Application

MAGMA GEOPARK norway

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A Definition of the region being proposed for nomination as a European Geopark

A1: Name of the region being proposed for nomination as a European Geopark

The name of the region for nomination as a European Geopark is "Magma Geopark" (MGP)[1]. The Geopark is named Magma[2] because of the Rogaland Anorthosite Province that covers more than 50% of the surface area and consists of intrusive magmatic rocks. Gneisses envelop the igneous rocks.

A2: Location

MGP is located in southwest Norway, about one hour by car or train southeast of Stavanger (The European Capital of Culture 2008). The Geopark is mostly situated in Rogaland County but the eastern sector is in Vest-Agder County (Fig. 1). The Rogaland Anorthosite Province (RAP) and its metamorphic envelope provide the geological basis for MGP, but the Geopark boundaries follow the administrative borders of the municipalities Bjerkreim, Eigersund, Flekkefjord, Lund and Sokndal (section A3).

A3: Surface area, geographical and human statistics (extent, population, physical characteristics, population density, etc.)

Administrative size

The Geopark has a total administrative area of 2.329 km^2. MGP covers the area of five municipalities – Eigersund, Sokndal, Lund and Bjerkreim in Rogaland County and Flekkefjord in Vest-Agder County (Fig. 1). The four municipalities in Rogaland County also comprise the Dalane district.

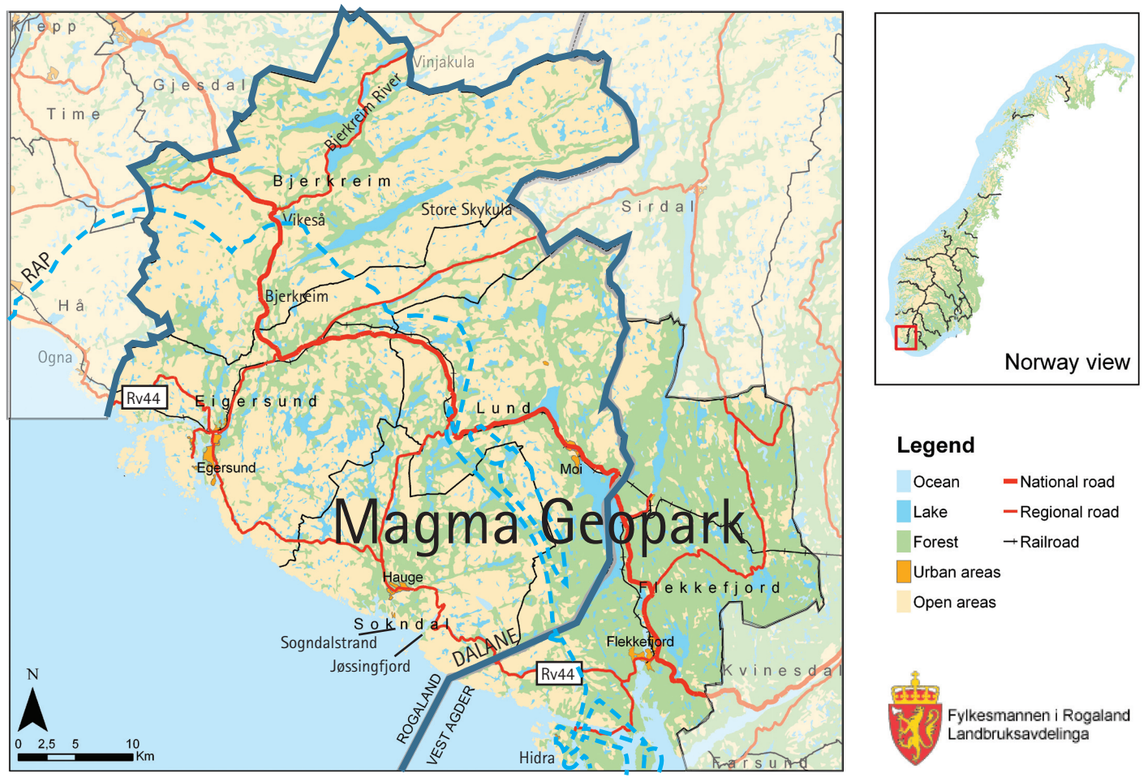

Figure 1: Location of Magma Geopark in southwest Norway. Boundaries and the main towns are shown for the 5 municipalities.

[1] For reason of simplification, MGP is used in the meaning "The region, Magma Geopark, being proposed for nomination as a European Geopark".
[2] Magma – molten rock material below the surface of the Earth. Magma at the surface of the Earth is called lava and forms extrusive igneous rocks in connection with volcanic activity. Magma that cools and crystallises below the surface of the Earth forms intrusive igneous rocks.

Physical characteristics

There are some deep, steep-sided, large lakes in the north of the Geopark, but they do not extend into the Rogaland Anorthosite Province (RAP). There are hundreds of small valleys and more than 6.000 lakes inside the Geopark. The highest mountains are in the north where summits are above 900 meters (Vinjakula, 907 m and Store Skykula, 906 m; Fig. 1). The landscape represents an ancient peneplain, a more or less flat surface that slopes gently down to the coast. In the west the slope gradually reaches sea level at the coast, whereas in the east there are steep coastal cliffs. This old peneplain has been deeply incised by rivers and glaciers, giving the hilly topography that we have today. There are only a few islands off the Geopark coast, most of which have no protection against the ravages of the North Sea.

The landscape is dominated by bare, rounded, rocky hills where crystalline rocks form the surface. Vegetation has, however, taken hold in areas with glacial and river deposits. The natural vegetation consists mainly of heather, juniper, marshlands and small birch forests. Bjerkreim municipality has a birch sprig in its civic heraldry. There are spruce forests in some of the valleys. Some of these trees were planted back in the 1920´s, but new forests are still being planted. Other common trees include aspen, oak, beech and planted evergreens. Eigersund municipality has an oak leaf in its civic heraldry whereas Lund has an acorn. The Geopark territory has, however, large areas with very little or no plants since the anorthosites are very poor in essential nutrients. There are dramatic changes in fertility from the bare, rocky anorthosite landscape to the vegetated moraine-covered lowlands. Areas underlain by mafic-rich and apatite-bearing rocks of the Bjerkreim-Sokndal layered intrusion and the jotunites are also covered in vegetation; this is where productive farms are located. Many of the largely un-vegetated areas are only suitable for sheep grazing.

Water plays a major role in the Geopark landscape. There are several important rivers in addition to the multitude of lakes. The Bjerkreim River is one of the best for salmon-fishing in Norway and is protected by law. When you drive along the road beside the Bjerkreim River you pass seven end-moraines on your way to the coast. Most of the Geopark coast consists of rocky cliffs with small inlets, but in the extreme west, just outside MGP, there is a beautiful sandy beach at Ogna (Fig. 1) where wind-blown sand has accumulated in a low-lying area.

Land use

A large part of the land areas within the MGP are so-called LNF areas, i.e. land areas for "agriculture, nature and recreation". Agricultural areas cover 1.527 km^2 which is 6,1% of the total land area. Sheep and cattle farming predominate since most of the land is not suitable for growing corn and vegetables. Some farmers have started to cultivate fruit and different kinds of berries. The relatively warm autumns and winters mean that blackberries and plums, for example, have good growing conditions here. Farmers in the region have traditionally also been fishermen, locally called "fish-farmers". The port of Egersund is an important harbour in southwest Norway and, measured in tons of fish caught, is one of the largest in the country.

Holistic Geopark philosophy

In MGP we want to explain the connection between the geology of this region and the way people have lived – and still live here. Our geology explains why farms, roads and people were located where they are. The Geopark and its activities will contribute to explain why mining has been so important here and why we have relatively few agricultural areas. We also want to demonstrate the relationships between geology and biology.

MGP has an exciting geological story to tell, and by studying this area one can learn about the processes that created the Earth. MGP will also explain how ice has changed the landscape in recent geological times.

Population

The total population within the Geopark is 31.347 (1st January 2007). 68% of the population live in towns and villages. There is abundant open space in the region which has a population density of 13,5 people per km^2, but with large variations as Bjerkreim only has 3,8 people per km^2 and Eigersund 31,5 people per km^2. Norway, which has a population density of 15 people per km^2 is, except from Island, the country in Europe with most open space. The population rate of growth over the last ten years has been 1,5% in MGP, 11% in Rogaland County and 6% in Norway as a whole. Among the municipalities in MGP there are large variations as Eigersund has had a growth of population of 3,9% and Sokndal a decrease of 4,8% over the last ten years.

The average age of the population in MGP is close to that of the rest of the country, but there are again some variations as the populations in Bjerkreim and Eigersund are relatively younger and those in Sokndal and Flekkefjord are relatively older.

The area has fewer people with higher education than the average for Norway. In Flekkefjord it is the other way around as the population has a slightly higher proportion of people with higher education than the average for Norway.

In years to come it will be a challenge to provide a variety of social services for the group of "oldest elderly" - a group in our society that is growing rapidly. On the other hand, people in the area live increasingly longer lives which is an indication that our region is a good place to live.

Trade and industry

The area has several large companies within the wood and fishery industries. There is production of equipment for fisheries, maritime electronics, the mechanical industry and shipyards. Mining plays a very important role (see D1). It is a relatively short distance from our region to the best fishing-banks in the North Sea, and the region has the largest cattle slaughterhouse in Norway. Egersund and Flekkefjord are the most important trade centres in the region, and people from all over the region travel to these towns to do their shopping.

Accessibility

MGP can easily be reached by car, train, ship or plane. The international airport at Sola is located near Stavanger, and from MGP it is a ~1 hour drive. The railway from Oslo to Stavanger passes through MGP, and an international ferry to Denmark sails from Egersund. A few years ago the North Sea Cycle Route was established, and roads that are especially suited for cycling are marked throughout the area (see C1; Infrastructure).

Tourism

MGP is located in an area where the main tourist activity takes place in the spring and summer. There is snow in the northern parts of MGP in the winter, and there are good possibilities for both downhill and cross-country skiing, but winter sports are not a major activity here. In summer, tourists from other parts of Norway, from Denmark and Germany, come to fish in the sea, lakes and rivers, and they often visit the small village of Sogndalstrand and the island of Hidra (Fig. 1). There has recently been an increase in yachts and small boats along the coast and they visit one of the many small harbours in MGP. The area is of special interest for divers because of the clear water and exciting submarine rocks and biology. The mountains provide challenges for climbers, perhaps not so much because of their height, but because of their shape. There has been a continuous growth in hiking both for locals and visitors from overseas. Since ancient times there has been a well-developed communications network in the area. Most of it consisted of simple trails and paths, but also improved tracks and bridle paths. In recent times, most of these have lost their function and become derelict, but 140 km of the old network has been cleared, signposted and marked to create interconnected walks between two main routes, known collectively as "Opplev Dalane" or "Experience Dalane".
There has also been a continuous growth in cycling as routes have been prepared and marketed for this use.

No other Geopark comparable to this in the European Geopark Network

The geological background of Magma Geopark is unique and is thoroughly described in Enclosures 1 and 2. The Rogaland Anorthosite Province includes the largest area of anorthosites in Europe and the largest layered intrusion in Western Europe. It also contains the world´s largest igneous Fe-Ti deposit. RAP is extremely well defined with clear geological borders. Visitors immediately know that they have entered a different and special geological area. The characteristic geological and topographical nature of the MGP has made its inhabitants aware that they live in a unique area. When the MGP idea was launched the normal reaction was "Of course, that's what it is; we live in a Geopark!"

MGP will offer many challenges – geoscientists have known this area for many years (there are more than 320 scientific geological publications from the area in the reference list (Enclosure 2)). We are convinced that MGP will open the eyes of many others who have not previously been very aware of the area. Our society is typical for rural districts along the Norwegian coast; we are used to welcoming anglers and trading companies. Now we look forward to welcoming geotourists from all over the world.

