapes in Europe and the landscapes of Geirangerfjord and Nærøyfjord are without doubt exceptional.

Their scale and grandeur are inspiring and most people who visit them are struck by their incredible beauty. Both fjords are magnificent and as a type of landscape they provide a powerful sense of "room" and are the classic image of what most people in the Northern Hemisphere associate with the word fjord. For more than 150 years, scientists, artists and tourists have come here to experience highlights in the fjord landscapes.

The two fjords represent one of the cradles of scenic tourism in Europe and have been able to cope with great influxes of tourists without losing any of their qualities. They have played an important role ever since in encouraging the public to understand and enjoy the natural wonders of Europe's environment.

Given the pristine qualities of the two fjords and the fact that the geomorphological features in each area represent the structure of a fjord landscape which is still actively evolving, the nomination site clearly has unique values. Geologically, the area may be characterised as an extremely well-developed example of a classic fjord landscape.

The proposed World Heritage Site possesses a unique combination of glacial landforms at the same time as each area is characterised by its own outstanding natural beauty. Each of the two areas stands on safe ground in a World Heritage perspective, but seen together they complement each other as regards geomorphology and display values which, collectively, are even greater than when seen individually. These values stem from the spectacular scenery and the pristine and unspoilt character of the areas. Collectively, they are a unique representation of fjord landforms.

Both fjord areas represent excellent examples of young, active glacial landscapes where the forces of nature are still in operation and evident. The combination of geology and the natural processes of water erosion are abundantly obvious and reinforce not only the strong visual identity and sense of "room" of the fjords, but also provide an additional sense of the continuously changing landscape. The evolving nature of the landscape is characterised by the structure and instability of the surface geology, the steep, exposed cliffs and rock faces, and the power, spectacle and abundance of cascading waterfalls, all of which combine to create a classic and ever-changing fjord landscape influenced by the unpredictability of frequent rock falls and avalanches which, in extreme cases, have created local, but dramatic, tsunamis in the enclosed waters of some fjords.

Both areas are important for contemporary geomorphological research (similar examples of some features are seldom elsewhere in Europe, if not in the world). In addition, the state of continual instability creates additional interest, excitement and a sense of expectation for those visiting the area. The continual threat of rock falls and avalanches represents a real danger to those who live within the shadows of the fjord walls and has resulted in a life style which is highly adapted to these conditions.

Experts consider the international research potential of the proposed site to be high. The Geirangerfjord area, with its exceptional topography and active mass movements, represents a key area for research related to geohazards. Compared to similar landscapes elsewhere, this area has a relatively dense population. An avalanche would have potentially severe consequences for a number of people, and thus the total risk is quite high. The historical rock slides and related tsunamis became internationally well known through early scientific papers. For examples, the world's most detailed survey of tsunami heights was carried out after the Tafjord disaster in 1934. Recent studies have also used this region as a research arena. The recently established International Centre for Geohazards (ICG), a Centre of Excellence financed by the Norwegian Research Council, will focus on this region in future international research.

In recent years, there has been much debate about climatic change and its potential effect on natural hazards. There is thus an increasing need for more high-quality data and improved analyses of risks connected with changes in meteorological conditions. Avalanches and landslides can be used as indicators of past extreme weather events. Several localities in the Geirangerfjord region have been studied to evaluate the frequency of avalanches during past periods of climatic change. Such data are important to evaluate the link between climatic change and the occurrence of different types of avalanches and landslides. In this context, the Geirangerfjord region, with its wide range of mass-movement processes, has a high research potential.

The bedrock geology in the area between Karmøy and Kristiansund is a key for understanding the geological history of western Scandinavia. Mountain building has taken place at different times, and the imprint of these events is evident from the study of the landscape and the individual rock types. During the relatively recent glaciation events, products of weathering were essentially removed, leaving a beautiful, ice- and wave-polished surface. The fjords, deeply dissecting the fresh bedrock, provide superbly exposed and remarkably continuous three-dimensional sections through the rock complexes. Thus, the fjords are important in the sense that they allow us to examine in detail rocks exhibiting an extremely complex history of evolution.

The active processes of water, landslides and avalanches have in some areas been the main reason for the presence of very specialised plant communities, species and populations which became established here immediately after the ice retreated. An outstanding symbol of this is the rare sub-species of arctic poppy (*Papaver radicatum* ssp. *relictum*) at Bleia in the Nærøyfjord area.

The legacy of traditional human use does not harm the natural values of the area and often enhances them. Although a "cultural imprint" of human activity exists in terms of structures, buildings and land-use features, this is light and is dwarfed in every sense by the scale, grandeur and inhospitable nature of the landscape. Indeed the contrast between the magnitude and grandeur of the fjords and the apparent insignificance of the scale of human use of the land accentuates the enormity and hostility of the fjord landscape.

In the fjord landscape, several semi-natural habitats have been developed over the years by the grazing of cattle, sheep and goats, and by haymaking. The special biodiversity of these habitats represents a positive supplement to the biodiversity in general.

The myriad of fjords and inland waterways represents a major assemblage of glaciated landscape features which have dominated communities, life styles and trading patterns in Western Norway for centuries. The versatility of man's use of these waterways has resulted in few of the fjords remaining unaffected by human use. In those fjord areas where the touch of man has been both light and limited; the landscapes have retained a remarkably natural and unspoilt character.

The Nærøyfjord and Geirangerfjord areas are considered magnificent examples of fjord landscape and represent areas of exceptional natural beauty and aesthetic value. When the two areas are compared, it is apparent that each of them contains unique properties (Table 3) while at the same time clearly exhibiting the main features that characterise fjord geomorphology. The Nærøyfjord area preserves more of the fluvial-dominated (palaeic) landscape and exhibits more rounded landforms compared to the partly alpine landscape in the Geirangerfjord area. In the latter, block fields are more prevalent and permafrost still prevails in the highest mountains.

When the various features of the Nærøyfjord and Geirangerfjord areas are summarised (see Table 3), it is seen that the two areas have some elements in common, but more particularly they supplement one another.

Table 3. Specific geological and geomorphological features that occur in the proposed areas.

Typical feature	Geirangerfjord area	Nærøyfjord area
Landform	Generally alpine and rugged	Generally rounded
Palaeic surface	Only summits reach the level of the palaeic surface	Present in several areas
Preglacial drainage pattern; agnor valleys		Nærøydalen area
Hanging valleys	Widespread (e.g. Vesteråsdalen, Skagedalen, Flydalen)	Jordalen, Brekkedalen
Block fields	Locally present	Present in the mountains
Permafrost	Locally present	Locally present
Thick till deposits	Present along valleys oriented transverse to the main ice flow. (Dyrdalen, Herdalen, Skagedalen.)	Present in Jordalen (transverse to the main ice flow)
Ice-marginal delta and raised shorelines	Geiranger	Jordalen, Nærøydalen, Undredalen
Terminal moraines	Synnylvsfjord, Geirangerfjord (sub-marine)	Bakka
Lateral moraines	Widespread (e.g. Herdalen, Dyrdalen, Flydalen)	Undredal
Large thresholds	Synnylvsfjord, Geirangerfjord (sub-marine)	Bakka
Avalanche deposits (rock/snow/debris)	Common along valley and fjord sides	Common along valley and fjord sides
Rock-slide deposits	Dominate the fjord bottom in Tafjord and Geirangerfjord	Characteristic features in Nærøyfjord and inner Aurlandsfjord
Deep fjord basins	Max. depth 480 m	Max. depth 500 m
Maximum relief	2300 m	2000 m
Present glaciers	Numerous (e.g. Flydalsbreen, Skjerdingsdalsbreen, Hestebreen)	Fresvikbreen (1500 ha) and Syrdalsbreen.

2b. Comparative analysis

The West Norwegian Fjords in a Norwegian and Nordic context

The full length of the Norwegian coastline is all of 83,281 km (measured on 1:50 000 maps) between 58° and 72° N, and the Svalbard archipelago, between 77° and 81° N, has a coastline of 7093 km (measured on 1:250 000 maps). The presence of numerous fjords extending far into the hinterland are characteristic elements in the landscape of the long, mountainous coast. The coastline of the Norwegian fjords alone is 21,000 km long, equalling half the distance around the world at the equator. Norway is truly a "land of fjords", some 200 fjords both short and long, narrow and broad, are to be found along the whole coast of the mainland and 35 along the coast of the Svalbard archipelago. The longest fjords extend 250 km into the country.

In a Scandinavian context, no fjords can compare in scale, grandeur and scenic value with Geirangerfjord and Nærøyfjord, both parts of larger fjords. Down the ages, the large Norwegian fjord systems have been loci for early and widespread settlement because they were also the most important communication arteries between the coast and the interior. Plentiful precipitation and great difference in height, combined with steep-sided valleys, have made the fjord landscape attractive for exploiting the potential for hydroelectric power offered by the rivers, and very few fjord landscapes still remain without substantial technical encroachments. Geirangerfjord and Nærøyfjord are among the few fjords which can boast that all the rivers flowing into them are intact and their natural processes remain undisturbed by power scheme developments and the like.

This has meant that these fjord landscapes have achieved the highest priority in the national effort to secure the preservation of a representative selection of unspoilt countryside. Both fjords have been designated protected landscape areas with the aim of ensuring that their natural values are preserved for future generations.

Tysfjord, in the county of Nordland, has been evaluated in a Nordic study as a potential World Heritage Site (NORD 1996:30/31) and has therefore been placed on the tentative Norwegian list. A future nomination of the Tysfjord area must be seen as an extension of the Lapponia World Heritage Site in Sweden and, based on the same premises (a mixed site), a cross-boundary initiative supplementing values already described in the Swedish nomination dossier (1995). In Tysfjord, the fjord landscape is one of several elements which, together in a united Lapponia perspective, create a foundation for the future nomination. The fjord landscape alone does not make Tysfjord relevant for nomination; its relevance is based on the wider, cross-boundary, Lapponia context.

In the Nordic countries, fjords are to be found primarily in Norway (including the Svalbard archipelago), parts of Iceland and in Greenland (Western Hemisphere). The polar fjords of the sub-Arctic and Arctic regions have been created under other geological and climatic circumstances.

The fjords of Greenland are in an earlier stage of development, both physically and in terms of natural history, than the Norwegian fjords, and their shape and geology are different. Kangia ("Ilulissat Icefjord"), near Jakobshavn in West Greenland, was evaluated in the same Nordic study as mentioned above, and was also proposed as a potential World Heritage Site. The Greenlandic authorities submitted the nomination dossier to UNESCO before 1st February 2003. Geirangerfjord and Nærøyfjord represent something totally different from Ilulissat. They are the most exceptional examples of this type of landform in the Nordic countries.

The West Norwegian Fjords in a global context

Fjords are among the most dramatic and spectacular landscapes on Earth. In considerable numbers, they are only present along the coasts of Norway, Greenland, parts of Iceland, Alaska (USA), British Colombia and Labrador (Canada), southern Chile, and parts of Antarctica and New Zealand. Their typical configuration is a long, narrow, deep and steep-sided inlet, which is frequently branched and sinuous, or in part remarkably straight, where firstly the fluvial drainage, and subsequently the glaciers have followed major fracture zones. In these high-latitude regions, vertical supramarine gradients have been accentuated by uplift of the landmass after the former ice sheets melted.

The Geirangerfjord and Nærøyfjord landscapes differ completely in morphology, geology, vegetation and cultural heritage aspects from the fjord landscapes in, for example, Alaska, Chile and New Zealand. Nowhere else in the world do we find fjord landscapes which, in a comparable manner, illustrate the geological processes and interplay between wild, dramatic scenery and cultural influences that have given the landscape great international merit as an area to be experienced.

2c. Authenticity and Integrity

Integrity of the West Norwegian Fjords

The Western Norwegian fjords, the fjords from Boknafjord in the county of Rogaland in the south to Sunndalsfjord in the county of Møre & Romsdal in the north, a distance of approximately 500 km, are the classic fjord landscape visited, adored and described by foreign travellers, tourists and scientists for the last 150 years. Today, the unique areas of Geirangerfjord and its surroundings in the north and Nærøyfjord and its surroundings in the south together represent the most spectacular and unspoilt parts of the Western Norwegian fjords. Both have the unique qualities of a world heritage site, but because they are supplementary to each other they are nominated together as equal parts representing the Western Norwegian fjords as a whole. All the elements of the classic fjord landscape are present within the unity of the two parts.

The landscape, landforms, geological elements, both bedrock and Quaternary features, avalanches and landslide deposits where nature is still at work, naked mountain tops and slopes, high and steep cliffs, beautiful waterfalls, colours, shadows and dramatic views, together with biological elements and archaeological and historical heritage, create the exceptional scenery of these fjords, changing throughout the year from winter to summer, making them unique in the world.

The central element of the site is the narrow fjord "room" created by the surface of the fjord and, on each side, the horizon of high and steep fjord walls or slopes with a distance from one shore to the other of 250 to 2000 metres. However, to understand the stages of evolution of the fjords it is necessary to take a broader view. Therefore, within the limits of the nominated site there are some areas that are not directly connected with the fjord scenery. They have been integrated because they tell supplementary stories of the creation and evolution of the fjord landscape and are binding elements of the longer and shorter natural history of the site as a whole. It will be apparent from the description that the landforms of the fjords, including nearby systems of lakes and rivers, are being actively shaped by geological processes. Thus, rather than considering the fjords as isolated phenomena, they must be regarded in the wider context of the landform of which they form an integral element.

When seen as isolated phenomena, the areas mentioned below represent elements which, on a larger scale, supply the understanding of the creation and evolution of the fjord landscape.

<u>The Geirangerfjord area:</u>

Herdalen-Dyrdalen area	*Important area for understanding the evolution and processes that are characteristic of the fjord landscape. Excellent examples related to processes during glaciations, deglaciation and reactivation of recent glaciers.*
Tafjord area	*A unique area showing the morphology of large rock-slide deposits in fjords and slide scars on mountainsides. The study of this area is vital for understanding the history and evolution of steep slopes in mechanically resistant bedrock (various gneisses).*

Sunnylvsfjord area	*Enormous features on the fjord floor resulting from a major rock slide. Active movements of a large part of the mountainside at Åkerneset. The area is important for understanding processes related to instability of steep mountain slopes in a fjord environment.*
<u>The Nærøyfjord area:</u>	
Gråsnosi area	*Palaeic landscape. This area provides an insight into the landforms that prevailed prior to the formation of deep fjords and valleys during major glaciations.*
Bleia area	*One of the most extreme and pristine parts of the fjord landscapes in Norway. Apart from the magnitude of the landscape, this area contributes significantly to the nomination due to the substantial botanical values related to avalanche deposits.*
Fresvik area	*An excellent example of an area showing active glacial landscape formation. (Fresvikbreen, a plateau glacier. (1500 ha (1981)).*
Mjølfjell area	*The area exhibits essential elements related to processes of glaciation and deglaciation, and is important for understanding how the fjord landscape formed.*
Flåm-Aurlandsfjord area	*Impressive rock-slide deposits on the fjord bottom. This is a key area for the study of the evolution and stability of steep rock slopes in weak bedrock (phyllite and schist).*

The outer frame of the nominated site is therefore similar to the boundaries of the present (Nærøyfjord) and future (Geiranger-Herdal) Protected Landscape Areas, with two supplements. Both Tafjord on the north side of the Geiranger-Herdal area and Aurlandsfjord east of the Nærøyfjord area have been added as they are valuable, unspoilt parts of the total scene when entering the site from these directions.

The nominated natural heritage site has had human activity for a long time. The settlements are, and always have been, concentrated in small areas close to the shore or at more extreme localities on the hillsides. These inhabited and cultivated areas, with some industry, five areas covering in all 1.4% of the total land area, have not been protected under the terms of the Nature Conservation Act, but are regulated through the Planning and Building Act. Nevertheless, and despite legal protection, these small areas have been integrated into the nominated site due to their function as gateways providing access to the countryside and because they are an integral part of the larger scale landscape.

Due to the private ownership of most of the area involved, the protective instrument used is the Nature Conservation Act category of Landscape Protected Area. In Norway, the National Park category may only be used for state-owned land; otherwise, both areas would have been protected as National Parks, since they clearly qualify for such status.

2d. Criteria

The proposed site must be characterised as the best geologically developed and preserved example of classic fjord landscape. The geology and ongoing erosional processes have provided a basis for the active development of ecological and biological processes as well as the development of traditional, in part extreme, land use that has not harmed the integrity of the natural site. Due to its beauty, the site represents some of the most visited sceneries in the Nordic countries.

44 (a) (i)

The area offers exceptional examples of landforms shaped and developed by ice and water, a unique landscape with significant geomorphological features, and a very young landscape in terms of Earth history that is continuously being formed by active erosional processes.

44 (a) (iii)

The area represents the most extreme, dramatic and magnificent fjord landscape in the world and has an exceptional natural beauty and aesthetic importance.

The fjords

- The quality of the fjord landform across the entire area of the property collectively represents a unique example of an archetypal fjord landform.
- The extreme height of the fjord cliffs combined with the considerable depth of the submerged parts of the fjord valley systems make this a unique landform.
- Most of the erosion since the last glaciation period has had local and comparatively minor effects, and the glacial landforms and fjords are unusually well preserved.
- The site contains some of the world's most spectacular features of rock-slide deposits in fjord settings.
- The structure and unspoilt natural character of the fjords and their hinterland and the manner in which these combine, represent an example of an area with outstanding scenic qualities and natural beauty.
- The human use of the site complements and adds interest and value to the landscape, rather than dominating it and degrading these natural values.
- The inspirational qualities of the area, in particular the manner in which the visual, oral and tactile senses are all simultaneously triggered when onlookers experience the fjord environment.
- The strong cultural identity of the area, as witnessed through its vernacular architecture and the heritage of buildings and historical sites, can be seen as a reflection of land use on nature’s premises over time.
- The opportunist economy which still exists in the area, as witnessed by the traditions of low-impact, transhumance goat farming supplemented by the production of cheese, short-season, soft-fruit production and ecotourism.

3 Description

3a. Description of the property

Introduction

Fjords are among the most dramatic and spectacular landscapes on Earth. They are common along the coasts of Norway, Greenland, Iceland, Alaska, British Colombia, Chile, Antarctica and New Zealand. Their typical configuration is a long, narrow, deep and steep-sided inlet, which is frequently branched and sinuous, or in part remarkably straight, where firstly the fluvial drainage and subsequently the glaciers have followed major fracture zones. In these high-latitude regions, vertical supramarine gradients have been accentuated by uplift of the landmass after the former ice sheets melted.

Fjords are restricted to coastal terrains once dominated by ice sheets. During several ice ages, repeated glacial advances and retreats have transformed the landscape into the highly carved and jagged mountain peaks and the fjords we see today. Typical features that characterise the fjords are over-deepened rock basins reaching depths far below sea level, prominent rock thresholds, or sometimes thresholds partly made up of large terminal moraines. Taken together, these features show that glaciers have played a major role in the shaping of the fjord landscape.

Although it appears solid, the bottom of a glacier flows like a liquid because the ice turns plastic under pressure. As it flows, the glacier can scour out bedrock, carving a trough and moving rocks and gravel great distances. The extent of glacial erosion will depend on the thickness of the ice cover, the nature of the bedrock, basal shear stress and the distance from the centre of the ice cap. Generally, the narrowest, most steep-sided fjords occur in areas with hard, jointed, crystalline rocks, while softer bedrock disposes for broader and less steep basins. Confluence of glaciers enhances the erosion, thus creating deeper basins. During the interglacial periods, the fjord geomorphology will be influenced by processes such as subaerial weathering and denudation in combination with fluvial and avalanche activity.

Landscapes are formed by a cyclic series of dramatic mountain building events followed by long periods of erosion and deposition of sediments along rivers and in submarine environments. Given enough time – tens to hundreds of millions of years – the slow process of degradation destroys mountain belts and levels the landscape to an almost even surface with very little relief. In the young and immature fjord landscape, these processes are taking place at a high rate and changes to the landscape are clearly visible even on human time scales.

The Nærøyfjord and Geirangerfjord areas are considered to be magnificent examples of fjord landscape and represent areas of exceptional natural beauty and aesthetic value. In the following, a short description of the areas is provided.

It will be apparent from the description that the landforms of the fjords, including nearby systems of lakes and rivers, are being actively shaped by geological processes. Thus, rather than considering the fjords as isolated phenomena, they must be regarded in the wider con-

text of the landform, of which they form an integral element. In chapter 3b, the geological processes and history of how the classical fjord landscape was formed are described in greater detail.

Topography and scenery of the fjord areas proposed for inscription

The proposed World Heritage Area in Western Norway consists of two sub-areas some 120 km apart. **The Geirangerfjord area** in Sunnmøre is the inner part of the Storfjord system. **The Nærøyfjord area** is one of the tributary fjords of the Sognefjord system. Jointly these two sub-areas represent the most outstanding example of the West Norwegian fjordland.

When these two fjord landscapes are compared, it is apparent that each of them contains unique properties (Table 3), while at the same time clearly exhibiting the main features that characterise fjord geomorphology and physiography. The Nærøyfjord area preserves more of the fluvial-dominated (palaeic) landscape and exhibits more rounded landforms compared to the partly alpine landscape in the Geirangerfjord area. In the latter, block fields are more prevalent and permafrost still prevails in the highest mountains.

In broad terms, these two landscapes greatly resemble each other, but in detail they complement one another with their special geological characteristics and scenery. Glacial erosion during the Quaternary era and other geological processes have created the precipitous fjord sides. There is still an active geological environment in the form of rock falls, active screes, alluvial fans and snow avalanches. In the midst of this magnificent, fascinating and, for many, almost frighteningly confined fjord landscape, people live and carry on a traditional form of agriculture and tourism. Six settlements with a total of 473 residents are located within the nominated World Heritage Area. Collectively, they occupy 1.4% of the total land area. Apart from these settlements, the Geirangerfjord and Nærøyfjord areas lack significant technical encroachments of recent date and the proposed areas are consequently the largest unspoilt fjord landscapes in Norway.

Throughout modern history, the landscape in the nominated area has made a lasting impression on visitors and both sub-areas have achieved international acclaim for the immense thrills their scenery generates. The magnitude of these impressions has been abundantly documented by paintings, photography, travel documentaries and scientific literature which confirm the status of the fjord landscape as regards its exceptional natural beauty and aesthetic importance.

The Geirangerfjord area *(Annex 1, Map B)*
Storfjord extends approximately 150 km inland from the Norwegian Sea near Ålesund and ends in the tributary fjords, Nordalsfjord – Tafjord and Sunnylvsfjord – Geirangerfjord. Storfjord follows faults and fracture zones in the bedrock. These are mainly oriented parallel or perpendicular to the coastline, giving the fjord a characteristic zigzag shape. Its maximum depth of 679 m is located immediately north of the junction between Sunnylvsfjord and Nordalsfjord. The land topography is characterised by mountains which reach only about 500 m a.s.l. along the coast, but rise inland to more than 1600 m adjacent to

Geirangerfjord. Sunnylvsfjord and Nordalsfjord are typically 2 km wide, while their innermost parts, Tafjord and Geirangerfjord, are about 1 km wide. The steep, up to 1300 m high, fjord sides and several cascading waterfalls such as the 'Seven Sisters' and 'Friaren', offer impressive views. Small glaciers in the mountains add to the dramatic scenery and their clay-rich meltwater colours the fjords turquoise.

The high mountains are traversed by numerous small valleys and cirques which give the area a predominantly alpine character. Along the fjord, spectacularly situated, now abandoned, farms bear witness to the frugal utilisation of the natural resources in the past. These small buildings on the mountainsides flanking the fjord provide a scale that intensifies the impression of the dimensions in the landscape and are most important for the thrilling experience of the landscape. The floors of several of the hanging valleys that enter the main valley retain traces of former transhumance dairy farms, and such farms are still intact and in use in Herdalen and Dyrdalen.

Innermost in Geirangerfjord, beside the mouth of the River Geiranger, is the village of Geiranger. The settlement is concentrated and sharply demarcated between the fjord and steep mountainsides, which are prone to rock falls and snow avalanches and tower sky-high over the rooftops. Further south, traditional agriculture with its farm buildings and cultivated fields leaves its mark on the landscape on the valley floor.

These habitations, nevertheless, do not detract from the drama and dimensions of the natural landscape, which is what dominates the experience of the scenery.

The Nærøyfjord area *(Annex 1, Map C)*
This area includes Nærøyfjord and parts of Aurlandsfjord and surrounding drainage systems. These fjords are tributary fjords to Sognefjord, constituting part of the largest fjord system in Norway. Sognefjord penetrates almost 200 km inland from the coast and has a maximum depth of 1308 m (Fig. 2A). The inner part has a number of hanging tributary fjords. The most impressive of these is the 17 km long Nærøyfjord, cut into the land block which rises to peaks up to 1700 m a.s.l.

The steep fjord sides are generally 900-1200 m high (maximum 1400 m), and the deepest part of the fjord is 300-400 m. The relief is extremely marked and the maximum height from the bottom of the fjord to the highest of the surrounding mountains is nearly 2000 m. For comparison, the Grand Canyon has a relief of 1600 m and is much wider. Since Nærøyfjord is a very narrow fjord, only 250 m wide at Bakka, the fjord landscape appears especially wild and dramatic (Fig. 2B). The mountains flanking the fjords tower right up to 1600 m a.s.l. at the Fresvik glacier and 1700 m a.s.l. at the Syrdal glacier, and have preserved much of the fluvial-dominated, rounded forms from before the last Ice Age.

The valley of Nærøydalen at the head of the fjord is a natural continuation of Nærøyfjord, and the lower slopes of its high, steep sides are largely covered by avalanche (scree) deposits, mostly generated by rock falls, but also by snow avalanches. The valley is narrow and extends south-westwards towards the watershed at Stalheim (Opheim). The valley floor is

mostly covered with fluvial material in its outer part (Annex 1, Map G). The river water is extremely clear and flows over alluvium consisting of pebbles and boulders of white anorthosite from the local bedrock. Parts of the flat river terraces on the narrow valley floor are cultivated and a number of farms are exposed to snow avalanches and sudden gusts of katabatic wind pouring down the huge valley.

In the high mountains, weathering processes have been very active and considerable areas of block field (felsenmeer) are present. Undredal is a narrow, U-shaped (in cross section) tributary valley to Aurlandsfjord, which is mostly covered by avalanche deposits except in its outer part where a fan of glaciofluvial material has been deposited. On the opposite side of Aurlandsfjord, a corridor across a prominent mountain called Bleia is included in the area, establishing a connection with the deep fjord basin of Sognefjord.

In the Nærøyfjord area, too, a number of old, now abandoned, fjord and mountainside farms provide a powerful contrast in the immensity of the scenery. Four small settlements are found at the mouths of the largest rivers. The largest of these is the village of Undredal with its traditional, well-preserved wooden buildings providing homes for about 100 inhabitants.

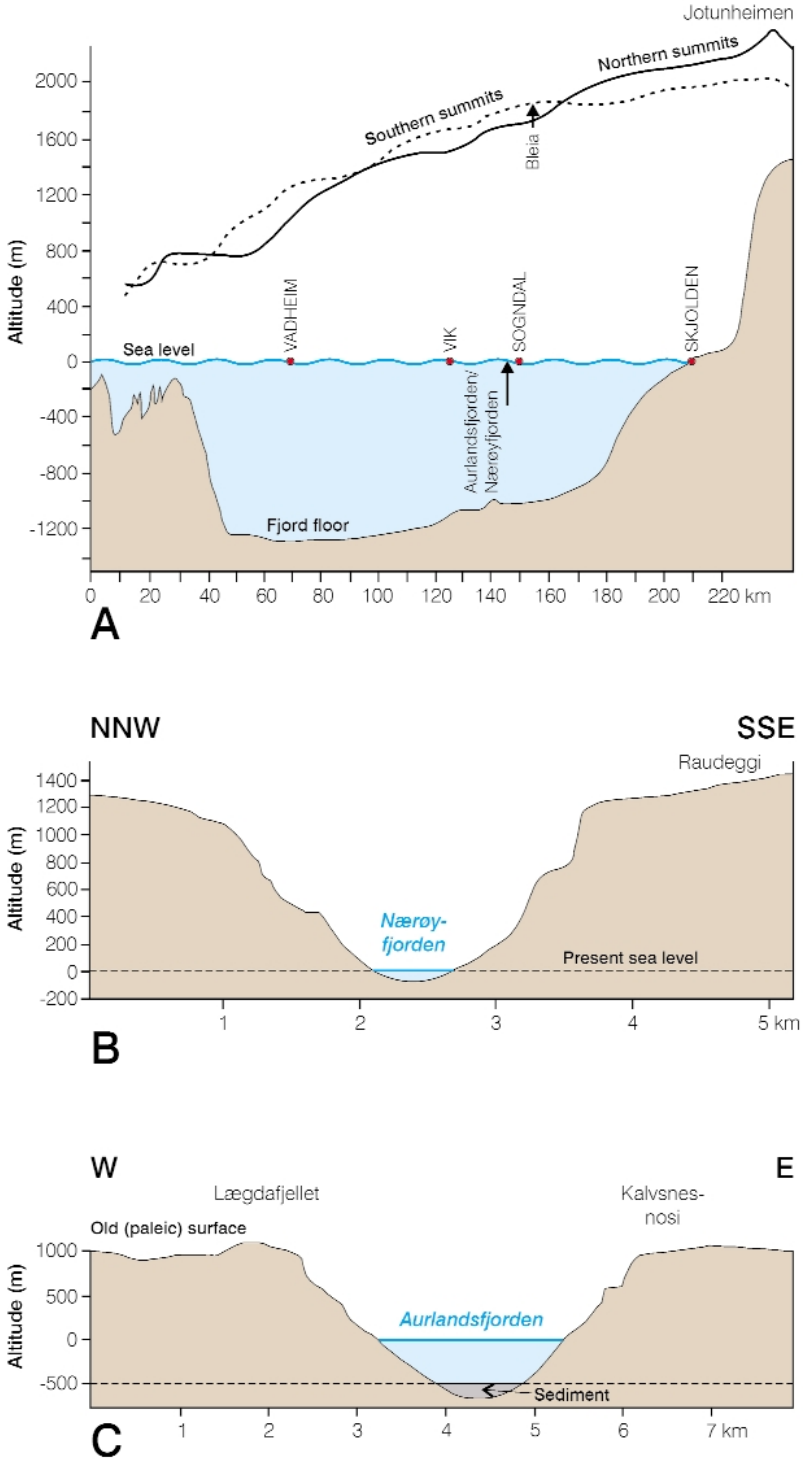

Figure 2.
A. Longitudinal profile along Sognefjord, with maximum summit levels north and south of the fjord. The hanging tributary fjord (Aurlandsfjord and Nærøyfjord) is indicated. After Nesje & Whillans (1994) and Holtedahl (1960).

B. Transverse profile across Nærøyfjord from Raudeggi towards the NNW illustrating the deep excavation of the fjord basin into the bedrock. For location: see Annex 1, Map G.

C. Transverse profile over Aurlandsfjord at Lægdafjellet and Kalvsnesnosi, near the mouth of Nærøyfjord. The fjord is incised into the palaeic surface. The fjord is 500 m deep here. For location: see Annex 1, Map G.

Climate

Both sub-areas are located close to the main watershed on the Scandinavian peninsula and in the transitional zone between the oceanic and continental climates. Climatically, the two areas are considered to be very similar, even though Geirangerfjord is located 120 km further north than Nærøyfjord.

The temperature differences through the year shift from being comparatively small in the outer parts of the areas to being moderately large in inner parts, where the climate has a pronounced continental character with warmer summers and colder winters.

The fjord landscape is generally characterised by large differences in the local climate within relatively small geographical areas. This is also the case in the Geirangerfjord and Nærøyfjord areas, where large altitudinal differences and the shifting orientation of steep mountainsides give different exposures to sun, shade and radiation.

No meteorological stations are located within the proposed World Heritage Area. The table below shows measurements from stations in the immediate vicinity of the areas in question. Full climatic data from these stations are available and can be supplied by the Norwegian Meteorological Institute.

Table 4. Climatic measurements.

Geirangerfjord area	**Annual precipitation** (Normal*)	**Temp. January** (Normal)	**Temp. July** (Normal)	**Annual temp.** (Normal)
Linge (15 m a.s.l., ca. 1.8 km north of the area)	1290 mm	0.8º C	14.3º C	7.1º C
Tafjord (50 m a.s.l., ca. 0.05 km east of the area)	965 mm	0.5º C	13.9º C	6.9º C
Helsem (84 m a.s.l., ca. 5 km west of the area)	1295 mm	-0.8º C	13.3º C	5.9º C
Nærøyfjord area				
Mjølfjell (695 m a.s.l., ca. 10 km south of the area)	1600 mm	-5.0º C	11.4º C	2.7º C
Vangsnes (51 m a.s.l., ca. 20 km north-west of the area)	1100 mm	-0.1º C	14.5º C	6.7º C
Lærdal (24 m a.s.l., ca. 12 km east of the area)	491 mm	-2.5º C	14.7º C	5.9º C

* Normal value = the average for the period 1961-1990

Ice conditions

In lower-lying areas, the water masses in the fjords stabilise the winter temperatures, except in periods when the fjord is frozen. The ice generally forms after a period with large amounts of precipitation followed by calm, cloudless and cold weather. Ice may occur from November to March, but most frequently in January and February.

Geirangerfjord freezes over for 1 km from its head two to four times a year, and remains frozen for two days to three weeks. Exceptionally (1971, 1981 and 1996), the fjord has frozen over as far as the Seven Sisters waterfall, 5 km from its head.

Aurlandsfjord does not become ice covered every year, but thick ice may form for up to 2 km along the fjord from Flåm. Nærøyfjord often develops a thick ice cover, which prevents vessels from reaching as far in as Gudvangen. The fjord may freeze over for as much as 9 km from its head (Styvissundet) and the ice can be thick, but is also often dangerously porous.

Snow conditions

The snow cover and snow depth vary greatly. In the Geirangerfjord area, the ground by the fjord is generally continuously snow covered from November to March. In the Nærøyfjord area, snow seldom lies on the low ground for longer than a few days to two or three weeks in the same period. There are generally comparatively large depths of snow in the mountains surrounding the fjords and a permanent, stable snow cover is normally present at 1000 m a.s.l. from the end of October to late May, when the thaw starts in earnest. In some places, snow patches and snowfields never melt completely, and there are also a number of glaciers, the largest of which is Fresvikbreen in the north-western part of the Nærøyfjord area.

Wind conditions

In the narrow fjord arms and valleys flanked by high, steep cliffs, the special topography results in the generation of sudden, extremely strong, katabatic, or fall, winds, particularly renowned at Gudvangen. In addition to these, which are generated by ordinary winds, an extremely dangerous type of wind, called an air blast, is produced by snow avalanches. It is dealt with in more detail in the section on avalanches.

Tides

The mean difference between high and low spring tides:
Geirangerfjord area: 1.71 m (highest spring tide is + 1.85 m, measured in 1954)
Nærøyfjord area: 1.40 m (highest spring tide in the last 20 years is + 1.52 m)

Bedrock geology

Introduction

The bedrock geology in the area between Karmøy and Kristiansund (Fig. 3) is a key for understanding the geological history of western Scandinavia. Mountain building has taken place at different times, and the imprint of these events is evident from the study of the landscape and the individual rock types. During the relatively recent glaciation events, products of weathering were essentially removed, leaving a beautiful, ice- and wave-polished surface. The fjords, deeply dissecting the fresh bedrock, provide superbly exposed and remarkably continuous three-dimensional sections through the rock complexes. Thus, the fjords are important in the sense that they allow us to examine in detail rocks exhibiting an extremely complex history of evolution. *(See also the account of the general geology in section 3b.)*

The Geirangerfjord area *(Annex 1, Map D)*

The bedrock in the Geiranger area is dominated by Precambrian gneisses of the Western Gneiss Region, most of which are of igneous origin. Some bodies of coarse-grained granitic gneiss make up relatively homogeneous bodies in otherwise layered and lithologically varied gneisses. Mica gneiss and schist occur in some places. These rocks represent sedimentary units which were transformed into crystalline rocks by metamorphism. Variably sized bodies of eclogite and olivine-rich peridotite occur locally (only the largest are shown on the map). Augen gneiss with inclusions of quartzite, garnet-mica gneiss and a number of olivine-rich ultramafic bodies occupy a large area in the east. This rock unit is considered part of the Middle Allochthon and has therefore been thrust over the subjacent gneisses during the Caledonian collision. In contrast to the Nærøyfjord area, the rocks in Geiranger do not preserve evidence of the Sveconorwegian orogeny, whereas the Scandian collision caused high- to ultrahigh-pressure metamorphism and formation of eclogite – a rock type formed only under high pressures. This is a spectacular and relatively uncommon rock type consisting mainly of reddish to pink garnet and a green pyroxene (omphacite). Of particular interest is the local presence of microscopic remnants of the mineral coesite (a high-pressure form of quartz), providing evidence for extremely high-pressure metamorphism of the rocks at depths of more than 100 km.