A4: Detailed description of the organisation in charge

Magma Geopark AS is a joint-stock company specifically established to meet the requirements for a European Geopark set by the European Geoparks Network. This company is owned by the municipalities and counties, and we will invite private individuals to buy shares in the company.

The MGP Organization has close relations to the regional business development department in Dalane and the local Tourism development company for South Rogaland. Both of these organiza-

tions share offices with MGP. The board of Magma Geopark AS has members from the municipalities and the counties. The articles of associations of MGP are presented in Enclosure 7.

In 2006, 2007 and 2008 the business development manager in Dalane is in charge of the administration of the Geopark. Our project manager is a geologist, and the entire staff of the office contributes to the work. From January 1st 2009 the administration of MGP will be in the hands of a managing director. We anticipate that we will have a number of projects with different project managers connected to the Geopark in various ways for many years to come. More development work remains to be done, and we will organize much of this work in different projects. This type of organization will be able to apply for funding and support, both from the counties and from the Ministries of Environment and/or Culture in Norway.

The MGP project has established a Geopark resource group with about 30 members. The members include representatives from the two counties and the five municipalities involved in the MGP, the two museums, outdoor organisations, universities (so far mainly the University of Aarhus, Denmark), Geopark Gea Norvegica, Geological Survey of Norway, the Tourism development company, outdoor exploration and event companies, overnight lodging companies etc. They are all invited to a Geopark conference held by the MGP and business development staff twice a year. The three Geopark conferences that have been held so far have been very successful.

Working groups

MGP has six groups that work with different themes. The Magma Geopark AS organisation is represented in all the groups listed below. The Geopark organisation also carries out guiding for groups from schools, universities, private companies etc.

The Education Group with its own project manager will start in April 2008 (the project manager of MGP has so far managed this group) with up-grading courses for teachers, Technolab, preparation of excursion guides, teaching, planning and participating in the "Geo" subject class trip to Lochaber Geopark etc. The group also includes the directors of education from each municipality, representatives from the local outdoor organisation and from the University of Aarhus. The group will work together with a representative from each of the 28 schools in the region to work out programmes for use in the daily teaching and programmes for postgraduate studies for local teachers. These programmes start with the local schools in MGP and involve themes such as geology, biology, culture, etc. The group plans to start a guide school that educates guides for use in the region by MGP or other companies working with tourists. The group is also involved in the planning of excursions locally and to Scotland.

The Locality Group has participants from each municipality, the universities, outdoor organisations, museums and land owner organisations. This group meets every other month. So far a total of 5 Geopark localities have been established and several new ones are in preparation (Tables B3.2 and B3.3).

The Business Development Group involves local entrepreneurs, a designer and an event company, and is led by the business development manager in the region. The group is working to establish various activities, both within the Geopark and for our partners. The aim of the group is to introduce products connected with MGP that can provide income and of course contribute to our common goal of teaching people more about geology, history and culture. One member of this group owns a newly started local brewery (see Partners below). In co-operation with Magma Geopark's designer, the brewery has recently created a "Magma Brown Ale" label with parts of the Geopark logo and with information about the Geopark. Magma Brown Ale was launched at the state-owned liquor store in February 2008 and is now available throughout Norway. Magma Geopark AS will receive a provision for every bottle sold.

The Climate Group has representatives from four municipalities and the energy company in Dalane. This group has its own project manager and has applied for economic support from the Ministry of Environment in Norway. The group will write a regional plan about climate and energy, and point out ways in which the local and regional authorities can contribute to the nation's goals of reducing global warming. This plan will also be used when the municipalities make their decisions for the location of new houses, infrastructure and settlement of schools, nursing homes etc. in the future.

The Art Goup, which works with local artists and designers, has had one sales exhibition. The exhibition of photographs of MGP rocks and minerals taken through a microscope was very successful, and the group has several ideas for new exhibitions. The pamphlet from the first exhibition "Micro" is provided in Enclosure 8.

The Centre Group is working with plans for the Jøssingfjord Centre (Fig. 1), and the goal is to start the first stage of building in 2009. The old Jøssingfjord power plant will be the first part of the centre with an area of ~450 m^2 and will have its first exhibition in the autumn of 2008. The old power plant is still in production but a new power plant is planned to be finished in the autumn of 2008 when the old plant will be shut down, enabling use of this building as part of the centre. Jøssingfjord Centre as a whole will cover ~1.000 – 1.500 m^2. This will be a modern documentation centre for the geology and mining history of the region. It will also have documentation of the activities in the area during the Second World War (the first contacts with the enemy during the Second World War in Norway took place in Jøssingfjord) and the more than one hundred years of industrial history in the area. Magma Geopark will have an office in the centre; there will be tourist information and a cafeteria. The centre will be an arena for concerts, education, scientific work and exciting exhibitions for all ages.

Partners

Counties and municipalities

The Geopark area straddles the border between Rogaland and Vest-Agder Counties. Four of the five involved counties and municipalities: Bjerkreim, Eigersund, Lund and Sokndal comprise the Dalane region of Rogaland County. Rogaland has 410.000 inhabitants (2007), covers an area of 9.325 km^2 and has a 2.293 km-long coastline. Offshore from Rogaland County there are 2.102 islands but these are mainly in the northern parts of the county. In the south where MGP is situated there are only a few islands. Vest-Agder is Norway's most southern county. It has 163.000 inhabitants (2007) with an area of 7.281 km^2 and has a 709 km-long coastline. 543 km^2 of Vest-Agder, Flekkefjord municipality, is inside the area of MGP.

Counties: Norway is divided into 19 administrative regions, called counties. The counties form the primary first-level subdivisions of Norway and are further divided into 431 municipalities.

Universities and Geological Institutes

The Universities of Bergen, Liège (Belgium) and Aarhus (Denmark) have carried out geological studies in the area for many years and have regular contact with the Geopark staff. There is a very close co-operation with the University of Aarhus. Other geological organisations with regular contact are the Geological Survey of Norway, Geological Society of Norway and Geopark Gea Norvegica.

Museums

Dalane Folkemuseum (http://www.museumsnett.no/dalmus: Regional heritage museum of the region Dalane) and Jærmuseet (http://www.jaermuseet.no: Regional heritage museum of the region Jæren; coastal and agriculture area between MGP and Stavanger) are partners of Magma Geopark AS. These two museums work closely with the Geopark administration to promote interpretation of natural science and cultural history to the public. They also have geological exhibitions. MGP hopes to start co-operation with Flekkefjord museum and Flekkefjord electrical museum in 2008.

Outdoor organisations (http://www.friluftsrad.no/dalane)

Dalane Friluftsråd (Open Air Council) has daily contact with the MGP staff in planning new Geopark localities and the maintenance of those already established. The Friluftsråd is also a member of the Localities and Education Groups. Dalane Friluftsråd manages and maintains the "Top Tour" programme and the "Experience Dalane" network of trails.

Centres

The main centre for the location of the MGP organisation and exhibitions will be the Jøssingfjord Centre. The Jøssingfjord Centre will be operated together with the partner Dalane Folkemuseum. Smaller centres are also planned in the Lund municipality and in Ørsdalen that will be connected to the Jøssingfjord Centre and the regional museums. The regional museums are also centres today and will establish new exhibitions in co-operation with MGP.

Companies with a co-operative contract with Magma Geopark AS

- Dalane Brygghus (brewery) (http://www.dalane-brygghus.no) is a commercial partner for the beer product. The first Geopark product "Magma Brown Ale" was launched at the state-owned liquor store in February 2008 and is now available throughout Norway. The bottles carry information about MGP.
- Sogndalstrand Media (www.sogndalstrand-media.no) is the designer and creative visualiser and works with the layout of Geopark material, pamphlets, art exhibitions etc.
- Dalane opplevelser (http://www.dalaneopplevelser.no) is an exploration and event company with experienced and well-educated guides, who take groups to Geopark localities etc.
- Egersund byutvikling, town development (http://www.egersund.org), is a company that develops the urban parts of the Geopark in areas close to towns and organizes events like festivals, concerts etc.
- Reisemål Syd Vest BA (www.visitdalane.no) is the Tourism Development Company (owned by four of the municipality partners) with 35 members and situated in the same building as the Geopark administration. Some of the RSV members (hotels and campsites) are close co-operators with MGP.

- ViaFjord AS (www.viafjord.no) is a local climbing company with which Magma Geopark AS is closely involved. This company was created as a direct consequence of the establishment of Magma Geopark AS.
- Sogndalstrand Kulturhotell (http://www.sogndalstrand-kulturhotell.no) works together with MGP with different arrangements and has also decorated part of the hotel with thin section photographs of the local rocks.

Geosite published guides

So far, MGP has produced five geotour guide pamphlets, one for each Geopark locality, in both Norwegian and English. There is also a larger geosite guidebook (Enclosure 6). The book "Opplev Dalane" (Experience Dalane) also contains several tours in the region and a presentation of the large network of trails. The "Top Tour" programme has 21 tours each year, from one to four hours in length, ending at a viewpoint. Four of these "Top Tours" are also Geopark localities, and four others are specifically suitable for families. The Top Tour programme is very popular and is visited by several thousand persons each year. Last year 50 individuals had visited all 21 summits! There are 4 – 5 new tours every year so up to now there are 30 marked top tours in the area. MGP plans to produce at least five new guide pamphlets each year.

Finances

Work within MGP has been organized as a project in 2006 and 2007 to which the municipalities and the counties have contributed financially. Project funding continues in 2008. The joint-stock company was established in March 2008, and both the municipalities and the counties have made decisions to contribute to the management of the company after January 1st 2009. Magma Geopark AS therefore has a sustainable economic structure and can concentrate fully on further development of the Geopark.

A5: Enclosures

1. Full geological description of the Magma Geopark area. Section B2 is a summary.
2. Reference list, a selection of geological publications
3. Letter of Commitment
4. Endorsement letter from the Norwegian UNESCO commission
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8. Geopark pamphlets

B Scientific description of the region being proposed for nomination as a European Geopark

B1: Definition of the geographical region

The nominated area is defined in section A.

B2: Summary of geology

Magma Geopark, located in southwest Norway, consists largely of igneous rocks that crystallised about 930 million years ago in large magma chambers that were ~20 kilometres below the surface. Large bodies of anorthosite, a rare rock-type that consists almost entirely of the mineral plagioclase, dominate much of the area. The largest layered intrusion in Western Europe is also present, and contains a very wide range of rock types as well as a variety of sedimentary-like structures that formed from crystallising magma. There has been a long history of mining, mostly for iron and titanium, and a considerable amount of cultural history in the area is related to early mineral exploitation. The resistant rocks that dominate the area are responsible for the bare, rounded outcrops that characterise the unique landscapes of MGP.

A full geological description is given in Enclosure 1

Area and ages

The most important part of MGP belongs to the Rogand Anorthosite Province (RAP) in southwest Norway (Fig.2). Apart from some Quaternary deposits, all the rocks in MGP were formed in Precambrian times during the Proterozoic eon; actually in the Meso- and Neoproterozoic. Each of these is divided into three geological periods. Most of the Rogaland rocks were therefore formed during six periods in the Proterozoic. Some of the western parts of the area were metamorphosed during the Caledonian orogeny (late Silurian period) and the entire area was strongly affected during the Quaternary. At least 8 geological periods are therefore represented.

Gneisses

Igneous rocks of the RAP were intruded into a gneiss complex (Fig. 2) consisting of three main units: banded, granitic and augen gneisses. The gneisses have been affected by several (4-6) phases of folding (two of which were isoclinal) and at least three metamorphic events (two of which were in granulite facies). Some of the banded gneisses, which have ages up to 1.65 Ga, had sedimentary precursors, but the nature of their protoliths is often difficult to establish. The early, folded and metamorphosed banded gneisses were intruded by a series of granites (now the granitic gneisses) and subsequently these rocks went through the same orogenic events together. At about 1050 Ma this gneissic complex was intruded by several coarse grained granites with large K-feldspar phenocrysts; these became the augen gneisses. The Sveconorwegian orogeny started at about 1000 Ma and terminated before intrusion of huge volumes of magma.

Anorthosites

There are three large massif-type anorthosite bodies in the RAP (Eigersund-Ogna (EgOg), Håland-Helleren (HH) and Åna-Sira (ÅS)) and two smaller bodies (Hidra and Garsaknatt) (Fig. 2). In some cases there is more than 10% orthopyroxene and the rock name leoconorite is appropriate. They all have ages of close to 930 Ma. The largest (EgOg) is a dome-like body with a diameter of ~20 km. The plagioclase is compositionally uniform (An_{40}-An_{45}) and there are local megacrysts of plagioclase and orthopyroxene. Plagioclase crystals sometimes show a beautiful play of colours. The entire marginal zone of EgOg is strongly foliated, reflecting diapiric uprise of the core under granulite facies conditions. The other anorthosites are broadly similar to EgOg, although some of them (ÅS and HH) contain important ilmenite ore deposits. Anorthosites are rare on a global scale. In Rogaland, where they are both easily accessible and superbly exposed, they are largely responsible for the unique, bare, rounded, rocky landscape.

The Bjerkreim–Sokndal layered intrusion

This (BKSK) is the largest layered intrusion in Western Europe, covering an area of 230 km^2 (Fig. 2). It spans a very wide and unusual range of rock types, from anorthosite to charnockite. It is therefore exceptional in that it links the two extreme rock types in the "Anorthosite Kindred" in a single intrusion. It was intruded after the massive anorthosites at ~925 Ma. BKSK has been deformed into a deep, doubly plunging syncline as a result of sinking of the relatively dense rocks into the less dense anorthosites and gneisses under granulite facies conditions. The layering was originally close to horizontal. BKSK is divided into three sectors or lobes of which the north-western lobe is the largest. The layered rocks here have a thickness of ~7000 m. The lobe has been divided into six "megacyclic units" that reflect sequences of rocks that crystallised from successive major influxes of magma into the chamber. The layering is locally deformed as a result of the impact of xenoliths on the floor of the magma chamber. These are blocks that became detached from the roof that has otherwise been completely removed by erosion. There is also evidence of local current activity along the floor of the chamber. The BKSK crystallised from magma equivalent to jotunite (= orthopyroxene monzodiorite). Many important

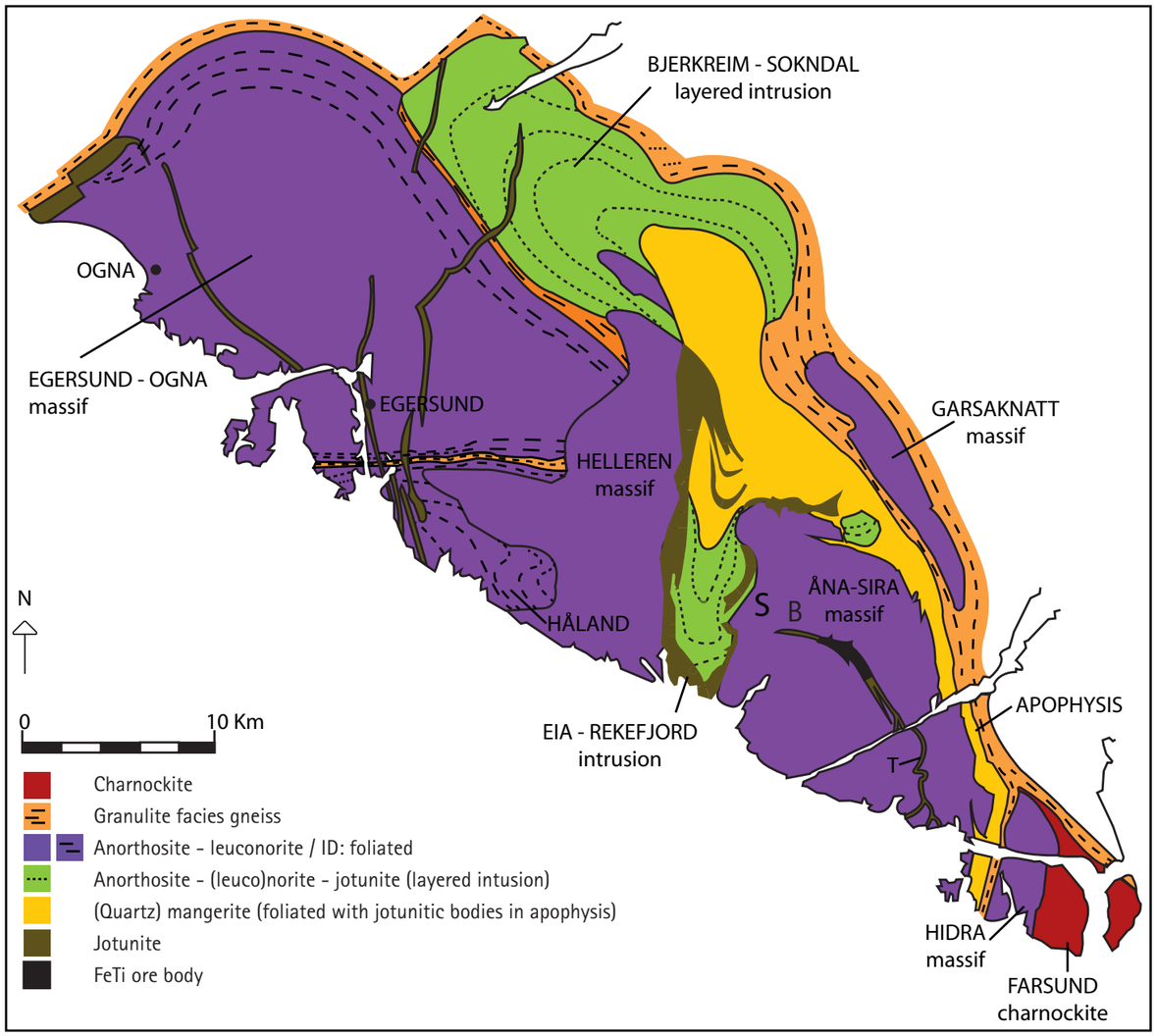

Figure 2: Simplified map of the Rogaland Anorthosite Province. In addition to several large anorthosites this includes the Bjerkreim-Sokndal layered intrusion. The Egersund dyke swarm and many jotunitic dykes have been omitted. B = Blåfjell and S = Storgangen (abandoned ilmenite mines); T = Tellnes dyke

features are superbly exposed, including evidence for magma replenishment, igneous layering, evidence for magmatic current activity and for collapse of the magma chamber roof.

Other intrusions

There are many other igneous rocks in the RAP (Fig. 2). The largest are the Apophysis that consists largely of quartz mangerite (broadly charnockite) and the jotunitic Eia-Rekefjord intrusion. The Farsund charnockite outcrops in the extreme southeast of the area, and there are several small noritic bodies in the marginal parts of the EgOg and ÅS anorthosites, as well as many jotunitic dykes that can be followed for many tens of kilometres. All of these were intruded 930-920 Ma ago. The youngest igneous rocks in the area are a suite of basaltic dykes (the Egersund dyke swarm) that were intruded ~616 Ma ago. The dilation related to their emplacement heralded the opening of the Iapetus Ocean whose sediments eventually formed the Caledonian mountain chain.

Geological resources

There are over 100 mines and prospects in the Geopark area; only one is currently active. Most of the mining activity has involved iron-titanium deposits, but nickel, copper, molybdenum and tungsten have all been mined in the past. Mining has played a very important role in the cultural and economic development of the area. The local history of mining can be studied at, for example, Gursli (molybdenum), Koldal and Blåfjell (iron-titanium) that are important Geopark localities. The active mine at Tellnes provides huge quantities of ilmenite ore which produces titanium oxide. This is extensively used, for example, as a white pigment in paint. Some of the igneous rocks are crushed and used as aggregate, most notably "white anorthosite" (altered anorthosite). Anorthosite is also quarried for its iridescence (play of colours); it is marketed as "Labrador Antique" and "Blue Antique".

Younger rocks and events

Metamorphism related to the Caledonian orogeny (at ~425-400 Ma) affected some of the most western rocks in the area. Since intrusion of the anorthosites a thickness of ~20 km of rocks has been removed, involving uplift and erosion at an average rate of ~0.02 mm/year. During the Pleistocene, Rogaland was repeatedly covered by ice during glacial advances. During the advances, loose-lying material was scoured away. When the glaciers retreated, huge volumes of melt water flowed across the area, deepening existing valleys, eroding new watercourses and depositing material in low-lying areas. Evidence related to the Ice Age includes impressive moraine deposits, such as the superbly preserved esker known as St. Olav´s serpent, several drumlins, many erratic blocks scattered across the landscape, glacial striations and chatter marks, pot-holes scoured by running water far above existing water courses, and major landslides.

B3: Lists and description of the geological sites

Geosites and Geopark localities

Geosites are geologically scientifically interesting sites. As a Geopark locality, a geosite must be of interest to the general public and not only to a geologist. There are also some Geopark localities under development that are of more archaeological and cultural value, but they still have strong connections to geology. We also have many viewpoints from which geological landscapes or other geological features can be observed.

A Geopark locality is a place that illustrates interesting geological features for the general public. A Geopark locality must, as a minimum, have a landowner agreement, marked trails, parking places and a pamphlet describing the locality. We have classified the Geopark localities by their regional, national or international interest, use (geotourism, education and science), protection status, availability (restrictions), threats and other information. We have used essentially the same categories as Gea Norvegica.

Geosites in Magma Geopark

A large number of important geosites are present inside MGP. Some of these geosites have been developed as Geopark localities and several are in progress or in the planning stage. We have so far registered and listed 89 geosites within the Geopark; 58 of these are regarded as "Geopark localities". Some of these already have information panels, trails, car-parking etc, established but the plan is to develop these sites in the future. Five Geopark localities have information panels and pamphlets produced by Magma Geopark and are in daily use by schools, geotourists, local inhabitants etc. (More information about the geosites and Geopark localities is presented in the coming Geopark Master Plan; section D5).

Theme	Abbreviation	Category
Rank	Int	International
	Nat	National
	Reg	Regional
Use	Edu	Education
	Tour	Geotourism
	Sci	Science
Protection status	NatP	Nature Protection
	CulP	Cultural Protection
	LNF	LNF area
	Awl	Agreement with Landowners
	NoP	No Protection
Availability limitations	Priv	Private property
	Saf	Safety
Threatened	Yes	Yes (possible)
	No	No
Other Information	Vwp	Viewpoint
	Hist	Historical interest
	Arch	Archaeological interest

Table B3.1: Explanation of the abbreviations used in geosite lists, Tables B3.2 and B3.3. Protection status is according to one of the following Norwegian laws: 1) Act relating to nature conservation (NatP), 2) Act related to the cultural heritage (CulP) and 3) Act related to outdoor recreation (LNF = agriculture, nature and recreation) (see also section B6).