The Nærøyfjord area *(Annex 1, Map E)*

The predominant rock types of the entire Nærøyfjord area are Precambrian anorthosite, gabbro and granulite. A few bodies of olivine-bearing ultramafic rocks are associated with the gabbros south of Nærøyfjord, and minor quartzites occur locally. Anorthosite is an igneous rock consisting primarily of plagioclase feldspar that develops a white weathering crust. Locally, the rock is referred to as 'kvitberg', i.e. 'white rock'. The rocks of the Jotun Nappe occupy an extensive area and constitute the largest province of anorthositic rocks in Scandinavia. The rocks originate from somewhere off the west coast of Norway and were thus part of westernmost Baltica. During the Scandian collision, thick slivers of the crust were detached from their original position and thrust eastwards onto the interior parts of the Baltic Shield. This explains why the Jotun Nappe is positioned above the par-autochthonous phyllites occurring near Flåm (and at Aurlandsvangen). Thrusts within the Jotun Nappe are also due to Scandian deformation. The massive and crystalline nature of the Jotun Nappe rocks makes them very resistant to erosion compared to the phyllites.

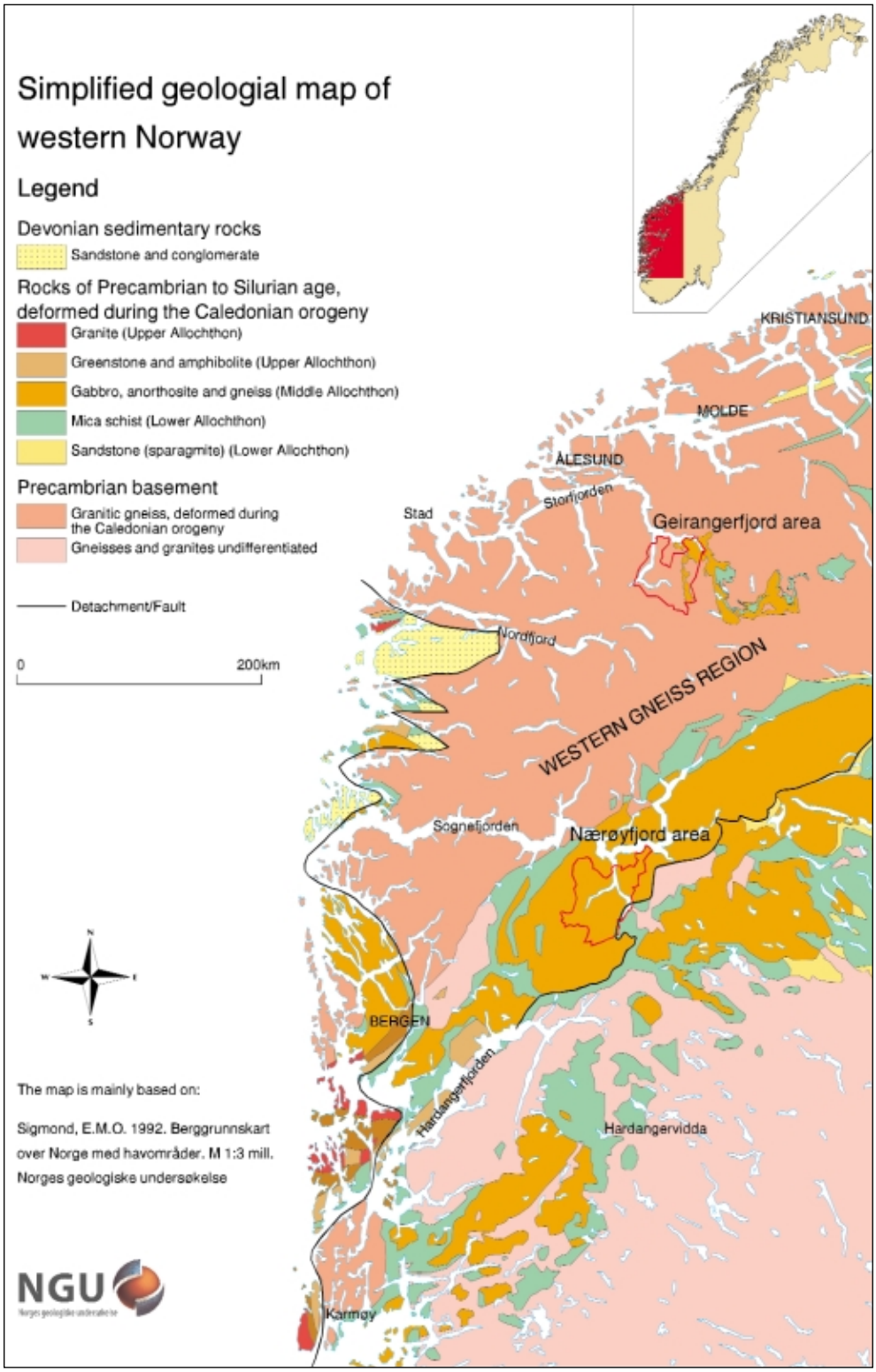

Figure 3. Simplified geological map showing the origin of major allochthonous rock units that constitute the Scandinavian Caledonides.

Quaternary era

Within the nominated area, there is an extraordinary range of landforms and geological phenomena related to the bedrock having recently been shaped by fluctuating ice caps and glaciers. Sporadic till cover and sinuous terminal and lateral moraine deposits are evidence that the landscape was shaped during recent periods of glaciation. However, the most obvious effects of the glacial processes include the sharply defined, deep and narrow fjords, representing ice-excavated valleys now filled with water. Hanging valleys and the characteristic agnor (fish-hook) valleys formed by river capture provide evidence of the long history preserved in these locally preserved remnants of older and partly preglacial landforms. The ice-carved valleys have been re-shaped by continued fluvial erosion forming marked gorges with cascading waterfalls. Along fjords and steep valleys, major rock and snow avalanches contribute to the continuous degradation of the over-steepened topography.

Both of the nominated sub-areas exhibit a range of properties that taken together represent all the archetypal aspects of an evolving fjord landscape. However, the need for brevity permits the description of only a selection of typical and particularly representative examples from each area. *(The history of the formation of the nominated fjord landscapes is described in more detail in section 3b.)*

The Geirangerfjord area *(Annex 1, Map F)*
The Geirangerfjord area exhibits superb examples of several features characteristic of a recently deglaciated fjord landscape - a landscape that is still very much alive and actively evolving through the operation of geological processes.

Deposits
Generally, the area is characterised by a relatively thin and quite unevenly distributed cover of superficial deposits. Block fields are common in some of the highest mountains (e.g. Melfjellet and Geitfonnegga) that probably protruded as nunataks during the glaciation. The landscape in the mountainous areas may therefore appear fairly barren. However, some lateral moraines (associated with numerous cirque glaciers) are present, as shown on the map of superficial deposits. Thick till deposits are also present, and prominent examples include those that have accumulated in valleys oriented transverse to the main ice flow (e.g. Dyrdalen, Herdalen and Skagedalen). Prominent terminal moraine ridges, confirming the extent of valley glaciers formed during the Younger Dryas, cross Sunnylvsfjord and the mouth of Geirangerfjord from Ljøen (Fig. 4).

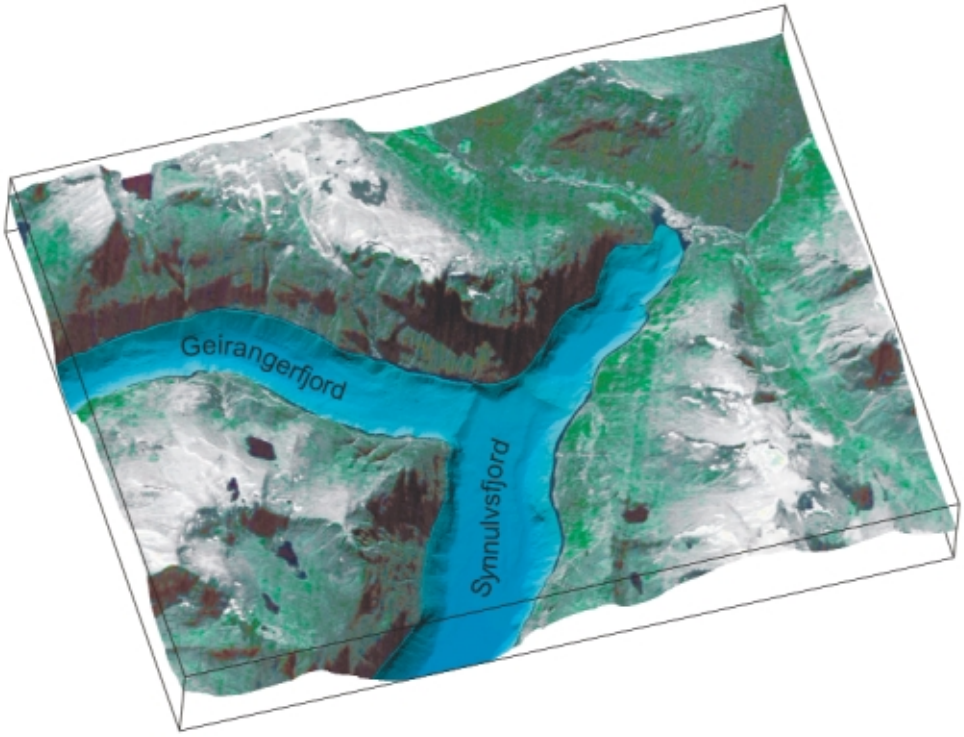

Figure 4. The moraine ridges crossing the fjords at the junction of Geirangerfjord and Sunnylvsfjord.

During the final melting of the main glacier, the meltwater built major deltas at the fjord heads (e.g. in Geiranger). These deltas have subsequently been expanded at gradually lower levels as the sea level changed due to glacial isostasy and the rise of the landmass.

Shorelines

During the last Ice Age, the Fennoscandian ice sheet expanded greatly and reached a thickness of several hundred metres over parts of Norway. The weight of the ice depressed the land. When the ice melted at the end of the Ice Age, this pressure was relieved and the land began to rise. There is generally little evidence of former shorelines in the area due to the extremely steep topography. However, the evolution of the delta system in Geiranger illustrates the relative drop in sea level following deglaciation.

Avalanches and landslides

The steep mountainsides and the deposits in valleys and fjords show that gravitational mass movements like avalanches and landslides are extremely important for the evolution and shaping of this rugged, alpine landscape. The area thus also represents one of the most hazardous regions for avalanches and landslides (Fig. 5). Annual snow avalanches on the steep sides of valleys and fjords represent a significant hazard, and an evacuation plan is needed in the village of Geiranger.

Table 5. Large snow avalanches occurring regularly in the Geirangerfjord area.

Locality	Avalanche name	Weather conditions*
Between Humlung and Gjørva (the largest)	Fonnjanesfonna	Generally occurs when the weather comes from the south-west (mostly wet slab avalanches)
From Geitfonnegga	Geitfonna	Generally occurs when the weather comes from the north-west (powder avalanches)
Directly across from Matvik (the most dangerous)	Stabbefonna	Generally occurs when the weather comes from the south-west (mostly wet slab avalanches)

*All avalanches occur after long periods of frost followed by precipitation

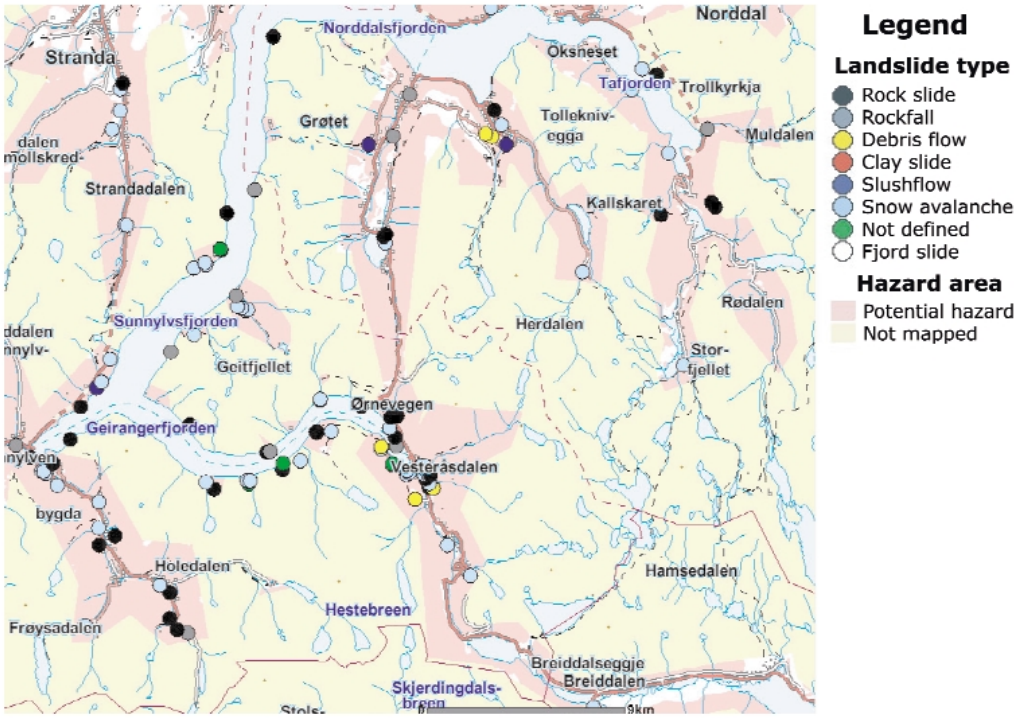

Figure 5. Map showing potential snow-avalanche hazard areas in populated areas and the location of known avalanche and landslide events in historical times.

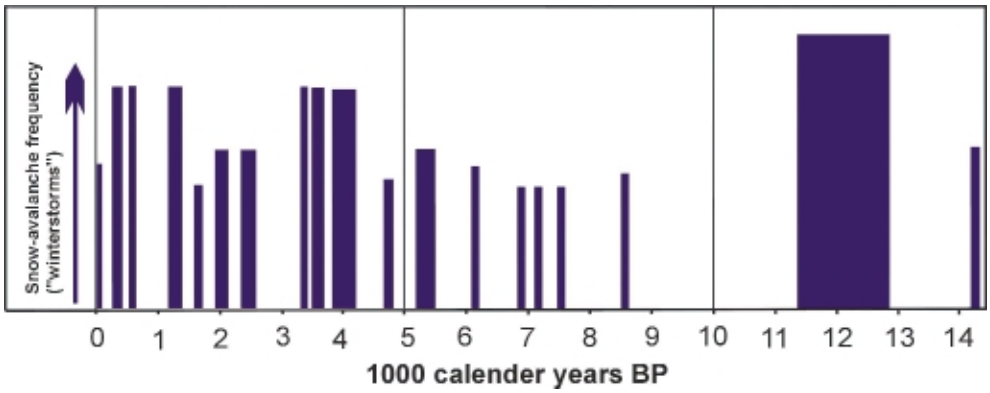

Figure 6. The time distribution and relative intensity of snow avalanches compiled from a series of localities in western Norway (modified from Blikra & Selvik, 1998).

Along fjords and valleys, the fractured and faulted gneisses are unstable and prone to rock avalanches and rock falls. There are numerous occurrences of well-defined slide scars and avalanche tracks ending in cones or slide aprons entering the fjords or along the lower valley slopes (Figs. 7 and 8). These features represent some of the world's most spectacular features of rock-slide deposits in fjord settings. On several occasions in historical times, rock avalanches plunging deeply into the fjords have generated large tsunamis that have destroyed villages and killed people.

The most recent catastrophic event was the Tafjord disaster in 1934, when about 3 million m^3 of rock fell into the fjord and created a tsunami (huge wave) reaching a maximum height of 62 m (Figs. 9 and 10). After moving 8-10 km along the fjord it was reduced to a height of 10-15 m, swamped three villages and killed 41 people. The small community at Fjøra was totally destroyed by the tsunami, and 17 people lost their lives. The several hundred-metre-high slide scar still looks fresh and stands out as a vegetation-free surface compared to the mountain slopes nearby. The deposits of many similar or larger avalanches are present along the fjord basins, confirming the wildness and dynamics of such a landscape.

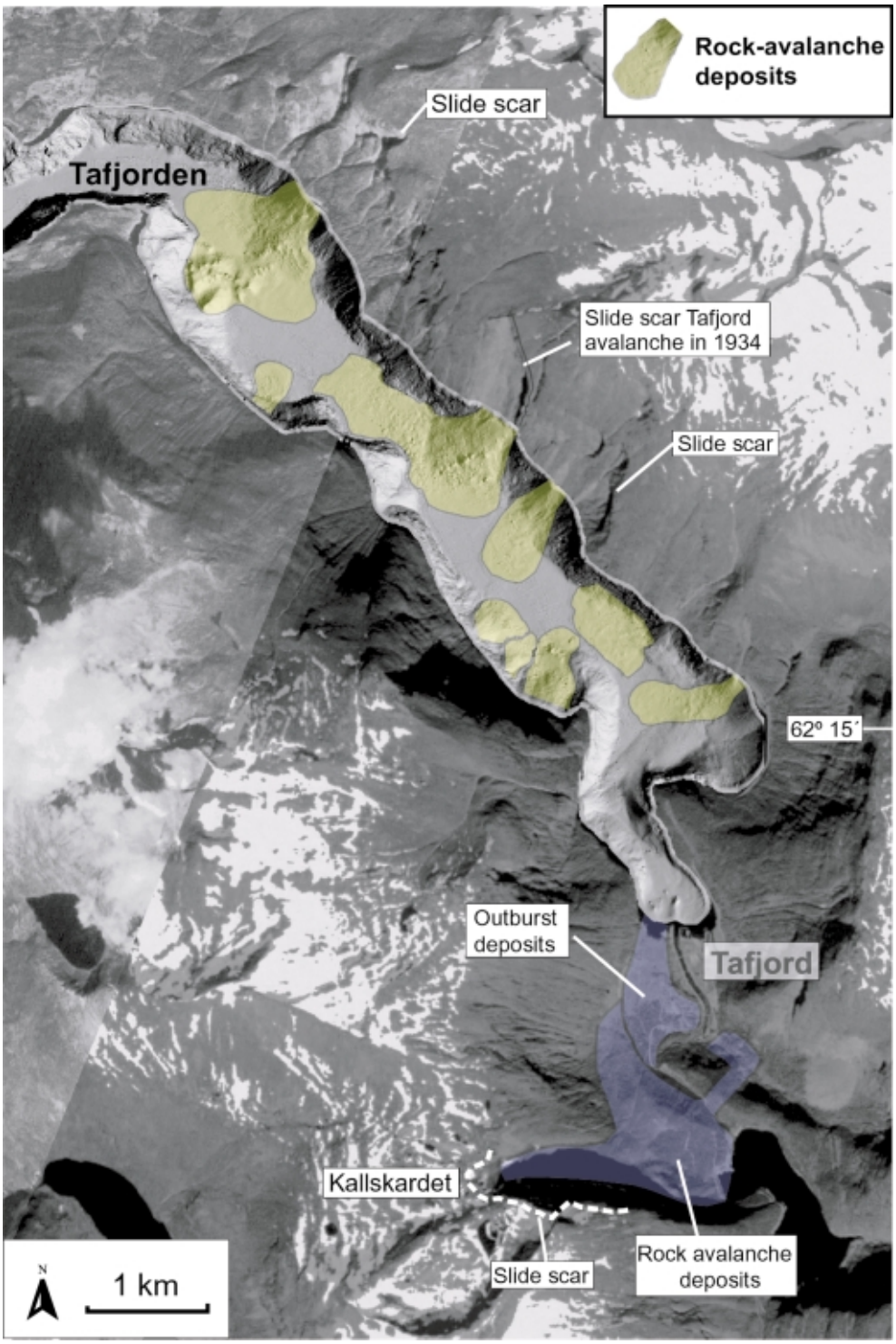

Figure 7. The inner Tafjord area with prominent slide scars on the steep mountain slopes and well-defined avalanche deposits on the fjord floor.

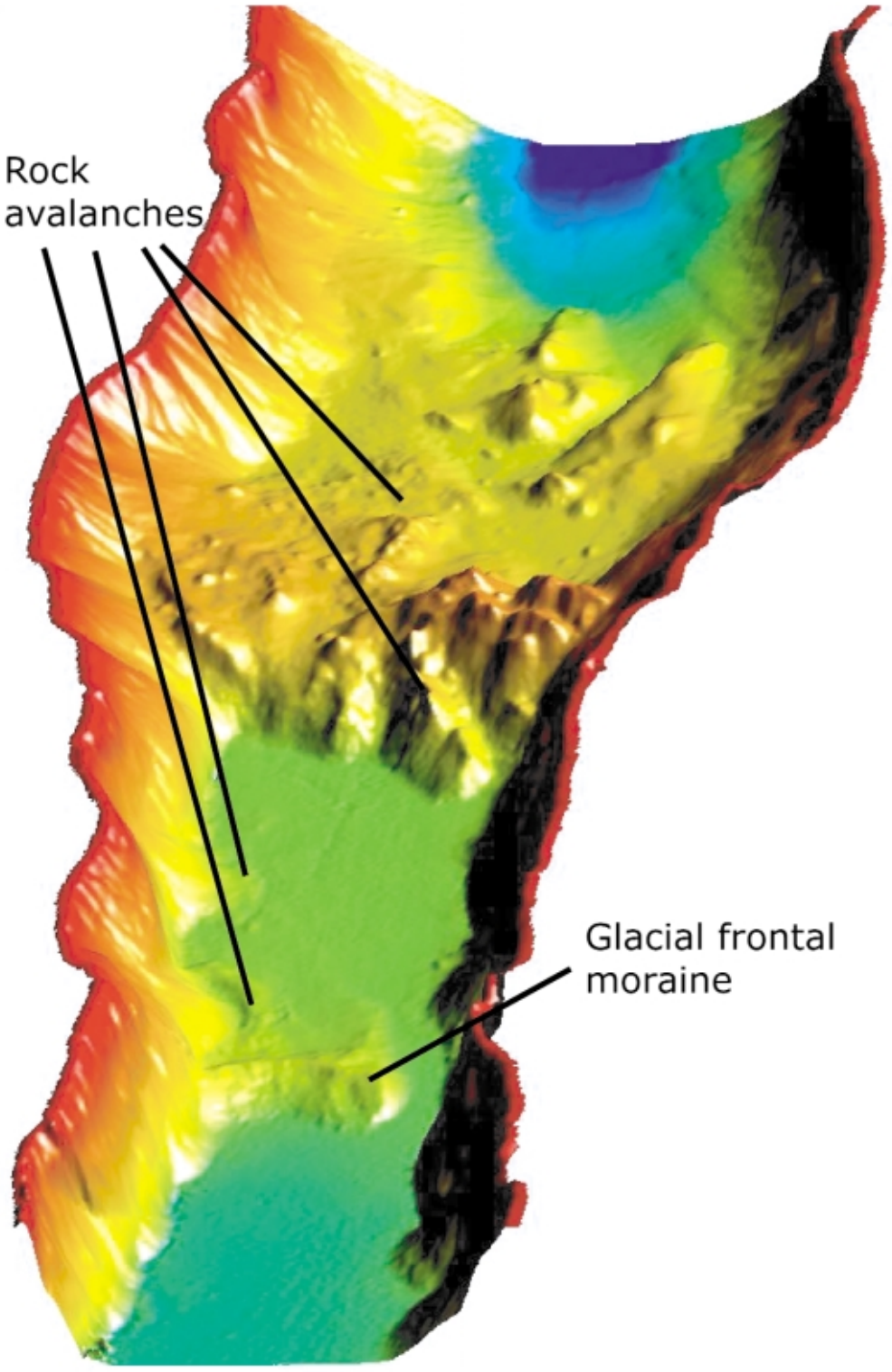

Figure 8. Large-scale rock avalanche deposits on the fjord floor. Note also the prominent moraine ridge in the foreground.

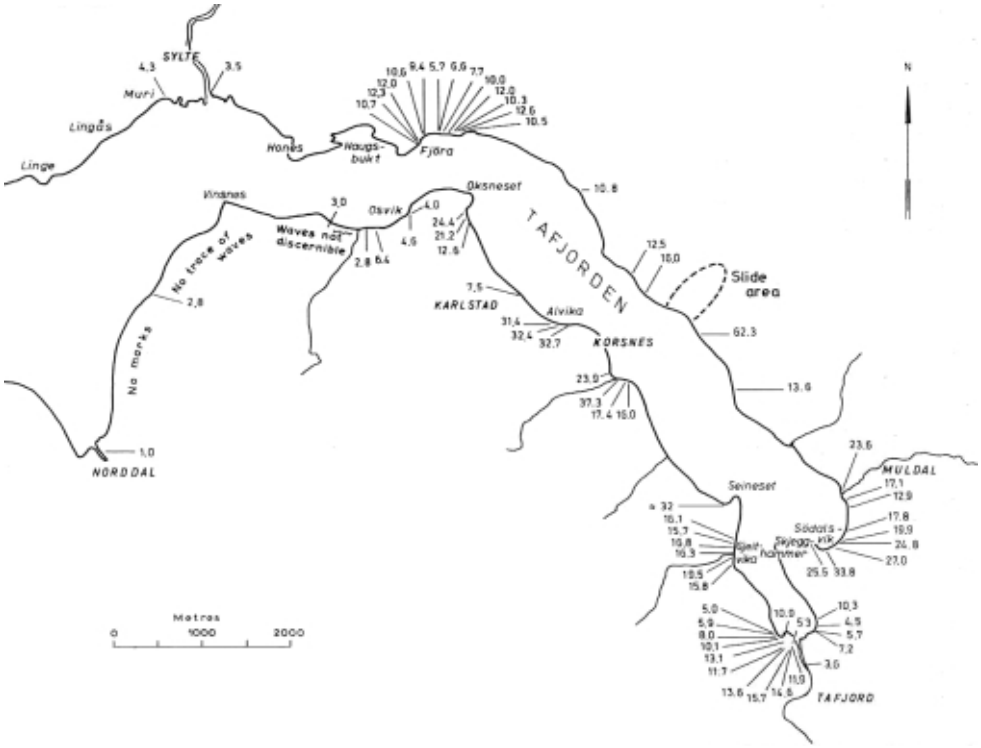

Figure 9. Tsunami heights in Tafjord after the 1934 disaster (after Kaldhol & Kolderup 1937).

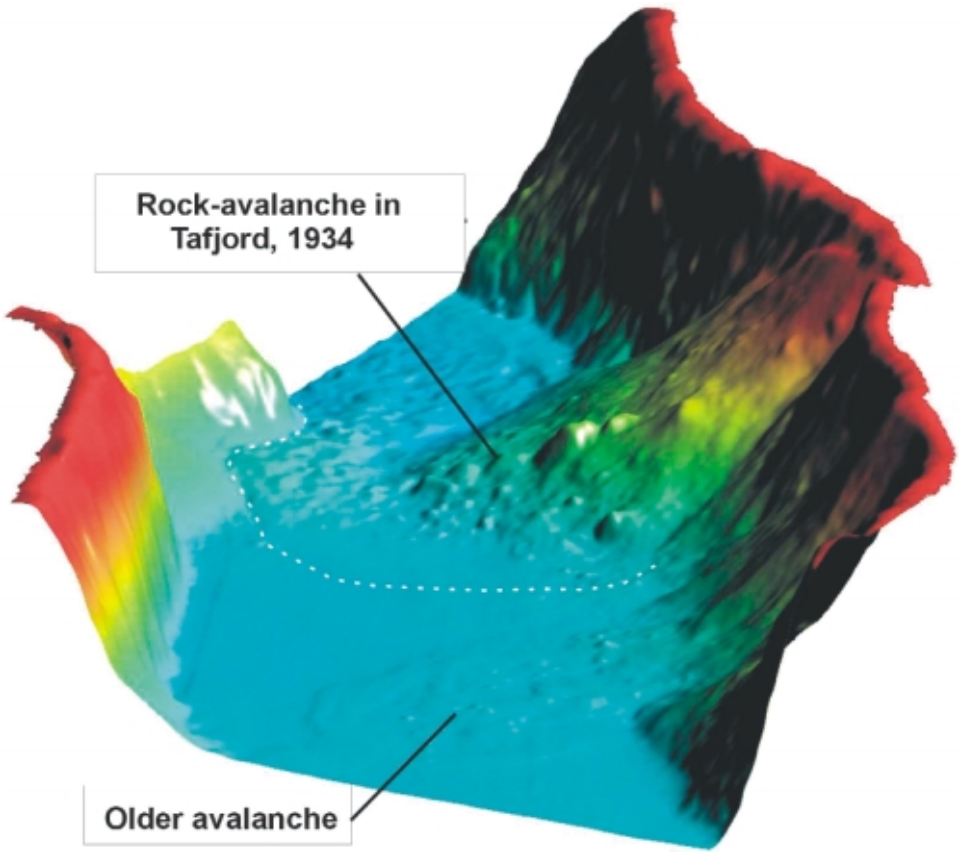

Figure 10. The deposits on the fjord floor produced by the Tafjord disaster in 1934.

The Nærøyfjord area *(Annex 1, Map G)*

In the Nærøyfjord area, the fjord cuts a narrow section through the bedrock. Steep cliffs along the fjord help to produce highly dramatic scenery with a maximum relief of up to 2000 metres from the bottom of the fjord to the highest mountains. The Fresvik glacier covers an area of about 15 km2 and provides a present-day illustration of the processes and conditions that formed the landscape during the last Ice Age.

Landforms

The landforms on the high ground between the fjord and the valleys are generally more rounded than those in the Geirangerfjord area, the old, preglacial palaeic surface being preserved in many places. Along fjords and valleys, benches on steep mountainsides represent such old landforms. Hanging valleys are common and form tributary valleys, such as Jordalen and Brekkedalen, to the major Nærøydalen valley. Due to the south-westward migration of the watershed, these valleys have formed fish-hook valleys. In some places, rivers have cut impressive gorges with waterfalls and rapids cascading down them.

Deposits

Exposed bedrock or a thin, discontinuous cover of superficial deposits dominates most of the Nærøyfjord area. The mountains are sparsely covered by frost-weathered material (block field) and sporadic, fairly thin deposits of till. Most of the till on the higher ground occurs in the valleys, in particular valleys located more or less transversely to the direction of ice transport. An example of this is Jordalen, where a thick cover of till is present on the western slopes of the valley. A prominent terminal moraine was deposited across Nærøyfjord at Bakka. This deposit formed when the retreating ice margin halted temporarily during the deglaciation. In Nærøydalen, at the entrance to Jordalen, a tributary valley, a glaciofluvial delta was built up to sea level in front of the valley glacier, showing that the sea level at that time was approximately 110 m above present sea level.

Avalanches and landslides

The steep valley and fjord sides have been unstable during postglacial time and are affected by various gravitational processes, especially in the inner part of the fjord system. A number of well-defined slide scars and large avalanche tracks (commonly funnel-shaped) are characteristic features (Fig. 11). Failures in the bedrock in the steep slopes have released several large rock avalanches with well-defined frontal lobes. A number of snow avalanches and minor rock falls have also occurred, and tongues and fans of scree material cover most of the lower parts of the steep mountainsides (Fig. 12). The Bakka terminal moraine is partly covered by bouldery avalanche material which forms shoals at the narrow entrance to the inner fjord basin. One of the most prominent snow avalanche fans is located at Styvi where avalanches from the snowfield north of Raudeggi transport weathered material down to the fjord every spring. At Tufto (Bakka), the cultivated areas are often covered by roots, stones and mud carried in snow avalanches, but the farm buildings are on safer locations. At Gudvangen Farm, two high stone walls were built many years ago on the lower side of the houses to protect them from the tremendous air blasts generated by the snow avalanches from the opposite side of the valley. In recent years, several earth banks have been constructed to protect the road and the buildings in the valley from snow avalanches, the largest

being located above the village of Gudvangen. This is one of many examples of how people managed and still manage to survive in a wild and dangerous landscape, and adjust their way of living to the rough nature.

In the inner part of Aurlandsfjord and at Flåm, the phyllitic strata are particularly prone to landslides due to the poor coherence of the rock. A number of instability features occur, including rock avalanches, large slow-moving slides and gravitational bedrock fractures. Prominent slide lobes are found on the western side of Flåmsdalen. Extensive hummocky deposits on the floor of Aurlandsfjord are further evidence of sliding. The instability of the phyllite represents a potential risk in the area, especially if a large avalanche enters Aurlandsfjord, generating a destructive tsunami.

Table 6. Large snow avalanches occurring regularly in the Nærøyfjord area.

Locality	**Avalanche name**	**Remarks**
Gudvangen-Bakka	The whole stretch	Several avalanches each winter
Gudvangen	Langageiti and Nautagrovi are the best known	Banks have been built to protect the settlements
Undredal	Djupånå and Breidskreda	Several avalanches each winter

Figure 11. Characteristic features on many of the fjord sides are ravines and gorges which end upwards in a funnel-like widening with a steep back wall. Above them, the even palaeic surface ends abruptly at the cliff. Photo looking east towards the steep side of Aurlandsfjord at Kalvenosi. Photo: Lars Løfaldli.

Figure 12. The Breiskreda fan, north of Bakka, is one of the most frightening, but fascinating, avalanche fans in Nærøyfjord. Photo: Inge Aarseth.

River systems and waterfalls

After the ice retreated from the fjords, running water is the most important factor that is shaping the fjord landscape and a vital element for our enjoyment of the scenery throughout the year. The rivers gradually erode the hard bedrock, forming canyons and gorges where joints assist their erosive power. Weathered material and unconsolidated debris from avalanches and rock falls on the mountainsides are transported into the fjords by the water. In winter, the rivers freeze and large columns of ice form up the mountainsides.

The area has numerous rivers, streams and waterfalls that have not been developed for hydroelectric power or other uses. Depending on the precipitation and the time of year, these alternate from being almost invisible, gently flowing and powerless to become dramatic, excavating, noisy and powerful. The colour of the water shifts correspondingly, depending on the time of year and the area. The meltwater rivers are coloured grey by all the fluvial material which they are transporting into the fjord, and they colour that turquoise. Rivers which flow through the areas that have hard anorthositic bedrock have crystal clear water that almost completely lacks nutrients.

The West Norwegian fjord landscape, with its narrow valleys and huge differences in altitude, has a great potential for the harnessing of rivers and waterfalls to produce hydroelectric power. The rivers in the proposed World Heritage Area are intact, in contrast to numerous other rivers in western Norway, which have been subjected to development, in some cases on a vast scale. The great significance which the rivers have for shaping the landscape, for the biological diversity and as an aesthetic element, is secured for posterity in two continuous areas.

The many waterfalls are spectacular landscape elements where they cascade down the mountainsides on their way to the fjords. Some dissolve into mist before they reach the ground, others thunderingly plunge into deep ravines along the fjord, and disappear. A few waterfalls cascade in free fall from a great height directly into the fjord. Along Nærøyfjord alone there are more than 25 large and small waterfalls.

Table 7. The most important rivers in the proposed World Heritage Area

River	**Drainage basin (km^2)**	**Mean rate of discharge** ($l/s/km^2$)	**Mean rate of discharge at** mouth (l/s)	**Area**
Geirangerelva	85	58	4912	Geirangerfjord
Norddalsvassdraget	105	65	6802	Geirangerfjord
Bygdaelva	94	60	5617	Geirangerfjord
Vossovassdraget	1486	*	*	Nærøyfjord
Dyrdalselvi	51	*	*	Nærøyfjord
Nisedalselvi	16	*	*	Nærøyfjord
Undredalselvi	92	*	*	Nærøyfjord
Flåmselvi	280	*	*	Nærøyfjord
Nærøyelvi	*	*	*	Nærøyfjord
Kolarselvi	*	*	*	Nærøyfjord
Tuftoelvi	*	*	*	Nærøyfjord
Jordalselvi	*	*	*	Nærøyfjord
Styviselvi	*	*	*	Nærøyfjord

* Data not available

Table 8. The most important waterfalls in the proposed World Heritage Area.