No.	Geopark localities, municipality and short descriptions	Category	Remarks
Gneisses			
1	**Ørsdalen Glassberget, Bjerkreim** Hydrothermal quartz and citrine vein in gneiss	Reg, Tour, Priv, LNF, Yes	2010+
2	**Tronåsen, Lund** Spectacular old road with abundant stonework	Nat, Edu, Tour, LNF, Hist	2010+
3	**Hyttevatnet, Eigersund** Very well exposed banded gneiss	Reg, Edu, Tour, Sci,LNF, Priv, Yes	2010+
4	**Old railroad, Flekkefjord** 17 km closed railroad with 13 tunnels and many possibilities to study the local rocks and rocks used as building material from a train	Nat, Edu, Tour, CulP, No, Hist.	2010+
Anorthosite The most accessible anorthosite province in the world and the largest in Western Europe (see section B2: Summary of Geology).			
5	**Eigerøy Lighthouse, Eigersund** Egersund-Ogna Anorthosite, agmatite of anorthosite and norite pegmatite	Nat, Edu, Tour, Sci, CulP98, Awl, Priv, Yes, Vwp, Hist	In daily use
6	**Jibbeheia, Sokndal** Large system of granitic dykes	Reg, Edu, Tour, Sci, Awl, No, Vwp	In daily use
7	**Hellerndalen, Sokndal** Anorthosite landscape, megacrysts, erratics	Reg, Edu, Tour, Awl, Priv, Yes, Vwp.	2008.
8	**Piggstein, Eigersund,** Megacrysts of plagioclase and orthopyroxene	Reg, Edu, Tour, Sci, LNF, Yes,	2010
9	**Auglend, Eigersund** Anorthosite coastal landscape, erratics	Reg, Edu, Tour, NatP, No, Vwp, Hist	2010+
10	**Kvassåstjørna, Haa** Plagioclase megacrysts with labradorescence	Nat, Tour, Priv, NoP, Yes, Vwp	2010+
11	**Old closed railroad from Eide to Hellvik, Eigersund** Anorthosite landscape, stonework, erratics	Reg, Edu, Tour, Awl, No, Vwp, Hist	2010+
12	**Den Vestlandske hovedvei, Eigersund and Haa** Anorthosite landscape, stonework, erratics	Reg, Edu, Tour, Awl, No, Vwp, Hist	2010+
13	**Jøssingfjord and Helleren, Sokndal** Dramatic fjord with houses built under a dramatic overhang	Int, Edu, Tour, LNF, Yes, Hist, Arch	2009
The Bjerkreim Sokndal layered intrusion The largest layered intrusion in Western Europe (section B2)			
14	**Odlandstø-Netland, Bjerkreim** Anorthosite inclusions in ilmenite norite	Reg, Edu, Tour,Sci, NoP, Yes, Vwp	2008
15	**Solbjørgnipa, Bjerkreim** Layered intrusion floor and lower series, gneissic country rocks	Reg, Edu, Tour, Sci, Awl, Yes, Vwp, Hist	In daily use
16	**Storeknuten, Eigersund** Very well exposed layered series, magma addition	Reg, Edu, Tour, Sci, NoP, Yes, Vwp	2009
17	**Jonsokknuten-Mysinghålå, Eigersund** Large scale layering, mangerite and erratic. Hiding place for resistance during Second World War	Reg, Edu, Tour, LNF, Awl, Yes, Vwp, Hist	In daily use

18	**Teksetjørni, Lund** Very well exposed layered series	Reg, Edu, Tour, Sci, NoP, Yes,	2009
19	**Eptelandsvatnet, Bjerkreim and Eigersund** Orthopyroxenite, large scale layering and jotunite, magma addition	Reg, Edu, Tour, Sci, LNF, Yes, Vwp	2010+
20	**Glerhaug, Sokndal** Mangerite and erratics	Reg, Edu, Tour, LNF, Yes, Vwp, Hist	2010+
21	**Gullbergtuva, Lund** The centre of the intrusion, mangerite and erratics	Reg, Edu, Tour, LNF, Yes, Vwp	In daily use
Other intrusions.			
22	**Koldal layered intrusion** Small, very well exposed layered intrusion	Nat, Edu, Scient, NoP, Yes,	2009
23	**Hogstad intrusion, Flekkefjord** Small layered intrusion	Reg, Edu, Scient, LNF, Yes,	2010+
24	**Gaudland, Sokndal** Anorthosite, basaltic and jotunitic dykes	Reg, Edu, Tour, LNF, No, Hist	2010
25	**Tekse road, Eigersund** Basaltic dyke	Reg, Edu, Sci, NoP, Yes,	2009
Geological resources There are over 100 mines and prospects in the Geopark area (section B2)			
26	**Gursli Mine, Lund** Molybdenum mine in gneiss from First World War	Nat, Edu, Tour, LNF, Awl, No, Hist	2008
27	**Liland Mine, Lund** Molybdenum mine in gneiss from First World War	Reg, Edu, Tour, NoP, Yes, Hist	2010+
28	**Blåfjell Mine, Sokndal** Old ilmenite mine in norite pegmatite	Int, Edu, Tour, LNF, Awl, Yes, Hist	2008
29	**Krigen Mine, Lund** Muscovite mine in pegmatite, from Second World War	Reg. Yes, Hist	2010+
30	**Ørsdalen Mine, Bjerkreim** Old tungsten mine and mine museum	Nat, Edu,Tour, NatP, No, Hist	2010+
31	**Koldal Mine, Eigersund** Old ilmenite mine	Reg, Edu, Tour, NoP, Yes, Hist	2010
32	**Ankerhus Mine, Eigersund** Old ilmenite mine	Nat, Edu, Tour, NoP, Yes, Hist	2010
33	**Homsevatn Mine, Haa** Magmatic copper and nickel	Reg, Edu, Tour, Sci, LNF, Yes, Hist	2010+
34	**Tellnes Mine, Sokndal** The world´s largest ilmenite mine in full production	Int, Edu, Scient,Tour, NoP, No, Vwp	2010+
35	**Sandbekk Mine, Sokndal** Old ilmenite mine	Nat, Edu, Sci, NoP, Tour, No, Hist	2010+
36	**Dydland Mine, Sokndal** Old kaolinite mine	Reg, Tour, LNF, No, Hist	2010+
37	**Tagholt, Lund** 2000 year old bog-iron mine	Nat, Edu,Tour, CulP, No, Hist, Arch	2010+
38	**Leidland, Eigersund** Kaolinite mine that was the main reason for the start of the ceramic industry in Egersund	Reg, Edu, Tour, LNF, No, Hist	2010+
39	**Laksedalen Mine** Old ilmenite mine	Reg, Tour, NoP, Yes, Hist	2010+
40	**Dimension stone quarries, Haa and Eigersund** Anorthosite, basaltic dykes, iridescent plagioclase	Reg, Edu, Tour, NoP, Yes,	2010+
Younger rocks and the Quaternary			
41	**Bjerkreim vassdraget, Bjerkreim** Seven end-moraines along one of Norway's largest salmon rivers. Well-formed pothole between Roaldsvatnet and Espelandsflæet.	Nat, Edu,Tour, NatP, No, Hist	2010-
42	**Gloppedalsura, Bjerkreim** One of the largest rock falls in Europe on top of a large end moraine	Int, Edu,Tour, NatP, No, Hist	2008
43	**Brufjell, Flekkefjord** Large potholes	Reg, Edu,Tour, LNF, No, Saf	2009
44	**Litle Beinsdalen, Sokndal** Area with many erratic blocks	Reg, Edu,Tour, LNF, Yes,	2009
45	**St. Olavsormen, Eigersund** Large esker	Int, Edu, Tour, NatP1973, No	2008
46	**Hesten (The Horse), Eigersund** Large erratic block used as an old marine landmark	Reg, Tour, LNF, No, Hist,	2010+
47	**Grødheim, Eigersund** Large potholes and erratics	Reg, Edu, Tour, NoP, Yes	2010+
48	**Toks, Sokndal** Large potholes	Reg, Edu, Tour, LNF, Yes	2010+
49	**Vigelandsvatnet west, Lund** Large area of glacial deposits	Reg, Edu, Tour, LNF, Yes	2010+
50	**Myklebust and Skadberg, Eigersund** Two large drumlins on Eigerøy	Nat, Edu, Tour, Sci, LNF, Yes	2010+
51	**Ruggesteinen, Sokndal** A 70 ton block that can be rocked by hand. First geological object to be protected by law in Norway.	Int, Edu,Tour, NatP1923, No, Hist	2009
Others			
52	**Old stone bridges, Magma Geopark** Several old bridges	Reg, Tour, CulP, No, Hist	2010+
53	**Stoplesteinane, Eigersund** Rock circle from ~800 AD	Nat, Tour, LNF, No, Hist, Arch	2010+
54	**Hestedrikker, Eigersund** Drinking vessel for horses carved out of the rocks	Reg, Tour, CulP, No, Hist, Saf	2010+

55	**Syngjarsteiner, Eigersund and Sokndal** "Singing" rocks (with no geological explanation so far)	Reg, Edu, Tour, LNF, Yes, Hist	2010
56	**Roslandsguden, Sokndal** ~2000 year old God-like figure made of ilmenite norite	Nat, Edu, Tour, Sci, CulP, No, Hist, Arch	2010
57	**Varberg, Eigersund** Rose-compass carved in the rock and other rock carvings	Reg, Tour, CulP, No, Hist	2010
58	**Rock carvings, Magma Geopark** Several different figures	Reg, Tour, CulP, Yes, Hist, Arch	2010+

Table B3.2: Geopark localities. Described in more in detail in the coming Geopark Master Plan (Section D5). This list will be updated annually.

No.	Geosites	Category
Gneisses		
59	**Krossmoen, Eigersund** The gneissic margin	Reg, Edu, Tour, Sci, NoP, Yes,
60	**Saglandsvatn, Eigersund** The gneissic margin	Reg, Edu, Tour, Sci, LNF, No
Anorthosite		
61	**Nese, Eigersund** Anorthosite and Lomland dyke	Reg, Edu, Sci, NoP, Yes,
62	**Kalvshagen, Eigersund** Central Anorthosite	Reg, Edu, Sci, NoP, Yes
63	**W. Haugsenga, Haa** The gneissic margin	Reg, Edu, Sci, LNF, No,
64	**Veten, Haa** Gneissic inclusions in the anorthosite	Reg, Edu, Sci, LNF, No,
65	**Ystebrød, Eigersund** Noritic pegmatite and gneissic inclusions	Reg, Edu, Sci, LNF, No,
66	**Liåsen sector, Eigersund** Different types of anorthosite, noritic and pyroxenitic gneiss	Reg, Edu, Tour, Sci, NoP, Yes,
67	**Stemmetjørn, Sokndal** Agglomerate of orthopyroxene megacrysts	Reg, Edu, Sci, NoP, Yes,
68	**Botnevatn, Flekkefjord** Folded leuconoritic gneiss	Reg, Edu, Sci, NoP, Yes,
The Bjerkreim–Sokndal Layered intrusion		
69	**Holmen to Odlandstø, Bjerkreim** Traverse through the lower part of megacyclic unit IB	Reg, Edu, Tour, Sci, LNF, Yes,
70	**Between Netland and Hytland, Bjerkreim** Boundary between megacyclic units IB and II	Reg, Edu, Sci, NoP, Yes,
71	**W. of Netlandsvatnet, Bjerkreim** Cm-scale layering and cross bedding	Reg, Edu, Sci, NoP, Yes,
72	**Hågåsen, Eigersund** Contact between MCUs II and III	Reg, Edu, Tour, Sci, LNF, No,
73	**Between Teksevatn og Teksetjørni, Lund** Contact between MCUs II and III	Reg, Edu, Tour, Sci, NoP, Yes,
74	**Launeset, Tekse, Lund** Magnetite, ilmenite and apatite-bearing cumulates	Reg, Edu, Tour, Sci, NoP, Yes,
75	**N. Hauge, Sokndal** Layered norites (Sokndal lobe)	Reg, Edu, Sci, LNF, No,
76	**Herveland, Sokndal** Mangerites	Reg, Edu, Tour, Sci, LNF, No,
77	**Ørsland, Sokndal** Transition from norites to mangerites and quartz mangerites	Reg, Edu, Tour, Sci, LNF, No, VwP
78	**Fidsel–Vardefjell, Flekkefjord** Apophysis, Hidra massif and country rock gneiss (contacts)	Reg, Edu, Tour, Sci, NoP, Yes
79	**Vorreknuten, Sokndal** Quartz mangerite	Reg, Edu, Tour, Sci, LNF, No, VwP
Other intrusions		
80	**Stigel, Eigersund** The Vettaland dyke	Reg, Edu, Sci, NoP, Yes,
81	**Varbergkaien, Eigersund** The Varberg dyke	Reg, Edu, Sci, NoP, Yes,
82	**Sleveland, Eigersund** Dolerite dyke	Reg, Edu, Tour, Sci, LNF, No,
83	**Løyning layered sill, Eigersund** Small layered intrusion	Reg, Edu, Tour, Sci, LNF, No,
84	**Rekeland, Sokndal** Eia-Rekefjord intrusion	Reg, Edu, Tour, Sci, LNF, No,
Geological resources		
There are over 100 mines and prospects in the Geopark area (section B2)		
85	**Svanes, Eigersund** The Svanes iron-titanium deposit	Reg, Edu, Sci, LNF, No,
86	**Jerneld, Eigersund** The Jerneld iron-titanium deposit	Reg, Edu, Tour, Sci, NoP, Yes,
87	**Rødmyr, Eigersund** The Rødmyr iron-titanium deposit	Reg, Edu, Tour, Sci, NoP, Yes,
88	**Hestnes, Eigersund** Nelsonite deposit	Reg, Edu, Sci, NoP, Yes,
89	**Flordalen, Sokndal** The Flordalen iron-titanium deposit	Reg, Edu, Tour, Sci, LNF, Yes,

Table B3.3: A selection of other Geosites that are important for education/science within the Geopark but of less interest for the general public. They are described in more detail in the coming Geopark Master Plan (section D5). This list will be updated annually. Some of the geosites can change status to Geopark localities in the future and vice versa. (These Geosites are desribed scientifically in: Rogaland Anorthosite province; an excursion guide, enclosure 6)

B4: Details on the interest and international, national or regional significance of these sites (scientific, educational, etc.)