Name of waterfall	**Height of fall** (metres)	**Area**
Seven Sisters (seven parallel waterfalls side by side)	350-300*	Geirangerfjord
Storsæterfossen	35*	Geirangerfjord
Friaren	60*	Geirangerfjord
Brudesløret	250*	Geirangerfjord
Bringeelva	50*	Geirangerfjord
Ljosurfossen	150*	Geirangerfjord
Slufsa (Tafjord)	200*	Geirangerfjord
Knøstelva (Herdal)	75	Geirangerfjord
Dampfossen (Herdal)	15	Geirangerfjord
Stalheimsfossen	126	Nærøyfjord
Sivlefossen	240	Nærøyfjord
Kjelfossen (Total fall 840 m. The highest in Norway)	200	Nærøyfjord
Rjoandefossen	140	Nærøyfjord
Helvete (gorge with foaming rapids, not free falling)	150*	Nærøyfjord
Lægdafossen	75*	Nærøyfjord
Flugande	75*	Nærøyfjord
Brekkefossen	45*	Nærøyfjord
Huldafossen (two parallel waterfalls)	90*	Nærøyfjord

* Heights are interpreted from maps; not precise measurements

Terrestrial flora

General aspects

The Geirangerfjord and Nærøyfjord areas display typical and representative aspects and qualities of the plant life in the West Norwegian Fjords. In addition to a number of rare, endangered or vulnerable species, there are also some which have the northern or western limits of their distribution here.

The coast – inland, north - south and altitudinal gradients mean that many habitats are represented within comparatively small geographical areas. The steep sides of fjords, screes, waterfalls, river gorges, hilly terrain and well-maintained transhumance dairy farm areas give variation and species diversity. Substantial differences in the local climate mean that species known from southerly latitudes may bear fruit just a few kilometres from high alpine plants that are better known from arctic environments.

The diversity of species in the fjord landscape is large considering that nutrient-poor gneisses dominate the bedrock. The continual formation of fissures and frequent rock falls and avalanches on the geologically active sides of the fjords mean that fine-grained material is continually being formed from which precipitation is able to dissolve plant nutrients. Pockets of nutrient-rich rocks in the dominantly nutrient-poor areas give rise to a richer flora with a higher diversity of species and several specialised plants. Occurrences of peridotitite and serpentinite in the Geiranger area and the belt of phyllites in the Nærøyfjord area are examples of such pockets.

Active geological erosion resulting in huge screes and avalanche fans gives rise to pioneer communities and species adapted to unstable sites. The rarest of these is the sub-species of arctic poppy (*Papaver radicatum* ssp. *relictum*) found at Bleia in the Nærøyfjord area.

Centuries of grazing and haymaking have resulted in the establishment in some parts of the fjord landscape of a number of semi-natural plant communities with several Red-listed species and species that are most important for other elements of the biodiversity (insects, birds and animals).

The Geirangerfjord area

Some plants that are confined to the coast are found in various natural environments, but the area is situated so far inland that this floral element is weakly developed. On the other hand, the thermophilous, southerly and south-westerly element is much better developed, and probably no other part of Sunnmøre has as many species from this element in as many localities.

Pockets of peridotite and serpentinite in the bedrock create ideal growing conditions (ultrabasic environment) for some pure specialists. Brown spleenwort (*Asplenium adulterinum*) grows exclusively on such rock. Other plants that may be associated with these areas are alpine catchfly (*Lychnis alpina*), a sub-species of alpine mouse-ear (*Cerastium alpinum* ssp. *glabratum*) and purple saxifrage (*Saxifraga oppositifolia*).

An extremely rare species that has its Norwegian name from this area grows in moist environments close to waterfalls. This is 'Norddal lady's mantle' (*Alchemilla semidivisa*), which is known from only a handful of localities in inner Sunnmøre, four of them within the proposed World Heritage Area.

A total of 41 Red-listed species of fungi, lichens, bryophytes and vascular plants have been recorded in the area (see Table 9).

The four most important main types of vegetation in the area are woodland, scree and rock, alpine and anthropogenous (cultural landscape) vegetation.

Woodland vegetation

Eighteen botanically valuable localities of woodland vegetation have been identified, and these fall into the divisions of old deciduous woodland, peridotite pine woodland, rich thermophilous deciduous woodland and wooded pasture.

Upland birch woodland dominates in the wooded areas. The woodland floor generally has bilberry and some oceanic ferns like hard-fern (*Blechnum spicant*) and lemon-scented fern (*Oreopteris limbosperma*). The thermophilous deciduous woodlands on south-facing fjord slopes cover a smaller area, but have an extremely high biological diversity. Thermophilous trees like wych elm (*Alnus glabra*) and hazel (*Corylus avellana)* in mosaics with silver birch (*Betula pendula*) or Scots pine (*Pinus sylvestris*) give a rich plant life and approximately 200 vascular plants have been recorded at two such localities. The Hyskjet Nature Reserve at Stranda is one of the richest localities with such woodland. Typical species here include broad-leaved helleborine (*Epipactis helleborine*), Braun's holly fern (*Polystichum braunii*), broad-leaved violet (*Viola mirabilis*), wild liquorice (*Astragalus glycyphyllos*), woodruff (*Galium odoratum*), dark-red helleborine (*Epipactis atrorubens*) and rough horsetail (*Equisetum hyemale*). The largest areas of thermophilous deciduous woodland are found along Sunnylvsfjord between Tindbjørgane and Åkerneset, and along the north side of Geirangerfjord. Other types of woodland vegetation are old pine woodland and old deciduous woodland, found in a few localities along the sides of fjords.

Scree and rock vegetation

Screes constitute the most important treeless, mineral soil habitats for grassland communities below the tree line in this region. The huge screes in the inner part of Geirangerfjord and up the valley south of Geiranger have interesting vegetation and a flora comprised of many species. For instance, the Red-listed sub-species of small-white orchid (*Leucorchis albida* ssp. *albida*) grows in several places here. Some vascular plants seem to have a relict-like occurrence in this type of habitat, i.e. they have survived here since the warm sub-Atlantic period 2000 years ago.

The richest occurrences are found where the bedrock contains carbonate. Southerly and south-easterly vascular plants are often found here, as well as many species that are otherwise uncommon in this region. Under such conditions, it is not unusual to find more than 100 species of vascular plants 1000 m above sea level.

The bicentric saxifrage, *Saxifraga hieracifolia*, which grows on limestone cliffs in Geiranger, preferably north-facing ones, is another important species which has its westernmost and south-westernmost localities here.

Alpine vegetation

The most interesting alpine flora with an abundance of species is found east and south-east of Geiranger from Stavbrekka and Dalsnibba in the south to Gråsteindalen in the north. Otherwise, a rich locality is known at Geitfjellet, north-west of Geiranger. The alpine flora is not particularly rich in a national context, but is nevertheless the best in the north-western part of western Norway. The snow cover is vitally important, and alpine vegetation communities are found on ridges, lee slopes and in association with late snow patches. The ridges are exposed to wind and are convex terrain forms with a thin snow cover. The lee slopes have quite a stable snow cover which thaws early in spring. The snow patches melt late in the summer and the vegetation there varies from polar willow (Salix polaris) to more grassy, herb-rich vegetation.

Anthropogenous vegetation

The most important biological values in the cultural landscape are associated with areas where the vegetation has been shaped by haymaking, grazing, scrub clearance or pollarding of trees. Over time, occurrences of specialised species have evolved on non-fertilised natural pastures or hayfields. Most of them are various types of grassland fungi belonging to the finger and club (*Clavaria*), red gill (*Entoloma*) and wax (*Hygrocybe*) families. The most important areas with rare and endangered species are found in association with the open, well-maintained cultural landscape around Herdalssetra and Botnen in Norddal.

Mosaics of natural pastures and woodland, preferably with pollarded birch or elm trees are other botanically interesting types of anthropogenous vegetation. The old elm trees are important key elements which often attract rare species of lichens and fungi which otherwise live in old thermophilous trees that for some reason or other are seldom found anywhere in western Norway.

The Nærøyfjord area

Studies of the vegetation in the Nærøyfjord area have primarily taken place along rivers and lakes in a number of valleys, Undredal, Dyrdal, Nisedal and Nærøydal. In addition, some areas of anthropogenous vegetation have been investigated, as well as the Bleia area and part of the phyllite belt in Flåmsdalen.

A characteristic feature of the vegetation in inner parts of Sognefjord is the presence of comparatively large areas of natural Scots pine woodland. Examples of good localities in the Nærøyfjord area are the Nordheimsdal valley and the Bleia area. Another characteristic feature is the rich alpine vegetation in areas with carbonate-bearing bedrock. In the area dealt with here, such plant communities are found on the phyllites in Flåmsdalen.

The sides of the fjords vary from steep, naked cliffs, screes and avalanche fans to inaccessible wooded slopes and some flatter parts that are largely influenced by traditional goat farming. As regards the screes, the Bleia area stands out in importance because of the occurrence there of the rare sub-species of arctic poppy, *Papaver radicatum* ssp. *relictum*.

Seven Red-listed species and seven species for which Norway has special responsibility have been recorded in the area, but these figures should no doubt be higher.

The phyllite belt in Flåmsdalen

The area with nutrient-rich, easily weathered phyllite in the hillsides above Flåmsdalen differs greatly from other areas in terms of its botanical qualities. More than 500 flowering plants have been found in the Flåm river catchment basin. This rich flora has earned great attention from botanists, and many investigations have been made there since 1932. 128 of the species recorded are alpine plants, which is about half of the total alpine flora in Norway. Two areas of outstanding botanical interest in this district are:

1) Dry rock, dry slopes and hazel woodland below Midtnosi
2) Woodland, rich fen, cliff, scree and meadow vegetation below Vidmenosi.

Undredal, Dyrdal, Nisedal, Nærøydalen

The vegetation in these valleys is characteristic for the region and no specially interesting plant occurrences are present. The valley sides and floor of Undredal are dominated by grey alder (*Alnus incana*) communities influenced by grazing, and the most important species in the field layer are tufted hair-grass (*Deschampsia cespitosa*) and raspberry (*Rubus idaeus*). Hazel and birch form the remainder of the tree vegetation. Dyrdal has poorer types of vegetation, dominated by birch, grey alder and pine on the low ground. Some areas of thermophilous deciduous woodland occur beside the fjord. The lower part of Nisedal has mixed woodland with birch (*Betula* sp.), rowan (*Sorbus* sp.), goat willow (*Salix caprea*) and bird cherry (*Prunus padus*), as well as some wych elm (*Ulmus glabra*). Nærøydalen has steep valley sides, active screes and a flat floor. The screes are generally clothed in grey mosses (*Racomitrium* sp.); otherwise grey alder and birch dominate. Thermophilous woodland occurs in sheltered pockets on the west side of the valley. The flat valley floor is mostly farmland.

Woodland vegetation

Along the sides of the fjords, the woodland vegetation varies with the soil, moisture, exposure, altitude above sea level and manner of use. Birch woodland communities of various kinds are most common. A somewhat richer grey alder community dominates on the avalanche fans beside the fjord. Due south of Dyrdal is a well-developed birch grove with large, pollarded trees and a grazed field layer.

Thermophilous deciduous trees such as small-leaved lime (*Tilia cordata*), wych elm and hazel grow here and there in small groups along the entire fjord. The best localities are on south-facing slopes. The best-developed occurrences of thermophilous woodland in the area are found at Beitelen and Lægdaviki. These are almost pure lime woods.

What is probably the best locality of virgin pine woodland in the whole of western Norway is found in Nordheimsdalen. It contains the entire woodland gradient from the fjord to the mountain tops, with an intact drainage basin and a large diversity of types of pine woodland which are characteristic for inner fjord districts. The area is protected as a nature reserve.

Alpine vegetation

Alpine vegetation, as far as is known, mainly consists of plants that are common in heather and grass heaths. Because of the climatic and topographical conditions, the alpine areas contain many snow patch communities with plants that have a short growing season.

Even though the mountainous areas mainly have bedrock that is resistant to weathering, several plants have been recorded that normally only grow on nutrient-rich soil. Holly-fern (*Polystichum lonchitis*), hair sedge (*Carex capillaris*) and lance-leaved moonwort (*Botrychium lanceolatum*) are examples of species that normally require calcareous soils.

Other species that are uncommon in the region include woolly willow (*Salix lanata*), mountain bog-sedge (*Carex rariflora*) and arctic meadow-grass (*Poa arctica*). The last-mentioned species has its best known occurrences in the county on Mjølfjell.

Bleia

The locality boasting the rare sub-species of arctic poppy (*Papaver radicatum* ssp. *relictum*) stretches from about 350 to 900 m a.s.l. on screes at Inste Drøfti, below a mountain called Bleia. This is the only known locality in the Nærøyfjord area. The Bleia area otherwise has a great deal of unusual vegetation that has been little disturbed by the activities of people. In contrast to the rest of the Nærøyfjord area, large parts of this area have not been grazed by domestic livestock, and natural grassland is among the types of vegetation found here.

Sub-alpine birch woodland covers large areas and has types of vegetation that are characteristic for the inner fjord districts of western Norway. Several Red-listed species of fungi, lichens and bryophytes have been recorded in association with the steep gorges on the mountainside facing Sognefjord. Old woodland and calcareous pine wood have been recorded near one of these, Hausagjelet. An infield meadow with an unusually rich variety of species is found at Hausen, an abandoned cotter farm.

The virgin-like pine wood above inner Frønningen contains several pine trees with a diameter of 1 m at chest height, suggesting that the soil has an unusually high quality class.

The alpine vegetation on the anorthosite is generally poor, but layers and lenses of phyllite at Grånosi and Bleiaskard have several rich and demanding plant communities, including mountain avens (*Dryas octopetala*) heaths. The most important are the area north of Grånosi (1347 m a.s.l.) and Bleiaskard.

Table 9. Known finds of Red-listed species in the proposed World Heritage Area.

Latin name	Norwegian name	English name	Red List status*	Area**
Fungi				
Antrodia pulvinascens	Hvit ospekjuke	A bracket fungus	R	N
Camarophyllopsis schulzeri	Gulbrun narrevokssopp		DC	G
Cantharellus pallens	Bleik kantarell	A chantarelle	DC	G, N
Ceriporiopsis aneirina	Ospekjuke	A bracket fungus	DC	N
Clavaria zollingeri	Fiolett greinkøllesopp	A club fungus	V	G
Clavulinopsis cinereoides		A finger fungus	V	G
Cortinarius cinnabarinus	Sinoberslørsopp	A cortina fungus	V	G
Cortinarius fulmineus	Safranslørsopp	"	R	G
Entoloma atrocoeruleum			DC	G
Entoloma caesiocinctum			DC	G
Entoloma corvinum	Ramneraudskivesopp		DC	G
Entoloma exile			DC	G
Entoloma formosum	Bronseraudskivesopp		R	G
Entoloma griseocyaneum	Lillagrå raudskivesopp		DC	G
Entoloma porphyrophaeum	Lillabrun raudskivesopp		DC	G
Entoloma xanthochroum			R	G
Hygrocybe fornicata	Musserongvokssopp	A wax fungus	DC	G
Hygrocybe glutinipes	Limvokssopp	"	V	G
Hygrocybe ingrata	Raudnande lutvokssopp	"	V	G
Hygrocybe phaeococcinea	Svartdogga vokssopp	"	DC	G
Hygrocybe quieta	Raudskivevokssopp	"	DC	G
Hygrocybe splendidissima	Raud honningvokssopp	"	V	G
Hygrocybe turunda	Mørkskjela vokssopp	"	DC	G
Lactarius citriolens	Duftsvovelriske	A milk cap fungus	R	G
Leccinum pseudoscabrum	Hasselskrubb	A cow fungus	R	G
Peziza succosa	Gulnande begersopp	A cup fungus	DC	G
Phellinus ferruginosus	Rustkjuke	A bracket fungus	DC	N
Porphyrellus porphyrosporus	Falsk brunskrubb		DC	G
Porpoloma metapodium	Grå narremusserong		V	G
Russula anthracina	Kokskremle	A russula fungus	R	G
Russula aurea	Gullkremle	"	R	G
Tricholoma atrosquamosum	Svartspetta musserong		DC	G
Macro-lichens				
Neofuscelia verruculifera	Stiftskjergardslav		R	G
Stereocaulon delisei	Kystsaltlav		R	G
Bryophytes				
Brachydontium trichodes	Skoddemose		DM	G
Bryum riparium	Kantknollvrangmose		V	G
Buxbaumia viridis	Grønsko		DM	N
Calypogeia suecica	Råteflak		DM	N
Encalypta microstoma	Alpeklokkemose		E	G

Table 9. Continuing.

Latin name	Norwegian name	English name	Red List status*	Area**
Vascular plants				
Alchemilla semidivisa	Norddalsmarikåpe	'Norddal lady's mantle'	R	G
Asplenium adulterinum	Brunburkne	Brown spleenwort	R	G
Bromus ramosa	Bergfaks	Hairy brome	DC	G
Cephalanthera longifolia	Kvit skogfrue	Narrow-leaved helleborine	R	G
Dryopteris expansa var. willeana	Bruntelg	Northern buckler -fern (var.)	DM	G
Leucorchis albida ssp. *albida*	Kvitkurle	Small-white orchid (ssp.)	DC	G
Papaver radicatum ssp. *relictum*	Urvalmue	Arctic poppy (ssp.)	V	N
Trisetum flavescens	Gullhavre	Yellow oat-grass	DC	G

* Status: E = Endangered, V = Vulnerable, R = Rare, DC = Declining, care demanding, DM = Declining, monitor species
** Area: G = Geirangerfjord. N = Nærøyfjord

Table 10. Known finds in the proposed World Heritage Area of species for which Norway has special responsibility.

Latin name	Norwegian name	English name	Red List status*	Area**
Macro-lichens				
Pannaria conoplea	Grynfiltlav		-	G, N
Peltigera britannica	Kystgrønnever		-	G
Sticta fuliginosa	Rund porelav		-	G, N
Lobaria amplissima	Sølvnever		-	G, N
Degelia plumbea	Vanleg blåfiltlav		-	G, N
Vascular plants*				
Alchemilla semidivisa	Norddalsmarikåpe	'Norddal' lady's mantle	R	G
Arabis petraea	Aurskrinneblom	Northern rock-cress	-	G, N
Asplenium adulterinum	Brunburkne	Brown spleenwort	R	G
Dryopteris expansa v. willeana	Bruntelg	Northern buckler-fern (var.)	DM	G
Papaver radicatum ssp. *relictum*	Urvalmue	Arctic poppy (ssp.)	V	N
*Primula scandinavica***	Fjellnøkleblom	Scandinavian primrose	-	G
Sorbus subarranensis	Småasal	Swedish whitebeam (var.)	-	N
Sorbus rupicola	Bergasal	Common whitebeam (var.)	-	G
Sorbus hybrida	Rognasal	Swedish service-tree	-	G

* - Kidney vetch (*Anthyllis vulneraria*) has been found in the Nærøyfjord area. This is probably the alpine sub-species, which is a responsibility species, but the precise sub-species has not been stated.
** - A map in Gjærevoll (1990) shows that Scandinavian primrose has been found at several places in the inner Sogn district, also on the south side of Sognefjord, but precise locations are not available.

Birds in the fjord landscape

The typical species which characterise the West Norwegian fjord landscape have been recorded nesting in the proposed World Heritage Area. The varied topography with fjords, steep hillsides along the fjords with naked cliffs and thermophilous woodlands, undisturbed watercourses with many waterfalls, and treeless mountain areas with heaths and fens provide a rich diversity of habitats and a varied avifauna. Approximately 100 species breed in the area and they range from species typically associated with the coast to those that are common in the Norwegian mountains. Fifteen of the species recorded here figure on the Norwegian Red List and eight are species for which Norway has special responsibility because large parts of the population reside in Norway part of the year.

Waterfowl and wetland birds

The topography in the Geirangerfjord and Nærøyfjord areas is dramatic and not particularly suitable for waders, seabirds and waterfowl. The commonest of the waterfowl is the red-breasted merganser (*Mergus serrator*). Herons (Ardea cinerea) and common gulls (*Larus canus*) are among the birds that find good nesting sites along the fjords. Along the many rivers are some of the densest populations of Norway's national bird, the dipper (*Cinclus cinclus*). Most of the mires are in the mountains or uplands, and it is here such waders as snipe (*Gallinago gallinago*), golden plover (*Pluvialis apricaria*), redshank (*Tringa totanus*), dunlin (*Calidris alpina*), purple sandpiper (*Calidris maritima*) and dotterel (*Charadrius morinellus*) are found breeding. Lapwings (*Vanellus vanellus*) nest on wetlands on lower ground. Waterfowl like wigeon (*Anas penelope*), teal (*Anas crecca*), goldeneye (*Bucephala clangula*) and scaup (*Aythya marila*) breed on a few mountain tarns. The Grånosmyrane Wetland Reserve (designated in 1995) in the Nærøyfjord area has numerous waders and passerine species, several of which are rare in the region. Large areas of wetland like this are not common in the mountains of western Norway. Lapland buntings (*Calcarius lapponicus*) and bluethroats (*Luscinia svecica*) are among the species that nest here. This Lapland bunting population is one of the south-westernmost in continental Europe.

Birds on fjord hillsides

The thermophilous woodlands and other well-developed types of woodland have a rich bird life. This particularly applies to the grey alder-bird cherry woodland, which is renowned for its great diversity of passerine species. Patches of former farmland produce variation in the woodland, and the transitional zones are very valuable for birds. Among the birds that are common in these woodlands on the sides of the fjords are the nuthatch (*Sitta europaea*), several species of thrushes, and warblers such as the blackcap (*Sylvia atricapilla*) and icterine warbler (*Hippolais icterina*). Woodpeckers are represented by the green woodpecker (*Picus viridis*), lesser spotted woodpecker (*Dendrocopos minor*), grey-headed woodpecker (*Picus canus*), black woodpecker (*Dryocopus martius*), wryneck (*Jynx torquilla*), great-spotted woodpecker (*Dendrocopus major*) and white-backed woodpecker (*Dendrocopos leucotos*).

The many vertical and partly overhanging cliffs offer good nesting sites for birds of prey. Both the white-tailed eagle (*Haliaeetus albicilla*) and the golden eagle (*Aquila chrysaetos*) breed in the proposed World Heritage Area. The latter, following a period with very few individuals, is now well established in both areas. The goshawk (*Accipiter gentilis*), rough-

legged buzzard (*Buteo lagopus*), gyrfalcon (*Falco rusticolus*) and peregrine (*Falco peregrinus*) are among the other birds of prey in this dramatic fjord landscape.

Birds in the mountains

A representative selection of the avifauna of the Norwegian mountains can be found in the treeless mountain areas approaching the permanent snow and ice. Among the common species are willow grouse (*Lagopus lagopus*), ptarmigan (*Lagopus mutus*), raven (*Corvus corax*), meadow pipit (*Anthus pratensis*), ring ouzel (*Turdus torquatus*), wheatear (*Oenanthe oenanthe*), twite (*Carduelis flavirostris*), golden plover (*Pluvialis apricaria*) and several of the other waders mentioned previously.

Table 11. Known observations of Red-listed species in the area.

Latin name	English name	Red List status*	Area**
Accipiter gentilis	Goshawk	V	G, N
Aquila chrysaetos	Golden eagle	R	G, N
Aythya marila	Scaup	DM	N
Bubo bubo	Eagle owl	V	G, N
*Caprimulgus europaeus**	Nightjar	DM	N
Cepphus grylle	Black guillemot	DM	N
Dendrocopos leucotos	White-backed woodpecker	V	G, N
Dendrocopos minor	Lesser spotted woodpecker	DC	G, N
Falco peregrinus	Peregrine	V	N
Falco rusticolus	Gyrfalcon	V	G, N
Gavia arctica	Black-throated diver	DC	N
Gavia stellata	Red-throated diver	DC	N
Haliaeetus albicilla	White-tailed eagle	DC	G
Jynx torquilla	Wryneck	V	G
Picus canus	Grey-headed woodpecker	DC	G, N

*only a single observation

Table 12. Known observations in the area of species for which Norway has special responsibility.

Latin name	English name	Red List status*	Area**
Calidris alpina	Dunlin	-	N
Carduelis flavirostris	Twite	-	G, N
Lagopus mutus	Ptarmigan	-	G, N
Haliaeetus albicilla	White-tailed eagle	DC	G
Tringa totanus	Redshank	-	G, N
Mergus serrator	Red-breasted merganser	-	G, N
Phalacrocorax carbo	Cormorant	-	G
Larus marinus	Greater black-backed gull	-	G, N

* **Red List status:** E = Endangered, V = Vulnerable, R = Rare, DC = Declining, care demanding, DM = Declining, monitor species

** **Area:** G = Geirangerfjord. N = Nærøyfjord

Insects and mammals

Species that are characteristic for the West Norwegian fjord landscape live in the proposed World Heritage Area. There are also some rarer species that are also uncommon in other parts of the Norwegian fjords.

Insects

The general level of knowledge of the insects living in the fjord districts is limited, as it is in the rest of the country. It is therefore difficult to judge how many species actually live in the area. Sporadic investigations can suggest that a great diversity of interesting insects are present. This applies especially to south-facing, well-developed screes, which are the habitat of the rare clouded apollo butterfly, among others. This species, which is endangered throughout northern Europe, was recorded at nine localities on the large screes in the inner parts of Geirangerfjord in 2000.

Many rare and endangered species of beetles have been found in old deciduous woodland and flowery meadows at several places in the inner fjord districts of Møre & Romsdal and Sogn & Fjordane. Both the Geirangerfjord and Nærøyfjord areas have such habitats and there is probably a great potential for discovering more Red-listed insects there. Habitats containing virgin-forest-like thermophilous deciduous woodland and virgin-forest-like dry pine wood in more or less inaccessible parts of the Nærøyfjord area will be specially interesting for more detailed study.

Table 13. Known finds of Red-listed species in the proposed World Heritage Area.

Latin name	English name	Red List status*	Area**
Diasemia reticularis	A pyralid moth	E	G
Parnassius mnemosyne	Clouded apollo	V	G
Zygaena lonicerae	Narrow-bordered five-spot Burnet moth	DC	G, N

* **Status:** E = Endangered, V = Vulnerable, R = Rare, DC = Declining, care demanding, DM = Declining, monitor species

** **Area:** G = Geirangerfjord N = Nærøyfjord

Mammals

The inner fjord district of Sunnmøre is one of few areas in Norway where all the four naturally occurring species of deer occur: reindeer (*Rangifer tarandus*), elk (*Alces alces*), red deer (*Cervus elaphus*) and roe deer (*Capreolus capreolus*). Red deer and roe deer are common, but elk occur only sporadically in the easternmost areas. The wild reindeer is the most important species of deer, both in a historical perspective and because of its status as a species for which Norway has special responsibility. It has lived in the mountains here since the last Ice Age and three separate strains now have parts of their grazing areas within the boundaries of the proposed World Heritage Area. These are:

Nord-Ottadal (ca. 2230) – Tafjordfjella in the Geirangerfjord area (also their calving area)
Nordfjella (ca. 2000) – Bleia area in the Nærøyfjord area
Fjellheimen (ca. 400) – Fresvik area in the Nærøyfjord area

A number of predatory mammals live in the area. Arctic foxes (*Alopex lagopus*) and brown bears (*Ursus arctos*) have been observed now and then; a bear was last observed in Vindedal in 1990. The red fox (*Vulpes vulpes*) is common and the lynx (*Lynx lynx*) is probably also resident here. Wolverines (*Gulo .gulo*), pine martens (*Martes martes*), mink (*Mustela nivalis*), stoats (*Mustela erminea*) and weasels (*Mustela nivalis*) are also common. The otter (*Lutra lutra*) population has recently recovered after a long period when the species was rare.

The following small mammals are also found in the area: common shrew (*Sorex araneus*), bats (probably several species), western hedgehog (*Erinaceus europaeus*), hare (*Lepus timidus*), red squirrel (*Sciurus vulgaris*), Norway lemming (*Lemmus lemmus*), northern water vole (*Arvicola terrestris*), field vole (*Microtus agrestis*), root vole (*Microtus ratticeps*), yellow-necked mouse (*Apodemus flavicollis*), wood mouse *(Apodemus sylvaticus*), common rat (*Rattus norvegicus*) and house mouse (*Mus musculus*).

Table 14. Red-listed species known to occur in the proposed World Heritage Area.

Latin name	**English name**	**Red List status***	**Area****
Alopex lagopus	Arctic fox	E	G
Erinaceus europaeus	Western hedgehog	DM	G
Gulo gulo	Wolverine	R	G
Lutra lutra	Otter	DM	G
Lynx lynx	Lynx	DM	G

Table 15. The following species for which Norway has special responsibility are known to occur in the area.

Latin name	**English name**	**Red List status***	**Area****
Gulo gulo	Wolverine	R	G
Lemmus lemmus	Norway lemming	-	G, N
Lutra lutra	Otter	DM	G
Rangifera tarandus	Wild reindeer	-	G, N

* **Status:** E = Endangered, V = Vulnerable, R = Rare, DC = Declining, care demanding, DM = Declining, monitor species

** **Area:** G = Geirangerfjord N = Nærøyfjord

Marine environment, selected species

Nærøyfjord is the only fjord in the proposed area in which scientific investigations have been performed that can provide general or specialised knowledge about the flora and fauna of the inner fjords. Many new species have been described following scientific investigations in Sognefjord. For instance, around 1970, more than 20 species of bristle worms (*Polychaeta*) that were new to science were discovered.

Aurlandsfjord and Nærøyfjord are submarine hanging valleys located 1 km or more above the floor of Sognefjord. Aurlandsfjord is 400-500 m deep, but becomes more shallow in its innermost portion. Nærøyfjord is approximately 300 m deep in its outer part, but more shallow (<80 m) innermost. The floors of the fjords are mainly flat and covered with clay and mud. The fjords have steep sides and very limited areas of shallow water with a high biological production.

In Nærøyfjord, the soft-bottom fauna displays emergence, i.e. species that are common in deep water in the open sea are found here in much more shallow water. They include Norway lobsters and several species of sea pens. *Kophobelemnon stelliferum* is a sea pen that occurs here at a depth of 35 m instead of its normal depth of more than 300 m. Deep-water communities containing several other kinds of sea pens, hagfish, Norway lobsters and the deep-water jellyfish, *Periphylla periphylla*, have been recorded in comparatively shallow water in neighbouring fjords. The fauna as a whole is characterised as abundant.

The deep-water basin off Gudvangen in Nærøyfjord lacks oxygen in its bottom layer and contains no animal life. The threshold at Bakka prevents the exchange of bottom water and the natural supply of organic material from the River Nærøy also results in additional consumption of oxygen when decomposition is taking place.

However, north of Bakka, the oxygen and general environmental conditions are good, as they also are at all the 17 stations in Aurlandsfjord where measurements have been undertaken. The organic content in the bottom sediments is low, suggesting that organic material that is introduced is consumed by demersal creatures and converted through decomposition. Studies of the demersal fauna show no indication of pollution and the presence of up to 76 species indicates good environmental conditions in both Aurlandsfjord and Nærøyfjord. Good occurrences of seaweeds along the shores are further evidence of good environmental conditions.

The common seal (*Phoca vitulina*) and five species of whales represent the marine mammals. A common seal colony of 15-30 individuals has its pupping site in Nærøyfjord, and the Red-listed common porpoise (*Phocoena phocoena*) is commonly observed in Geirangerfjord and Nærøyfjord. White-beaked dolphins (*Lagenorhynchus albirostris*), sperm whales (*Physeter macrocephalus*), minke whales (*Balaenoptera acutorostrata*) and killer whales (*Orcinus orca*) have seldom been observed in recent years.

The fish that occur in the area are the same species which occur elsewhere in the inner fjord districts (see the table below). Aurlandsfjord has its own strain of herring called the Fretheim herring. Sprats migrate every few years from one fjord to another and considerable quantities are fished in Sognefjord as a whole. The River Nærøy is the only river in the proposed World Heritage Area that contains salmon. Sea trout also enter the rivers in the area, and are popular quarries for anglers in the fjords and rivers.

Table 16. Red-listed species and species for which Norway has special responsibility that is known to occur in the area.

Latin name	English name	Red List status*	Area**
Phocoena phocoena	Common porpoise	DM	G, N

* **Status:** DM = Declining, monitor species

** **Area:** G = Geirangerfjord N = Nærøyfjord

Table 17. Fish known to occur in the Geirangerfjord and Nærøyfjord areas.

Latin name	Norwegian name	English name	Area
Anarhichas lupus	Gråsteinbit	Catfish	G
Anguilla anguilla	Ål	Eel	G/N
Argentina silus	Vassild	Greater argentine	G/N
Argentina sphyraena	Strømsild	Lesser argentine	N
Benthosema glaciale	Nordlig lysprikkfisk	Glacier lantern fish	N
Brosmius brosme	Brosme	Torsk	G
Callionymus maculatus	Flekket fløyfisk	Spotted dragonet	N
Clupea harengus	Sild	Herring	G/N
Clupea sprattus	Brisling	Sprat	G/N
Cyclopterus lumpus	Rognkjeks	Lumpsucker	G/N
Diplecogaster bimaculatus	Dobbeltsuger	Two-spotted clingfish	N
Gadiculus argenteus	Sølvtorsk	Silvery pout	N
Gadus merlangus	Hvitting	Whiting	G
Gadus morhua	Torsk	Cod	G/N
Gasterosteus aculeatus	Stingsild	Three-spined stickleback	N
Gobiidae	Kutlinger	Gobies	N
Hippoglossus hippoglossus	Kveite	Halibut	G
Labrus berggylta	Bergylte	Ballan Wrasse	G
Limanda limanda	Sandflyndre	Dab	N
Lophius piscatorius	Breiflabb	Angler	G
Melanogrammus aeglefinus	Hyse	Haddock	G/N
Micromesistius potassou	Kolmule	Blue whiting	N
Microstomus kitt	Lomre	Lemon sole	N
Molva byrkelange	Blålange	Blue ling	G
Molva molva	Lange	Ling	G/N
Myoxocephalus scorpius	Vanlig ulke	Short-horned sculpin	N
Pleuronectes platessa	Rødspette	Plaice	G
Pollachius pollachius	Lyr	Pollack	G
Pollachius virenes	Sei	Saithe	G/N
Salmo salar	Laks	Atlantic salmon	G/N
Salmo trutta trutta	Sjøørret	Brown trout	G
Scomber scombrus	Makrell	Mackerel	G/N
Sebastus marinus	Uer	Redfish	G/N
Somniosus microcephalus	Håkjerring	Greenland shark	G/N
Squalus acanthias	Pigghå	Spiny dogfish	N
Trisopterus minutus	Sypike	Poor cod	N

Archaeological and historical monuments and sites (pre-1537 - pre-Reformation)

Information about stray finds and ancient monuments that can provide insight into how people have used the natural resources in these areas, and where they have lived, is limited. Surveys of archaeological monuments and sites (pre-1537) were undertaken in lowland parts of the proposed World Heritage Area in the 1970s, but little work has been done in the mountains. However, partly thanks to the keen interest for landscape and cultural heritage objects shown by local people for a long time, considerable knowledge exists. Section 3b describes the cultural history of the area in more detail. The finds and localities that are known include the following.

Hunting and trapping of wild reindeer in the mountains around the fjords
Both the Geirangerfjord and Nærøyfjord areas have numerous traces of ancient hunting and trapping. The traditional methods were based on the permanent migrating routes of the wild reindeer. With the help of leading fences partly constructed with wooden stakes or stones, and natural obstacles like lakes and steep hillsides, the animals were driven off cliffs or into systems of covered pitfalls. Hunters with bows and arrows or spears also hid behind low stone walls (hides) close to routes habitually used by the roaming reindeer. A pitfall for reindeer was generally 2 m deep, 2 m long and 0.7 m broad. Traces of camp sites can probably be linked with the use of hunting sites in the Stone Age, but no permanent settlements have been found in the mountains.

The trapping systems in the area are large and imply that many people must have co-operated on the hunt. The very largest systems comprise up to 80 hides and leading fences that were several hundred metres long.