The international and national interest of the geology in the region

The international and national interest of the MGP region is well documented in Enclosure 2 that contains references to more than 320 geological publications from the area. The Bjerkreim-Sokndal Layered intrusion and the Rogaland Anorthosites in particular have been important research topics for almost 200 years. Several of the names used in the nomenclature for rocks belonging to the anorthosite – charnockite family originally came from Norway. For example, mangerite is named after Manger near Bergen (Kolderup, 1904) and jotunite after Jotunheim (Hødal, 1945). The term norite, now used for plutonic igneous rocks consisting dominantly of plagioclase feldspar and orthopyroxene, is from Norway itself ("Norge" in Norwegian) and was first used by Esmark in 1823 for some Rogaland rocks in the MGP area.

The first major contribution started in 1937 when Professor Paul Michot from the University of Liège (Belgium), started research in the area. He began studying the anorthosites and defined the various massifs and produced the first geological map of the area. Under his leadership, many petrological and geochemical studies were initiated in the massifs. This work was continued by a group led by Professor Jean-Clair Duchesne (also from Liège). Since the mid 1980s groups from the Universities of Aarhus and Bergen, led by Professors J. Richard Wilson and Brian Robins, have been working in Rogaland. All these universities are still active in the area. Over the last few years we have also noted that primary and secondary schools have started to use the area in their teaching.
An updated excursion guide book from 2003 (Enclosure 6) bears witness to the international interest in the area.

Internationally significant geosites within Magma Geopark

There are several world-class geological localities in the Geopark area.

Anorthosite massifs are rare on a global scale; the Rogaland examples (Eigersund-Ogna, Håland-Helleren and Åna-Sira) are the most accessible in the world and the largest in Western Europe. Important features include megacrysts of plagioclase and orthopyroxene; the essentially monomineralogical character of anorthosites over huge tracts of country; plagioclase labradorescence; their dome-like structure. These rocks give rise to much of the unique landscape within the Geopark.

The internal structure of the largest layered intrusion (Bjerkreim-Sokndal) in Western Europe can be studied in detail, including the floor, walls, a 7 km-thick section of layered rocks with clear evidence for magma replenishment, visible layering with a variety of sedimentary-like structures that formed in molten rock in a magma chamber, and a wide variety of xenoliths. The variety of rock types in this single intrusion covers the entire range of igneous rocks in the province, from anorthosite to charnockite. A long history of the economic importance of iron-titanium mineralization is superbly illustrated, for example at the abandoned Blåfjell mine.

One of the largest landslides in Western Europe is dramatically exposed in the northern part of MGP, at Gloppedal.

A superbly preserved esker (St. Olav's serpent) is readily accessible and represents one of many moraine features in the area. St. Olav's serpent has been protected by law.

B5: Current or potential pressure on the proposed Geopark and these sites

The MGP region is only partly an established tourist area, but it has a rather well developed infrastructure and a growing number of tourist and accommodation facilities. Some of the geosites are already popular tourist attractions, but visitor pressure is certainly not above an acceptable level. The municipalities and outdoor organisations are working on the maintenance of trails and Geopark sites.

In Rogaland County 15% of the area is protected by law. The rights of landowners are firmly established and they are normally paid large compensations when new areas are protected. As there still is much to do to protect nature and preserve the biological diversity there is a need for even more geoconservation. Even then there will not be large potential pressure on the proposed Geopark and its sites; we will ensure that this remains the case in the future.

The geological basement of the entire MGP area consists of crystalline rocks; there are no fossils and mineral collection is only minor. The easiest way to protect the localities is to make an agreement with the relevant landowner about the use of the area. These legal contracts are made between landowner and the municipality and are normally made for ten years, but when possible for thirty years or even longer. These contracts keep control on new building activity. The main problem is the growing of new trees that cover the surface and change the landscape. Here the MGP administration works together with landowner organisations to stimulate the continuation of sheep-farming and to maintain the cultivated pastures in the future.

B6: Current status in terms of protection of the sites

Protection of the Geopark geosites

Protection status is according to one of the following Norwegian laws: "Act relating to nature conservation" (NatP) and the "Act related to the cultural heritage" (CulP) are the strongest ways to protect an area or place. Six of the Geopark localities are protected by the nature conservation law and thirteen by the cultural heritage law. The third way to protect an area is by the outdoor recreation law or by obtaining a status as a LNF area (agriculture, nature and recreation). In a LNF area it is not permitted to construct new buildings and there are several restrictions regarding usage, but the Geopark localities in this category are not very strictly protected. There is, however, a tendency for approval of new buildings to be more difficult to obtain. 29 of the Geopark localities in Tables B3.2 and B3.3 are in so-called LNF areas. There is also the Planning and Building Act and, finally, a legal contract with an individual landowner can provide some protection for a locality.

Protection of geosites against damage

The localities that are protected according to the acts relating to nature conservation and cultural heritage are strongly protected and the sites have signs in Norwegian, English and German that clearly state their status. This protection includes; destruction or removal of parts of geological heritage is prohibited; sampling is not allowed; hammering, blasting, digging etc. are prohibited; and the use of a grill or open fire is forbidden.

All panels and pamphlets contain information as to how you should behave in the area.

B7: Data on management of the sites

The management responsibility for the geosites in the LNF areas lies entirely within the municipalities. When it comes to management of the nature- and cultural protected areas it is more complex. For management of the nature protection areas it is "The County Governor" that looks after the sites and he reports to "The Directorate for Nature Management". When it comes to cultural heritage it is "The Directorate of Cultural Heritage" that is responsible for medieval and other churches, and "The County Councils" that are responsible for archaeological heritage. They are all under the Ministry of Environment.

The County Governor is the King´s and Government´s representive in each county, functioning as the connection between the state and the municipalities. The main responsibilities of the Governor include controlling and being an instance of appeal for municipal decisions, and the main instance for exercising state regulation of agriculture and local environmental impact.
The Norwegian Directorate for Nature Management is Norway's national governmental body for preserving Norway's natural environment, including establishing and regulating national parks and other protected areas. The directorate's mission is to "preserve biological diversity and strengthen the common right of access to the countryside."

B8: Listing and description of non-geological sites

MGP has much to offer in addition to geological sites. Here you can experience town life and outdoor life on the same day. Some of the non-geological sites are listed in Table B8.1.

	Non geological sites	
1	**Kløgetvedttunet, Bjerkreim** Farm, with dwelling house, cow shed made of rocks and smithy. Exhibitions and concerts	Reg, Tour, CulP, No, Hist
2	**Austrumdal kornløe, Bjerkreim** Farm with old corn house	Reg, Tour, No, Hist
3	**Kvitlen, Bjerkreim** Hidden valley with old cultivated landscape	Reg, Tour, LNF, No, Hist
4	**Varberg, Eigersund** Rose-compass carved in rock and older rock carvings	Reg, Tour, NoP, Yes, Hist
5	**Bringedal, Lund** Spectacular valley	Reg, Tour, LNF, No, Hist
6	**Eikeland/Solliknuten, Lund** Old track between the two municipal centres of Lund and Sokndal	Reg, Tour, LNF, No, Vwp, Hist
7	**Aknipen/Naså, Lund** Special rock formation that looks like a face	Reg, Tour, LNF, No, Vwp

8	**Sætra area, Lund** Area used for recreation summer and winter	Reg, Tour, LNF
9	**Vigelandsheia, Lund** Old tracks with variable nature and several cultural remains (connection to Geopark locality Tagholt)	Nat, Edu, Tour, LNF, No, Hist
10	**Førland, Lund** Old farm with variable nature and several cultural remains	Reg, Tour, CulP, Yes
11	**Kongevegen/postvegen, Lund** Old pack and riding road	Reg, Tour, LNF, No
12	**Rotten-Dybing, Lund** Old pack and riding road (connection to Geopark locality Gullbergtuva)	Reg, Tour, LNF,
13	**Indre Sandstøl/Espelistøl, Lund** Old farms, millstream with mill and saw	Reg, Tour, LNF,
14	**Jærmuseet, Haa** Geological exhibitions, expertise in several subjects	Nat, Edu, Tour, Sci, No, Hist, Arch
15	**Dalane Folkemuseum, Eigersund** Exhibitions and experts in several subjects including mining history. Future management of Jøssingfjordsenteret	Nat, Edu, Sci, No, Hist, Arch
16	**Flekkefjord museum, Flekkefjord** Exhibitions and experts	Nat, Edu, Sci, No, Hist, Arch
17	**Flekkefjord electricity museum, Flekkefjord** Flekkefjord was one of the first towns in Norway to have electric streetlights	Nat, Edu, Sci, No, Hist, Arch
18	**Sogndalstrand, Sokndal** Harbour village from 1600	Nat, Edu, Tour, CulP, No, Hist,
19	**Old town Egersund, Eigersund** The old wooden houses of Egersund	Nat, Edu, Tour, CulP, No, Hist,
20	**Old town Flekkefjord "Hollenderbyen" Dutchtown, Flekkefjord** The old wooden houses of Flekkefjord	Nat, Edu, Tour, CulP, No, Hist,
21	**The Churches of the region, MGP** Several old wooden churches	Nat, Edu, Tour, CulP, No, Hist,
22	**Julebyen Egersund "The Christmas Town", Eigersund** Large exhibition of local products and "slow food" with 50.000 visitors in two weeks every year in December http://www.julebyen.no	
23	**The local play "Strandaspelet", Sokndal** A play in an amphitheater made of the local rocks. Performances for 5 days each year with ~3.500 visitors in August, http://strandaspelet.no	
24	**Bjerkreimsmarken "The Bjerkreim market", Bjerkreim** Large local market every year. In 2008 World Championship in sheep-shearing. 50.000 visitors expected from all over the world http://www.vm2008.no	
25	**Hågåsen battery, Hidra, Flekkefjord** Place with remains from Viking aged and a large fortress from Second World War	Nat, Tour, No, Vwp, Hist, Arch
26	**Grønnes battery, Flekkefjord** Historical military battery from the Napoleonic War built in 1801.	Nat, Tour, No, Hist,
27	**The first Cittaslow municipality in Norway, Sokndal** http://www.sokndal.kommune.no/kommune/content/view/full/2846	

Table B.8.1. Non-geological geosites and geosites with minor geological interest but where rocks often have been used in one way or another; some of them are linked to sites of geological interest. These geosites are all potential Geopark sites and are described in more in detail in the coming Geopark Master Plan (section D5), There are also 30 tracks from the top tour programme that are not mentioned in this overview; they are also described in coming Geopark Master Plan.