The systems were probably in use from the Stone Age until as late as the 1600s, showing that wild reindeer inhabiting the mountainous areas have always been an important resource for people living in the surrounding fjords and valleys.

Table 18. Hunting and trapping systems recorded in the two areas.

Locality	Area*	Description	Height m a.s.l.
Litlejordshornet	G	300 m long leading fence and several groups of hides	**
Vinsåshornet	G	Hides	1400
Vesteråshornet	G	Hides	1600
Grandevatnet	G	Pitfalls	1000
Gomsdalen	G	Pitfalls for red deer	**
Oaldsegga/ Oaldsvatnet	G	Hides	1200-1400
Nonshaugen/ Eidsheia	G	Several groups of hides	1000-1100
Dyrdalen area	G	Hides	1000
Torvløysa	G	Hides	1800
Handalseggi	N	100 m long, up to 1.2 m high fence leading towards a cliff	**
Langafjellet	N	Several hundred hides. Remains of a 100 m long leading fence	**
Syringefjellet	N	Remains of 60 hides and 2 leading fences	**

Table 18. Continuing.

Locality	Area*	Description	Height m a.s.l.
Tuftafjellet	N	80 hides and 40 m long stone wall leading to a cliff	**
Vardane	N	Large systems of pitfalls and leading fences	**
Styvisdalsvatnet	N	Several pitfalls near a river mouth	**
Gravhalsen	N	3 hides, 3 hunting systems, 5 leading fences and a house site	**
Halsavatnet	N	Pitfalls and leading fences at the outlet from the lake	**
Vassetvatnet	N	Large area containing many pitfalls	**
Jøtebotn near Raudeggi	N	8 pitfalls with a leading fence	**
Raudeggskardet	N	One hide	**
Soleifletvatnet	N	4 pitfalls and 5 hides	**
Reinsgrovene	N	Line of pitfalls	**
Fessene	N	Hides and a pitfall	**
Kjelfossbotn	N	Pitfalls (no written records)	**
Drøfteskardet	N	Pitfalls	1150-1200
Høgdavatnet	N	Pitfalls	1182

* G = Geirangerfjord, N = Nærøyfjord

** Height above sea level not calculated

Other archaeological and historical (pre-1537) remains recorded in the area

Comparatively few graves or objects dating from the Stone Age or Bronze Age have been found along Geirangerfjord and Nærøyfjord. This may support a theory that these areas became permanently settled later than the more easily accessible fjords in western Norway.

Table 19. Sites and objects recorded in the two areas.

Locality	Area*	Description
Lundaneset	G	Flint chippings and arrows from the Late Stone Age (ca. 3000 – 2000 BC)
Djupdal area	G	Flint chippings and blade knife from the Stone Age found on a hunting site
Gomsnes/ Gomsdalen	G	Slab-lined cist (Late Stone Age or Bronze Age). Flint knife and saucer quern as grave goods
Smoge	G	Burial cairn from the Iron Age (500 BC – AD 1050) containing a sword, an anvil, a hammer, a knife, arrowheads and spearheads, a stone quern and a saucer.
Herdalssætra	G	Stone foundations of Viking Age houses (AD 800 – 1050)
Vinje in Geiranger	G	Burial mound from the Viking Age
Styvi	N	Burial cairn from the Bronze Age or Iron Age
Holmo	N	Burial cairn (15 m diameter, 2 m high)
Dyrdal	N	Three burial cairns from the Late Iron Age. A greenstone axe, boat rivets (clench nails), a two-edged sword and an axe were found as grave goods.
Hemri	N	Slab-lined cist from the Iron Age
Skjerpi	N	Burial cairn from the Iron Age
Fronnes	N	Group of 10 burial cairns
Drægo	N	Late Iron Age grave

Table 19. Continuing.

Locality	Area*	Description
Grindefletene	N	Several camp sites and several sleeping spots beneath overhanging cliff faces (hunting related)
Soleifletene	N	Grave find (sword) from the Late Iron Age, hunting site and camp site
Raudeggi and Breidalen	N	Stone circles, probably used as votive sites
Fresvikvarden	N	Large cairn

* G = Geirangerfjord, N = Nærøyfjord

Many foundation sites belonging to early, transhumance summer dairy farms are also found in the mountains. About 50 such localities are known in the Nærøyfjord area. It is uncertain how old these are, but such transhumance farming was mentioned in the Viking Period Gulating Act (written down in AD 1180). The Sagas of the Norwegian Kings (written by the Icelander Snorre Sturlasson, who lived from 1179–1241) refer to transhumance dairy farms in the Geiranger area in connection with the account of Olav Haraldsson's journey through the area in 1029.

Existing buildings and settlements (post-Medieval cultural heritage objects)

Cultural environments and cultural heritage objects of special historical value

Several cultural environment sites that are almost inaccessible other than by boat are found along the fjords. They consist of farm buildings and associated arable land and grazing, and have outstanding cultural historical, biological and scenic value. None of these sites are protected under the terms of the Cultural Heritage Act, but the most important ones are situated in protected landscape areas designated under the terms of the Nature Conservation Act. Cultural environments and cultural landscapes are highly esteemed by the local people and municipal land-use planning helps to look after them. Both the Geirangerfjord and Nærøyfjord areas have sites listed among the cultural landscapes that are given national priority.

The landscape made extreme demands on engineering skills when roads had to be built. Churches have been built in and close to the proposed World Heritage Area ever since the 12th century. Undredal Church from 1147 is the smallest of the 28 surviving stave churches in Norway. This type of construction is considered to be the most important contribution to world architecture made by Norway.

Table 20. The most important cultural environments and historical cultural heritage objects.

Locality *(Maps L & M)*	**Area***	**Description**
A. Fjord and mountainside farms, farmland and their environment		
Mølltunet	G	Intact cluster of 11 old farm buildings (the oldest from the 1600s) and surrounding hayfields, pastures and orchard. Steep, south-facing terrain with many warmth-demanding plants.
Homlungsætra	G	Abandoned summer farm on the steep south side of Geirangerfjord.
Knivsflå	G	Abandoned fjord farm 240 m a.s.l. on the north side of Geirangerfjord near the Seven Sisters waterfall. In an exposed position on a rocky ledge above a cliff dropping into the fjord. Farmhouse and hay barn.
Skageflå	G	Abandoned fjord farm 250 m a.s.l. Three buildings. Partly restored by the Friends of Storfjord in 1993. Restoration of the remaining buildings is being planned.
Syltavika	G	Fjord farm beside Sunnylvsfjord, 30 m a.s.l.
Blomberg	G	Mountainside farm on a ledge 450 m a.s.l. above Geirangerfjord; the farmhouse, hay barn and livestock barn combined in a single building. Restored by the Friends of Storfjord in 1998.
Matvika	G	Abandoned fjord farm on the north side of Geirangerfjord. The buildings are placed in a sheltered, safe cove surrounded by avalanche-prone slopes. Well known for very favourable local climatic conditions (able to grow apricots, for example).
Me-Åkerneset	G	Farm on a ledge high above Sunnylvsfjord. Five buildings linked together in a row and located under a large overhanging cliff, allowing snow avalanches to pass over their roofs without causing damage. Restored by the Friends of Storfjord in 2000.
Oaldsbygda	G	Hamlet on the east side of Sunnylvsfjord, composed of several farms. In the 19th century, this school district had more children than any other in the borough.
Smogeli	G	Abandoned mountainside farm (350 m a.s.l.) with 2 buildings. Sunnylvsfjord.
Smoge	G	Abandoned mountainside farm (250 m a.s.l.) with 5 buildings. Sunnylvsfjord.
Skrenakken	G	Abandoned mountainside farm (450 m a.s.l.) with 3 buildings. Norddalsfjord.
Verpesdal	G	Abandoned mountainside farm (350 m a.s.l.) with 6 buildings. Norddalsfjord.
Ospahjellen	G	Abandoned mountainside farm (200 m a.s.l.) with 3 buildings. Norddalsfjord.
Kvennhusneset	G	Abandoned mountainside farm (100 m a.s.l.) with 2 buildings.
Osvik	G	Abandoned fjord farm (10 m a.s.l.) with 2 buildings. Tafjord.
Kastet	G	Abandoned mountainside farm (150 m a.s.l.) with 3 buildings. Tafjord.
Korsnes	G	Abandoned mountainside farm (200 m a.s.l.) with 2 buildings. Tafjord.
Herdalssætra	G	Summer farm with 15 dwellings and 9 livestock sheds. Worked continuously since the 18th century. A row of 7 boathouses by the sea (Norwegian trestle-frame construction). Foundations of Medieval buildings near the present farm.
Nærøy / Bakka / Tufto	N	Group of farms still keeping sheep and goats. Built on a spit where Nærøyfjord is at its narrowest. Own church (see below).
Styvi	N	Working farm, lacking a road. Fully intact cultural landscape. Farm museum. Nærøyfjord.
Dyrdal	N	Abandoned group of farms with intact buildings. Nærøyfjord.
Stigen	N	Two mountainside farms. One is worked in summer, keeping goats and providing services for tourists. Aurlandsfjord.
Undredal	N	Hamlet with intact, wooden buildings beside Aurlandsfjord. Stave church. Active farm keeping goats.

Table 20. Continuing.

Locality *(Maps L & M)*	**Area***	**Description**
B. Churches		
Geiranger Church	G	Octagonal wooden church built in 1842. On the National List of Protected Buildings.
Undredal Stave Church	N	Stave church built in 1147, on Aurlandsfjord; automatically protected as a pre-1537 building.
Bakka Church	N	Wooden church built in 1859. On the National List of Protected Buildings.
C. Roads		
Geirangervegen Rv 63 (Ørnefjellsvegen)	G	Begun in 1889 as part of the route over the mountains to Lom in eastern Norway.
		Listed in the National Conservation Plan for Roads, Bridges and Road-related Cultural Heritage Features. Includes an arched bridge from 1889 and a workmen's shed from 1904.
Postal road at Ljøen	G	Part of the ancient postal road from Bergen to Trondheim. Stone quay at Nedre Ljøen, Sunnylvsfjord.
Stalheimskleiva	N	Built in 1842-49. The first stretch of road to be built in accordance with European regulations. Spectacular, steep road with hairpin bends close to a magnificent waterfall. Open to vehicles in summer. Listed in the National Conservation Plan for Roads, Bridges and Road-related Cultural Heritage Features.
Postal road between Bleiklindi and Styvi	N	5.5 km authentic postal road from 1647. Part of the postal route between Oslo and Bergen. In use until 1909, now used by hikers.
Old road between Jordalen and Sivle	N	Old road running south-westwards towards Voss. Partly made into a cultural history trail.

* G = Geirangerfjord, N = Nærøyfjord

Table 21. Type of building registered on the fjord and mountainside farms in Table 20.

Type of building or function	**G**	**N**	**Number**
Dwelling	27	83	110
Livestock shed or barn	8	4	12
Hay barn	20	42	62
Boathouse	14	16	30
Building containing a well, or used for baking, washing, etc.	12	19	31
Hut on a transhumance dairy farm used for sleeping, cooking, dairy work, etc.	17	58	75
Miscellaneous (shed for storing leaves, cheese-making hut, raised storehouse for food, shed at the end of an aerial wire, etc.)	12	24	36
Number of buildings registered	110	246	356

Table 22. The total number of buildings, remains of buildings and removed buildings registered in the area during the SEFRAK work.

Dating	Removed building		Ruin		Existing building		Total number	
	G	N	G	N	G	N	G	N
17th century			1	1		1	1	2
18th century			6	8	5	7	11	15
19th century	8	2	50	159	74	152	132	313
20th century	5		12	5	36	59	53	64
Unknown			159	189	86	85	245	274
Total number	13	2	228	362	201	304	442	668

Building traditions in the fjord landscape

The steep, roadless, avalanche-prone fjord landscape has placed strict limitations on where people could settle and how they constructed their houses. Most buildings are on sites that were least at risk of being hit by avalanches and rock falls, such as river mouths and spits. The most outstanding ones are, however, the farms which, due to the risk of avalanches and the former scarcity of resources, occupy lonely, almost inaccessible sites on ledges above precipitous slopes several hundred metres above the fjord. The way these buildings are constructed and the materials used are adapted to the necessity of minimising the transport effort. Using other materials than they could obtain at the site meant extremely strenuous, time-demanding and sometimes dangerous portage. However, materials used to build houses since just before 1900 have generally been transported up on an aerial wire.

The traditional wooden houses have a design that varies according to when they were built and their intended function. The mode of construction varied between cross-jointed timber, Norwegian trestle-frame construction and half-timbering. Not only the foundations, but in a few places all or most of the house walls were built of stones found in the vicinity.

Better access to areas with pine woods and good-quality timber has meant that the architecture in Nærøyfjord differs somewhat from that in Geirangerfjord. Very little building timber was available in Geirangerfjord. It was therefore necessary to employ modes of construction that permitted the use of wood from local deciduous trees, such as the houses constructed of birch planks. However, in both areas, dwellings from 1800 to 1940 were largely built of cross-jointed timber, that used in Geiranger having to be transported a long way by boat. It was generally sawn flat to reduce the weight and to fully utilise the material.

Such groups of buildings comprise a great variety of architectural styles, owing to shifting influence from elsewhere. In the valleys at the heads of the fjords, the houses are generally built on the sunniest side of the valley, but this depends on the risk for rock falls and avalanches. Along the sides of valleys and fjords, the buildings are often erected in rows with their gable ends oriented transverse to the hillside, but where the terrain permits they commonly face the valley or fjord. Close to the fjord, the boathouses are generally grouped side by side with their gable ends facing towards and away from the sea.

In the villages by the fjords, the architecture of hotels and other modern buildings differs significantly from the local building tradition as regards dimension, style and use of materials.

Spectacular placing of buildings in the landscape

In the steep, fjord landscape, ground that is sufficiently flat to be cultivated or built on is extremely scarce almost everywhere. Houses and groups of buildings are therefore constructed so that as little as possible of the area is taken up. The houses are generally built extremely close together, and dwellings and livestock barns often share a common roof (e.g. Blomberg and Me-Åkerneset in Geiranger).

Where the farm is located on steeply sloping ground, the buildings, except perhaps the smallest ones, are placed on the upper part of the cultivated area, with their longest dimension and gables aligned along the terrain. This is favourable with respect to both the local climate and the manure from the livestock.

On mountainsides that are prone to rock falls and avalanches, the exploitation of outfield resources in the old days resulted in some spectacularly sited farms high in precipitous terrain between the fjord and the summits. These farms, referred to as mountainside farms, are a characteristic feature of the West Norwegian Fjords. Their only access is generally a very steep path that winds up the mountainside from the fjord, sometimes having to resort to ladders to tackle the very steepest sections.

The great risk of avalanches in winter was a decisive factor for the precise location of the buildings. In some cases, the decisions were marginal. At Me-Åkerneset, the buildings were placed under an overhanging cliff so that avalanches could pour over their roofs. In other places, avalanches that took place every year passed just a few metres from the buildings, which were conspicuously sited on knolls on the hillside which were safe from avalanches. Several of the mountainside farms were abandoned as early as the 19th century, while others were farmed until shortly before 1970. Some farms have been preserved (Table 20) and stand out as valuable monuments with great aesthetic value in the fjord landscape. The photograph shows Me-Åkerneset in the Geiranger area, where two farmers had their dwellings, storehouses, hay barns, cattle sheds, goat sheds and stalls combined in a single building on the only site where it was absolutely certain not to be swept away by an avalanche – beneath the overhanging cliff.

Norwegian trestle-frame buildings

The Norwegian trestle-frame building is a genuine example of a regional building custom that was adapted to local conditions in an excellent manner. This form of construction was dominant in non-insulated, wooden outhouses in western Norway from central Rogaland in the south to Sunnmøre in the north. The exceptions are Voss in Hordaland and inner Sogn, including Nærøyfjord, where good-quality pine timber was more readily available and cross-jointing was the dominant form of construction. Trestle-frame construction is known from Medieval buildings and is related to the far more refined stave technique employed in the stave churches, such as Urnes Stave Church (a World Heritage Site in Luster, further up Sognefjord than Nærøyfjord). Norwegian trestle-frame construction is thought to be the oldest form of stave technique that has been in continuous use up to our time. The best-known examples of Norwegian trestle-frame buildings are mainly outhouses in the Geirangerfjord area.

In Geirangerfjord, timber was difficult to obtain and many farms stood in very inaccessible positions several hundred metres up precipitous mountainsides above the fjord. The use of Norwegian trestle-frame construction enabled the erection of strong, comparatively large buildings from local wood without involving significant transport. Relatively small, crooked birches and pines were satisfactory as building material. The construction also required little working of the tree trunks and permitted rapid building using simple tools (see Fig. 13).

In Geiranger, roofing generally consisted of birch bark and turf since the local bedrock is unsuitable for making flagstones, which are common further south in western Norway.

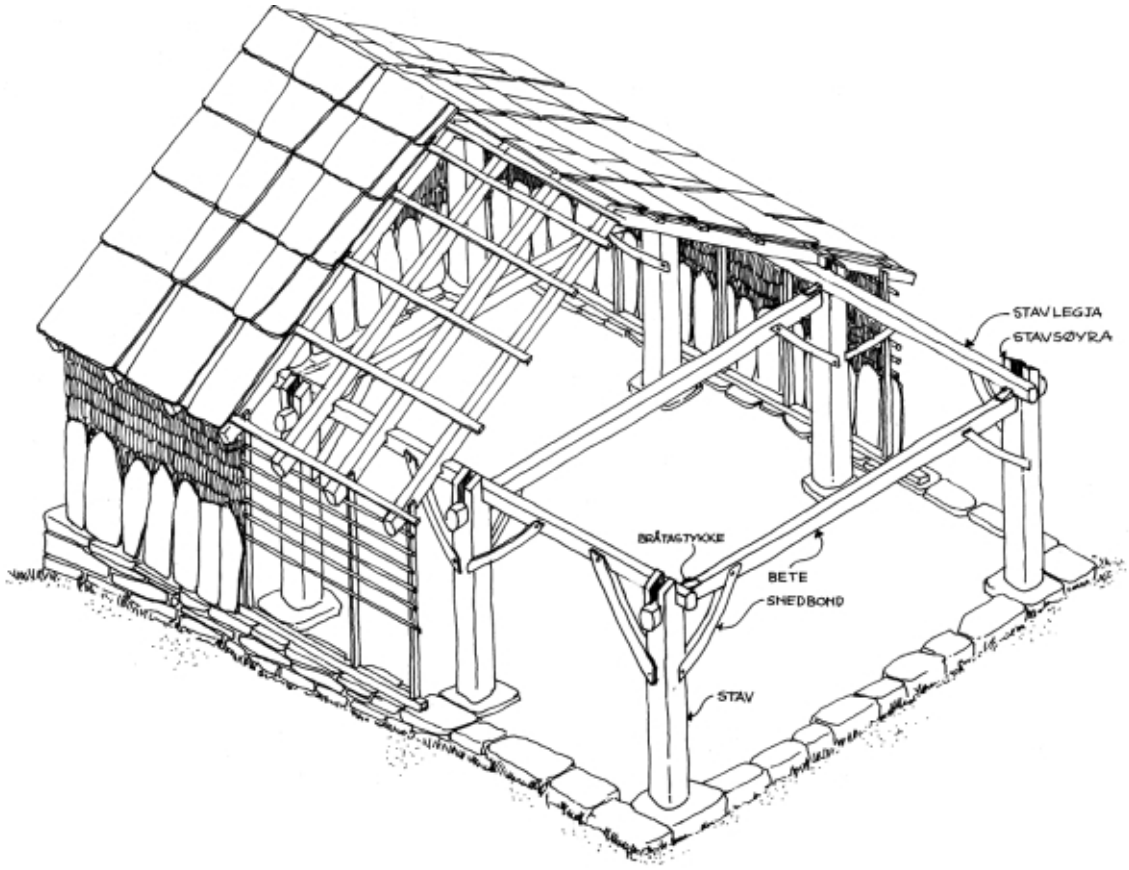

Figure 13. An example of a hay barn built using the Norwegian trestle-frame construction technique (isometric section).

Farming and animal husbandry

Even though the steep, fjord landscape offered little space for farms, agriculture has a long history in the area. All down the ages, farming has depended greatly on using marginal land for rough grazing, haymaking, gathering leaves for fodder and felling trees for firewood and building purposes. Despite a great reduction in the number of farms, traditional agriculture is still an important occupation in the inhabited parts of the proposed World Heritage Area. All told, 34 farms with a total of 345 ha of cultivated land are now being worked in the area. It is vital for the appearance of the landscape and to maintain the population that cultivated land and other infields are kept up by active farming.

Livestock graze in summer in many high valleys and on some fjord slopes. Transhumance summer dairy farming and marginal grazing are important to maintain the special biological diversity associated with old grazing and haymaking, and they also help to keep open parts of the landscape which are so valuable in terms of cultural history and which create variation in the scenery.

When land becomes increasingly overgrown, the biological diversity and cultural historical character suffer, giving negative consequences for the aesthetics of the landscape. From the standpoints of both nature conservation and cultural heritage, increased grazing and, in places, clearance of vegetation are desirable (see the management plan). This is not considered to be in conflict with the objective of preserving the natural ecological links in the countryside as a whole.

The level of farming in the area is as follows:
(Sources: Land Register (NIJOS) for 1984 and applications for production grants)

Geirangerfjord area

Table 23. Farms.

Farms whose land is entirely or largely in the World Heritage Area (all worked)	12
Farms which have grazing in the World Heritage Area	24
Total number of farms with land or grazing rights in the World Heritage Area	36

Table 24. Agricultural land (ha).

Cultivated for arable crops	Norddal	16.6
	Stranda	178.1
	Total	194.7

Table 25. Livestock and grazing animals.

Animals	**Fed all winter**	**Milked**	**No. on grazing**
Sheep	1041		3472
Goats	770	917	1278
Cattle	389	153	382

Nærøyfjord area

Table 26. Farms.

Farms whose land is entirely or largely in the World Heritage Area (22 farms are worked)	56
Farms which have a small part of their land in the World Heritage Area	41
Total number of farms with land in the World Heritage Area	97

Figures are lacking from Vik and Lærdal (neither have farms with most of their land in the proposed World Heritage Area).

Table 27. Agricultural land (ha).

Cultivated land	For arable crops	107.6
	Surface cultivation for permanent grassland	42.3
Area of land worked		**149.9**
Land no longer worked		105.0

Table 28. Livestock and grazing animals.

Animals	**Fed all winter**	**Milked producers**	**Meat**	**Young animals on grazing**	**Grazing animals from elsewhere**	**Total on grazing**
Sheep**	529			752	1246	2527
Goats	607	607	10*	147		754
Cattle	72	55	26	49		120
Horses	19					19

* Nurse goats
** Figures lacking from Vik

Table 29. Fruit cultivation (number of trees).

Plums	**Apples**	**Cherries**	**Morello cherries**	**Pears**	**Raspberries (da)**
56	196	13	392	39	1

Hunting and fishing

Hunting

Hunting has taken place in these areas ever since the first people came here, and landowners and others with hunting rights still gain some of their income from it. Each year, the populations of red deer, reindeer and elk are still regulated by an autumn open season. The hunting is strictly regulated through acts and regulations, open seasons and inspection schemes. Quotas are set on the basis of annual counts and evaluations of the available grazing.

Detailed hunting statistics are available for the species that may be hunted, but since the hunting districts do not coincide with the boundaries of the proposed World Heritage Area it is difficult to give exact figures for bags in the proposed area. In general, it can be said that the steep slopes along the fjords have good stocks of red deer. Three strains of wild reindeer have parts of their home range within the proposed World Heritage Area, whereas elk only occur in a few of the largest valleys.

Freshwater fishing

Comparatively little fishing is done in fresh water and it is a leisure occupation. The municipal committees which administer the resources of the state-owned common lands look after the fish resources there and carry out regular trial fishing in tarns and lakes, maintain statistics of catches and organise the sale of fishing licences. The landowners are responsible for selling fishing licences on privately owned land. Some salmon run up the River Nærøy, but in recent years it has only been permissible to fish sea trout.

Fishing in the fjords

The fishing of salt-water fish in the fjords used to form a valuable portion of the householding, but little commercial fishing is done nowadays. Fishing is now principally a leisure occupation.

Tourism

The fjord scenery is the main attraction for the visitors, and after 150 years of extensive tourism, the landscape still retains the qualities which attracted the first tourists to the fjords. Most people experience the Nærøyford and Geirangerfjord areas from cruise ships which have ports of call in the fjords, but the areas also have much overnight accommodation, mainly in the villages beside the fjords. Geirangerfjord and Nærøyfjord have been, and still are, the most visited fjords in Norway.

Both Geirangerfjord and Nærøyfjord have been magnets to both Norwegian and foreign tourists for a great many years and tourism is an important business in these areas. The total number of visitors exceeds one million each year and these two fjords are among the six most visited scenic attractions in Norway.

The village of Geiranger has been visited by numerous tourists for 150 years. Four large hotels, a national geology park and several other visitor facilities make their mark on the village. In the Nærøyfjord district, most of the large overnight accommodation facilities are located outside the boundaries of proposed World Heritage Area. The exception is Gudvangen, which has overnight accommodation facilities near the quay.

(The development of tourism is dealt with in more detail in section 3b, and more details about the numbers of visitors, activities and attractions can be found in section 4i.)

Communications

In the old days, the fjords served as important communication arteries linking the outer coast and the interior of Norway, as well as offering an easy means of transport between local farms and different parts of the same property. From the head of the fjords, the means of transport shifted to paths, packhorse tracks and eventually roads, which conveyed travellers and goods eastwards across the mountains to the interior of the country. A number of small paths cross the mountains that separate every fjord. Nowadays, both these fjord districts are linked to roads that are not at the mercy of rock falls and avalanches, and which offer safe communication and good accessibility throughout the year.

Geiranger

The steep hillsides flanking Sunnylvsfjord, Geirangerfjord and Tafjord, with their constant risk of avalanches and rock falls, have no roads. The proposed World Heritage Area has one old-established, main road running right through the area and which comes down the valley from the south-east to Geiranger at the head of the fjord and then climbs up the mountain-side to the south end of Eidsdalen, a valley which takes it out of the area towards the north. The present road was completed in 1889 and received a gold medal for outstanding engineering at the World Exhibition in Paris in 1900. It has since been improved, but follows the same route and is normally kept open in winter despite having a difference in height of 1038 m, a steep incline of 1:10 and exacting conditions in winter.

Nærøyfjord

The topography along Nærøyfjord has also prevented the building of a road link between the various settlements, except for the old postal track following the shore between Bleiklindi and Holmo that was completed in 1647 and is now a grass-covered path, popular among hikers. A minor road provides a link to the hamlet of Bakka, but because of the risk of rock falls and avalanches, it is mostly placed in tunnels.

A main east-west road through the area, partly by way of three long tunnels linking the valleys of Aurlandsdal, Undredal and Nærøydal; the third tunnel, to Stalheim in Nærøydal, was completed in 1991. An alternative route which motorists can take southwards across the mountains from Nærøydalen in summer is up Stalheimskleiva via a series of steep hairpin bends. It was constructed in 1849.

(See Chapter 4 for more details about communications.)

Place names and dialect names

Considering its marginal settlement, the West Norwegian fjord landscape has an unusually high density of place names. It was particularly important in this difficult and in places hazardous terrain to have place names that provided precise information about features in the landscape, or described events that had taken place or ways in which the land was used. This is a well-known aspect in many places, but here where absolutely everything has been valuable to people, the use of names is extremely highly developed. Several thousands of names have been collected and located on maps in Sunnylvsfjord and Geirangerfjord alone, and a similar situation applies in Nærøyfjord.

The place names contain valuable information about the landscape and historical events and are an important source of knowledge about both the countryside and the people who have lived in it.

Table 30. Typical examples of descriptive place names and their meaning.

On topography, rock falls and avalanches	*Skrenakken* – "the Avalanche Neck" *Moldfallet* – "the Landslide" *Rutla* – "The Avalanche that Slides More Slowly than Others"
On flora	*Hatlevika* – "Hazel Bay" *Blomskorane* – "Fern Gorges"
On fauna	*Bergulstien* – "Eagle Owl Path" *Bjønnaknausen* – "Bear Knoll" *Raudstuthola* – "Fishing Spot for Redfish (raudstut)" *Bleikevika* – "Whiting Bay"
On the productivity of land	*Geitepina* – "Goats' Torment" *Sælebota* - "Salvation Patch"
On the use of the area	*Purkemyra* – "Pigs' Bog" *Saudehellen* – "Sheep Shelter Cliff"
On events	*Tøstenropet* – "The Place where Torstein Drowned" *Presthellen* – "a slope where a priest, K. Harboe, perished in an avalanche in 1701"

Art

Painting, music, literature and photography

Landscape with *outstanding natural phenomena, unusual natural beauty and aesthetic importance* (criterion 44 a iii)) also has a great strength of impression and scenic value. The West Norwegian fjord landscape has inspired artists for several hundred years, but in different ways.

In the 18th and early 19th centuries, the fjord landscape was regarded as ugly, frightening and awful. In keeping with this view, beauty was only linked to that which was altered and cultivated. Wilderness could at a pinch have scenic value in the form of "pleasing horror" and the West Norwegian fjord landscape was characterised in literature as representing awesome places.

Later in the 19th century, a change gradually took place and the ultimate shift occurred when the Danish painter, Johannes Flintoe, travelled to Aurland and elsewhere in 1819. After that the West Norwegian fjords became essential motifs for Norwegian Romantic painters in Dresden. Here, it was possible to cultivate the national identity in motifs with rural culture, historical monuments and landscape, the like of which nowhere else could exhibit. Around 1840, the Dusseldorf school gained a leading position in landscape painting. The Romantic painting became played down, the colours became milder and the fjords were often depicted as idyllic places. In the latter part of the 18th century, traditional Romantic landscape paintings ceased to appear and art increasingly portrayed the practical and commercial life in the fjords with a high degree of credibility.

Among the notable artists who have portrayed the West Norwegian fjords from their studios in Dresden, Dusseldorf, England, Denmark or Sweden are:

Carl Johan Fahlcrantz (Sweden), Holger H. Jerichaú and Johannes Flintoe (Denmark), Francis Danby (England and Ireland), Edward Price (England), Adolf Tidemand, Hans Gude, Thomas Fearnly, Peder Balke, Knut Baade, Johan Christian Dahl, Adelsteen Normann and Hans Dahl (Germany and Norway).

Lithographies, which became common in the late-19th century, spread the fjord motifs to a wider audience. However, it was the photograph that enabled the ordinary man in the street to own his own picture. The fjord landscape was an important motif for the first landscape photographers, and early photographers have left us substantial documentary collections with artistic content.

The large number of paintings produced in the 1800s meant that 20th century artists looked upon the fjord landscape as an exhausted cliché. The fjords, nevertheless, achieved great importance again in 1915 after the Russian sculptor, Naum Gabo (1890–1977), visited western Norway and, following the great thrills he derived from the landscape, defined what modern sculpture should be concerned with, namely constructivism and description of *space*.

Henrik Ibsen (1828–1906), the father of modern drama and one of the world's most famous playwrights, derived inspiration in Sunnylvsfjord before he wrote Brand, the work which made his breakthrough, in Italy in 1865. His descriptions of the house of the village policeman, the avalanche and the mountain scenery clearly show that his inspiration came from here.

Superstitions and traditions

Supernatural beings and places

Many legends and stories are associated with the dramatic fjord landscape. A typical legend is linked to Korsen in Geirangerfjord, where a betrayed woman is said to have made use of her supernatural abilities to sink the boat carrying the bridal party to the church in Stranda. After the disaster, a white cross was painted on the cliff face where the boat foundered.

Olav Haraldsson, the king who brought Christianity to Norway and was canonised after his death in 1030, has given rise to a lively Olav tradition which is frequently linked with inexplicable natural phenomena. Some of the richest traditions are associated with Sunnmøre, because Olav sailed into Geirangerfjord when he was fleeing to Russia in 1029. Several formations on mountainsides and features in the terrain in the Geiranger area are supposed to be relicts of St Olav's flight.

In the Nærøyfjord area, many legends and place names survive that are linked with the dramatic journey through the area undertaken by King Sverre in 1177.

Rituals

Several small cairns can be seen along roads leading to the mountains. These sites, called *kast*, are said to be places where it was, and still is, a tradition to make a sacrifice to ensure safety when journeying across the mountains. One of these is Fresvikvarden, in the middle of a valley called Fresvikjorddalen.

3b. History and development

The geological history of the classic fjords

General geology

The available evidence shows that the oldest rocks in western Norway must have formed more than 1650 million years back in time. The most important event that affected the rocks in the nominated area is the formation of the Caledonian mountain belt in Scandinavia about 400 million years ago. This belt, the Scandinavian Caledonides, formed during a major plate tectonic event – the Scandian continent-continent collision between Laurentia (North America and Greenland) and Baltica. On a regional scale, the Caledonian rocks can be grouped into a number of tectonostratigraphic units forming extensive thrust sheets that were stacked on top of each other during the collision. The Scandinavian Caledonides is one of the archetypal mountain belts composed of thin, laterally extensive, far-travelled nappes and thrust sheets. Our understanding of the Scandinavian Caledonides is based on the identification of the complex sequence of tectonostratigraphic units and the recognition that these represent rocks generated in widely different settings and reflecting disparate geological histories. During continental collision, they were assembled and thrust hundreds of kilometres onto the Baltic craton. A simplified sequence of units is shown in figure 14.

The lowest tectonostratigraphic unit, called the Western Gneiss Region (WGR), dominates the area and represents a segment of the former Baltic craton. Although of Proterozoic origin and age (about 900-1650 million years old), the rocks were considerably reworked, or reconstituted, during the Sveconorwegian orogeny (about 1000 million years ago) and the Caledonian orogeny about 400 million years ago. The Sveconorwegian orogeny did not affect the northern part of the WGR, from Geiranger northwards.

During the Caledonian collision, the western edge of Baltica was forced down below the Laurentian plate and subducted to extreme depths of more than 150 km, i.e. deep into the mantle, one of the Earth's two very large provinces of ultrahigh-pressure rocks.

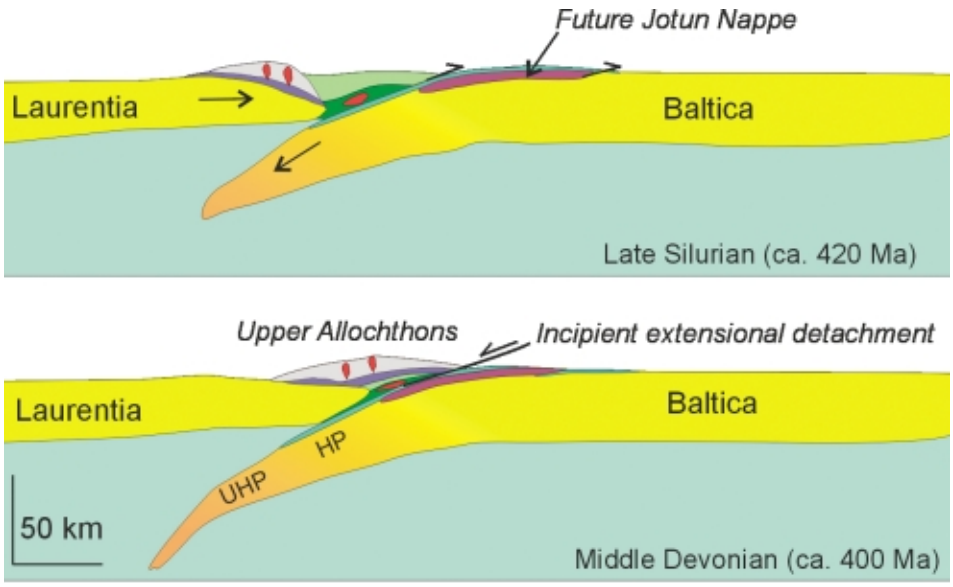

Figure 14. Cartoon illustrating the collision event that formed the Scandinavian Caledonides.

The rocks reaching these depths were subjected to high- to ultrahigh-pressure metamorphism, the highest pressures being recorded in the coastal districts near Stad and towards the north-east. Evidence for these processes mainly derives from the rarely preserved occurrences of minerals such as diamond and coesite (a high-pressure equivalent of quartz), which are stable only at extremely high pressures. The rocks further inland also show evidence of high-pressure metamorphism, and the entire area is well known for the presence of variably sized bodies of eclogite (a high-pressure mafic rock). Numerous pods of peridotite also occur over wide areas of the WGR. During subduction, these were probably introduced from the sub-continental mantle into the crustal rocks of the WGR.