C Arguments for nominating the region as a European Geopark

C1: Comprehensive analysis of the regions potential for the development of economically sustainable geotourism

Tourism is a growing economic sector in the MGP-area but it is modest compared with the economic importance of other industries. The growth in overnight stays pr. year from 2005 to 2006 was 4.5% and there is an increasing number of companies that offer different types of services for tourists. The regions of Stavanger to the north and Kristiansand to the south receive many visitors and had a growth during the same period of 14%. We are convinced that many of these tourists will visit MGP and/or stay longer in our region when the Geopark becomes established. While Dalane has had a growth in overnight stays of 20% in the period 2000 – 2007, it has in the same period lost the share of the market from 5.1 to 4.0% compared with Rogaland County as a whole.

Traditional industries are still characterized by hard labour but there is a growing industry that has higher qualification requirements. Young people, especially girls, who take a higher education tend not to return to Rogaland. Therefore it is important that the region develops more jobs for people with a higher education. It is also important to build up richer opportunities for cultural and outdoor activities for the inhabitants. The establishment of MGP will have a positive effect in both of these aspects.

Regional strategy

Tourism is one of six top priorities in Rogaland County. Tourism based on nature and culture is marked as being especially important. In the "Master/county plan for Rogaland 2006 – 2009" one of the goals is: "Sustainable regional development in co-operation with others". In the plan the county underlines that they want more outdoor areas to be made available for the public, and give both tourists and local people access to good experiences based on the nature and culture of the region. Based on these priorities Rogaland County has made large economic contributions to the planning of MGP.

The "Regional plan for tourism in Dalane" from 2004-2008 has a main priority to develop at least three new attractions for the public each year based on nature in the region. The plan states the following: "Dalane, like most of Norway, bases its work on tourism on the experiences of nature that people can have here. Nature and outdoor activities will therefore have top priority in advertising and marketing the region." Magma Geopark is one of the most important projects in this region when it comes to reaching this goal.

Catchment area

About 31.000 people live in the MGP area itself. Within a radius of 1½ hours travel from the Geopark area there is a population in excess of 450.000 i.e. within day-tour distance of the Geopark. If we increase the travel distance to 7 hours the catchment volume increases to more than 2 million people; this would include the northern part of Denmark.

Infrastructure

MGPis located in an area with very good connections to the rest of Norway and to Europe. Visitors can travel here by road, air, train and car ferries.

Airports: There are two international airports relevant for MGP. Sola international airport just outside Stavanger has direct flights to all of Europe – with an increasing number of low-fare flights. There are many daily flights to Gardemoen (Oslo) and Kastrup (Copenhagen) which provide possibilities for international travel. About 700.000 passengers arrive at Sola from abroad each year. The other international airport is Kjevik outside Kristiansand that welcomes about 125.000 passengers from abroad each year. This airport is much smaller than Sola, but also has a number of destinations in Europe.

Railway: The main railway route "Sørlandsbanen" crosses MGP. The trains travel from Oslo to Kristiansand and further on to Stavanger. There is also a local train "Jærbanen" from Egersund to Stavanger, with stops near several of the geosites and future localities. About 6 million people travel on these railway routes each year.

Car-ferries: International ferry connections relevant for MGP are:
Hanstholm (Denmark) – Egersund. This ferry has 60.000 passengers per year; many of them are visitors from Germany and Denmark.
Hirtshals (Denmark) – Kristiansand. There is both a rapid ferry (2½ hours) and a slower ferry (4 hours). It then takes 1½ hours to drive or travel by train to MGP.
Hanstholm (Denmark) – Kristiansand. Rapid ferry (2½ hours). It then takes 1½ hours to drive or travel by train to Magma Geopark.
Newcastle (England) – Stavanger. Cruise ship that takes 17 hours. It is then ~1 hour by car or train to MGP.

Road connections: One of the major highways in Norway (E-39) crosses the Geopark. This highway continues into Denmark, and it ends in the northern parts of Norway running along the coast. This is the main road for visitors coming to MGP. For those who like to

drive more slowly and enjoy the wonderful landscape, the "North Sea Road" (Rv44) is a better choice. This road runs close to the coast and the North Sea is visible for most of the journey.

Accommodation within the Geopark is possible in hotels, motels, cabins and at campsites. The bed capacity is more than 100.000 overnight stays pr. year (there were 73.333 overnight stays in 2007). There are plans for new hotels in Flekkefjord, Egersund and Sogndalstrand. Cabins can be rented for a single night or for longer stays. Many of the cabins have a high standard, and at several places visitors are offered boats to rent, diving, horseback riding etc.

Tourism potential: The MGP area has a large potential for an increase in tourism and tourist-related activities. The decision for the five municipalities and the two counties to establish a Geopark in the area is based on analyses of the types of activities in which visitors wish to participate. Norway as a whole has spectacular natural assets, and visitors travelling from far or near desire to be part of this nature. We strongly believe that tourist companies of different sorts will benefit from the establishment of MGP. Representatives from these companies participate in planning of the Geopark in different ways, and we hope to get some of them involved as active partners.

Economic impact of Magma Geopark: As part of planning the Geopark we have made some estimates of the potential for new jobs that will be established directly or indirectly as a result of approval of the Geopark. Our goal is that in 2012 a total of 30 new jobs will be established connected to the Geopark within our area. The expected increase in the number of yearly overnight stays will, as a result of the establishment of Magma Geopark, reach 30.000 by 2012 and then pass 100.000. Magma Geopark will have an impact on hotels, shops, galleries and restaurants in the area. We will create jobs within our own organization as guides and hosts. One of the comprehensive schools in the area has already hired a teacher for the subject "geo", and our project manager is also teaching some related topics. MGP will strengthen the role of outdoor activities. We hope to be able to help the farmers and landowners that are affected by the establishment of the Geopark. In Norway, landowners can receive economic support if they, for example, contribute by clearing forest paths, or establish parking places connected to a project like the Geopark. When MGP geosites and localities are established it will be the local landowners who get the first rights to the official funding for this work.

C2: Description of the existing geological institutions and geological activities in the region

Geopark Staff

Part time Project manager (will work full time in Magma Geopark AS from summer 2008)
Part time business development manager
Part time information technology manager
Part time tourism development manager
Part time geology professor, University of Aarhus, Denmark
Full time centre development manager (engaged 2008 and 2009)
Part time designer

Geopark project board, (until the end of 2008; total 12)
1 representative from the regional museum
5 representatives from the municipalities
1 representative for outdoor organisations,
2 representatives of the county councils
1 representative from a private company
Business development manager
Project manager

Magma Geopark AS board, start March 2008.
5 representatives from the municipalities
2 representatives of the county councils

Resource group
In addition to the project board members and Magma Geopark AS board members: one museum; the University of Aarhus, Denmark; Geopark Gea Norvegica; Geological Survey of Norway; the Tourism Development Company; Rural Development in Dalane; Egersund Town Development; outdoor exploration and event companies; overnight lodging companies etc.

In this group, that meets twice a year at a geopark conference, there are geoscientists, biologists, a historian, an ethnologist, a geographer, an economist and a socio economist.

Institutions

MGP has several institutions that work closely together with the Geopark staff and are important for development of the Geopark. Their responsibilities and skills are co-ordinated through MGP and are allocated as follows:

The Rogaland and Vest-Agder County Councils
Rogaland County is divided into 27 municipalities, and Vest-Agder County into 15 municipalities. The Councils have provided economic and personal resources for the MGP project.

Dalane Council (www.dalane.no)
Dalane Council is the largest local government body. It consists of nine politicians, including representatives of the four municipalities relevant for MGP. The Council has provided generous economic and personal resources for the MGP project.
The municipalities are responsible for public education and cultural development, including schools, museums, libraries, outdoor facilities etc.

Dalane Business Development Agency (www.dalane.no)
Co-ordinator the MGP project.

Reisemål Syd Vest BA (www.visitdalane.no)
Reisemål Syd Vest BA is the Tourism Development Company with responsibility for the development of tourism in Dalane. They do marketing, arrange courses for guides and hosts and have the administrative responsibility for the areas internet page for tourists. They are MGP´s contact with the national tourism development organisation and the capital of culture (Stavanger in 2008).

Region Lister/Tourist office Flekkefjord and Kvinesdal BA (www.regionlister.com)
Flekkefjord Municipality is one of the four municipalities in Region Lister (Kvinesdal, Farsund, Lyngdal and Flekkefjord), the Tourism Development Company for the Lister region, providing information for tourists over the internet as well as pamphlets and brochures. Flekkefjord is the municipality closest to Dalane, but MGP will also invite the other three municipalities to a co-operation.

The outdoor organisations
Dalane Friluftsråd (www.friluftsrad.no/dalane) and
Lister Friluftsråd (www.friliftsrad.no/lister).
These outdoor organisations (Open Air Councils) are financed by the local municipalities and are responsible for the arrangement of a variety of outdoor activities in the region. They are responsible for infrastructure like huts, tracks, parking places and for the arrangement of tours (with and without guides) and manage and maintain the "Top Tour" programme and the "Experience Dalane" network of trails.

The North Sea Road (www.nordsjovegen.no)
"The journey along the sea" is the motto of this organisation of municipalities along the coast from Kristiansand in the south to Haugesund in the north.

The Magma Geopark municipalities are part of this co-operation, and benefit from the various profiling activities, both nationally and internationally. The North Sea Road websites and brochures will be an important marketing arena for Magma Geopark in years to come.

North Sea Trail (www.northseatrail.org)
The aim is to create a series of footpaths around the North Sea Coast to enable people to enjoy walking in these special coastal landscapes and, at the same time, to discover the special things about these places - what makes them different and what gives them a common North Sea culture.

North Sea Cycle Route (www.northsea-cycle.com)
The North Sea Cycle Route is a 6.000 km chain of exciting experiences and variety of scenery in eight different counties: cities, charming towns, villages, countryside from mountains to below sea level! The overall aim of the project is to develop the North Sea Cycle Route as the backbone of cycle tourism around the North Sea. The route opened in 2001 and has joined the ranks of the famous. In May 2003 the route was awarded a Guiness record certificate confirming that the North Sea Cycle Route is the world's longest cycle route. The route is just over 6.000 km long, based on existing national, regional and local cycle routes, and uses existing signposting.

Cycle tourism in Norway (www.bike-norway.com)
Cyclist Welcome is a concept for accommodation establishments in Norway which are especially interested in cycle tourism. The concept was developed and put into practice by The Institution for Cycle Tourism in 1999. This means that chosen hotels, motels, guest houses, campsites and youth hostels make special arrangements to suit the needs of the cycling tourist. CW-establishments are situated along a signposted cycle route and/or have signposted cycle routes for day trips in the immediate vicinity.

Rural Development in Dalane (BU i Dalane)
«Rural Development in Dalane» is a joint project between national, regional and local authorities, which aims at securing vigorous rural communities and a viable agriculture. Rural Development in

Dalane is a valuable partner for the Geopark when it comes to calling attention to local facilities. Farmers who wish to produce local specialities for a niche market, or wish to offer overnight accommodation or other activities, receive useful guidance from the Rural Development consultant in Dalane – who also belongs to the county network of equivalent consultants. Encouraging the expansion of renewable energy has been the main task for Rural Development in Dalane over the last few years.

Museums in the Region

Magma Geopark contains several museums, including smaller branches. Dalane Folkemuseum (http://museumsnett.no/dalmus) and Jærmuseet (www.jaermuseet.no) are already central partners, both because of their technical competence and also because of their exhibitions and activities in the region. Scientific aspects of the geopark will be a future task for the museums; establishment of the documentation centre in Jøssingfjord will be the first major joint task.