The WGR is considered a world-class example of deeply subducted continental crust and of well-preserved, high- to ultrahigh-pressure rocks. As the topography and extensive exposure of bedrock allow the rocks to be studied on a range of scales, the area is the focus of intensive international research (see list of references).

Above the Baltica basement, remnants of a very thin cover sequence of quartzites and conglomerates overlain by metamorphosed shales and schists are locally preserved. These units and rocks, assigned to the Lower Allochthon, are of relatively minor importance in the area considered here. The rocks of the Middle Allochthon are mainly present in the Bergen – Jotunheimen area and are represented by the Jotun Nappe and correlative rocks in the Bergen Arcs and small areas south of Stad. Rocks assigned to the Middle Allochthon also occur in the eastern part of the Geiranger area. Collectively, the rocks of the Lower and Middle Allochthons were derived from the outer margin of Baltica and were originally positioned somewhere to the north-west of where they now occur.

Near the west coast of Norway, a system of large-scale normal faults or extensional detachment zones (collectively referred to as the Nordfjord-Sogn Detachment) separates rocks that experienced high-pressure metamorphism from low-grade metamorphic rocks that did not. The detachment zones underwent relative movements more or less opposite to those of the collision-related thrusts and are the response to the extreme over-thickening of the crust that occurred during the collision. Rocks from the upper levels of the tectonostratigraphy are present above the Nordfjord-Sogn Detachment. They are overlain by extensive sequences of Devonian conglomerates and sandstones resulting from the rapid breakdown of the mountain belt immediately after its formation. These relationships, and recent isotopic age determinations, show clearly that following attempted subduction, the buoyant crustal gneisses rapidly returned towards the surface. Further extension of the crust continued intermittently along shear zones and normal faults throughout the Palaeozoic. In Geiranger and adjoining coastal areas, faults are predominantly oriented parallel to and at high angles to the coast. In general, faults are best expressed in the coastal areas, but faulting also affected inland areas, one example being the southwest-northeast oriented Lærdal-Gjende Fault.

Origin of the fjord landscape in Norway

In the Late Mesozoic-Early Tertiary, the landscape in most parts of Norway was low, smooth and mature, and characterised by a slightly undulating surface (a peneplain) with wide valleys (depressions) and rounded hills. In the Early Tertiary, the area became tectonically active, with full sea-floor spreading between Greenland and Scandinavia starting about 55 million years ago. During the Tertiary (2.5-66 million years ago), uplift of the Norwegian landmass took place with substantial relative displacement along fault systems parallel to

the coast. The uplift was oblique and gave rise to an elevated, mountainous area parallel to the western coast with a gentle slope towards lower ground to the east. The tilting of the landmass and enhanced topography led to an increase in fluvial erosion, resulting in rejuvenation of the old, fluvial drainage systems with the formation of steep, deeply incised river valleys. When the large ice sheets started to form 2.5 million years ago, these valleys became deepened and widened by glacial erosion and were shaped into deeply entrenched fjords. Thus, the fjords and fjord-head valleys were originally old (preglacial) river valleys (normally V-shaped in cross section). During the glaciation, many of them were repeatedly excavated and shaped by the glaciers, creating troughs with a U-shaped cross section. The fjords are generally narrow, steep sided and deep, commonly with extensive basins and thresholds. The fjord basins contain sediments up to 300 m in thickness (Fig 2A), partly with extremely low gradients of less than 1 m per km.

During the glaciation, the weight of the thick ice sheet caused significant depression of the crust in Scandinavia. Following the ultimate melting of the ice, crustal rebound led to a relative drop in sea level, despite a major influx of meltwater to the oceans. Evidence from raised shorelines helps to show that this effect was relatively minor along the coast compared to the inland parts of the fjords.

The Norwegian coastline is more heavily dissected by fjords than that of any other country in the world, and appropriately the term *fjord* is of Norwegian origin. There are some 200 principal fjords along the mainland and 35 on the Svalbard islands. The coastline of the Norwegian fjords alone is 21,000 km long, equalling half the distance around the world at the equator. Sognefjord (200 km long and 1300 m deep), with its system of tributary fjords and fjord valleys, is clearly among the most impressive fjords on Earth. Norway occupies a latitudinal range similar to that of Greenland and the Canadian archipelago. However, the Gulf Stream conveys warm water along the entire length of the Norwegian coast, resulting in a climate not unlike the fjord coast of western North America. Environmental concerns are extremely important with respect to the Norwegian fjords, as most of the population is situated on the coast.

Compared to other fjord landscapes, the unique qualities of the fjord landscape of western Norway stem from its visual display of geological history, its range of impressive natural attributes, and the low level of human activity governed by a challenging and hostile environment. The bedrock of the area has evolved through several major tectonic episodes. It features a legacy of multiple mountain building events including a world-class example of rapid exhumation of crustal rocks subsequent to deep burial in a continent-continent collision zone. The landforms were created by rifting and uplift of the crystalline rocks, which have subsequently been carved into their present shape by successive periods of heavy glaciation. Uplift due to postglacial rebound causes slow but noticeable changes along the shorelines of the fjords and influences the development of deltas, mainly located at fjord heads. In contrast, the more dramatic effects of deep gully erosion, and rock falls and various types of avalanches cause more obvious changes to the landscape. These geological processes are in part caused by heavy rain and snowfall in the Atlantic climate of western Norway, and contribute conspicuously to the shaping of the landscape. However, most of the erosion since the last glaciation period has had local and comparatively minor effects, and the glacial landforms and fjords are unusually well preserved.

Origin of the landscape in the Geirangerfjord area

The oblique uplift of Scandinavia in the Tertiary era led to the formation of a high mountainous area parallel to the coast and sloping gently towards lower ground to the east. The uplift also rejuvenated the old, fluvial drainage systems, resulting in the formation of steep, deeply incised river valleys.

During the last glacial maximum about 20,000 years ago, Scandinavia was covered by a thick ice sheet. However, in the Geirangerfjord area, some of the highest mountains may have protruded as nunataks. The ice generally flowed towards the north-west with ice streams through the fjords that continued across the continental shelf onto the shelf margin. In the Geiranger area, the glaciers eroded deeply into the bedrock, and thick till deposits accumulated only in some of the valleys oriented transverse to the main ice flow (e.g. Dyrdalen, Herdalen and Skagedalen).

When the glaciers started to retreat, the fjords became free of ice at an early stage, leaving local glaciers in the mountains between the deep fjords. During the intensely cold Younger Dryas period about 12,000 years ago, renewed glacier growth caused the development of cirque glaciers in the mountains and valley glaciers through Tafjord and Geirangerfjord. Detailed maps of the fjord bathymetry reveal prominent terminal moraine ridges, confirming the extent of these valley glaciers. Outstanding examples include those crossing Nordalsfjord from Linge and Sunnylvsfjord and the mouth of Geirangerfjord from Ljøen (Fig. 4). In the mountains, some lateral moraines and numerous cirque glaciers are present and can be seen on the map of superficial deposits. During the final melting of the main glacier, the meltwater built major deltas at the heads of the fjords (e.g. at Geiranger). These deltas have subsequently been expanded at increasingly lower levels as the sea level changed due to glacial isostasy and the rise of the landmass.

Origin of the landscape in the Nærøyfjord area

When the large ice sheets started to form 2.5 million years ago, the drainage system in the Nærøyfjord area differed from the present one (Fig. 15 A), for instance, its watershed was further north and north-east. Sognefjord was a large river valley and Nærøyfjord and Aurlandsfjord were tributary valleys coinciding with the present fjords. South of the watershed, the rivers drained towards the Voss drainage basin.

During the Quaternary, the landscape with the uplifted, old (palaeic) surface was glaciated several times. Many of the preglacial river valleys were intensively eroded (Fig. 15 B). They include Nærøyfjord and Aurlandsfjord, which were deeply excavated by the glaciers. These fjords, and the fjord-head valley, Nærøydalen, were incised in the higher valley generations, and remnants are represented by benches in the steep mountainsides. In Nærøydalen, between 380 m and 470 m a.s.l., such benches occur at the mouth of Jordalen, on the opposite side of the valley and on the Stalheim plateau. Tributary valleys, such as Jordalen and Brekkedalen, were not so deeply eroded and now form hanging valleys to Nærøydalen. They were previously branches of the Voss drainage system (draining towards the south), but were later captured by Nærøydalen due to the south-westward migration of the watershed. The present rivers in these valleys drain southwards until they meet Nærøydalen where they suddenly change direction towards north-east into Nærøydalen and the Sognefjord drainage basin. Such drainage patterns produced by river capture are called fish-hook valleys (agnor valleys) because of their unnatural change in direction. The rivers in the hanging tributary valleys have in places adjusted themselves to the present morphology. The river in Jordalen

has cut an impressive gorge with waterfalls and rapids cascading down to the floor of the inner part of Nærøydalen, while the rivers in Brekkedalen and Øvsthusdalen-Brandsetdalen form the beautiful waterfalls, Sivlefossen and Stalheimfossen, respectively. Many other spectacular waterfalls occur along the steep sides of valleys and fjords. East of Gudvangen, the observant viewer can get the thrill of looking at the beautiful Kjelfossen waterfall. The river above this waterfall also used to drain towards Voss.

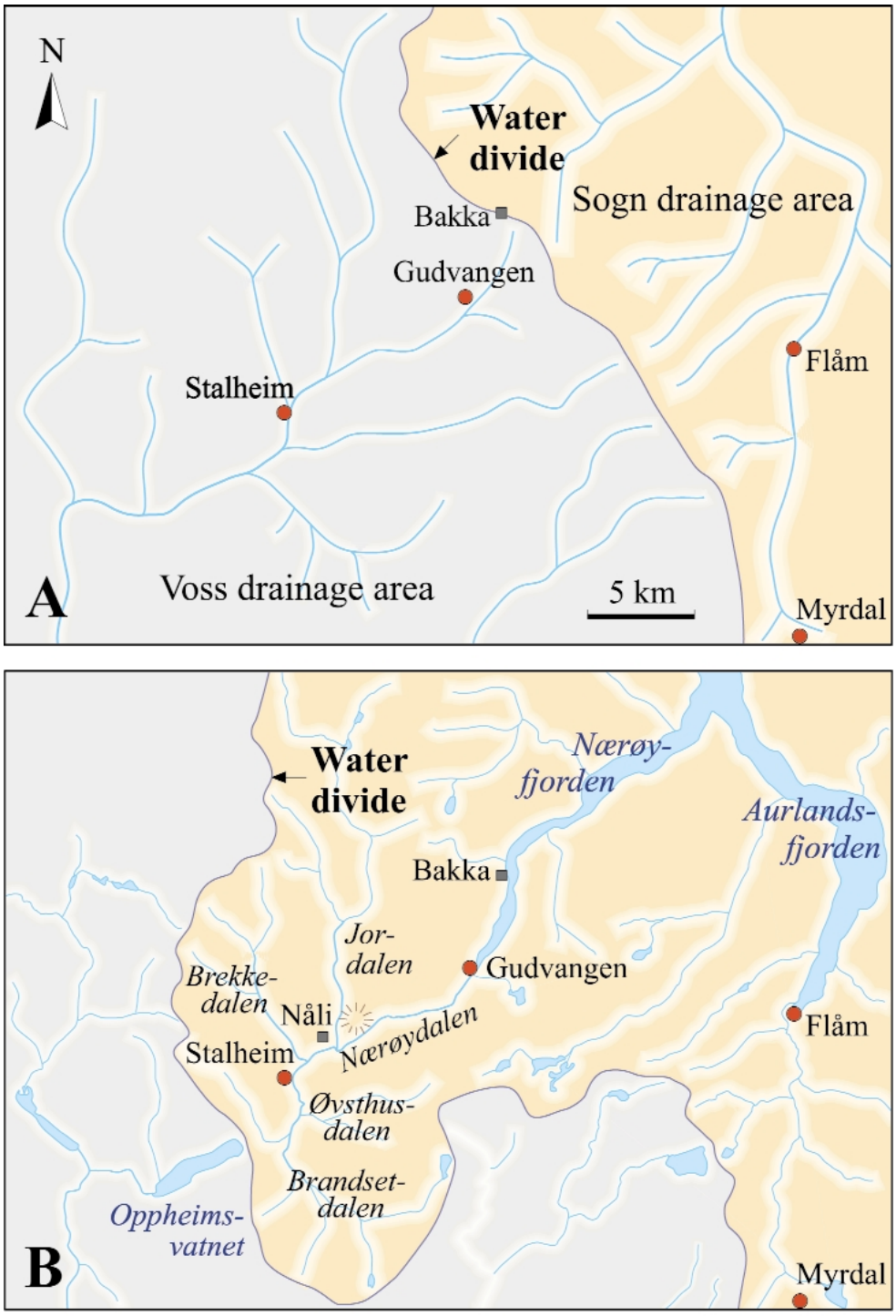

Figure 15. Drainage systems in the Nærøyfjord area. A. Preglacial drainage system. B. Present drainage system. (After I. Aarseth in W. Helland-Hansen (in press)).

The last glaciation and postglacial time

During the maximum of the last glaciation (about 20,000 years ago), the entire area was covered by ice. In the mountains west of Nærøyfjord, the glaciers flowed westwards, whereas in the fjord area the ice drained northwards to Sognefjord. Most of the till on higher ground was deposited in valleys, in particular those located more or less transversely to the direction of ice transport. An example of this is Jordalen, where a thick cover of till was deposited on the western slope of the valley.

At the end of the glaciation, an ice cap was situated in the area of Fresvikbreen, with ice flows directed towards the north and south. During the retreat of the ice margin in Sognefjord, the glacier in Nærøyfjord was supplied by ice from the Voss drainage area towards the north-east via Opheim and Stalheim. Valley glaciers from the tributary valleys of Brandsetdalen, Øvsthusdalen, Brekkedalen and Jordalen coalesced to form the glacier in Nærøyfjord. During the deglaciation of Nærøyfjord, the retreating ice margin stopped temporarily at Bakka and a terminal moraine was deposited across the fjord. When the ice margin receded to the inner part of Nærøydalen about 11,000 (calendar) years ago, an ice-marginal delta was formed by accumulation of meltwater deposits at the mouth of Jordalen, indicating a relative sea level at that time about 110 m above the present level.

During early postglacial times, a significant climatic amelioration occurred and the glaciers melted rapidly, and most of them disappeared during the postglacial climatic optimum (about 8000-5000 years ago). Subsequently, the climate deteriorated and the glaciers in the mountains were re-established. Fresvikbreen is the largest of the present glaciers near Nærøyfjord, and covers an area of about 15 km^2. Its highest point is 1648 m a.s.l., and provides a magnificent view.

Review of the vegetation development

In the Boreal period (9500–8000 years ago), the ice sheet melted almost completely, leaving only some small glaciers on the highest mountains. Birch and Scots pine were the dominant species of trees, accompanied by a few other deciduous species. In the Atlantic period (8000–5000 years ago), the climate became warm and moist, and thermophilous species like oak, lime and ash became the dominant kinds of trees. Gradually, the climate became somewhat drier, but the vegetation did not change significantly. Around 2500 years ago, the pine forest extended right up to 1200–1300 m a.s.l. Today, the temperature is lower, humidity is higher and the tree line stands at around 800–900 m a.s.l. in the inner fjord districts. Apart from areas with old, virgin-like woodland, two kinds of habitat stand out as particularly interesting from the viewpoint of the vegetation history, screes and semi-natural grassland associated with former pastures. Each have characteristic vegetation communities.

Screes and pioneer vegetation
Both sub-areas have extensive scree slopes which are continually being supplied with falling rocks derived by frost weathering on the cliffs above or brought by snow avalanches which sweep debris down the mountainsides. These active geological processes also result in the development of extremely interesting vegetation in these areas and permit studies of the development of pioneer communities. One of many examples is Bleia.

The occurrence of the rare sub-species of arctic poppy (*Papaver radicatum* ssp. *relictum*) at Bleia in the Nærøyfjord area is the most interesting and rarest botanical element in the proposed World Heritage Area, The scree at Bleia is outstanding because of its impressive size (1000 m long) and the alternation of stable and unstable sections. Open mineral soil occurs here due to frequent avalanches, and the growing season is so short and cold that closed vegetation cannot survive. This small population (approximately 200 individual plants) of arctic poppies has survived and now has great value as a documentation of the vegetation history and a reference occurrence for research. It is probably a remnant of a distribution that was larger just after the last Ice Age, and in this very limited area the plants have growing conditions corresponding to those in the Boreal period when mineral soil was dominant and this poppy, as a pioneer species, had good conditions for growth and dispersal. As the plant cover became increasingly closed, this sub-species of arctic poppy was ousted from almost all other sites than this.

Semi-natural vegetation
The fjord landscape has been used by people ever since the ice retreated. The first domestic animals came to the area some 5000 years ago, and since that time grazing and haymaking have taken place in parts of the area. Over the years, this has led to the development of semi-natural plant communities with a large biological diversity. For instance, 17 different Red-listed species of fungi associated with pasture land have been recorded in the Geirangerfjord area.

The small clearings on the wooded slopes of the fjords produce variation, and the large number of flowering plants there support a rich insect life, which, in turn, is important for birds and animals in the area.

Cultural history development

Despite the wild scenery and the steep, almost inaccessible fjord landscape with its high risk of rock falls and avalanches, people have left many traces of their presence down the centuries. The extent of human activity here has varied with the size of the population, power factors and markets. The traces left today are merely slight imprints on the grand scale of the fjord landscape. Perhaps a pitfall left by a hunter in the mountains, a foundation wall from a former house, or a hayfield with its rich diversity of plants producing variation in the otherwise wooded fjord slopes. The mechanised farming methods and modern infrastructures of the 20th century, which interrupted the natural ecological processes and left discordant blots on the scenery along most other stretches of fjord, gained little foothold on the steep hillsides facing Geirangerfjord and Nærøyfjord. Nor are there any weekend cottages or quays for small motorboats, such common features along most stretches of fjord elsewhere in the country.

Even though the traces left by people may seem insignificant in the great spaces of the landscape, they are nevertheless bearers of vast cultural historical value. To a trained eye, they tell an exciting story of the way people have utilised and adjusted to demanding terrain. Existing farms with their buildings surrounded by open infields and grazing land are significant elements in the landscape setting and have high cultural historical value.

The landscape and the natural conditions have set the overriding bounds for the development of the cultural history in both Geirangerfjord and Nærøyfjord. Both areas have experienced an approximately parallel development throughout history, even in modern times. Because of their exceptional landscape qualities, both areas have achieved a status as national icons for tourism, which has left its mark on their development in the last 150 years.

Pioneering period 10,000 – 3800 BP (Stone Age)
Hunters began to utilise inland districts as the ice retreated some 10,000 years ago. The presence of extensive systems of pitfalls and other means of trapping wild reindeer, dispersed across the mountains, demonstrates that these creatures were an important quarry for Stone Age hunters, and finds of arrows and other relicts dating from younger periods show that such sites continued to be used through to the Middle Ages, and probably up to the 17th century.

Only one definite Stone Age occupation site is known, at Lundanes where Geirangerfjord and Sunnylvsfjord meet. Flint tools and chippings dated to about 3000 – 2000 BC have been found here at 70 m a.s.l. (the marine limit here is about 100 m a.s.l.). This was probably a suitable site for hunting and for fishing in the fjord. A greenstone axe from earlier than 1500 BC is the oldest known find in the Nærøyfjord area.

Agriculture reached Norway in the Late Stone Age, but no finds attributable to early farming have been made in these two areas. However, short distances to varied resources in the mountains and fjords, and a somewhat warmer climate than nowadays, should imply that conditions were favourable in suitable places for combining farming with hunting, fishing and whaling.

1800 BC – AD 1050 (Bronze Age - Viking Period)

During the Bronze Age, the people living in Norway shifted from being nomadic or semi-nomadic to having permanent settlements. Some of the camp sites that were regularly used became permanent settlements and farms. These, in turn, gradually developed into hamlets and villages as the population grew and the original farm was divided into several farms.

Place names and the location of settlements in the landscape are important sources that help to explain the earliest history of settlement in the countryside. The first settlements or farms have names associated with the landscape, and they generally had prominent locations. Dale (dal = valley) was the name of the original farm from which both Norddal and Eidsdal, two modern settlements beside Norddalsfjord, grew. Dale has a strategic position on a high sand and gravel terrace, easily visible from the fjord. Undredal and Dyrdal in the Nærøyfjord area are corresponding examples of early settlements.

Farm names reflecting ancient forms of farming generally indicate Early Iron Age farms established during the Celtic Iron Age or Early Roman Period. Gjørva and Vinje, two farms in Geiranger, include the syllable –vin, which means a flat area or a clearing in woodland, which was used for grazing (cf. the German gewonne = cultivated fields). Maråk, another farm in Geiranger, which directly translated means 'the field by the sea', is a similar, old name. These farms also stand on high terraces with fine views of the fjord.

Few graves from the early part of the period have been found in the Norddal-Geiranger area. A richly furnished grave dating from the Roman Period or the Migration Period of the Early Iron Age has been found at Veiberg in Eidsdal, and a large barrow survives at Vinje in Geiranger. Bronze Age and Early Iron Age burial cairns are known beside Nærøyfjord, at Styvi, Holmo and Dyrdal, as well as at Hemri and Skjerpi in Nærøydalen.

In the Migration Period, it seems there was no longer space for further expansion in outer coastal districts, where land suitable for farming was limited relative to the growth in the population that apparently took place as the Iron Age progressed. As available land in the middle part of the fjord districts also became occupied, people moved on to the innermost arms of the fjords in search of land to cultivate. Since the good agricultural areas in Eidsdal, Norddal and Geiranger were already well established, judging by the richly furnished graves found there, the new immigrants had to clear areas that were marginal for agriculture. Place names related to the Viking Period confirm this. Farms containing –set in their name were originally transhumance summer dairy farms that eventually became permanently occupied. Engeset and Furset in Norddal, and Årset, Haugset and Ørjasæter in Geiranger are such examples.

Farms located some distance from the fjord were also cleared in the Nærøyfjord area during the Late Iron Age. Grave goods dating from AD 600 and 800 have been found at Hemri in Nærøydalen and Drægo in Dyrdalen (300 m a.s.l.). More finds have been made from the Viking Period (AD 800 – 1050), and they are also more widely dispersed, suggesting that power was originally concentrated but the society gradually became more egalitarian. Mountainside farms along the fjords began to be permanently occupied during this period. An example is Smoge, situated at 275 m a.s.l. beside Sunnylvsfjord, where a richly furnished Viking Age man's grave has been found.

The Middle Ages - AD 1050 - 1536

Following the introduction of Christianity and the amalgamation of the minor kingdoms, the Church and estate owners gained great power and the old class of freeholder farmers disappeared. A large growth in population and the desire for the greatest possible return from their properties led to many small farms being cleared in highly marginal areas. At the same time, the climate improved and better tools became available. The fjord farms were established during this period, on land that had formerly been used by other farms for haymaking and grazing. Likewise, many new farms were cleared in the uplands. Remains of longhouses at Herdalsseter in the Geirangerfjord area may suggest that farming took place here in this period.

In the Nærøyfjord area, the church in Undredal was built in 1147 and remains of longhouses and transhumance farmhouses have been dated to before AD 1350. Around 300-400 people probably lived in this area about 1300.

The Black Death hit these areas in the winter of 1349-50 and probably more than half the population perished. The depletion in the population seems to have been greatest in inland districts. A deterioration in the climate also took place from the 1300s, and this may help to explain why the effects of the pest lasted as long as they did. With the Black Death, peripheral farms were abandoned, but the original, centrally located farms continued to be worked. The most outlying transhumance farms also ceased to be used, and some ordinary farms became transhumance farms, or their land was just used for grazing or harvesting of fodder.

Fifteen farms in the Nærøyfjord area were abandoned due to the pest. Only Dyrdal and Undredal, which are mentioned in documents from the 1300s and 1400s, are thought to have remained inhabited following the Black Death.

The Reformation (1537) to 1814

Following a long period with a reduced population owing to the Black Death, a strong growth in population took place in the late-16th century. Herdal, Lundaneset and Knivsflå are among the farms in Geirangerfjord mentioned in a document from 1603, and many of the abandoned farms were cleared again in the 17th and 18th centuries. However, the land on many of the former farms continued to be used by larger farms just for grazing and haymaking.

A similar development took place in the Nærøyfjord area, and several of the former mountainside farms were cleared again around 1600. Considerable division of farms took place throughout this period.

In the 17th century, most farmers were tenant farmers and in the Nærøyfjord area only 22% of the land was owned by the farmers themselves. The remainder was held by public officials and priests who acquired rental in the form of wares that could be sold, like butter, corn and hides. Legislation was introduced in 1720 banning priests from owning large areas of land, and the financial situation for the farmers improved.

The population grew until the mid-19th century, when people began moving to towns in Norway and the great emigration to America started.

The 19th and 20th centuries

As elsewhere in the country, both employment in farming and the area of land worked reached their maximum in the 1860s, and then began to decline. The fjords became an important goal for tourists in the second half of the 19th century, and tourism quickly grew into an important summertime industry *(see the separate section on the development of tourism)*.

At the turn of the century, centralised dairies came into operation and the traditional cheese and butter production on each individual farm ceased. Farming gradually changed in character from being mixed to becoming specialised in goat and sheep husbandry. Goats became specially important because they were particularly well suited to the steep fjord landscape.

Most mountainside farms were abandoned in the first half of the 20th century, and in the second half of the century many of the farms in central parts of the fjord settlements also ceased to be worked. This was a response to the general increased mechanisation of Norwegian farming and the growing import of foodstuffs, which resulted in reduced prices and poorer profitability. The population also dropped accordingly.

During the last decade, increasing numbers of farms with road links have ceased to be worked as independent farms, but they have not been abandoned.

Table 31. The number of farms and the population figures in the Nærøyfjord area.

Year	**1522**	**1612**	**1701**	**1801**	**1900**	**2000**
Population	24	102	190	587	708	238
Main farms*	2	14	18	20	16	12
Farms**	4	18	27	36	53	24

* Main farm = an area with farmhouses, infields, transhumance dairy farms and upland areas run by one or more families
** Farm = part of a main farm, a holding, owned or used by a single family

Farming, transhumance dairy farming and utilisation of resources on marginal land

Ever since the first permanent farms were established, farming in the fjord landscape has been based on animal husbandry and extensive utilisation of large marginal areas for rough grazing, haymaking, gathering leaves for fodder, transhumance dairy farming, hunting and fishing. Corn cultivation has been limited to specific farms. The marginal land and mountainous areas have therefore had greater value for the working of the fjord farms than the steep fields around the farm buildings themselves.

Infields and marginal land

The traditional fjord farm comprised infields, marginal land and one or more transhumance summer dairy farms. The infields were used to cultivate corn, potatoes, root crops, greens and grass for fodder. On the marginal land, wild grass was scythed, leafy branches were removed from deciduous trees to provide winter fodder, and trees were felled for firewood. From June to September, all the cattle, sheep and goats were driven to the dairy farms, where cheese and butter were made. The sweet upland grazing gave better milk and meat production, and transhumance farming was very valuable for agriculture.

The following figures from the Nærøyfjord area say a great deal about the use of the infields and the value of the marginal land in 1863:

Table 32. The use put to the infields in the Nærøyfjord area in 1863.

No. of farms	Meadows	Cornfields	Potato land	Total infield area
43	1646 da	429 da	70 da	2145 da

Table 33. The amount of fodder used on the farms in the Nærøyfjord area in 1863.

No. of farms	Fodder from infields	Fodder from marginal land	Leaves gathered for fodder	Total amount of fodder
43	327,700 kg	259,700 kg	44,500 kg	631,900 kg

The figures show that the fjord farms obtained about half their fodder on their marginal land, where they scythed grass and lopped leafy branches to dry the leaves for use as valuable additional fodder. This took place right up to 1960. The warmth-demanding deciduous trees, elm, ash and lime, had the highest nutritional value, but were limited in occurrence. Birch was less nutritional, but more abundant. The branches were lopped to increase the proportion of young growth, and these pollarded trees acquired a characteristic appearance that can still be recognised many decades after leaves ceased to be gathered.

In the steep, almost inaccessible fjord landscape, people have always had to carry almost everything on their own back, and a great deal of manual labour was invested on land that was difficult to work. Consequently, over the centuries, special techniques and practical solutions were developed to make the work easier. The hayfields on marginal land were

often located in such places that the grass first had to be carried down to the fjord to be taken by boat to the path that led up to the farm and then borne on the back up to the farm. From about 1870, in the last period before the fjord and mountainside farms were abandoned, aerial wires became common, enabling the hay to be transported directly from the marginal land to the barn, or to be lifted up to the farm. The simple wire was an equally important revolution in farming methods for farms that were difficult to work as the tractor was for other farms.

Along the fjords, people have been more dependent than elsewhere on having good relations with their neighbours, and they gave each other a helping hand to manage to solve many practical tasks in the running of the farm. There are many examples of what were already basically marginal farms being divided to maintain an essential relationship between neighbours. People along the fjord also had their own signals. A light in the living room window in the evening, or a piece of cloth on the field in daytime, might provide important information to neighbouring farms, which might be many kilometres away, perhaps on the opposite side of the fjord.

Transhumance dairy farms

Each farm generally had several transhumance dairy farms that were used from June to September. Such farms consist of an area of grazing with a simple building where the livestock could be milked, and cheese and butter could be made. Such farms might be situated up to 20 km from the home farm and at heights of 200-1000 m a.s.l. The dairy products were carried down to the home farm once a week.

Transhumance dairy farms were vital for exploiting the rich upland pastures which gave a higher yield of milk and meat than the grazing around the home farm. Transhumance dairy farming was common throughout Norway, but was particularly highly developed in the fjord landscape because it was more difficult there to grow sufficient winter fodder around the farm itself. The upland dairy farms furthest away from the home farms were abandoned between 1870 and 1900, but many of the closest ones were used until the 1970s. Nowadays, only a few transhumance dairy farms are still operating in the proposed World Heritage Area. The most important and best preserved one is Herdalsseter in the Geiranger area, which has been worked continuously for the last 300 years and has the largest goat herd in the country in summer. In the Nærøyfjord area, transhumance dairy farms are still being worked at Melhus and Langhuso in Undredal.

Large parts of the upland area have been used for transhumance dairy farming and detailed information exists about the farms and about their ruins, which can be seen in most of the upland valleys. Many have spectacular access routes which walkers now use as thrilling paths.

Farmers and cotters

From 1750–1930, the fjord settlements were dominated by two social groups, farmers and cotters. A cotter was a person who had a leasing contract for a piece of land and the right to use an area of marginal land, in part for rough grazing. The cotter had to pay an annual rent in the form of money or goods, and was often obliged to work a certain number of days a year for the farmer.

Cotters did not pay tax and generally lived in simple, small houses near or in the actual farmyard. On the farms down by the fjord, the houses occupied by the cotters were usually right down by the shore. The cotters often kept livestock without having any significant infield area, and they fetched hay and leaves from marginal land which the farmer did not use, generally high on the mountainside or in rugged, difficult terrain.

The number of cotters rose until 1860, when many emigrated to America or moved to the towns on the coast. In 1928 an act was passed that gave cotters the right to purchase the land on which their house stood.

The figures below say a great deal about the differences between farmers and cotters in the fjord districts.

Table 34. Farmers in the Nærøyfjord area.

Year	No. of farms	Corn*	Potatoes*	Horses	Cattle	Sheep	Goats
1666	20	204	-	16	319	-	-
1723	28	242	-	26	268	279	
1802	32	499	-	40	411	706	
1865	43	675.5	1541	50	463	667	449

* barrels (1 barrel = 139.12 litres)

Table 35. Cotters in the Nærøyfjord area.

Year	No. of farms	Corn*	Potatoes*	Horses	Cattle	Sheep	Goats
1645	7	-	-	0	-	-	-
1723	10	-	-	0	-		
1802	27	20	-	0	56	85	
1865	66	6	713	0	140	226	273

Development of scenic tourism

Geirangerfjord and Nærøyfjord have been goals for tourists for 150 years and may be looked upon as national icons for the tourist industry. Together, these fjords are Norway's signature landscape for marketing its scenic qualities abroad and also one of Europe's most important signature landscapes in a global context.

Internationally, the fjords may be considered one of the cradles of scenic tourism. The first foreign tourist ship sailed into Geirangerfjord as early as 1869, and since then the fjords have given millions of visitors tremendous thrills of scenic and cultural character. The West Norwegian fjords have kept alive and given legitimacy to the notion of preserving valuable scenery for the sake of its outstanding beauty and its natural and cultural value.

In summer, the need arose for horse-drawn transport, catering, overnight accommodation, mountain guiding and transport on the fjord with small boats. This provided valuable income for many people running marginal farms. Tourism soon became an important sideline for farmers by the fjords and, by degrees, the main job for many.

The importance of the fjords as a goal for tourists quickly influenced the kind of buildings and other constructions that appeared. The overnight accommodation and the roads in the vicinity had an appreciable capacity for handling large numbers of visitors as early as the end of the 19th century. Despite considerable tourism for 150 years, the fjords have retained their original magical power of attraction, scenic beauty, character and qualities.

Some facts about the development of tourism in the fjords:

Geirangerfjord area

1858 A steamer, ”Sundmør”, starts to call at Geiranger once a week, resulting in more tourists reaching the fjord.
1867 The first hotel opens in Geiranger.
1869 A sailing ship is towed into Geirangerfjord. The first tourist ship calls at Geiranger with passengers from England.
1889 The Geiranger Pass over the mountains to Grotli and south-east Norway is opened.
1882 S/S ”Ceylon” of London calls. This cruise to Norway was the first time in the world that a ship undertook a pure cruise with paying passengers.
1888 Two Norwegian shipping companies combine a scheduled service to Britain with cruises in the fjords (Leith - Bergen - Trondhjem via Nærøyfjord and Geirangerfjord).
1888 39 tourist ships call in Geiranger.
1904 93 tourist ships call in Geiranger.
1907 The tourist traffic on land is organised through the Geiranger Skysslag.
1939 The road up to the scenic vantage point of Dalsnibba is completed.
1955 Ørnevegen between Geiranger and Eidsdal is opened. Geiranger gets a road link that is open throughout the year.
1969 Special sightseeing trips begin on Geirangerfjord.
1979 The Union Hotel begins to stay open all year round.
2002 Norsk Fjordsenter is opened by H.M. Queen Sonja.
2004 Geirangerfjord will be the only fjord in Norway to be visited by the largest cruise liner in the world, ”Queen Mary II”.
2006 The stretch of road from Geiranger to Trollstigen will be designated a national tourist road.

Nærøyfjord area

1849 Stalheimskleiva is opened, providing a good link between Gudvangen and Voss.
1850 Lords from Britain begin to hunt and to fish salmon in Aurland.
1883 The railway is completed between Voss and Bergen. The number of visitors increases and Stalheim and Gudvangen become well-known places for tourists.
1885 Stalheim Hotel is opened.
1888 Two Norwegian shipping companies combine a scheduled service to Britain with cruises in the fjords (Leith - Bergen - Trondhjem via Nærøyfjord and Geirangerfjord).
1895 An English company applies for a licence to build a railway line for tourists from Voss to Stalheim. The scheme was not realised.
1910 80 ships carrying about 10,000 passengers visit Nærøyfjord and Gudvangen.
1937 The road between Gudvangen and Voss is improved and a scheduled ferry begins to sail between Gudvangen and Lærdal. The road becomes the main road link between western and south-eastern Norway.
1940 The railway line between Flåm and Myrdal is opened. Aurlandsfjord can now be reached via the national railway network.
1970 Cruise vessels start to offer a popular excursion involving landing in Flåm, train to Voss, coach to Gudvangen and a cruise along Nærøyfjord.
1991 A road link (by way of tunnels) is opened between Flåm and Gudvangen, giving a large increase in the number of visitors.

The fjords as communication arteries

Ever since the ice disappeared, the fjords have been the most important communication arteries in the West Norwegian landscape. Since the Middle Ages, Nærøyfjord has been a well-known section of the main route between east and west, between Oslo and Bergen. Because of its location, Geirangerfjord did not have corresponding significance until tourism became an important business in the mid-19th century (*see the section on the history of tourism*). However, Sunnylvsfjord was an important section of the ancient postal route between Bergen and Trondheim (started in 1785) and parts of this boat and road link crossed the Geiranger area.

In the 1600s, the main route from the east was established over the mountains to Lærdal and from there either by boat direct to Bergen or by boat along Nærøyfjord to Gudvangen and then via Voss to Bergen.

When the postal service was organised in 1647, an overland postal route between Kristiania (now Oslo) and Bergen was set up. Farmers along the entire stretch were given responsibility for carrying the post a certain distance. In Nærøyfjord, there were such post- farmers at Stalheim, Gudvangen, Styvi and Dyrdal. Until 1800, there was only a bridle path along the Nærøydalen valley, and the post was carried by a man on foot or horseback. At Bakka, the postal route crossed the fjord and followed the eastern shore as far as Styvi. This 5.5 km stretch is now a popular path for walkers. From Holmo, the post was rowed to Lærdal. In 1858, the steamship service between Lærdal and Bergen began and the postal route ceased to operate.

From around 1846, the entire road between Gudvangen and Voss could be used by horse and carriage. Stalheimskleiva was considered a real achievement in engineering and this road brought more travellers to Nærøyfjord. Transporting travellers and tourists soon provided a valuable secondary income. In 1937, Stalheimskleiva was improved to be able to serve motor vehicles, and a ferry service began operating between Gudvangen and Lærdal. This was now the main road for motor vehicles between western and eastern Norway.

Nowadays, the road between Lærdal and Voss no longer needs to use a ferry link. Four tunnels built in the 1990s provide rapid communication from east to west without a risk of avalanches, and Nærøyfjord has lost its importance as an east–west communication artery.

3c. Form and date of most recent records of property

AREALIS – national land-use information system

This is a national project aimed at making land-use, resource and planning information more readily available to local authorities and county administrations. The principal objective is to gather information from specialist bodies and process it in a manner suitable for planners. Specifications have been drawn up for important geographical data sets in many fields, including archaeological and historical monuments and sites, biological diversity, water supply, agriculture, land-use plans and population figures. As of January 2004, the following data sets are available for the counties of Møre & Romsdal (Geirangerfjord area) and Sogn & Fjordane (Nærøyfjord area):

Table 36. Data sets available for Møre & Romsdal (Geirangerfjord area).

Data set:	**Description:**
Bedrock	Bedrock geological map (1:250 000) showing the broad distribution of rock types. Geological Survey of Norway (NGU), published in 1998
Superficial deposits	Quaternary geological map (1:250 000), NGU 1995
Lakes	Key information (name, size, height a.s.l., circumference, drainage basin, local authority) about lakes. 2002
Catchment basins (REGINE)	Hydrographic division. 2002
Disturbance-free countryside	Data set showing areas in Norway that were still undisturbed in January 1998
Prioritised disturbance-free countryside	Areas to be kept undisturbed, according to the County Plan
Shore zone	Disturbance within 100 m of the shoreline
Nature conservation areas	Areas protected pursuant to the Nature Conservation Act and given administrative protection as of 2002
Other important areas of countryside	Important areas of countryside that have not been protected pursuant to the Nature Conservation Act (updated to 2002)
Watercourses protected from hydroelectric power development	Watercourses, or parts thereof, protected from further development for hydroelectric power production, as of 2002
Valuable cultural landscapes	Cultural landscape areas given the highest priority according to the national register of valuable cultural landscape in 1994
Natural pasture	Sheep flocks allocated specific grazing areas in woodland and on the mountains in 2002
Plants on the Red List	Documented localities and species (vascular plants, bryophytes, lichens and fungi)
Prioritised areas for wildlife	
Migration routes for big game	Migration routes used by members of the deer family, updated to 2002
Paths and tracks	Marked or unmarked paths and tracks
Protected buildings	Automatically protected and administratively protected (‘listed’) buildings, as of 2003
SEFRAK	Buildings and ruins from before 1900, updated to 2003
Protected archaeological and historical sites and objects	Automatically protected archaeological and historical sites and objects shown on land-use maps, updated to 2002
Administratively protected security zones	Security zones around protected archaeological and historical sites and objects, updated to 2003
Demography	Population data, updated to 1 January 2000

Table 37. Data sets available for Sogn & Fjordane (Nærøyfjord area).

Data set:	**Description:**
Bedrock	Bedrock geological map (1:250 000) showing the general distribution of rock types. Geological Survey of Norway (NGU), published in 1998.
Structural geology	Faults and fractures
Mineral raw materials	Mineral resources, ores
Superficial deposits	Quaternary geological map (1:250 000), NGU, published in 1989
Avalanche danger	Areas at risk of landslides, snow avalanches and rock falls. Contingency arrangements.
Lakes - locations and depths	Key information (name, size, height a.s.l., circumference, drainage basin, local authority) about lakes, updated to 2002
Catchment basins (REGINE)	Hydrographic divisions, updated to 2002
Disturbance-free countryside	Data set showing areas in Norway that were still undisturbed in January 1998
Nature conservation areas	Areas protected pursuant to the Nature Conservation Act and given administrative protection as of 2002
Watercourses protected from hydroelectric power development	Watercourses, or parts thereof, which have been protected from further development for hydroelectric power production, as of 2002
Valuable cultural landscapes	Cultural landscape areas given the highest priority according to the national register of valuable cultural landscape in 1994
Plants	Vascular plants, lichens, bryophytes and fungi
Wildlife	Amphibians, bats, birds, deer family, large carnivores and small game recorded in the county
Invertebrates	Insects, microfauna and other invertebrates
Outdoor recreation areas	Areas given priority for outdoor recreation in the County Plan
Fishing licence zones	Zones for the sale of fishing licences (angling in fresh water)
Protected buildings	Automatically protected and administratively protected (‘listed’) buildings, as of 2003
SEFRAK	Buildings and ruins from before 1900, updated to 2003
Demography	Population data

A number of registrations, registers and data sets are still not available through AREALIS, the national land-use data base, but more information will be added in the years to come.

Many other kinds of informative material are also available.

Maps

In general, the quality and availability of maps is good. The most relevant maps include:

Land-use Maps Scale 1:5000. Cover areas below 800 m a.s.l. Contour interval is 5 m. They show paths, tracks, roads, place names, contours, types of land, ancient monuments and property boundaries, etc.

Main Series of Topographical Maps Scale 1:50 000. Contour interval 20 m. Sheets 1219 I (1989*) & II (1995), 1319 III & IV (1995), 1316 I (1994), 1317 II (1985), 1417 III (1985) and 1416 IV (1994). Norwegian Mapping Authority. (*Year when checked in the field) (*Annexes 5 & 6*)

Bedrock Geology Maps Scale 1:150 000. Geological Survey of Norway. 2002
(*Annex 1, Maps D & E*)

Quaternary Geology Maps Scale 1:150 000. Geological Survey of Norway. 2002
(*Annex 1, Maps F & G*)

Photographic documentation

As a large number of landscape photographers have taken numerous photographs in the area between 1880 and 2004, the photographic documentation is immense. Among the earliest are:

- The Knudsen Collection from 1862-1900, held at the University Library in Bergen.
- The Lindal Collection from 1880-90 held at the Norwegian Folk Museum.
- Galleri Nord. National archive of digitised photographs from 1880-1950, held at the National Library.

Recent additions are

- The Directorate for Cultural Heritage has an archive of 1000 diapositive photographs taken in the summer of 2003. 100 of these have been sent to UNESCO.
- Some photographic documentation of buildings in the property was made during the SEFRAK investigation from 1990-2000.

The archives at Fjellanger Widerøe Kart AS contain vertical and oblique aerial photographs of the Geirangerfjord and Nærøyfjord areas taken in 1935-2003.

Landscape mapping

The Norwegian Institute for Soil and Forest Mapping (NIJOS) has prepared a national system for mapping landscape. The technique is based on the Visual Management System (U.S. Forest Service 1974). It identifies, for instance, important visual features and rare types of landscape on the basis of a total evaluation of natural and anthropogenic factors. The system forms the basis for management zones that are geographically expedient and identifies, for instance, areas whose scenic value has been marred by infrastructures and other man-made

disturbances, and evaluates the scenic value on the basis of three factors, variation, totality and strength of impression.

Geirangerfjord area: Melby, M. W. & Fjeldstad, H. 2001: Landskapsanalyse. Environmental report 2001/1.

Nærøyfjord area: NIJOS, 1994: The landscape in inner Sogn. Delrapport II.

Geological information

The bedrock and Quaternary geology of the area are well documented. References to the most important publications are in section 7c.

The Norwegian Geotechnical Institute is performing continuous measurements to monitor the risk of landslides and rock falls in the Geirangerfjord area. The International Centre for Geohazards has chosen the area as an important focus for research. The quantity of data collected is expected to increase in the coming years.

Biological diversity in general

Extensive background material exists for terrestrial biology. The earliest sources are from 1756 and scientific records exist from limited areas since the end of the 19th century. The scientific breadth in the early investigations is great and ranges from experts on vascular plants to entomologists, lichenologists and bryologists, etc. Modern investigations and surveys have taken place in connection with nature conservation work since the 1970s.

As a follow-up of the Convention on Biological Diversity, Norway has undertaken a municipal programme from 1999–2003 which included the recording of important habitats, the ranges of important species and the precise haunts of Red-listed species. The local authorities prepare thematic maps and combined maps which classify the values in the areas shown. The records are fed into the national nature data base (**naturbasen**) which, in turn, is linked to the land-use information system, **AREALIS**, in each county administration.

Norddal, Stranda, Aurland, Voss and Lærdal Borough Councils completed their effort in the field during the summer of 2002 and all the data will be available in the appropriate data bases within a year or two.

National nature data base
This data base contains information derived from the mapping of biological diversity, as well as data on nature conservation areas, outdoor recreation areas and cultural landscapes. It enables statistics and maps to be produced for use in planning, environmental impact assessments, management, monitoring, etc. Various key figures can be derived from it. The data base covers the whole country and is updated quarterly. Norddal, Stranda, Aurland, Vik, Voss and Lærdal Borough Councils and the offices of the County Governors of Møre & Romsdal, Sogn & Fjordane and Hordaland can access it.

Selected investigations of terrestrial flora and fauna

Several systematic investigations were undertaken in connection with the preparation of conservation plans. Occurrences of seals have also been recorded in recent decades. The most important faunal investigations are listed in section 7c.

A report on the entire biological diversity of the Geirangerfjord area was completed in May 2001. Based on earlier investigations and new field studies, the report considers 68 valuable localities in the area (Gaarder, G., Holtan, D. & Jordal, J.B. 2001: Biologisk mangfald innafor Geiranger-Herdalen landskapsvernområde. Rapport 2001:03. Fylkesmannen i Møre og Romsdal).

In connection with the assessment of rivers that had been proposed for permanent protection from being developed to produce hydroelectricity, ornithological investigations of biotopes and species were undertaken in the rivers of the Nærøyfjord area in the summer of 1983 (Godø, G. 1983: Ornitologiske registreringer i Indre Sogn i samband med Samla plan for forvaltning av vassressursane sommaren 1983. Fylkesmannen i Sogn og Fjordane).

In connection with a report on the merits of the Grånos fens (the Nærøyfjord area), a broad ornithological study was undertaken there in 1991 (Håland, A. et al. 1991: Ornitologiske undersøkelser av Grånosmyrane, Voss kommune. Zoologisk museum, Univ. i Bergen).

Marine environment

General speaking, considerably less is known about the marine environment than the terrestrial environment.

The University of Bergen assessed the environmental conditions in the recipients, Aurlandsfjord and Nærøyfjord, in 1987 and 1993. Samples were taken at 21 locations on 30 September – 2 November 1987 and in November 1993. The investigation covered hydrography, sediments, benthos and littoral.

Sogn & Fjordane Regional College investigated the common seal (Phoca vitulina) colonies in inner Sogn in 1996. The study concerned a population estimate and investigations of fish otoliths found in faeces.

Lakes and rivers

In addition to the open data base containing information about Norwegian lakes, Aurland has its own, more detailed data base for lakes in the borough. It covers most of the lakes in the Nærøyfjord portion of the proposed World Heritage Area and contains information about fish species, spawning conditions, trial fishing, stocks and any changes.

Inhabitants and commercial life

Considerable statistical information exists, including:

Statistics Norway (Statistisk Sentralbyrå) releases more than 800 sets of statistics a year (www.ssb.no/english). As one of very few statistical agencies in the world, Statistics Norway also performs extensive research and analysis.

National Population Register A continually updated register recording births, deaths and the domicile of every individual.

Real Properties, Addresses and Buildings Called **GAB** in Norwegian, this is a national register and an information system containing data on real property, owners, addresses and buildings throughout the country. It covers every property in Norway, complete with its owner(s) and their official, allocated addresses, as well as all buildings larger than 15 m^2, with varying degrees of detailed information. It is updated daily, these routines being authorised in Norwegian legislation. Norddal, Stranda, Aurland, Vik, Voss and Lærdal Borough Councils have access to the register.

Agricultural Register is a register of all agricultural properties, operative units in agriculture, owners and users throughout the country. Contains information on the classes of agricultural land, productive woodland and the total area of farmland in active use.

Cultural history

Our knowledge of visible cultural history remains is considerable and the information is found in several registers.

SEFRAK – register of buildings covers buildings and remains of buildings from before 1900; approximately 495,000 in the whole country. The original data for this area are stored at the Møre & Romsdal, Sogn & Fjordane and Hordaland County Council Offices. The digital version is included in the GAB register.

SEFRAK – register of other cultural heritage objects and environments covers other kinds of post-Reformation (post-1537) cultural heritage objects. The records are incomplete. Approximately 20,000 are registered in the whole country. The original data for the area are stored at the Møre & Romsdal, Sogn & Fjordane and Hordaland County Council Offices. They will be transferred to the Cultural Monuments' Data Base.

Register of Protected Buildings covers all protected buildings and all objects and sites covered by an Individual Protection Order. Approximately 4000 objects in the whole country.

Archaeological and Historical Monuments and Sites Data Base (Askeladden) covers all automatically protected (pre-1537, also standing structures from pre-1650) and not necessarily protected (post-1537) archaeological and historical monuments and sites. The data base contains descriptive data and co-ordinates. A newly revised data base became operative on 20 January 2004.

Legal provisions

The Lovdata Foundation has web pages on the Internet (www.lovdata.no) listing all the Acts and national and local Regulations that relate to the property.

3d. Present state of conservation

Great awareness exists locally, regionally and nationally that the Geirangerfjord and Nærøyfjord areas contain unique natural and cultural values. The steep and, in part, inaccessible terrain has helped to ensure that few major encroachments of a technical nature have been realised. Extensive protection under the terms of the Nature Conservation Act ensures that this will not take place in the future either. The international reputation of the area for its spectacular scenery, and the great value it has had for tourism through 150 years, have given strong, local focus and awareness as regards the preservation of cultural landscape values linked with the parts of the area where people have lived, or are living, and cultural heritage objects elsewhere. The basis that is present through existing legislation, planning and knowledge means that the potential for a continued good state of preservation is considered to be excellent.

Nature conservation

The Geirangerfjord and Nærøyfjord areas contain scenery of international, national or regional value. On the basis of reports dealing with national and regional qualities, the Government has consequently protected substantial areas under the terms of the Nature Conservation Act. Special regulations prevent forms of land use and disturbance that are detrimental to the natural values in the protected areas, which cover 96% of the total area of the property (see Chapter 4).

The Government decided in 1993 to protect eight of the most important watercourses in the area from being developed in the future to produce hydroelectric power. Moreover, the salmon river, the River Nærøy in Nærøydalen, is currently being appraised for such protection.

Technological development and ever-increasing exploitation of natural resources have led to a great reduction in the undisturbed areas in Norway. This trend has not been equally marked in the Geirangerfjord and Nærøyfjord areas. An undisturbed area means an area that is more than 1 km from a road, railway line, settlement, hydroelectricity development scheme and power line. In the West Norwegian fjord landscape as a whole, Geirangerfjord and Nærøyfjord stand out as the two districts least affected by major technical encroachments.

Both the Geirangerfjord and Nærøyfjord areas have natural populations and occurrences of rare, vulnerable or endangered plants and animals. There have been no reports of circumstances that indicate a negative or critical trend for any of the species that are known, and it has not been considered necessary to implement special programmes beyond the restrictions embodied in the Regulations for the individual protected area (see the Regulations in Annex 3).

Landscape protected areas

Many Red-listed species that have been recorded in the area are directly associated with parts of the landscape influenced by grazing, haymaking and pollarding of Ulmus glabra, Tilia cordata, Fraxinus excelsior, Betula pubescens and B. pendula. In recent years, focus has been directed on values attached to the cultural landscape, especially relating to problems associated with areas becoming overgrown by natural successions of shrubs and deciduous trees. The discontinuation of traditional farming, resulting in formerly farmed areas becoming overgrown, leads for instance to:

- A reduction in the total biological diversity because the semi-natural plant community that often contains numerous species ceases to exist, causing a loss of biotopes that are important for insects, birds and animals.
- Reduced accessibility because old paths and tracks become overgrown with scrub.
- Impoverished scenic values because the man-made historical traces are erased and the variation in the scenery decreases.
- Loss of knowledge about traditional sustainable uses of the landscape and natural resources.

A **"National registration of valuable cultural landscapes"** took place in 1994 to select the cultural landscape areas in Norway that were most worthy of protection. Geirangerfjord and Nærøyfjord were selected as particularly important areas in this context, and this was acknowledged through land-use planning and the allocation of public funds for the preservation of the cultural landscape values.

The **Storfjord Project** (Geirangerfjord area)
The borough councils of Norddal, Stordal and Stranda, in co-operation with the office of the County Governor of Møre & Romsdal, have prepared a report on the cultural landscape in the area. This will form the basis for the future management of the cultural landscape and places focus upon:

- the drawing up of a management strategy for maintaining active farming
- integration of concern for the cultural landscape in all planning
- making the local inhabitants aware of the need to look after the cultural landscape and activating them in this task.

Action plan for nature and landscape management in Aurland (1998) (Nærøyfjord area)
As part of the Agenda 21 strategy in the borough of Aurdal, the plan lays down strategies and actions to ensure the sustainable utilisation of the natural and landscape resources in Aurdal. The plan is intended to ensure that the principles of paying concern for the landscape and sustainable resource management are incorporated in all activities in the borough. The plan was adopted as a Municipal Sub-plan on 11 June 1998. Among other things, it places focus on stimulating green farming, niche products and the establishment of firms specialising in upkeep and maintenance.

Automatically protected archaeological and historical monuments and sites

Ever since the first Cultural Heritage Act in 1905, all pre-Reformation (pre-1537) archaeological and historical monuments and sites have been automatically protected. Known localities of this kind are recorded in the Monument and Site Register and by an R symbol on land-use maps (scale 1:5000). Known archaeological and historical monuments and sites are, in general, at risk of being damaged or destroyed, and the estimated annual loss in the country as a whole is 1%. Standing structures from pre-1650 are now also automatically protected by the Act.

Particularly valuable architectural settings

Special attention is attached to safeguarding the characteristic, abandoned fjord and mountainside farms (see Table 20). To preserve the most valuable ones, owners and voluntary organisations have joined forces to carry out extensive restoration work with the approval and guidance of the cultural heritage authorities.

The land-use part of the Municipal Master Plan

Municipal Master Plans ensure that all building work and other disturbances within and away from inhabited parts of the area are approved by planning authorities before they are implemented.

3e. Policies and programmes related to the presentation and promotion of the property

Geirangerfjord and Nærøyfjord receive more than one million visitors a year. The wildness of the scenery, its beauty and the distinctive nature of the cultural heritage have to a great extent made these fjord areas self-promoting. However, a broad range of measures is ensuring the provision of information about the unique qualities and values of the area for the local people, those with administrative responsibility, school pupils, students and visitors. Presentation is one of several topics dealt with in more detail in the general management plan for the area.

Information from the environmental conservation authorities on the natural and cultural heritage of Norway

National and regional environmental conservation authorities prepare and impart quality-assured information about conservation values and the management of the natural and cultural heritage of Norway. World Heritage status will help to direct still more focus on the values of the fjord district and provide a stimulus for the continuous task of providing information through publications and brochures, public authority web sites, administrative processes and ordinary contact with the public.

Local World Heritage web portals

In connection with the nomination work, the local authorities have set up local web sites to provide information about the World Heritage work. The intention is to develop these web portals to provide complete, up-to-date information on the World Heritage Area. The sites will be interlinked.

The International Centre for Geohazards (ICG - Centre of Excellence)

The Centre is financed by the Norwegian Research Council, and future international research on geological hazards will focus on the Geirangerfjord region (www.geohazards.no).

The Norwegian Fjord Centre in Geiranger

The Norwegian Fjord Centre in Geiranger is a national visitor and discovery centre imparting information on the cultural and natural heritage of the fjords through permanent and temporary exhibitions. The centre, which opened on 14 June 2002, will be a central facility for providing information about the World Heritage Area. It has a large capacity and is specially equipped to provide high-quality information to passengers from cruise liners and coaches.

The Norwegian Wild Salmon Centre in Lærdal

The wild salmon as a species, and the traditions associated with salmon fishing in the rivers, are important aspects of the cultural and natural heritage of the Norwegian fjords. This visitor centre provides information about the Atlantic salmon and the management of the wild salmon stocks in Norwegian rivers. The River Nærøy in the Nærøyfjord area is one of the Norwegian salmon rivers.

"Fjordarium" - Sognefjord National Fjord Centre (not yet a reality)

On the initiative of scientists at the Regional College for Sogn & Fjordane, a pilot project has been considering the feasibility of opening a "fjordarium" in Flåm to provide information about the natural history and environment associated with fjords, putting special focus on conditions under water.

The Fjord Heritage Foundation

The aim of the Fjord Heritage Foundation is to promote sustainable value creation by providing the experience of high-quality food and a range of outdoor activities. It also prepares and presents admirable information on the natural and cultural qualities of the area (http://fjordarv.no). The Foundation is located in Nærøyfjord, but covers neighbouring areas, as well as other parts of the Norwegian fjords which develop products for tourists that meet strict demands on authenticity and quality.

Schools, study circles and training of guides

During the nomination process, people from the district have expressed a desire for the preparation of quality-assured material concerned with World Heritage and World Heritage values in the Geirangerfjord and Nærøyfjord areas. The material must be appropriate for use in schools, for training guides, for tourist hosts, for inspection and surveillance staff, and for study circles which may include any of the inhabitants in and around the World Heritage Area. The aim will be to ensure that as many as possible get to know their local area and acquire knowledge about the content and values of the World Heritage Area. The idea for such a project came from the Agricultural Landscape of Southern Öland in Sweden, which was designated a World Heritage Site in 2000.

4 Management

4a. Land ownership

The vast majority of the property is privately owned. Areas of sea beyond a depth of 2 m are state owned. The areas of sea amount to 10,746 ha, or 8.8% of the total area.

The ownership situation in the already established or proposed nature conservation areas in the Geirangerfjord and Nærøyfjord areas (96.35% of the total area) is as follows:

Table 38. Ownership.

Area	Sea area State owned	Land area State owned	Land area Privately owned	Number of owners*
Geirangerfjord	4585 ha	0	45,302 ha	330
Nærøyfjord	3386 ha	9800 ha	55,160 ha	262

* The names and addresses of legal owners can be obtained from the Directorate for Nature Management.

4b. Legal status (as of 1st January 2004)

Except for the inhabited areas of Geiranger, Undredal, Breisnes, Dyrdal, Bakka, Gudvangen and Nærøydalen, all the land area in the proposed World Heritage Area has already been protected, or is in the concluding stage of being protected, under the nationally applicable terms of the Nature Conservation Act. Legally binding provisions will regulate the land use to ensure that the natural assets are preserved for posterity. Special, legally binding, land-use plans pursuant to the Planning and Building Act have been drawn up for the areas that are not protected under the terms of the Nature Conservation Act (*Annex 1, Map J and K*).

The important special bills with national application, the **Nature Conservation Act** and the **Cultural Heritage Act**, are, moreover, of great importance for protecting and managing parts of the special landscape of the West Norwegian Fjords. Under the provisions of these Acts, the Norwegian Government, through resolutions adopted by the King in Council or by the Directorate for Cultural Heritage, has protected areas with outstanding natural assets and archaeological and historical monuments and sites. Within their boundaries, the Acts furnish the environmental conservation authorities with the right to control all acts of a physical nature that have a bearing on the protected assets. In addition to protection under the terms of the Nature Conservation Act, the Norwegian Parliament has determined that the most important watercourses in the area shall be permanently protected from development to produce hydroelectricity (*see section 4c for more details*).

The **Planning and Building Act** is the most important statute for managing the inhabited parts of the nominated World Heritage Area and for areas bordering onto the nominated area. The Act functions through a system of plans, the overriding instrument at the local

level being the parts of the Municipal Master Plan referring to land use. The borough councils adopt the master plans and evaluate them every 4 years. Provisions that refer to both maps and text lay down the premises for the preservation and development of the cultural landscape and its natural and cultural values.

A number of other Acts have indirect and direct significance for the protection and management of values in the landscape of the property in that they regulate the utilisation of individual natural resources, or facilitate control and supervision.

All told, the various parts of the national legislation offer an effective legal means for controlling development in every aspect of the use of land and resources in the property so that the values protected are preserved.

The various relevant Acts are described in more detail below, and in section 4c.

Nature Conservation Act of 19th June 1970

The Nature Conservation Act states that nature is a national asset which must be protected. The Act also emphasises the close interrelationship between man and nature, and that the quality of nature must be preserved for the future.

The Act authorises the preservation and protection of rare and endangered species of animals and plants and natural areas containing regional, national and international values in connection with animal and plant life, geological features and landscapes. The protection takes place by Royal Decree, which means that the Government adopts a resolution through the King in Council.

As a step in the democratic process associated with the setting aside of protected areas, a round of consultations is undertaken where relevant parties are given an opportunity to comment on the plans.

Table 39. Protected areas in the Geirangerfjord area (Annex 1, Map J).

Chap. II, § 5	Protected landscape area Geiranger-Herdalen Protected Landscape Area (a proposal, expected to be adopted in spring 2004)	 49 745 ha
Chap. II, § 8	Nature reserves Kallskaret Nature Reserve (designated in 1984) Hyskjet Nature Reserve (designated in 2003)	 90 ha 52 ha
		Total 49 887 ha

Table 40. Protected areas in the Nærøyfjord area (Annex 1, Map K).

Chap. II, § 5	Protected landscape areas Nærøyfjorden Protected Landscape area (designated in 2002) Bleia-Storebotnen Protected Landscape area (a proposal expected to be adopted in spring 2004)	 57 884 ha 6 595 ha
Chap. II, § 8	Nature reserves Nordheimsdalen Nature Reserve (designated in 1999) Bleia Nature Reserve (a proposal expected to be adopted in spring 2004) Grånosmyrane Nature Reserve (designated in 1995)	 1 330 ha 2 180 ha 357 ha
Chap. II, § 11	Natural monument Hatle-Styve Natural Monument (designated in 1933)	 0 ha
		Total 68 346 ha

Chap. II § 5 Protected Landscape Areas
A protected landscape area is set aside to preserve distinctive or beautiful natural or cultural landscapes. No activities may be undertaken there which can substantially alter the nature or character of the landscape.

Chap. II § 8 Nature Reserves
Nature reserves are set aside where strict protection is essential. They contain habitats, biota or biotopes that are of special scientific or educational significance.

Chap. II § 11 Natural Monuments
Natural monuments are set aside to protect geological, botanical and zoological occurrences that have scientific or historical interest, or a distinctive character. Areas surrounding the occurrence may be protected along with it, as a natural monument, when this is deemed necessary in order to safeguard it.

Cultural Heritage Act of 9th June 1978

The purpose of this Act is to protect archaeological monuments and sites and cultural environments, which are part of our cultural heritage and identity, as part of the overall management of the environment and resources.

All archaeological and historical monuments and sites from before 1537 and Sami monuments and sites that are more than 100 years old are automatically protected under the terms of the Act. In addition, standing structures dateable to the period 1537-1650 are normally also automatically protected. An automatically protected monument or site always has a 5 m broad protected security zone extending from its perimeter. The automatic protection also concerns monuments and sites under water. The Act, moreover, protects all ship finds older than 100 years.

Under the terms of the Act, the Ministry of the Environment may issue an Individual Protection Order to protect structures or sites that date from 1537 or later. The County Council administration is authorised by the Act to issue Temporary Protection Orders.

An area surrounding all types of protected monuments and sites may be protected to secure their effect and significance within the landscape or to protect scientific interests associated with them. A Royal Decree may, moreover, protect cultural environments as an entity.

The Act thus protects archaeological and historical monuments and sites from adverse disturbances, prescribes penalty scales that may be meted out to those who damage a protected monument or site, and describes the rights and obligations of the owners. The Act protects archaeological and historical monuments and sites on land as well as under water. The Directorate for Cultural Heritage is responsible for ensuring that the Act is complied with.

The Act stipulates prior notification to the proper authorities from anyone who intends to initiate projects which may lead to the disturbance of an automatically protected archaeological or historical monument or site, or a ship find. The person responsible for initiating the project must ensure that the obligation regarding prior notification is fulfilled. The project must be reported to the Division for Cultural Heritage Affairs in the appropriate County Council. The initiator of the project must bear all the costs of any mapping, excavations or protective measures arising out of such notification.

Table 41. Protected objects and areas in the West Norwegian Fjords.

Chap. II, § 3	Automatically protected archaeological and historical monuments and sites All cultural heritage objects in the present World Heritage nomination that date from before 1537 are automatically protected. This concerns all archaeological monuments and sites (for instance, Stone Age localities and Medieval cultural layers), ruins and buildings.
Chap. II, § 6	Security zone around automatically protected cultural heritage objects The area around an automatically protected archaeological monument or site is protected against any and all measures or disturbance (for a minimum of 5 m from the periphery).
Chap. IV, § 14	Ship finds Ship finds older than 100 years are the property of the State and must not be moved or damaged without the permission of the Cultural Heritage Authority.

Planning and Building Act of 14th June 1985

This Act applies to the entire area, including rivers, streams and areas of sea. It regulates all physical planning that is not regulated through the protection provisions attached to the individual nature conservation areas. The Act requires that **environmental impact assessments** be performed for all new, major undertakings that may affect natural or cultural assets.

Planning under the terms of the Act must pave the way for co-ordinating national, county council and local authority activities and provide a basis for decisions on the use and protection of resources, development and giving consideration to aesthetic aspects.

Table 42. Guidelines and legally binding plans for the West Norwegian Fjords and neighbouring areas.

Chap. IV § 17-2	Planning at the national level Ban on building, etc. inside a 100 metre belt from the sea
Chap. V	County planning County Plan for Møre & Romsdal (2001-2004) County Plan for Sogn & Fjordane (2001-2004) County Plan for Hordaland (2001-2004) County sub-plans Disturbance-free areas (Møre & Romsdal) (2000) Land use (Sogn & Fjordane) Agricultural and outdoor recreation (Sogn & Fjordane)
Chap. VI	Municipal planning Municipal Master Plan for Norddal 1996-2007, approved by the Borough Council in 1995 Stranda 1992-2002, approved by the Borough Council in 1992 Lærdal 1991-2002, approved by the Borough Council in 1990 Aurland 1991-2000, approved by the Borough Council in 1990 Vik 2001-2004 approved by the Borough Council in 2000 Voss 2003-2014 approved by the Borough Council in 2002 Municipal sub-plans Geiranger area (Stranda). Being prepared Flåm and Flåmsdalen (Aurland) Cultural landscape Nordfjella wild reindeer area (Aurland and Lærdal) Wild reindeer
Chap. VII § 28-2	Local Development Plans Local Development Plan for Dalsnibba (Stranda) Local Development Plan for Homlung (Stranda) Local Development Plan for Flydalsjuvet (Stranda) Local Development Plan for the centre of Geiranger (Stranda) Local Development Plan for Gjørvahaugane (Stranda) Local Development Plan for Undredal (Aurland) Local Development Plan for Gudvangen (Aurland) Local Development Plan for Skjerping (Aurland) Building Development Plan

Chap. IV § 17-2 Ban on building and disposal of part of a property inside a 100 metre wide belt along the shoreline to the sea

The Act lays down a general ban on the erection of new buildings closer to the sea than 100 metres from the shoreline measured horizontally from the shoreline at normal high water. The provision does not apply to built-up areas, or areas covered by a Local Development Plan. The ban means that large stretches of the shore zone can remain undeveloped by buildings.

Chap. V County Planning

The County Plans for Møre & Romsdal, Sogn & Fjordane and Hordaland consist of objectives and long-term guidelines for development in the respective county and have direct influence on physical planning in the Boroughs of Norddal, Stranda, Aurland, Vik, Voss and Lærdal. The plans contain regional policy guidelines for land use in five areas:

- general guidelines for land-use planning
- land-use policy for the development of business and industry
- sustainable land use in the coastal zone
- sustainable land use in towns and other inhabited areas
- land-use policy for the management of open countryside and biological diversity.

Separate county sub-plans for land-use planning give more detailed guidelines for land-use planning in the Geirangerfjord and Nærøyfjord areas.

Chap. VI Municipal Planning

According to the Norwegian Planning and Building Act, Municipal Master Plans are intended to co-ordinate physical, economic, social, aesthetic and cultural development within the local authority in question. They consist of a long-term component containing targets for development and guidelines for sector planning and a part referring to land use to enable the management of land and sea areas and other natural resources.

The land-use part of the Municipal Master Plans for Norddal, Stranda, Aurland, Vik, Voss and Lærdal consists of a map of the respective borough on which the whole area is divided into zones with associated planning provisions. The maps have legal effect for land use.

Chap. VII Local Development Plans

In general terms, a Local Development Plan is a detailed plan with associated provisions which regulate the use and protection of land. It is drawn up whenever it is essential to ensure that general planning work is implemented in accordance with the law.

Chap. VII § 28-2 Building Development Plans

In general, the drawing up of a Building Development Plan may be required to establish the design of buildings and associated outside areas within a specifically limited area.

Chap. VIIa Environmental Impact Assessments
Any undertaking that may have significant impact on the environment, cultural heritage objects and sites, natural resources or the community generally generates an obligation for an environmental impact assessment to clarify its effects.

Chap. III Consultation, publication and information
National, county council and local authority planning bodies are generally obliged to keep the public informed of planning matters. Individual persons and groups affected by plans must be given an opportunity to participate actively in the planning process.

Other legislation that is important for land use and management

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

The Norwegian Forest and Forest Protection Act (1965)
The principal objective of this Act is to ensure that the forestry business, through rational management procedures, should secure a satisfactory result for those engaged in forestry at the same time as emphasis should be given to the importance of the forest as a source of recreation for the public, as a major element of the natural scenery, as a living environment for plants and animals, and as areas for hunting and fishing.

Act relating to Motor Traffic on Uncultivated Land and in Watercourses (1977)
The purpose of this Act is to regulate motorised traffic on uncultivated land and in watercourses on the basis of overall considerations of the public interest, with a view to protecting the natural environment and promoting public well-being.

Wildlife Act (1981)
All wild-living land mammals, birds, amphibians and reptiles within the property are protected under the terms of this Act unless a Regulation provides specific exemption. The purpose of the Act is to manage the wildlife and its habitats in such a way that the productivity and species diversity found in nature are preserved.

Pollution Act (1981)
The purpose of this Act is to protect the external environment from pollution, reduce existing pollution, reduce the quantity of refuse and encourage better treatment of refuse. The Act is intended to ensure that the quality of the environment is acceptable so that pollution, contamination and refuse do not become detrimental to health, well-being or the ability of nature to produce and regenerate itself.

Act relating to Salmonids and Fresh-water Fish, etc. (1992)
The purpose of this Act is to ensure that natural stocks of anadromous salmonids, freshwater fish and their habitats, and other freshwater organisms are managed in such a way as to maintain natural diversity and productivity. Within this framework, the Act is intended to provide a basis for the improvement of the stocks with a view to raising yields for the benefit of holders of fishing rights and sports fishermen.

Act relating to Land (1995)
The purpose of the Land Act is to ensure that land resources are employed in a way that is best for society and for those employed in agriculture.