Egersund Town Development (www.egersund.org)

Egersund Town Development is a new company established in 2007. It works especially with cultural activities and events. Julebyen (Egersund: the Christmas Town), Egersund Visefestival (folk music festival) as well as other minor and major events in Egersund town, are central tasks for the company which is financed by Eigersund municipality and companies with links to the town of Egersund.

Business Associations in the Region

Magma Geopark is a vital business development project in our region, and several business associations are already crucial partners and will continue to be so in the coming years. The business associations decide the opening hours for shops, organise markets and festivals, as well as making suggestions to the government efforts for strengthening of the infrastructure.

Magma geopark activities

Since the first geological paper was written by Esmark in 1823 the MGP area has been of great interest for geological research. The reference list (Enclosure 2) includes ~320 geological scientific publications. It is noteworthy that ~50 of these references are from year 2000 or later. Researchers from Universities in Belgium, Denmark, Germany and Norway, and the Geological Survey of Norway, have carried out most of the studies in the area.

Arranging excursions and teaching

MGP is going to visit Lochaber Geopark in Scotland with a group of students from local comprehensive schools from 31st March to 4th April 2008. A five-day excursion in connection with the 33rd International Geological Congress in 2008 (IGC 33) in Oslo is also planned. MGP representatives will be involved in further education for the local teachers. The MGP staff also gives lectures at primary, lower secondary and comprehensive schools. Every year MGP also arranges the "Day of Geology" together with the local schools, companies and guided tours in co-operation with the Geological Society of Norway.

Guided tours

MGP has arranged several guided tours for lower secondary and comprehensive school pupils and, so far, one especially for teachers. Members of the Geopark staff have taken part in Geopark walks (about one each month) in 2007 and will continue in 2008. We are also establishing the "Geokiosk" in Jøssingfjord that will have daily guided tours in the Jøssingfjord area and to the Geopark localities Hellersheia and Jøssingfjord. In co-operation with Grand Hotel in Egersund, MGP-staff will arrange guided tours to Eigerøy Lighthouse every Sunday during July 2008.

Geopark conferences

The Geopark and business development staff have organised two Geopark conferences each year where all the members of the resource group, plus some special invitees, have taken part. Speakers at these conferences have been our own staff, guests from Gea Norvegica and the Geological Survey of Norway, Professor J. Richard Wilson and several of our partners. Three such conferences have been held so far and have been very successful with ~30 participants each time. The regional and the local press have participated in the conferences, and we have been able to give much information to the public from these events.

MGP localities

MGP has so far established five Geopark localities and will establish at least five more each year. Each Geopark locality has a marked trail, a parking place and a pamphlet. At the starting point there are panels describing the tour and the geology and other things that can be experienced during the walk. In 2008 there are also plans to establish a bicycle geo-trail tour. The five established Geopark localities are very popular and have already been visited by several hundreds of individuals. In order to assess numbers we currently rely on books in which walkers write their names, but we have plans for electronic counters in the future.

Art Exhibition

The art exhibition "Micro" with 24 pictures of thin sections of local rocks taken under the microscope (Enclosure 8) has been of great interest to the public and press. The photographs have been printed on canvas in different sizes up to 1 x 1.33 m and sold at prices from 100 to 700 Euros, depending on the size. Up to January 1st 2008 pictures have been sold for ~15.000 Euros and new orders are received weekly. The exhibition has also been used for lectures in geology and treasure hunts!

Competing for "The National Rock of Norway"

The Geopark has already resulted in there being a noteworthy interest for geology in the area. This was very clear during selection of "The National Rock of Norway" in January 2008. This involved an electronic selection using the internet; anorthosite come in third, despite the fact that this is not a widespread rock type in Norway outside Rogaland and that the area is relatively sparsely populated.

Partners using MGP

The event company has arranged for several companies to visit Geopark localities and the Micro exhibition. The MGP staff have also helped with providing information for future Geopark localities that the event company already uses in their visitor programmes.
The Tourism Development Company uses the Geopark in their marketing for the North Sea road, bicycle routes and walking trails. The Geopark is also used as an argument in favour of investments in new accommodation in the area, most recently in connection with a planned hotel at Sogndalstrand with 48 rooms.

C3: Polices for the protection, enhancement and economic development of the geological heritage present in the region with details of existing policies and actions and those under preparation

National, regional and local authorities in Norway have, for the last few years, prioritised development of tourism on the basis of culture, nature and outdoor life. In January 2008 the government presented their proposition for tourism development, and in it the clean Norwegian nature, cultural heritage and local identity were stressed as the country's foremost resources. Authorities at all levels have also put global warming and sustainable development on the agenda. While protecting the environment used to be a topic concerning non-governmental organisations, it is now an issue involving municipal councils and county councils all across the nation.

In Norway, all municipalities draw up a Municipality Plan every fourth year. One part of this plan concerns which areas should be used for industrial purposes, housing, schools and nursery schools; which areas should have extra protection as they are used for agricultural purposes; which areas should be used for outdoor a ctivities, and so on. The municipality plans are legally committed to mark areas of special geological interest, and if there are any geological phenomena of particular significance these must be given special protection with regards to building and/or expansion permits. The municipalities of Magma Geopark have long taken the unique geology, and the abandoned and active mines, into consideration when various plans have been drawn up. The establishment of Magma Geopark will further result in more landowners realising the possibilities offered by our unique geology.

Some organisations work specifically towards taking care of the natural and cultural heritage of the MGP area:

The Skerries Park in Vest-Agder

The Ministry of the Environment decided in 1998 that a new skerries park should be established in Vest-Agder county. The establishment of a skerries park west of Lindesnes entailed a significant boost in outdoor life by the sea in Southern Norway. Today, the skerries park comprises 15 areas along the coast including their naturally surrounding land i.e. islands, islets and adjacent mainland areas. These 15 areas constitute around 114 hectares. There are at present negotiations involving 20 other areas, so the total expected size is in accordance with the conditions of a varied selection of 150-300 hectares of new areas for outdoor life. An administration plan is presently being compiled to accommodate the new areas and incorporate them with existing outdoor life areas in the region.

Stavanger Trekking Association (Stavanger Turistforening)

Stavanger Trekking Association is responsible for a considerable network of routes for hikers all over southern Rogaland. It co-operates with the Norwegian Trekking Association that has branches across the country and is an important supplier of terms for the government with regards to outdoor life policies. The local branch in our region is Dalane Turlag, which again co-operates closely with Dalane Friluftsråd (Dalane Outdoor Life Council).

Outdoor Life Council of Dalane and Outdoor Life Council of Lister (Dalane Friluftsråd and Lister Friluftsråd)
The outdoor life councils of Dalane and Lister are in charge of four and six municipalities respectively. The outdoor life councils are the municipalities' joint organisation for the promotion of outdoor activities. These organisations are bodies entitled to comment on municipality plans, and have a special responsibility to ensure that outdoor activities are promoted when these plans are adopted. Both the councils have full-time managers.

Dalane Friluftsråd is a member of Vestkystparken (the skerries park of Western Norway) and has introduced the service called Skjærgårdstjenesten (www.skjaergardstjenesten.no) (a public service in charge of renovation and maintenance along the coastline). The outdoor life council of Dalane has two municipalities with coastlines – Eigersund and Sokndal. As of today, proper protection of areas used for boating excursions has only been implemented in Eigersund municipality.

As opposed to other outdoor life councils of Vestkystparken, Dalane Friluftsråd does not have practical responsibility for the operation of these boating excursion areas. This responsibility belongs to the individual municipality. An operational unit has been established called Skjærgårdstjenesten in Dalane, where Dalane Friluftsråd sits on the board.

The skerries near Egersund are unique since they are virtually the only off-shore islands along the coastline between Hidra and Ogna (Fig. 1). This is also why most of the leisure boats along this stretch of water make for Egersund harbour. The bulk of the boating excursion facilities are located at the northern sea entrance of Egersund harbour. This is the area that is most widely used by boating enthusiasts.

The Vestkystparken skerries park has more than 70.000 registered leisure boats. In Eigersund municipality, around 2.200 boats are registered in Småbåtregisteret (www.redningsselskapet.no/sbr). This means that Eigersund is the 4th largest leisure boat municipality in Rogaland County. The limited size of the Dalane skerries leads to intensive use of the facilities and results in considerable operational demands.

C4: The territory's interest in joining the European Geoparks Network.

MGP is being established in a region whose identity, settlement, business and industries have always evolved around rocks, mountains and mines. Perhaps the people of the region have not been aware of precisely how unique the geology of the area is, but they have still lived with the rocks and mountains as a defining condition for how their lives have been led. The logo of the Dalane region is four rocks piled on top of each other making up a cairn; everyone in the region instantly recognises it when they see it. When the outdoor amphitheatre at Sogndalstrand was to be built, there was never any doubt that local rocks would be the building material. Similarly, many houses in the region have stonewalls made from natural stone using a building technique that is not known in, for example, the Oslo region. The identity of the MGP area is clearly closely linked to its rocks.

Unique Geology

The geology of MGP has been described in depth elsewhere in this application. Here we will only mention how this pro-ject has given the people who live here a new pride and added a new dimension to their local identity. Through MGP the people here will not only become more aware that they live in a "rock region", they will also learn about the origins of the area, how the geology has laid the premises for settlement and industry, and prove to them that they live in an area which is of great interest for others as well. So far the MGP area has been visited by many researchers and students because of its geology. Through the Geopark the area will be made accessible for tourists visiting for shorter or longer periods. In addition, MGP aims to profile the mining industry, both the history of mining and the role of active mines today. Companies operating on the global market are obviously known by their employees and their immediate surroundings, but may not be as known in the region as such. Many areas try to stand out as unique and special, particularly in the field of tourism, sometimes without sufficient rerason. Visits to abandoned or active mines will give experiences that no other regions can provide and add a new dimension to the existing tourism.

Source of Inspiration for Scientific Subjects

The MGP area suffers from stagnation in population, and we have major challenges to recruit the skilled work force required by industry and the public sector. The lack of labour with the necessary competence is particularly noticeable when it comes to engineers. The oil industry (particularly in the Stavanger area) is attractive with its good conditions, and our industries struggle to compete. It is therefore important for us that young people from our region chose an education within these special fields. If they are to be engineers, they need to study scientific subjects, and MGP will contribute to strengthen the interest for mathematics and the natural sciences by offering excursions, lectures, competitions and research tasks.

Unexploited Potential for Tourism

The MGP area has a considerable potential for expansion of the tourism sector. We have plenty of space, but still not enough facilitated attractions and services. MGP will provide a great leap towards a sustainable and professionally managed tourism industry in the region. One of the main reasons why the municipalities of the regions are so emphatically behind the Geopark project is that they see how it will give a vital boost to the on-going work to establish the area as a tourist region, side by side with our larger neighbours to the north and south.

Already Positive Effects

The MGP project has been up and running since the autumn of 2005, and already we can see positive extended effects of the work. One example is the satisfactory participation in our own events. Even more important is the increasing local awareness of the geology and the natural surroundings in which we live. The press – newspapers, web sites and radio – have all had stories about the Geopark and its various projects. At a variety of levels in the schools we now observe a new interest for the scientific subjects, particularly geology. A local brewery has created Magma Brown Ale, and the event company "Experience Dalane" reports an increasing interest for trips and information about the geological heritage of the area.

C5: Endorsement letter from the National Commission for UNESCO

See enclosure 4.

D General information on the territory

D1: Economic activity

The MGP area is located in two regions. Most of the geopark area is within the Dalane region (consisting of the Bjerkreim, Eigersund, Lund and Sokndal municipalities) of Rogaland county council, and Flekkefjord is in the Lister region of Vest-Agder county council.

The primary industries of the region have traditionally been mining, fishery and agriculture. A number of industrial companies were founded in the 20th century. These have included production of faience (tin-glazed pottery), wood, mechanics, and in the last few decades, electronics. The towns Flekkefjord and Egersund are the trade centres of the region, and a number of smaller towns and villages provide private and public services. A few major industrial companies still employ a large part of the population and this explains why settlement and public income have remained quite stable here for a relatively long period.