Provisions in the Land Act state that cultivated land must not be used for purposes that are not directed at agricultural production, and that cultivable land must not be used in such a way that it becomes unsuitable for agricultural production in the future. Exemption from these provisions may be granted in special cases following an application which must be submitted to the local authority concerned.

Nature Inspectorate Act (1996)
The King can set up a Nature Inspectorate to safeguard national environmental merits and prevent environmental crime. This inspectorate is intended to ensure that provisions laid down in a number of Acts are complied with, the Acts concerned being the *Open-air Recreation Act, Nature Conservation Act, Act relating to Motor Traffic on Uncultivated Land and in Watercourses, Cultural Heritage Act, Wildlife Act and the Act relating to Salmonids and Fresh-water Fish, etc.* The inspectorate has the task of providing guidance and information, upkeep and maintenance, registration and documentation.

Act relating to Watercourses and Groundwater (2000)
The purpose of this Act is to ensure that watercourses and groundwater are used and managed in a manner that is in the best interests of society.

4c. Protective measures and means of implementing them

Protective measures - national level

The Norwegian Government, national and regional authorities, Norddal, Stranda, Aurland, Vik, Voss and Lærdal Borough Councils and the landowners have the common objective of helping to ensure that the values which underlie the nomination are preserved for posterity. A number of documents confirm this objective, help to give the parties a sense of responsibility, and list the prioritised practical measures that will help to ensure its successful implementation.

A general management plan for the proposed World Heritage Area is being drawn up. This plan clarifies the division of responsibility for managing the World Heritage Area. A draft of the plan is in Annex 3.

Declaration of Intent (1st January 2004)
A Declaration of Intent between Norddal, Stranda, Aurland, Vik, Voss and Lærdal Borough Councils, the County Councils and Government authorities has been drawn up regarding co-operation and joint responsibility for preserving the geological, biological and cultural values in the property (Annex 3).

According to this Declaration of Intent, two consultative groups will be set up for the World Heritage Area. They will meet regularly to clarify relevant issues that may arise between the various interests in the World Heritage Area.

Nature conservation (nature protection resolutions under the terms of the Nature Conservation Act)

96.4% of the proposed World Heritage Area is protected, or protection regulations are in the final stages of deliberation, pursuant to the Nature Conservation Act. According to this Act, the overriding objective of Norwegian nature conservation is:

- *"Nature conservation implies utilising the natural resources from the viewpoint of the close interrelationship between man and nature, and bearing in mind that the quality of nature must be preserved for the future. Encroachments should only be undertaken on the basis of a long-term, broadly based allocation of resources that takes into account that nature is preserved for the future as a basis for the employment, health and well-being of the people."*

Three protected landscape areas, five nature reserves and one natural monument have already been, or are in process of being, set aside. Legally binding conservation regulations exist for each protected area, and these contain provisions regulating the use of the area and protecting its natural assets. The objects clause for the various protected areas in the proposed World Heritage Area is cited below. The full protection provisions for the individual areas can be found in *Annex 3*.

The purpose of setting aside the **Geiranger-Herdal Protected Landscape Area** is to:

- *safeguard a distinctive, beautiful landscape of fjords and mountains containing a rich and varied plant and animal life.*

- *safeguard valuable cultural landscapes where fjord farms, transhumance dairy farm settings and historic and prehistoric monuments and sites form important elements in the distinctive character of the landscape.*

- *safeguard geological features and landscape forms.*

The purpose of setting aside the **Nærøyfjorden Protected Landscape Area** is to:

- *safeguard a beautiful and distinctive natural and cultural landscape stretching from the fjord to the mountain tops in a magnificent, glacially sculpted landscape containing a great diversity of plant and animal life and where a cultural landscape comprised of hayfields, pastures, clusters of transhumance dairy farms, farms and cultural heritage sites produced by active farming make a significant contribution to the character of the landscape.*

The purpose of setting aside the **Bleia-Storebotnen Protected Landscape Area** is to:

- *safeguard a beautiful and distinctive area of natural and cultural landscape from the fjord to the mountain tops, where the moulding of an ancient plain and fjord landscape by ice, and varied vegetation and fauna, including wild reindeer, comprise important elements in the character of the landscape.*

The purpose of setting aside the **Kallskaret Nature Reserve** is to:

- *safeguard an area containing deposits of eclogite in alternation with other rock types, the alternation of rock types having been decisive for the formation of a beautiful, characteristic landscape.*

The purpose of setting aside the **Hyskjet Nature Reserve** is to:

- *safeguard a hillside carrying one of the best-developed thermophilous deciduous woodlands in the fjord district of Sunnmøre, along with its natural plant and animal life.*

The purpose of setting aside the **Nordheimsdalen Nature Reserve** is to:

- *safeguard a wooded area, along with all its natural plant and animal life. One of its special qualities is that the reserve forms an intact catchment area with a forest gradient stretching from the shore to the mountain tops, which contains an unusually wide variety of types of pine woodland that are typical for inner fjord districts, some of which have a virgin-forest character that is probably the most pronounced in western Norway.*

The purpose of setting aside the **Bleia Nature Reserve** is to:

- *protect a locality containing a sub-species of the arctic poppy* (Papaver radicatum ssp. relictum) *of exceptional scientific value, outstanding fjord scenery displaying unusually large ravines and magnificent ridges, and a section stretching from the fjord to mountain peaks that displays valuable botanical qualities and includes woodland of virgin-forest character.*

The purpose of setting aside the **Hatle-Styve Natural Monument** is to:

- *protect a small-leaved lime* (Tilia cordata) *which, owing to delayed development of chlorophyll, has lemon-yellow leaves in summer, thus forming a distinctive element in the landscape.*

When nature conservation areas are established, the management authority prepares separate management plans which explain how the protection provisions are to be interpreted and contain the following:

- *a plan to monitor the state of the environment and the natural history of the area*
- *a plan for special care and maintenance measures that are essential to follow up the intentions of the protection resolutions*
- *a surveillance plan*.

Together, these plans will form the basis of a detailed, overall management plan which will meet the requirements of a future World Heritage Area. Annex 3 contains a draft of the overall management plan for the Nærøyfjord area. A corresponding plan will be prepared for the Geirangerfjord area.

In connection with the setting aside of the nature conservation areas in the proposed World Heritage Area, the Directorate for Nature Management has proposed the appointment of three new wardens in the *Norwegian Nature Inspectorate (SNO)*. It is natural to view these new posts in connection with management tasks related to an entire World Heritage Area comprised of two sub-areas and nine nature conservation areas.

Plans to protect watercourses from hydroelectric development (Adopted by Parliament in 1993)

A national protection plan for watercourses was adopted by the Norwegian Parliament in 1973. This was succeeded by three more protection plans. The most recent, and probably the final one, was adopted by Parliament in 1993. In all 341 Norwegian watercourses are now protected from further hydroelectric development.

Table 43. Watercourses permanently protected from hydroelectric development. The Geirangerfjord area.

Watercourse	Catchment area	Status
Vesteråselva/ Geirangerelva	85 km²	Protection plans III and I
Norddalsvassdraget	105 km²	Protection plan IV
Bygdaelva	4 km²	Protection plan IV

Table 44. Watercourses permanently protected from hydroelectric development. The Nærøyfjord area.

Watercourse	Catchment area	Status
Vossovassdraget	1486 km²	Protection plan III
Dyrdalselvi	51 km²	Protection plan IV
Nisedalselvi	16 km²	Protection plan IV
Undredalselvi	92 km²	Protection plan III
Flåmselvi	280 km²	Protection plan III (slightly developed)
Nærøyelvi	Not estimated	Being considered for protection

Encroachments in other rivers in the proposed World Heritage Area will require the carrying out of a thorough environmental impact assessment prior to a possible application for a licence can be substantively discussed. Applications regarding encroachments on rivers in the protected areas will be in conflict with the protection provisions and are out of the question. The licensing procedures are co-ordinated with the Planning and Building Act, with respect to provisions about notification and impact assessments. Hence, the Norwegian licensing procedures for hydroelectric development comply with European Union Directives.

National Conservation Plan for Roads, Bridges and Road-related Cultural Heritage Objects (2002)

This plan is normative for the management by the Norwegian Public Roads Administration of its own cultural heritage objects, and is intended to ensure the preservation of a representative selection of road-related cultural heritage objects and environments. The aim is that such prioritised cultural heritage features will receive legal protection. The following roads and related objects in the proposed World Heritage Area have been prioritised in the national conservation plan:

- Geiranger road from Djupvasshytta to Geiranger (1889). Won a Gold Medal at the World Exhibition in Paris in 1900.
- Blåfjellbrakka. A building dating from 1904, which is representative for the Authority's buildings along mountain roads in Norway.
- Stalheimskleiva (1849). The first Norwegian road to be built in accordance with new European demands regarding road-building technology (1850), called the *chaussen*.

National salmon rivers and salmon fjords

To improve the protection of wild salmon, the Norwegian Government has proposed the designation of 37 national salmon rivers and 21 national salmon fjords, at the same time as the temporary security zones for salmon are retained in fjords which are not covered by this scheme. Sognefjord is one of the prioritised salmon fjords. Its standing as a national salmon fjord will, among other things, entail a ban on establishing new plants to produce salmonid fish for consumption, and also involve an appraisal of possibilities for moving existing plants to other sites *(St.prp. no. 79 (2001-2002) On national salmon rivers and salmon fjords).*

National survey of disturbance-free countryside

Norway has undertaken a national survey to determine the extent of its continuous areas of countryside which lack disturbance from major infrastructures. The areas are divided into three categories:

1. Zone 2: areas 1-3 km from major infrastructures which cause disturbance
2. Zone 1: areas 3-5 km from major infrastructures which cause disturbance
3. Wilderness-like areas: areas more than 5 km from major infrastructures

The survey has been most important for land-use management and the preservation of the areas that remain undisturbed.

The proposed World Heritage Area includes parts of two of the last remaining wilderness-like areas in western Norway (more than 5 km from major infrastructures).

National Register of Valuable Cultural Landscapes

In 1994, Geirangerfjord and Nærøyfjord were listed as particularly valuable areas of cultural landscape in the National Register of Valuable Cultural Landscape. This status weighs heavily when land-use planning is being performed and government funding is being allocated to preserve cultural landscape values.

Protective measures - regional level

County Plan for Møre & Romsdal for 2001-2004

This plan directs focus on sustainable land-use management. It points out that protection under the terms of the Nature Conservation Act only safeguards small areas and other areas have to be managed in a manner that helps to preserve the variation and wealth that characterises the landscape of the county. The County Plan has direct significance for physical planning in the Boroughs of Stranda and Norddal.

Examples of prioritised measures:

- Identification and shielding of biological diversity through good land-use management.
- Preparation of a County Sub-plan for cultural landscape to secure aesthetic, cultural and biological values for posterity.

County Sub-plans with special significance for parts of the proposed World Heritage Area

- County Sub-plan for Undisturbed Countryside. The Geiranger-Herdalen area is one of 18 prioritised areas in the county where new disturbances will not be permitted.

County Plan for Sogn & Fjordane for 2001-2004

In the programme for managing cultural heritage, land use and natural resources, the plan states that the county still has rich biological diversity and contains remnants of intact, natural ecosystems. The county council states that Sogn & Fjordane has special responsibility for monitoring and following the development of the natural and cultural landscapes and intends to complete the biological diversity survey in the individual boroughs by 2004. The County Plan points out that human-induced changes in living conditions for the various species in areas of natural environment and in cultural landscapes are the greatest threat to biological diversity. Improved registering of the present state, clarification of values and greater expertise among the general public and decision makers are targets that are given priority in the County Plan.

County Sub-plans with special significance for parts of the proposed World Heritage Area

- County Sub-plan for Land Use (http://kart.sf-f.kommune.no/fdpareal/).
  Areas to be given priority include:
  Aesthetics in landscape management, with guidelines for securing important landmarks and landscape elements.
  Outdoor recreation and important areas of countryside, with guidelines for safeguarding areas for outdoor recreation from future disturbance. The plan assigns the following areas in the proposed World Heritage Area special status:
  Undredal-Grindaflete - national value as an important area for hiking
  Bleia - regional value as an important area for hiking
  Biological diversity, with guidelines aimed at preventing disturbance in areas containing important biotopes, and for registering.
  Cultural heritage objects and cultural landscape, with guidelines to ensure the documentation and preservation of important cultural heritages in connection with municipal land-use planning.
- *Management of agricultural, scenic and outdoor recreation areas earmarked in the municipal plans*, with guidelines for, among other things, new building development, road building and outdoor recreation facilities.

County Plan for Hordaland for 2001-2004

In the programme for *protection and the use of land, environmental and natural resources*, the plan directs focus on, among other things, protecting the most valuable areas, such as those with outstanding natural history, important scenic areas and cultural landscapes, cultural environments, the shore zone and large areas of undisturbed countryside.

County Sub-plans with special significance for parts of the proposed World Heritage Area

- Local Agenda 21 (adopted in 1997)
- County Sub-plan for Outdoor Recreation (adopted in 1994)
- County Sub-plan for Cultural Heritage Objects (1998-2010)

Protective measures - municipal level

The Planning and Building Act sets the bounds for municipal land-use planning, and applies to all land areas in Norway. In nature reserves and the like, separate provisions under the terms of the Nature Conservation Act apply (see also section 4a).

In built-up and inhabited areas that are not covered by the Nature Conservation Act, municipal plans with authorisation in the Planning and Building Act control land-use management. Such areas comprise 1.4% of the proposed World Heritage Area, and are in the boroughs of Stranda (the Geirangerfjord area) and Aurland (the Nærøyfjord area).

Stranda

The Municipal Master Plan for the inhabited part of Geiranger, that is valid for 1992-2002, includes provisions which ensure that consideration is taken for natural and cultural landscape values when applications are submitted to erect new buildings, build roads, etc.

A separate Municipal Sub-plan for Geiranger is being prepared. It is expected to be completed in spring 2004 and will contain detailed provisions for future development and land use in the inhabited area at the head of Geirangerfjord.

There are separate Local Development Plans for Homlung and Flydalsjuvet.

A separate Code of Ethics for architectural traditions and aesthetics has been drawn up by Stranda and Norddal Borough Councils for use when handling building applications. It contains proposals for guidelines for planning and building tasks which ensure that local architectural traditions and distinctiveness are taken care of in connection with the restoration of old property, or when designing and siting new buildings.

Aurland

The inhabited parts of Aurland are Gudvangen-Nærøydalen, Bakka-Tufto, Dyrdal and Breisnes. The current Municipal Master Plan for 1991-2000 will be revised in 2004. It includes guidelines for building and construction work which require that any new buildings must not be in conflict with important agricultural, environmental and outdoor recreational interests, or serve to reduce the value of cultural landscape qualities.

In connection with the revision of the Municipal Master Plan, special attention will be directed at accommodation to the landscape and visual vulnerability when building is taking place. This will have relevance for all the inhabited parts of the Nærøyfjord area, but particularly for the Ramsøy-Bakka area, which is visually exposed in Nærøyfjord.
A Local Development Plan was drawn up for the centre of Undredal in 1995. It ensures that the landscape qualities present there will be preserved in connection with any new construction work.

A separate Zone Plan that concentrates on controlling land use has been prepared for the stretch from Gudvangen to Hylland.

4 d - e. Government agencies with management authority

National authorities (government agencies)

Directorate for Nature Management

The Directorate for Nature Management is the professional advisory and executive body for the Ministry of the Environment in matters relating to nature management. It has multidisciplinary expertise in fields connected with ecology, land-use management and outdoor recreation, and is the thematic centre for data-based information on ecology and biology. The Directorate has broad knowledge of the state of nature and authority to issue instructions on professional matters to the environmental conservation divisions in the offices of the County Governors within its own fields of responsibility. It endeavours to preserve biological diversity and protect and strengthen the right of common access.

The **Norwegian Nature Inspectorate** was set up under the terms of the Nature Inspectorate Act of 21st June 1996 and is intended to maintain an overall watch on the national effort to supervise the natural environment. It is intended to create understanding and respect for regulations covering this field and to prevent environmental crime. Its main tasks are to provide information and guidance, perform surveillance and monitoring, carry out registration and documentation, and care for, maintain and run sites.

A great deal of emphasis is placed on establishing good co-operation with others involved in supervising the natural environment, not least co-ordinating with the police with regard to surveillance tasks. The inspectorate is at present a separate department attached to the Directorate for Nature Management, but most of the work takes place locally in areas where the need for improved supervision is greatest.

Directorate for Cultural Heritage

The Directorate for Cultural Heritage is the professional advisory and executive body for the Ministry of the Environment in matters relating to cultural heritage management. The Directorate has multidisciplinary expertise in aspects connected with archaeology, art history, ethnology, architectural history, restoration and land-use management, and is the thematic centre for data-based information on prehistoric monuments and sites, historical monuments and sites and cultural environments.

The Directorate has authority to issue exemptions to the automatic protection of archaeological and historical monuments and sites and marine archaeological monuments and sites. It can issue Protection Orders for post-Medieval structures and sites.

The Directorate has overriding professional responsibility and responsibility to follow up the management of archaeological and historical monuments and sites performed by county council staff. It must assist local authorities in incorporating cultural heritage interests in their land-use planning and their management of archaeological and historical monuments and sites as valuable resources in the overall management of the environment.

Regional authorities

Government agencies

County Governors of Møre & Romsdal, Sogn & Fjordane and Hordaland

The County Governor is the representative of the Government at the county level and has special responsibility for co-ordinating Government-initiated activities in the county so that important national policies can be implemented in a balanced manner with respect to local authorities, for example.

A primary task of the County Governor's Office is to ensure that local authorities fulfil the obligations for which they are largely responsible, namely to implement tasks concerned with information, surveillance and monitoring in important areas of society. This concerns the spheres of nature conservation, agriculture, civil contingency planning, social care, child care, nursery schools, municipal economy and general municipal organisation and administration.

The Division for Environmental Conservation is, among other things, responsible for:

- registering natural features that are worthy of protection
- implementing conservation plans
- administering areas that are protected or preserved
- nature monitoring
- administering public areas for outdoor recreation
- managing game and freshwater fish
- looking after environmental concerns in planning and encroachment issues
- surveillance, monitoring and considering matters related with pollution problems.

The Division for Agriculture is, among other things, responsible for:

- controlling and supervising commercial activities in agriculture and forestry, including ensuring that they are carried out in accordance with the demands for sustainability and the maintenance of biological diversity.

In general terms, the County Governor's Office plays an important role in laying down premises for, and being a partner in, the planning efforts made by the local authorities and sectors to fulfil the terms of the Planning and Building Act and sectoral legislation.

County authorities

Møre & Romsdal, Sogn & Fjordane and Hordaland County Councils

The county council is an independent political body at the regional level that is responsible, among other things, for planning matters and the development of business and industry. It has been delegated authority under the terms of the Cultural Heritage Act, and advises landowners and local authorities on all matters relating to archaeological and historical monuments and sites.

In this context, the county council has such tasks as:

- determining claims for exemption regarding protected post-Medieval cultural heritage objects
- taking decisions on Temporary Protection Orders under the terms of the Cultural Heritage Act when archaeological or historical monuments or sites are in imminent danger of being removed or damaged
- participating in local authority land-use planning by contributing input on cultural heritage matters and providing advice and guidance to local authorities and private individuals in the same context
- presenting objections to local authority planning proposals that threaten regional or national cultural heritage assets or, alternatively, reporting the matter to the Directorate for Cultural Heritage which, in some cases, will present the objection.

Local authorities

Norddal, Stranda, Aurland, Vik, Voss and Lærdal Borough Councils
The borough council has a number of tasks to fulfil in various areas of society. In the present context, it is its special primary responsibility for allocating the use of land and resources under the terms of the Planning and Building Act to which focus will be directed. When performing land-use planning, due consideration must be given to natural assets, archaeological and historical monuments and sites, cultural environments and cultural landscapes. Under the terms of the Act, the local authority may, among other things, regulate areas for preservation as well as, generally speaking, for agricultural purposes, nature protection and outdoor recreation.

4f. Agreed plans related to the Property

Plans relating to the West Norwegian Fjords

Declaration of Intent in connection with the World Heritage Area *(see Annex 3)*

Investigating biological diversity and wildlife
Biological diversity has been given high priority nationally and by the County Governors.

The aim is to acquire more knowledge about the biological diversity, better information about key biotopes and a good instrument to enable the natural values to be well looked after and well managed in the future. An investigation of the biological diversity provides a sound scientific basis for much planning and many everyday activities.

All the local authorities are surveying the distribution of their wildlife by gathering local knowledge and reviewing the literature. This work is a valuable part of the task of recording the biological diversity and is important for tracing trends in land use relative to endangered habitats and haunts, and safeguarding localities for endangered species and areas with endangered and vulnerable habitats. The borough council's wildlife committee reviews the

wildlife map annually, supplementing and correcting it. The map undergoes major revision every fourth year when the land-use part of the Municipal Master Plan is revised.

The biological diversity investigation, completed in summer 2003, was carried out by the respective municipal environmental conservation officer in co-operation with local natural history associations, private individuals and scientists.

The investigations cover habitats and species diversity in selected parts of the boroughs. From 2004, this information will be available in the national nature data base, which is linked to the land-use information system, AREALIS.

National tourist roads

At present, Norway has four stretches of road that are designated national tourist roads. The intention is to have 15 new stretches in the course of the next ten years. The objective of designating national tourist roads is that tourists will, from their vehicles, be able to derive pleasure from some of the most outstanding examples of Norwegian scenery, including fjords, waterfalls, mountains and coastlines. The roads will have lay-byes equipped with good information signs.

Two stretches of road that are given high priority will be important gateways to the nominated World Heritage Area:

- Geirangerfjord area: Geiranger – Trollstigen
- Nærøyfjord area: Aurland – Erdal

Plans relating to the Geirangerfjord area

Storfjord project (2000-2003)

The boroughs of Norddal, Stordal and Stranda, in co-operation with the County Governor's Office in Møre & Romsdal, have prepared a report on the cultural landscape of the Storfjord area. This will form the basis for the future management of the cultural landscape.

The aims of this three-year project have been to:

- look after the values in the cultural landscape and promote a sense of well-being for local people and tourists
- safeguard the diversity of cultural history and biology
- draw up a management strategy to maintain active farming
- integrate consideration for the cultural landscape with planning
- make local people aware of the need to look after the cultural landscape, and activate them in this task.

Measures in the Geiranger district (2003-2006)

Since many farms have been taken out of production in recent years, this project aims to find ways of encouraging animal husbandry and preventing the cultural landscape in the immediate vicinity of Geiranger and in the valley to the south-east from becoming more over-

grown. The project is intended to demonstrate the value of active farming for tourism in Geiranger. The committee running the project consists of representatives from the landowners, the Farmers' and Smallholders' Union, the tourist industry and the Borough of Stranda. The project will take an active part in preparing the Municipal Sub-plan for Geiranger.

Care and maintenance plan for parts of Møllsbygda (1990 -)
This plan concerns two farms and prescribes care and upkeep measures that are appropriate for various kinds of land.

Care and maintenance plan for Møll and Grande (1991)
This plan for Møll and Grande in Geiranger surveyed and described the values in the cultural landscape and proposed methods and actions to attend to the general care and upkeep of the area. The plan will form part of a future, general management plan for the Geirangerfjord area.

Operating plan for the Ottadalen wild reindeer area (2000-2004)
This plan has been drawn up by the Wild Reindeer Committee in Ottadalen and sets targets for the sustainable management of the wild reindeer strain in the area. In winter, the strain numbers 2230 individuals (in 2003-2004) and it has parts of its grazing area in the proposed World Heritage Area.

Research project on Ecological Process Systems and Biocoenoses in the Central Norwegian High Mountains (2000-)
The principal aim of this interdisciplinary project being carried out by the University of Oldenburg in Germany is to investigate the structure, mode of function and dynamics of ecosystems in the high mountains of central Norway in different gradients. The investigation concerning the sub-oceanic area is being carried out near Dalsnibba, in the eastern part of the proposed World Heritage Area.

Plans relating to the Nærøyfjord area

Care and maintenance plan for the Styvi-Holmo Protected Landscape Area (1994)
This plan describes what the management authority considers is a desirable development for the area, based on the aims of taking care of the cultural landscape and retaining the highest possible diversity of species. The plan describes measures and means for the general care of the area. It will form part of a future, overall management plan for the Nærøyfjord area.

Plan for the protection of cultural heritage objects in the Borough of Aurland (1990)
This plan comprises a survey and appraisal of the value of material and immaterial cultural heritage objects in the Borough of Aurland. Its purpose is to provide background information which will ensure that the sites in question will be safeguarded during municipal planning processes.

Operating plan for the River Nærøy for 2002-2004
The purpose of this plan is to present measures that will help to preserve or improve the fish resources and biological diversity of the river. The plan is a management tool for owners of fishing rights, to ensure that the whole river is managed in a consistent manner.

Management plan for state-owned common land in Aurland for 1997-2000 (A new plan was distributed for comments in 2003)
This plan is intended to ensure that state-owned common land in the Borough of Aurland is administered in such a way as to promote the practising of traditional occupations and the utilisation of resources on the common land, as well as to look after nature conservation and outdoor recreational interests.

Action plan for nature and landscape management in the Borough of Aurland (1998)
As part of the municipal Agenda 21 strategy, this plan presents strategies and measures to ensure the sustainable utilisation of natural and landscape resources in Aurland. It is intended to help the principles of giving consideration to the landscape and sustainable management of resources to be incorporated into all activities in the borough. The plan was adopted as a Municipal Sub-plan on 11th June 1998.

Fishery management plan for the Borough of Aurland for 2001-2005
The purpose of this plan is to help to protect and improve the fish stocks and ensure the sustainable utilisation of the resources during commercial and hobby fishing. A data base containing 315 large and small lakes has been established as a basis for the work. It contains information on the size and height above sea level of the lakes, the number of fishing licences, the species of fish present in the lakes and the state of the stocks.

Area development project for Undredal for 1999-2003
This project, initiated by the County Governor for Sogn & Fjordane, has performed a broadly based appraisal of existing and new measures to ensure that the living village community will survive. The project has given priority to information, measures to invigorate traditional occupations, the development of new occupations, the cultural environment and cultural heritage sites, local cultural activities, co-ordination of public planning and the aquatic environment.

Action plan for outdoor recreation in the Borough of Voss for 2001-2004
Among the measures proposed by this plan is that two ancient tracks in the south-eastern part of the Nærøyfjord area should be restored to improve them for walkers. This will involve the clearance and restoration of the old ‘King’s Road’ near a waterfall (Stalheimsfossen) close to Stalheim, in consultation with the County Conservation Officer, and clearance work and safety measures along the old track from Stalheim to Jordalen.

Grazing land husbandry plan for the Borough of Aurland
This plan forms part of a nationwide information system for grazing land husbandry on marginal land. It contains maps and statistical data concerning grazing areas, livestock density, percentage losses and weight at slaughter. (http://beite.nijos.no/)

4g. Sources and levels of funding

National environmental conservation authorities

There exists both funds specially earmarked to follow up national World Heritage obligations and instruments to follow up conservation and protection resolutions in the fields of nature and cultural heritage management.

World Heritage follow-up
The Government budget allocates funds annually to the budget of the Directorate for Cultural Heritage to administer existing World Heritage objects (Chap. 1429, Item 72.9) and from 2004 a corresponding item will figure on the budget of the Directorate for Nature Management (Chap. 1427). These two Directorates will thereafter be able to co-operate and work together to follow up the individual World Heritage Area, as and when necessary.

Management of areas where nature is protected, and management of protected species
Since there are a number of protected areas in the Property (the West Norwegian Fjords), money will be made available for their upkeep and surveillance through sums allocated in the national budget to the Directorate for Nature Management (Chap. 1427) and the Norwegian Nature Inspectorate (Chap. 1426).

Management of protected cultural heritage sites
The County Councils of Møre & Romsdal, Sogn & Fjordane and Hordaland will be able to acquire funding for protected archaeological and historical monuments and sites in the Property (the West Norwegian Fjords) from the budget of the Directorate for Cultural Heritage (Chap. 1429).

Norwegian Cultural Heritage Fund

This national fund was set up in 2002 and began to function in 2003. Subject to certain conditions and specific rules, money can be sought from the fund on behalf of cultural heritage objects, buildings and environments that are worthy of being preserved.

National agricultural authorities

SMIL funds Funding for special measures in the cultural landscape related to agriculture is allocated by the County Governors of Møre & Romsdal, Sogn & Fjordane and Hordaland in response to applications from the local authorities. This grant scheme covers, among other things, measures concerned with archaeological and historical monuments and sites, cultural environments, the use of formerly cultivated land, and biological diversity.

The **Innovation Norway** allocates grants for investments in, or associated with, farming. Such grants are additional to money which the farmer can acquire from ordinary credit institutions.

The **Agricultural Development Fund** is allocated money through the income settlement for farmers and funds a variety of measures in farming, forestry and related rural industries. The borough council or County Governor provide information about the scheme.

Direct national budget funding. Grants towards other investments are provided directly through items on the national budget. This concerns, for example, long-term investments and commercial activities in forestry.

County and borough council authorities

Based on their own priorities, county councils and borough councils may allocate funds for measures and projects concerned with following-up World Heritage interests.

Voluntary work carried out by organisations and societies

Voluntary organisations and societies (see section 4h) invest a significant number of work-hours every year on the care and upkeep of the landscape and on providing facilities for outdoor recreation. Converted into wages for labour this represents substantial sums.

4h. Sources of expertise and training in conservation and management techniques

Local level

Local inhabitants

Many local inhabitants have substantial practical and theoretical knowledge of local traditions and culture. Through their business activities, societies and organisations, as well as their documentation efforts, local people help to pass on vital knowledge concerned with looking after values in the local community.

Organisations and societies

Many voluntary organisations and societies have members with specialised knowledge about various aspects of the areas, and they form an important resource for the present-day and future management of the World Heritage Area.

Natural history

Regional and local nature conservation organisations have broad knowledge of the natural history assets of the areas.

- Nature Conservation Association in Sogn & Fjordane, PB 470, NO-6853 Sogndal
- Voss Nature Conservation Society, PB 462, NO-5702 Voss
- Norwegian Wild Salmon Centre, PB 6, NO-6887 Lærdal

Outdoor recreation

Ensuring safe hiking in the mountains requires the provision of guides and the marking of paths, all the while bearing in mind vulnerable assets in the environment. Several regional and local societies arrange organised hikes in the mountains, provide information to the public and perform simple marking and clearing of paths, where consideration is given to vulnerable and dangerous areas.

- Ålesund-Sunnmøre Turistforening (www.aast.no)
- Stranda Turlag, NO-6200 Stranda (http://home.online.no/~slunde/turlag.html)
- Aurland Turlag,
- Lærdal Turlag, NO-6887 Lærdal
- Vik Turlag, NO-6893 Vik
- Idrettslaget Modig, NO-6896 Fresvik
- Voss Utferdslag, PB 55, NO-5701 Voss

Tourism

The tour operators in the fjord districts are attached to organisations which co-ordinate groups of visitors and channel the traffic.

- Geiranger Fjordservice AS
- Geiranger Skysslag (www.geirangerfjord.no)
- Aurland & Lærdal Tourist Association, NO-5745 Aurland
- Sognefjord Tourist Association BA, PB 53, NO-6898 Balestrand
- Hordaland Tourist Association, NO-4008 Dregge and NO-5835 Bergen

Cultural landscape

Several local organisations possess considerable knowledge of history, traditions and practical upkeep.

- **The Friends of Storfjord** (www.storfjordens-venner.no) is a local voluntary organisation whose motto is ”Protect our heritage”. About 1000 members work actively on the restoration and upkeep of the cultural landscape along Storfjord. The organisation has helped to preserve a large number of buildings that are of great value for the cultural history of the Geiranger area.

- **Aurland Natural and Cultural Heritage**, NO-5741 Aurland, is a local organisation which attempts to promote traditional, small-scale processing of local raw materials. It has considerable knowledge about the use of the cultural landscape, and encourages its traditional upkeep.

Other centres possessing knowledge and expertise:

- Aurland Naturverkstad BA, PB 27, NO-5741 Aurland
- Skjerdal Landskapspleie, NO-5745 Aurland
- Local History Archives in Aurland, Lærdal, Voss and Vik
- Sogn Agricultural and Horticultural College, NO-5745 Aurland
- Styvi Farm and Farm Museum, NO-5748 Styvi
- Stigen Farm, NO-6896 Fresvik

Borough Council Administration

The administrations of Norddal, Stranda, Aurland, Vik, Voss and Lærdal Borough Councils include such staff as a municipal environmental conservation officer, a municipal cultural affairs officer, a municipal planning officer and a municipal agricultural officer. These posts are held by persons with expertise within their fields.

Local authorities which have upland, state-owned common land have municipal committees whose members are specially knowledgeable regarding the surveillance and management of such areas and the rights of the general public there. Aurland and Lærdal have such committees.

Regional level

County Governors of Møre & Romsdal, Sogn & Fjordane and Hordaland
These offices have expertise in several fields and special responsibility for looking after the interests of the state in their respective county. The following divisions may be mentioned:
Division for Environmental Conservation Affairs has special expertise in the environmental field.

Agricultural Division has special expertise in agriculture.

Addresses:
County Governor of Møre & Romsdal, Fylkeshusa, NO-6404 Molde
County Governor of Sogn & Fjordane, Department for Environmental Conservation Affairs, PB 37, NO-6861 Leikanger
Department for Agricultural Affairs, PB 14, NO-6801 Førde
County Governor of Hordaland, PB 7310, NO-5020 Bergen

Møre & Romsdal, Sogn & Fjordane and Hordaland County Councils
The county councils have expertise in several fields. The following may be mentioned:
The Planning Department has special expertise in land-use planning and geology. It gives advice to the local authorities and provides external constraints and guidelines regarding land-use planning via the County Plans.
The Cultural Affairs Department has, among other things, special expertise regarding areas containing archaeological and historical monuments and sites.

Addresses:
Møre & Romsdal County Council, Fylkeshusa, NO-6404 Molde
Sogn & Fjordane County Council, Fylkeshuset. NO-6863 Leikanger
" " " Department of Cultural Affairs, PB 173, NO-6801 Førde
Hordaland County Council, PB 7900, NO-5020 Bergen

Regional bodies with special expertise in managing wild reindeer strains
The Geirangerfjord area:
- Ottadalen Wild Reindeer Committee, NO-2690 Skjåk
- Ottadalen Wild Reindeer Committee, NO-6320 Isfjorden

The Nærøyfjord area:
- Nordfjella Wild Reindeer Committee, NO-5728 Eidslandet
- Nordfjella Wild Reindeer Committee, NO-5745 Aurland
- Fjellheimen Wild Reindeer Committee, NO-6893 Vik i Sogn

National level

Directorate for Nature Management and Norwegian Nature Inspectorate
This is a national body concerned with nature management and has specialists in all fields in its area of responsibility. It includes a division that performs fieldwork.

Directorate for Cultural Heritage
This is a national body that manages the cultural heritage and has specialists in all fields in its area of responsibility.

Norwegian Institute for Nature Research
This is a national research institute employing highly qualified specialists in natural history, biology, ecology, etc.

Norwegian Institute for Cultural Heritage Research
This is a national research institute employing highly qualified specialists in cultural history, etc.

Universities and museums
Institutions with relevant, special expertise in natural and/or cultural history are:
- Sogn & Fjordane Regional College, Department of Natural History, PB 138, NO-6851 Sogndal
- University of Bergen, PB 7800, NO-5020 Bergen
- Museums

4i. Visitor facilities and statistics

Visitor figures

Probably more than 1 million people a year visit the proposed World Heritage Area.

The fjord districts concerned can be reached by motor vehicle, train, ship or boat, and are partly accessible on foot. Every business in the tourist industry, in and near the area, reports its visitor figures annually. However, it is a demanding task to record the total number of visitors precisely. The basis for monitoring the development is, nevertheless, considered to be very good because of the large number of recording points.

Examples of annual recording points in the area:
- vehicles per day per year on the most important roads in the area
- passengers on the railway (Flåm Line)
- number of calls by cruise ships in the fjords in question
- number of passengers on scheduled vessels
- number of passengers on ferries
- number of guest-days at overnight accommodation facilities inside and outside the area
- number of visitors at various tourist attractions and visitor centres
- number of people on guided excursions in the fjord districts

Most visitors experience the natural history, countryside and scenery from a distance, from the deck of a ship, from a road or from one of the villages in or close to the area. Few actually physically go out into the steep, often more or less inaccessible terrain.

Geirangerfjord had 151 calls from cruise ships in 2003.
Nærøyfjord and Aurlandsfjord had a total of 157 calls in 2002.

The Norwegian Tourist Board has supplied the following figures for visitors to the fjords in question in 2002:
Geirangerfjord: **378,000** persons (the third most visited natural attraction in Norway)
Nærøyfjord: **296,800** persons (the sixth most visited natural attraction in Norway)

These figures are calculated on the basis of the number of passengers on cruise ships, scheduled passenger vessels and chartered vessels. It is estimated that a further 200,000 travel through the Geiranger area by car or coach. Hence, the actual number of visitors will amount to some 500,000-600,000. A similar figure is also realistic for the Nærøyfjord area.

Communications

Compared to other fjord districts with a comparable geographical location, the choice of communications available in these two areas is very good. Good quality roads that are open in winter link both areas to other parts of the national communication network, to trunk roads, mainline railways and airports, both eastwards towards inland areas and westwards towards the coast. However, heavy snowfalls and rock falls may briefly isolate them, but avalanche protection works and the construction of many tunnels have reduced this problem.

Geirangerfjord area

Roads (distances from Geiranger)

Railway station (Åndalsnes)	98 km (bus connection)
Airports (Vigra, Ålesund)	125 km (bus connection)
Oslo	430 km (bus connection)
Bergen	345 km (bus connection)
Trondheim	378 km
Nærøyfjorden	320 km

Scheduled boat services
Ferry:
Geiranger – Hellesylt (65 min) 4–8 sailings each way 1 May – 30 Sept.
Valldal - Geiranger (140 min) 2 sailings each way 15 June – 15 Aug.
Eidsdal - Linge (10 min) ca. 40 sailings in summer, 25 at other times.

Coastal express:
Calls daily in Geiranger, except in winter.

Sightseeing boats:
Guided round trips (1.5 hrs) on Geirangerfjord, departing from Geiranger, from May to September. Opportunities to go ashore to visit farms along the fjord.

Nærøyfjord area

Roads (distances from Aurland)

Mainline railway station (Voss)	77 km (bus connection)
National airport (Sogndal)	64 km (bus connection)
International airport (Bergen)	192 km (bus connection)
Lillehammer	285 km (bus connection)
Oslo	324 km

Scheduled boat services

Ferry:

Gudvangen-Kaupanger-Lærdal (3 hrs) 4 sailings daily in summer.

Passenger vessels:

Flåm-Bergen: Express boat, 2 sailings daily in summer.

Flåm–Gudvangen: 4 sailings daily in summer, 1 in winter.

Flåm-Balestrand: 2 sailings daily in summer.

Accommodation

Both areas have been popular goals for tourists for some 150 years, and a wide choice of accommodation capable of serving many people is available in and near the nominated areas. A complete list of overnight accommodation in and near the Geirangerfjord and Nærøyfjord areas can be obtained from the Directorate for Nature Management.

Geiranger area

In the proposed World Heritage Area

Geiranger	4 hotels with a total of 800 beds
Geiranger	130 camp site cabins
Herdalssætra	20 beds

Within a short distance of the proposed World Heritage Area

Norddal	Guest house with 25 beds
	2 cabins with a total of 12 beds
Hellesylt	60 beds
Stranda	140 beds

Approximately 200,000 guests were recorded as having stayed overnight in Geiranger itself in 2002, according to records from hotels and camp sites (cabins, tents, campers and caravans).

Nærøyfjord area

In the proposed World Heritage Area (5 firms):

Undredal	holiday flats
Gudvangen	60 hotel beds and camp site cabins

Within a short distance of the proposed World Heritage Area:

Flåm	hotel, guest house, cabins, camp site
Stalheim	278 beds all told in hotels, holiday flats and cabins
Aurlandsvangen	hotel, guest house and cabins
Vik	hotel, cabins and camp site
Voss	hotel, cabins and camp site
Lærdal	hotel, cabins and camp site

A total of 198,400 guests were recorded as having stayed overnight in hotels and camp sites (cabins, tents, campers and caravans) in Aurland and Lærdal in 2002.

Restaurants and food shops

Because these fjord districts have been serving tourists for so many years, a considerable number of varied service facilities are available in and near the areas. They include restaurants with international cuisine and others serving local, traditional fare. In addition to ordinary supermarkets and smaller food shops, most of the larger places have an increasing range of shops selling locally produced and processed food, chiefly meat, cheese and bakery products.

A complete list of businesses providing meals and food in and near the proposed World Heritage Area can be obtained from the Directorate for Nature Management.

Local museums and visitor centres

There is a wide range of museums and visitor centres in and near the two areas. The most important or best known ones include:

Geirangerfjord area

Norwegian Fjord Centre in Geiranger

National visitor centre providing information on the natural history, scenery and culture of the region. Permanent and temporary exhibitions, and a multimedia show presenting the fjord landscape throughout the year.

Herdalssætra

A working, upland dairy farm with a long, interesting history. The largest goat farm in Norway, with 400 – 450 goats, as well as cattle, sheep and horses. Provides information about how such transhumance dairy farms have been run down the centuries. Demonstrations are given of how cheese and other traditional food products are made. The cultural landscape is well looked after and the valley is a major tourist attraction. The farm has as many as 34 buildings, the oldest dating from 1800.

Geiranger Geological Park

An unusual discovery park displaying minerals and rocks. Accessible to wheelchair users.

Destination Geirangerfjord-Trollstigen AS
Tourist information office in Geiranger, providing information on attractions, activities and overnight accommodation in the Geiranger area.

Nærøyfjord area
Tourist information offices
Located in the local administration centres, these offices provide information on attractions, activities and overnight accommodation in the Nærøyfjord area.

Styvi Farm and Farm Museum
A fjord farm on Nærøyfjord, worked in summer and providing information on the cultural landscape, traditional farm methods and craft techniques. Overnight accommodation and meals provided to 1115 visitors in 2002.

Undredal Stave Church built in 1147
The smallest stave church in Norway. 7500 visitors in 2002.

Stalheim Hotel
Private collection of paintings with motifs from Stalheim and Nærøydalen, and a museum displaying the history of the local buildings and culture. 4000 visitors guided in the museum in 2002, and a total of 275,000 visitors to the hotel.

Norwegian Wild Salmon Centre, Lærdalsøyri
National visitor centre providing information about Norwegian wild salmon. 21,500 visitors in 2002. The River Nærøy in the Nærøyfjord area has a stock of salmon.

Local History Centre at Aurlandsvangen
Provides information on the local history of Aurland. 8000 visitors in 2002.

Guiding

Several organisations offer professional guiding services for visitors wanting information on the natural and cultural heritage. They include:

Geirangerfjord area
- Guided sightseeing on the fjord, with walks to fjord and mountainside farms, and to the largest waterfalls.
- Guided excursions to Herdalssætra.
- Professional guiding on sightseeing vessels, the coastal express ships, ferries and cruise ships.
- Guided hikes on several glaciers, including Hestbreen and Flydalsbreen.

Nærøyfjord area
- Guided canoeing on Nærøyfjord.
- Guided kayaking on Aurlandsfjord from Flåm.

- Guided boat trips for small groups from Flåm to Gudvangen.
- Guiding at Stigen Farm, with opportunities for kayaking on the fjord and combined canoeing and hiking from Fresvik to Stigen.
- Professional guiding on sightseeing vessels and ferries.
- Guided excursions to the caverns at Gudvangen to experience the anorthosite from the inside.
- Guiding in Undredal Stave Church and Undredal Goat Cheese Factory.
- Various guided mountain hikes from Flåm.

Goals for visitors

Both areas have many sights and attractions. However, the most important thing is to experience the fjord scenery as a whole. Popular goals include:

Geirangerfjord area

- Marked paths for long and short hikes in the mountains. Paths from Sunnylvsfjord and Geirangerfjord to all the fjord and mountainside farms.
- Several waterfalls, including the Seven Sisters, Friaren, Brudesløret, Hellesyltfossen and Grindalselva.
- Dalsnibba, a mountain top 1500 m a.s.l. A viewing point accessible by car.
- Flydalsjuvet. View of a deep ravine from RV-58.
- Ørnesvingen 600 m a.s.l. A bend on the main road, offering a marvellous view of Geirangerfjord.
- Abandoned fjord and mountainside farms like Skageflå, Knivsflå, Blomberg, Syltavika and Matvika, Oaldsbygda, Me-Åkerneset near Geirangerfjord and Sunnylvsfjord.
- Upland transhumance dairy farms like Herdalssætra in Norddal, Kvanndalen and Vinsås in Geiranger.
- Knuten. Negotiable stretch of the original road to Geiranger, completed in 1889. An example of outstanding engineering that is included in the National Conservation Plan for Roads, Bridges and Road-related Cultural Heritage Objects.
- Geiranger Church (built in 1842). Octagonal church, beautifully situated with a fine view of the fjord. The church is open to visitors in summer.

Nærøyfjord area

- The road to Nåli, a cotter's farm, and the Medieval 'King's Road', a path near the Stalheimfossen waterfall, have benches and tables, as well as two large boards with information about the natural history of the area (in Voss).
- Many marked paths following ancient routes to former transhumance dairy farms. Attractive paths are shown on the Stølsheimen-Nærøyfjorden (1:100 000) (Statens kartverk 1997) and Lærdal (1:50 000) (Statens kartverk 2000) maps.
- The ancient track used by postmen from 1660 to 1858 between Bleiklindi and Styvi (5.5 km) has been renovated for hiking. Each May, Styvi Farm Museum, Aurland Tourist Association and the County Governor's Office in Sogn & Fjordane organise the 'King's Walk' along this track.
- The Institute of Geology at the University of Bergen arranges annual excursions to demonstrate features of the outstanding Quaternary geology near Stalheim.

Publications and web sites

Geirangerfjord area

Nydal, A. 2003: *Langs Sæterråsa*.
H.M. Dronning Sonja 2002: Klangbunn: *En personlig beretning i ord og bilder*.
Bruaset, O. & A. Aasheim 2001: *Geiranger: Juvel i fjordlandet*.
Døving, K.D. 1997: *Herdalen*.
Flydal, A. 1996: *Fjorden, fjellet og folket. Geirangerfjorden, Indre Storfjord med Tafjorden*.
Søvik, H. 1995: *Storfjordens Venner, 1975-1995*.

www.stranda.kommune.no Local information site describing the work leading up to the World Heritage nomination of the Nærøyfjord area.
www.geiranger.no Information portal for Geiranger and Geirangerfjord. Information in English and German about communications, attractions, overnight accommodation, excursions, activities, etc.
www.geirangerfjord.no Joint web site for the tourist industry in the area. Carries maps and information in English and German about excursions to fjord farms, old roads and tracks, and scenic attractions.

Nærøyfjord area

The Nærøyfjord area is presented in many handbooks and guides aimed at tourists and tourism. The local tourist associations issue good, local guides and brochures each year. Aurland and Lærdal have a joint brochure.

Thue, J.B. 2003. *Båtreisa Bergen – Sogn*. Forlaget Skald, Valdres trykkeri 2003. (A travel account describing Frønningen, Nærøyfjord, Aurlandsfjord and Flåm in detail in separate chapters.)

Djupedal, T. 1997. *Undredal. Kyrkja og bygda*. Selja forlag, Undredal sokneråd 1997.

www.verdensarv.org Local information site describing the work leading up to the World Heritage nomination of the Nærøyfjord area.

www.fjordarv.no Web site for the Norwegian Fjord Heritage Foundation, which aims to develop high-quality services for tourists in the fjords. It presents the effort being made jointly by Aurland Natural and Cultural Heritage and the village of Undredal, and carries much detailed information about the World Heritage Area.

www.fjord.info Entry portal for all kinds of information on Sogn & Fjordane (in English)

www.alr.no The web pages of the Aurland and Lærdal Tourist Association with tourist information on ”The fjords” – Aurland – Flåm – Lærdal.

www.visitflam.com Web site run by Flåm Utvikling.

www.visitvoss.no Tourist guide from Voss Tourist Information Office.

www.sognefjorden.no Web portal for tourist information about the Sogn region. Information on activities and special attractions, and links to local tourist information sites.

Photographs from the area can be found on www.aurland.com www.sognafoto.no www.vikjavev.no www.imageshop.no/flam www.hist.uib.no/vossnow/

Film & TV

Over the years, many films and TV programmes have been made that contain footage from the areas dealt with here. Among the more recent ones are:

Geirangerfjord area

Der elden slokna. NRK (Norwegian Broadcasting System) programme made in 1999 (55 min) describing life on the farms along Storfjord, traditions, the ways they were run, communications, etc.

Storfjordens venner. NRK programme made in 1990 (14 min) about the founding of the society, the Friends of Storfjord, and the work it was doing to preserve the fjord and mountainside farms in the area.

Fantesti og Keisarveg – Geirangervegen 100 år. TV production from 1989 (39 min). Made by Oddgeir Bruaset.

På cruise og tvers i Geirangerfjorden. TV production from 1981 (68 min) about cruiseship tourism and the scenic attractions in Geirangerfjord. Made by Oddgeir Bruaset.
Fjellgårder i Geiranger. Documentary from 1952 (1 hr. 36 min). Norsk Film / NRK.

Nærøyfjord area

Flåm and its scenic gems. Souvenir video (30 min). Made by E.A. Vikesland Kunstforlag in 2001. Contains: ”Welcome to Flåm: Myrdal”, ”Flåm Valley: Rallarvegen”, ”Aurland: Aurlandsfjord, Undredal, Nærøyfjord, Gudvangen, Otternes, Flåm Church”.

The struggle for life – a film about the Atlantic salmon. Vestvisjon, Førde 1996. Shown at the Wild Salmon Centre in Lærdal. The film was awarded the ”Sølvruten” prize for the best documentary made in Norway in 1996.

Nærøyfjorden - ein norsk juvel (Nærøyfjord - a Norwegian gem), an NRK programme from 1998.

Frå Fresvik til Stalheim (From Fresvik to Stalheim) A programme being made by NRK. To be shown in 2004.

Sommerdag i Sogn og Fjordane (A summer’s day in Sogn & Fjordane) An NRK programme about Sognefjord, including a visit to Stigen, a mountainside farm in Nærøyfjord. Shown on 20 May 2002.

Norge Rundt. ‘A trip on the Gudvangen ferry’ part of a programme shown on Friday 19 September 2003. Produced by NRK in 2003.

Rescue services

The fjord districts have a well-organised life-saving service based on co-operation between public bodies and voluntary organisations. The people involved are well trained and well equipped to tackle difficult tasks in demanding terrain, and comprise the:

- **Red Cross**

Local sections composed of volunteers exist in all six boroughs. They turn out at short notice on search and rescue operations.

- **Civil Defence**

State-run organisation based on volunteers, with local groups in all the boroughs. They turn out at short notice on search and rescue operations.

- **Fire and ambulance services**

Local fire and ambulance stations in all the municipal centres. 24-hour emergency service.

- **Rescue helicopter**

25 min from the Geirangerfjord area (Ålesund)
20 min from the Nærøyfjord area (Regional Hospital in Førde)

4j. Property management plan and statement of objectives

A comprehensive management plan for the Nærøyfjord area is nearing completion and will be finished in spring 2004. It covers the nature conservation areas and inhabited parts of the proposed World Heritage Area. A draft of the plan can be found in Annex 3.

A similar plan will be prepared for the Geirangerfjord area during 2004. Work on the plan will commence as soon as the designation of the Geiranger – Herdal Protected Landscape Area has been adopted by Royal Decree in spring 2004.

4k. Staffing

The following employees are responsible for maintaining the qualities in the areas.

Geirangerfjord area

Norwegian Nature Inspectorate (SNO)
Plans exist to set up a new post as warden of the Geiranger – Herdal Protected Landscape Area.

Nærøyfjord area

Aurland Municipal Committee for Marginal Land
Operates a wardening system covering general environmental inspection tasks, supervising hunting and fishing in upland areas, performing fish cultivation work, and looking after its property (cabins, boat houses and boats).

Nordfjella Wild Reindeer Committee
Employs inspectors during the open season in the Nordfjella Wild Reindeer District.

Owners of rights on the river in the Nærøydalen valley
Privately-run inspection of the River Nærøy

Local police offices
Police officers undertake some inspection of salmon rivers and supervision of hunting activities, in addition to general policing work, which also includes fighting environmental crime.

Mickael Hov's contract with the County Governor for Sogn & Fjordane
Performs upkeep of the cultural landscape on the stretch from Styvi to Holmo.

Botolv Hov's contract with the County Governor for Sogn & Fjordane
Performs inspection and surveillance on the stretch from Styvi to Holmo

Norwegian Nature Inspectorate (SNO)
Performs surveillance in the Stølsheimen area. Plans exist for 2 new posts to perform surveillance in Nærøyfjord and Bleia.

5 Factors affecting the area

5a. Development pressures

As much as 96% of the nominated area is already, or will be shortly (during 2004), subject to special provisions pursuant to national protection regulations. Consequently, both development work and extraction will be prohibited here without thorough, prior environmental impact assessments of any future applications to weigh these applications up against the reasons for the protection, environmental concerns and the protection provisions.

Any new activity in the proposed World Heritage Area will require the following evaluations:

- The development or activity must be proven to be in the National interest of the State.
- The proposal cannot be undertaken in any alternative way or take place or be located in any other location outside the designated area or the area proposed for designation.
- The proposal does not detrimentally harm the integrity of the proposed candidate World Heritage Area or the World Heritage Area already designated and/or any of the special qualities for which the area is proposed for designation or was designated.
- The economic benefits to the local community of undertaking the development or activity significantly outweigh the environmental impact of the proposal.

As a consequence of the nomination process in 2003, Norwegian Ministry of Defence plans regarding more extensive use of an old-established artillery range just outside the nominated area were shelved.

Quarrying and mining

Mineral resources that are currently commercially valuable are found in both areas, and the larger deposits may have great commercial potential some time in the future. However, all forms of mineral extraction, mining and quarrying are prohibited in the protected areas without a thorough, prior environmental impact assessment, which will place great weight on environmental concerns. Should major, environmentally positive, technological innovations, combined with underground working, make extraction still more attractive in the future, such assessments will nonetheless have to be undertaken before working can be permitted in the nominated area.

Geirangerfjord area
Peridotite quarrying is now an important industry in the Borough of Norddal. A large quarry is being worked at Sunnylvsfjord (Raudbergvika) and plans exist for another at Onilsa in Tafjord. However, both quarries are located outside the boundaries of the proposed World Heritage Area.

Nærøyfjord area
The anorthositic rocks in the Nærøydalen - Mjølfjell area are of interest for industry. Underground working from one location has taken place at Jordalsnuten in Nærøydalen for the last 10 years. Temporary storage takes place on the surface before the rock is transported from the area by boat from Gudvangen. If disturbance on the surface increases, the landscape qualities may be reduced.

The opening of any new sites for underground working will only be approved in response to careful environmental impact assessments which will place great emphasis on environmental concerns. Should it prove profitable to extract anorthosite on a larger scale, the Gudvangen deposit is so large that it will be able to justify the cost of making the extraction practically ”invisible” in the Nærøyfjord area. Previous studies have shown that any future working may be possible using an extraction site outside the protected area near Gudvangen, followed by direct transport out of the fjord using one lighter a day. New quarries or temporary surface storage of stone are out of the question. This study placed decisive weight on accommodating to the environment and that any future working must not come into conflict with the protection regulations and any World Heritage status for the area.

Military defence

The Mjølfjell artillery range immediately south of the Nærøyfjord area covers approximately 126 km^2 and contains two demarcated fields of fire. The remainder of the area is looked upon as a buffer and security zone (at least 1 km broad).

The possibility of using the range as a training ground for fighter planes, too, was assessed in spring 2003. Following detailed consideration, the defence authorities decided to halt further planning.

Road construction

Road building during the 1990s resulted in the trunk road from Oslo to Bergen achieving a high standard in this area. Several tunnels were constructed to reduce distances, alleviate traffic problems, avoid ferry connections and avalanche hazards, and reduce scars in the landscape. There are nine tunnel entrances in the Nærøyfjord area.

In the Geiranger area, it will be necessary in the future to undertake work to reduce the avalanche hazard on several exposed stretches of road. This may entail the construction of new tunnels, or of protective roofs above existing roads.

Farming

Traditional farming with livestock grazing on marginal land is not looked upon as coming into conflict with protection interests in the area. Any future plans to change the farming practice on parts of the protected areas will need to be approved by the management authority.

No development pressure on account of increased farming exists now in the proposed World Heritage Area. The problem is indeed the opposite. Farms in the area are small and their land is often steep and difficult to work. National farming policy, moreover, favours larger units, which has resulted in poor profitability and a reduction in traditional animal husbandry. A consequence of this is that several plant communities and species associated with semi-natural grassland are now threatened. Reduced grazing pressure may lead to loss of biological diversity and changes in the scenery. If this trend continues, there will be less diversity in the landscape and the areas will become less accessible because old paths and tracks, and presently treeless areas, will become overgrown by scrub.

The national agricultural policy for 2000-2001 included an aim to stimulate product development and niche production in keeping with consumer demand (White Paper no. 92). Hopefully, this objective will, in the long term, stimulate the development of local products that can give better profitability.

Settlement and disturbance of the terrain

No plans exist today for new activity in the inhabited areas that is considered to endanger the protection values in the proposed World Heritage Area. It is conceivable that flood-prevention work will need to be considered in the vicinity of the inhabited areas at some time in the future if rivers change their course, or climatic conditions shift radically. Similarly, it may be necessary to secure existing settlements from rock falls and rock and snow avalanches by constructing earth and stone banks if climate change results in greater risk of falling rocks or avalanches. Generally speaking, this is not considered to be relevant because long experience has brought considerable knowledge about where buildings and fields need to be sited to be safe from the forces of nature. Nevertheless, banks were constructed in 1998 to protect buildings and traffic in Gudvangen (the Nærøyfjord area) from avalanches and air blasts from two extremely active avalanche sites on the mountainside west of the village.

Hydroelectric power

There has been some interest for planning micro- and mini-hydroelectric power stations in connection with a few inhabited areas. These concern small plants to produce power for private use. Such plants may result in the removal of long stretches of aerial wires from the existing power supply grid and thus prove to be aesthetically highly beneficial. Any future applications for licences will be given a total evaluation with respect to existing regulations, the scale of the disturbance and possible environmental benefits.

Aquaculture

Sunnylvsfjord and Geirangerfjord are considered to have comparatively little potential as sites for fish cultivation. The risk of avalanches, the knowledge that the area is prone to the occurrence of toxic algae, and exposure to wind are negative factors, whereas the water depth and current conditions are positive factors favouring the location of plants here. Its status as a protected landscape area prohibits all disturbances which may alter the nature or character of the landscape. The management authorities take decisions on this in each individual case. Three applications to commence shellfish cultivation in Sunnylvsfjord have recently been refused.

Fish cultivation has been banned in the whole of Sognefjord, including Aurlandsfjord and Nærøyfjord, to protect the local wild salmon strains.

5b. Environmental pressures

Viewed in a broader perspective, the local environmental pressures in the area are few and not dramatic, but external environmental pressures may potentially occur as disasters.

Discharges to the atmosphere or water
No industry or other activities that handle or produce environmentally hazardous materials are found within the Property, or its immediate vicinity.
The handling of artificial fertilisers, livestock manure and spray chemicals in agriculture is controlled by national regulations that help to reduce the risk of run-off.

Physical disturbances
No illegal building activities have been registered in the Property in recent years.

Behaviour and activities
No illegal **activities** have been registered in the Property in recent years. Motorised traffic outside the existing road network and on marginal land is strictly regulated through special legislation and is not considered to pose a real threat to the protection values.

Controlled hunting and fishing take place. Wild reindeer hunting is regulated by specially appointed Wild Reindeer Committees, whose decisions may, if necessary, be overruled by national authorities. Surveillance is performed regularly during the open season. The shooting of small game (mainly willow grouse, ptarmigan and hares) is controlled through the sale of shooting licences, which is administered by the municipal committees that are responsible for overseeing rights on state-owned common land, and by the owners of privately owned land. Fishing regulations also ensure the general public the right to fish provided a licence is purchased. Ordinary surveillance of fishing and small-game hunting takes place. Statistics also exist regarding the number of red deer, elk and reindeer shot in the various hunting countries in the area, and also for fish taken in lakes on state-owned common land.

5c. Natural disasters

Rock avalanches and rock falls
Many scars left by former, large avalanches and rock falls are obvious in both the Geirangerfjord and Nærøyfjord areas, where mass-movement processes are extremely active. The last major disaster took place in Tafjord (the Geirangerfjord area) in 1934. 23 people perished when an initially 62 m high flood wave (tsunami) swept over the settlements along the fjord.

At Åkerneset in Sunnylvsfjord (the Geirangerfjord area), a 6 million m^3 large bluff on the mountainside is moving and may crash into the fjord. An approximately 700 metre long fissure 800 m a.s.l. is opening at a rate of 2-3 cm a year. If the entire bluff falls at once, it will produce a tsunami that will sweep over the built-up area in the centre of Hellesylt to a height

of 6 metres. In co-operation with the Norwegian Geotechnical Institute, the local council has installed automatic measuring instruments which monitor the opening of the fissure through daily measurements. The data are transferred to the council offices by mobile telephone.

Snow avalanches
Both the Geirangerfjord and Nærøyfjord areas have very active fjord slopes with frequent avalanches in winter, and avalanches have taken many lives over the years (see section 3a). Physical actions, deliberate location of buildings and great local knowledge about places and periods that are prone to avalanches, evaluated on the basis of snow conditions and temperatures, mean that such avalanches do not pose a threat. Climate changes which result in changes in snow and wind conditions may, nevertheless, represent a potential threat to existing settlements in the area.

No knowledge exists in 2002 of other potential natural disasters that might hit the property in a manner that makes it appropriate to have special contingency plans, or other measures.

5d. Visitor and tourism pressures

Both Geirangerfjord and Nærøyfjord have been goals for tourists for a great many years. As a consequence of the influx of substantial numbers of visitors over the past 150 years, significant expertise has been developed regarding the handling of large numbers of visitors without the attractions being depreciated. Over time, the areas have proved to have a capacity and tolerance for such numbers. The awareness that it is the landscape as a whole which is the commodity means that the area has the best premises for meeting future challenges.
The steep, almost inaccessible landscape means that traffic is channelled naturally to the fjords with their ships and to the main thoroughfares. No wear and tear, pollution, disturbance of animal life or environmental crime has so far been linked with tourist traffic.

Positive impacts
A strong awareness of the significance of the landscape qualities as a product for tourism helps to promote the notion of preservation. Tourism creates a market for niche products in traditional farming and stimulates the upkeep of landscape qualities which are important for biological diversity and enjoyment of scenery.

Negative impacts
Both areas have localities with plant or animal life that is specially vulnerable in parts of the year. Indiscriminate guiding or provision of information may lead to disturbances that can harm the natural environment. The right to free access is an important aspect of Norwegian cultural heritage and, except in nature reserves, it is not normal practice in Norway to restrict traffic on foot or on skis on marginal land.

The presence of cruise ships and other large vessels in the fjords may hinder the leisure use of kayaks, canoes and small boats there.

There has been some discussion regarding whether waves generated by tourist vessels in the fjords can lead to erosion in the shore zone. Since no such damage has so far been found, the implementation of measures to safeguard against it has not been considered.

Ships represent a potential pollution hazard if one founders. A pilot is required to be on board any ship that enters confined waters, and no mishap or accident has so far occurred which suggest that special contingency plans should be drawn up.

5e. Number of inhabitants in the area

Residents in the Geirangerfjord area: 230 persons (figure from 2003)
Residents in the Nærøyfjord area: 243 persons (figure from 2001)

6 Monitoring

6a and b. Key indicators for measuring the state of conservation and administrative arrangements for monitoring the Property

The responsibility for monitoring is shared among a number of parties, some of whom have formal responsibility (see Chap. 4) and some scientific responsibility (they carry out the work). Some of the statistical material can be used directly, but the more sophisticated scientific investigations require analysis over time.

A number of investigations have been carried out during the past 30-40 years which have direct or indirect significance for the conservation and management of values in the West Norwegian Fjords.

Relevant registrations and key figures which only cover the proposed World Heritage Area will be:

Topic: Nature management

Protected areas/category	Number	Area (hectares)
Protected landscape areas	3	114,224
Nature reserves	5	4009
Natural monuments	1	0

As the authorities in charge of their management, the County Governors of Møre & Romsdal, Sogn & Fjordane and Hordaland are responsible for maintaining a watch on the status of the protected areas. The management plan, expected to be completed in 2004, will pave the way for arrangements to monitor the values being protected.

The recording of biological diversity performed by the local authorities from 1998 to 2002 (103 localities) and future supplements will provide background data for a number of key indicators. Annual catch and bag statistics for salmon, freshwater fish, deer, elk and small game give additional ones. A selection of earlier registrations of special species, biotopes, habitats and environments may form a basis for new inventories (e.g. previous investigations of the marine environment, areas with special ornithological value, the stand of the arctic poppy sub-species, and the common seal colony in Nærøyfjord). Special attention will be given to species placed on the Norwegian Red List and those for which Norway has special responsibility.

In the Geiranger area, Stranda Borough Council and the Norwegian Geotechnical Institute have installed measuring instruments to automatically monitor the development of fissures in an area with a particularly serious landslide hazard.

Local supervisors, the police and the Norwegian Nature Inspectorate will report annually on any *guiding* and *environmental crime* taking place in the Property.

Topic: Management of archaeological and historical monuments and sites, and cultural environments

The cultural heritage authorities (the Directorate for Cultural Heritage, the County Council Cultural Heritage Offices and the local authorities) maintain records of changes in the area that are of significance for cultural heritage objects which are worthy of preservation. Routines for reporting will be dealt with in more detail in the management plan for the proposed World Heritage Area.

Relevant indicators are the number of buildings and their immediate surroundings protected by Individual Protection Orders, the number of automatically protected archaeological and historical monuments or sites, new finds and registrations, restoration work performed by private owners, local councils, voluntary organisations or cultural heritage authorities, and reports on the state of selected cultural environments.

Local supervisors, the police and the Norwegian Nature Inspectorate will report annually on any *guiding* and *environmental crime* taking place within the Property.

Topic: Agriculture and cultivated land

The agricultural authorities allocate production subsidies on the basis of detailed reports on farming activity. Based on the property numbers of the farms, it is possible to monitor any changes in the farming industry that may have significance for the upkeep of the landscape.

Relevant key indicators may be the number of farms, the acreage being worked, the number of livestock, the area of grazing used, animal races, transhumance farming, etc.

Some cultural landscapes of particularly high value are found in each area. Reports submitted regarding local, regional and national measures and grant schemes directed at upkeep, restoration and preservation of particularly valuable farmland will indicate the trend.

Relevant key indicators will be considered more closely when the general management plan is prepared.

Topic: Tourism and outdoor recreation

Tourism in the Geirangerfjord and Nærøyfjord areas is organised through local and regional organisations which report annually on the trend in tourism as a whole. These reports also include figures from transport firms in the areas (buses, coaches and vessels).

Relevant key indicators may be the number of visitors, overnight stays, lengths of stay, activities, the number of passengers (bus, coach, ferry, cruise ship and other transport companies) and the number of visitors.

Topic: Land-use management in the inhabited areas (6% of the area)

Based on municipal activities concerned with planning work and building applications, it is possible to draw up simple reporting routines which give indications of landscape changes resulting from new housing or changes in land use.

The national register of Real Properties, Addresses and Buildings (GAB) is regularly updated as regards new buildings with a base in excess of 15 km^2. The data base of disturbance-free areas of countryside contains up-to-date information on roads, power lines and telephone lines, and other infrastructures.

Key indicators and reporting routines will be dealt with in more detail when the general management plan is prepared.

Topic: Other relevant issues

Climate data for some meteorological stations are available from the Norwegian Meteorological Institute.

Demographic figures are available from Statistics Norway.

Changes in legislation that affect the management of the area.

6c. Results of previous reporting exercises

The following is just a small selection of the relevant data available for the area. Relevant key indicators will be defined in detail in connection with the general management plan that is being prepared and will provide a basis for monitoring the conservation values and acquiring data for the UNESCO Periodic Reporting Programme.

Topic: Nature management	**Numbers**
Localities investigated for biological diversity (as of 2003)	103
Recorded Red List species	71
Recorded species for which Norway has special responsibility	27
Phoca hispida - minimum number recorded in Nærøyfjord in 1996	29
Marine environment (hydrography, sediments, benthos, littoral at 21 stations)	(various figures)
Rangifer tarandus - number in winter in three separate strains	4630
Papaver radicatum ssp. *relictum* - number of individuals at Bleia in 1994	100
Salmo salarisa - Atlantic salmon stock (Nærøyelva), count of spawning fish in 2000	127
Landslide monitoring (6 mill. m^3 of rock in Sunnylvsfjord)	2-3 cm/yr

Topic: Archaeological and historical monuments and sites (2003)	**Numbers**
Registered standing buildings from before 1900 (Geirangerfjord area)	201
Registered ruins (Geirangerfjord area)	228
Registered standing buildings from before 1900 (Nærøyfjord area)	304
Registered ruins (Nærøyfjord area)	362

Topic: Tourism (2002)	Numbers
Passengers travelling to the Property by ship	674,800
Cruise ships	308
Overnight stays in Geiranger	ca. 200,000
Overnight stays in Aurland and Lærdal	198,400

Topic: Agriculture (2003)	Numbers
Cultivated area being worked (ha)	345
Grazing livestock (cattle, goats, sheep and horses)	8552
Farms being worked	34

Topic: Inhabitants (2003)	Numbers
Residents in the Geirangerfjord area (2003)	230
Residents in the Nærøyfjord area (2001)	243

7 Documentation

7a. Photographs

Annex 2
100 colour slides with descriptions.

7b. Copies of management plans

Annex 3
Present management framework and plans.

7c. Bibliographies

Selected documents, draft plans and adopted plans concerning nature conservation management, physical planning and management

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7d. Addresses where inventory, records and archives are held

Riksarkivet (National Archives of Norway)
PO Box 4013 Ullevål stadion, NO-0806 Oslo. E-mail: riksarkivet@riksarkivaren.dep.no

Statsarkivet i Bergen (Regional State Archives)
Årstadveien 22, NO-5009 Bergen. E-mail: statsarkivet.Bergen@Riksarkivaren.dep.no

Statsarkivet i Trondheim (Regional State Archives)
PO Box 2825 Elgesæter. NO-7432 Trondheim.
E-mail: statsarkivet.trondheim@Riksarkivaren.dep.no

The Digital Archive a public service from the National Archives in Norway
http://digitalarkivet.uib.no

Statistisk sentralbyrå (Statistics Norway)
PO Box 8131 Dep., NO-0030 Oslo. E-mail: ssb@ssb.no

Norwegian University of Science and Technology
Institute of Archaeology and Cultural History, Museum of Natural History and Archaeology
NO-7491 Trondheim.
E-mail: arkeologi@vm.ntnu.no

NIKU (Foundation for Cultural Heritage Research)
PO Box 736 Sentrum, NO-0105 Oslo. E-mail: niku@niku.no

NINA (Foundation for Nature Research)
Tungasletta 2, NO-7485 Trondheim. E-mail: firmapost@nina.no

Riksantikvaren (Directorate for Cultural Heritage)
Dronningensgt 13, PO Box 8196 Dep. NO-0034 Oslo. E-mail: riksantikvaren@ra.no

NGU (Geological Survey of Norway)
NO-7491 Trondheim. E-mail: ngu@ngu.no

Direktoratet for naturforvaltning (Directorate for Nature Management)
Tungasletta 2, NO-7485 Trondheim. E-mail: postmottak@dirnat.no

8. Signature on behalf of the State Party

Oslo 20 th January 2004

Børge Brende
Minister of the Environment
Norway

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* *Secretary of local working group.*

Cover photo: From the Nærøyfjord area. Finn Loftesnes. Back cover photo: From the Geirangerfjord area. Finn Loftesnes

THE WEST NORWEGIAN FJORDS

The proposed World Heritage Site represents a magnificent example of the classic fjord landscape with unique geology, exceptional natural beauty and high aesthetic qualities

MILJØVERNDEPARTEMENTET

Norwegian Ministry of the Environment