Both Dalane and Lister are regions with much traditional industrial labour. The level of education is lower than the average for Norway, and it is a problem that young people who move away to study do not come back when they are finished. The reasons for this are several; the young students may not be aware that the traditional industry is about to change, and many companies are now offering jobs that require higher education. Other companies still have challenges to develop jobs requiring the skills of people with higher education.

Main structures responsible for sustainable economic development policy in the region

There is a wide range of actors with different areas of responsibility within regional development.

Innovation Norway

The state-owned company Innovation Norway is responsible for sustainable business development both on a national and regional (county) level. Innovation Norway gives grants, loans and, in some cases, financial support to groups of people or individuals who have a good idea and want to establish a new company. Women and young people have the highest priority and rural areas receive financial support more readily than urban areas. The business development funds have been created within regulations that the Norwegian state has signed with the European Union. Innovation Norway has regional offices in Stavanger and Kristiansand, and will be important funding partners for companies in MGP.

The Counties of Vest-Agder and Rogaland

The Vest-Agder and Rogaland counties each draw up regional development programmes (RUP). The Ministry of Local Government and Regional Development has assigned the county councils the role of being regional development actors, hence playing an active part in the development of both business and industry and district settlements. This is partly a national commitment, meant to be implemented countrywide, and partly it is left up to the individual county to introduce measures that will lead to positive developments regionally and locally.

SIVA (Statens selskap for industrivekst)

The governmental company for industrial growth SIVA plays an active role in the establishment and management of regional business development departments and knowledge parks in Norway. In the MGP area, there is a regional business development department situated in Egersund, which offers advice for establishers, courses for businesses and individuals, university level supplementary education and coordination of business development projects. Many of the businesses located here have in various ways contributed to further development of the MGP project. Dalane Regional Business Development Department has branches in Sokndal and Lund, and has an extensive co-operation with similar concerns nationwide.

The County Governor's Agricultural Department (Fylkesmannens landbruksavdeling)

The County Governor is the government's supervisory body in the counties, but also has a special responsibility for developing the agricultural and environmental sector. The County Governor's Agricultural Department of Rogaland has a separate rural developer employed in MGP, who contributes actively in the project, for instance assisting farmers who wish to establish new and alternative activities, in addition to more traditional farming. The rural developer is part of the MGP reference group.

The Business Development Manager of Dalane (Næringssjefen i Dalane)

The Business Development Manager of the Dalane region has the administrative responsibility for executive work on cases for the regional council Dalanerådet, who is head of the development of business and industry in Dalane. The Business Development Manager initiated the Geopark project through the regional council. The Business Development Manager is responsible for the project and is a member of the project management group. Furthermore, the office of the Business Development Manager has special know-how on tourism, and is working actively with infrastructure issues – broadband expansion in particular has been on top of the agenda in recent years.

Lister Kompetanse/Studiesenteret i Dalane

Lister Kompetanse is responsible for supplementary and further education in the Lister region (Flekkefjord municipality is part of Lister region that also includes 3 other municipalities east of MGP), where parts of Magma Geopark are included. The study centre in Dalane is about to be established and covers the rest of the Geopark area, and will offer similar activities. University and university college education will be offered to people who are already working, businesses that wish to increase the level of expertise of their employees, and to municipalities wishing to secure a qualified work force.

Private Initiatives

Private actors also contribute actively to business development in the region. Dalane Kapital is a group of investors who are involved in innovative projects especially linked to Egersund harbour. Moreover, the banks in the region are offensive players; the SR Bank recently established a separate foundation that gives both grants and loans to entrepreneurs, while the bank DnB NOR stimulates creative activities with their annual Innovation Prize.

EU Projects

Rogaland county council was the main partner for the inter-regional project the North Sea Cycle Route, which passes through the MGP area. This project has laid the groundwork for a considerable increase in cycle tourism in the area. The project Baltic Rural Broadband is about to be completed, where regional broadband strategies are being developed in an international network. MGP is our contribution in another inter-regional project, KISoLL (Knowledge Investment Strategies on Local Level), where it is being assessed what needs to be done to link research and development circles with business, industry and public organisations.

Network of local enterprises, artists etc.

MGP has collaborated in developing a new beer – Magma Brown Ale - produced by a local brewery Dalane Bryghus. The presence of MGP is also evident in the material produced by the regional tourism agency, and a photo from the Geopark is on the front cover of the regional tourist brochure created for the summer of 2008. Local and regional newspapers have contributed considerably with information about the geopark project, and encouraged their readers to vote for anorthosite as Norway's national rock. Anorthosite received the third most votes, a result we are very happy with considering that it was the rock Larvikite from the first geopark in Norway, Gea Norvegica, that won.

D2: The provisions for the protection of the region

See section C3

D3: Brief analysis of the present status of protection of the region

See section C3

D4: Existing facilities (museums, sites open to the public, marked trails, etc.) and details of their collaboration with the Geopark

The North Sea Cycle Route has been mentioned previously. Marked cycle routes along the North Sea coast pass through MGP and overnight accommodation businesses in the region offer special services directed at cyclists. The two hotels at the final stops have facilitated the cycle ride between Sogndalstrand and Egersund. The cycle route project has its own mobile phone service, which could be interesting for MPG to join. The service provides information on your mobile phone in three languages, directly to the different attractions. The responsible project leader for the North Sea Cycle Route in Rogaland is also a member of the MGP management group. Additionally, MGP is planning a guided geo cycle route through the Geopark area.

Experience Dalane, along with the route network of the Norwegian Trekking Association, offers good facilities for trekkers visiting the region. Fishing spots, both by the rivers and some larger lakes, have been opened in connection with the route network. The route network of Experience Dalane has often been a chosen starting point for tourists, both because they walk in exciting and attractive areas, but also because of the parking spaces etc. found at a number of locations. It is important for MGP to take advantage of the existing infrastructure in order to reduce the degree of intervention into nature as much as possible.

Flekkefjord Museum is situated near the sea at Grisefjorden in the centre of Flekkefjord and is a natural part of the old town Øvrebyen. The museum offers town walks all year round. In the main building from the 1720s you can see textiles, furniture etc. from the 18th to the 20th centuries. The boathouses offer permanent and temporary exhibitions. There are, for example exhibitions by the local pupils "Our distant past" and "Amsterdam – the city on Norwegian piles". Between the main building and the museum there is a lovely garden where the visitors can relax and enjoy a cup of coffee on sunny days. Flekkefjord Electricity Museum, exhibiting the town's history of electricity from 1901 until today, is located nearby.

Dalane Folkemuseum was founded in 1910 and is a regional museum for Dalane, including the municipalities of Eigersund, Bjerkreim, Sokndal and Lund. The museum comprises several sites of various sizes scattered across the region. The main site is at Slettebø just outside the centre of Egersund town. In Egersund there is also the Fayance Museum, which is regarded as a branch of Dalane Folkemusem. The museum's branch of naval history is in Sokndal, the museum "Lund Bygdetun" is in Moi, and the cultural heritage site Kløgetvedttunet is in Bjerkreim.

D5: Future facilities planned

Master Plan Outline

Work with a master plan for Magma Geopark AS will be completed in the summer of 2008. An overview has been made covering all the locations planned to be made available to the public, and this overview includes a time frame for each location. (See the lists of future facilitation of the locations; Tables B3.2, B3.3 and B8.1).
The education and the business development groups are working on equivalent plans for their activities. All this will be compiled in a joint document that will govern future work in Magma Geopark AS.

Economy and Finances

Magma Geopark AS has been set up such that the limited company will have a large owners' equity. This is essential in order to have finance available to be able to make future investments in the Geopark, but also to have capital income for the day to day running of the company. The five participating municipalities have guaranteed operational income covering a minimum of one full-time position including salary and other administrative costs. Continued co-operation is envisaged with both the Business Development Manager of Dalane and the regional tourism agency (Reisemål Syd Vest) when it comes to common aims. The county councils of Vest-Agder and Rogaland will continue to contribute with development and project funding, which will be essential for the establishment of new localities. There are also good national and regional support schemes for Norwegian farmers wishing to develop their properties, and these schemes will be used to finance the marking and maintenance of the network of paths and car parks.

MGP will sell services like guiding, teaching and presentations. A number of trained guides have already been hired out for specific events, and more will be trained. MGP products like photographs, maps, books and souvenirs will also contribute to the economy of the company.

Staff

Magma Geopark AS will have a general manager in a full-time position by the end of summer 2008. The co-operation with the Department of Earth Sciences at the University of Aarhus, Denmark, will also be continued (equivalent to a ~25% position). This Department will, together with the general manager, be the professional advisor for Magma Geopark. Young people have been employed to work as guides.

The staff at the office of the Business Development Manager in Dalane has so far contributed with executive work, writing of applications and the development of newsletters and our website. This work will continue after the company takes over from the current project organisation.

Geopark Products

So far a unique geopark ale has been developed, and a number of pictures of thin sections of rocks taken under the microscope (Enclosure 8) have been produced. The selling of these products is already bringing income to the geopark, and this cooperation will continue. Posters, postcards and smaller souvenirs will be ready for the tourist season of 2008.

Communication

A new excursion guide for the MGP area is being prepared in connection with the international geological congress IGC33 that takes place in August 2008. All localities will have a separate presentation brochure. So far five brochures have been produced (in two languages), and all these are enclosed with this application. The local newspapers (Dalane Tidende and Agder), and the regional newspaper (Stavanger Aftenblad) have all followed the Geopark project closely since its beginning in 2005. Press contacts and presentations in the media will continue to be a high priority task.

The website of MGP has been profiled at a number of events, and receives visitors regularly. The website is under con-tinuous development.

All localities will be provided with information boards and brochures. Larger overview boards will be put up at the entrances to MGP along the main roads E39 and Rv44. In the longer term, there are also plans to provide information at the ferry terminals and airports.

Information Centres

The Jøssingfjord Centre will be the main information and documentation centre for MGP. There are also plans to create documentation centres in all the participating municipalities. In Lund, a centre of this kind is already being organised; the other municipalities are still in the planning stage. The tourist information office in Egersund is open all-year around, providing brochures and other information about MGP. The information services of each of the municipalities will also provide current information to the public in their opening hours.

Geotourism

MGP is vital when it comes to geotourism in our region. We aim to further develop co-operation between various other groups and companies which have the goals of sustainable tourism and respect for nature and culture. The local mountain climbing club, diving clubs, Dalane miljø- og ressurslag (who organise private fishing rights and localities for the landowners) and event organisers would be of interest as collaborators. The aims of Innovation Norway are important to us, and MGP will participate in their activities together with the tourist agencies.

Geopark Science

Scientists, particularly geologists, regularly visit our region. MGP wishes to accommodate those scientists that already come here, and hopes to attract more of them. The Jøssingfjord Centre (planned as a documentation centre for rocks and geology of the area) will assist researchers who wish to work in the area for longer or shorter periods. In order for this to be successful, continuation of the close co-operation with the universities of Bergen, Aarhus and Liège, and the Norwegian Geological Survey, is vital.

Important Future Events

The next major event in MGP will be when we hopefully are accepted as a member of the European Geopark Network. This will be marked with a major regional event and several smaller events in the municipalities. Annual events will be the "Day of Geology", a large-scale outdoor cultural event in Jøssingfjord, and a Geopark conference.

In August 2008, the world famous singer Katie Melua will be giving a concert in the opencast mine Titania. This will give MGP a unique opportunity to spread information about the importance of geology and mining to the thousands of people living in our region. A sculpture symposium, including Norwegian as well as international artists (http://wwwtbdalanekunstprosjekt.wordpress.com), is also being organised in 2008, and this will be a good chance to show how art and sculptures can be created from raw materials from the Magma Geopark area.

Layout: Sogndalstrand Media - Front page, large potholes at Brufjell Flekkefjord (Geopark locality no. 43) photo: Jan Ove Grastveit