

THE ELECTION OF A NATIONAL NORWEGIAN GEOLOGICAL MONUMENT. A TOOL FOR RAISING AWARENESS OF GEOLGICAL HERITAGE

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Abstract: In 2010, The Geological Society of Norway (NGF), the Geological Survey of Norway (NGU) and GeoPublishing together formed an initiative to celebrate the geological diversity of their country. The public were invited to elect a National geological monument. Prior to the election, everybody were encouraged to nominate candidates. A jury picked 10 candidates from the nominees. The 10 chosen nominees were designated as geological national heritage. The candidates were presented and promoted by the Norwegian Broadcasting Corporation and the Norwegian Trekking Association. The candidates were also thoroughly presented and promoted on a joint website, and the public was invited to vote for their favourite candidate on the website. The winner was then presented on national television on October 18th. The nomination process mobilised local communities all around the country, and our aspiration was that the voting process would raise local and national awareness. This article presents the background, motivation and result of the process.

Key words: Geotourism, awareness, geological heritage, geological monuments, Norway

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INTRODUCTION

Norwegians are obsessed with outdoor activities in the natural environment. Visiting tourists also hold nature as the main attraction of the country. However, the geological aspect of the natural history is often not appreciated. There is a potential in teaching residents, pupils and tourists about the geological influence on the Norwegian natural environment, as well as learning more of the stories the rocks and particular landscapes can tell.

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Some phenomena are unique to Norway, while others are more globally widespread. Nevertheless they all tell their little part of the story of the origin of Norway. Some geological attractions, such as World Heritage areas and geoparks are appreciated internationally. Other local attractions can serve as good examples of geological processes and phenomena suitable for field education in schools. Other geological attractions can also be primary spectacular, meaning that they generate attention and interest.

GEOLOGICAL DIVERSITY IN NORWAY

Norway exhibits a wide array of landscapes, from soaring alpine peaks to gentle coastal cliffs. These different landscapes are all formed through a combination of tectonic forces from within the Earth and the action of water, wind and ice on the earth's surface. These processes have acted during different time periods and neighbouring landscapes may be of widely different ages. The gently undulating upland plateau of Hardangervidda is an ancient flatland that has been tectonically uplifted to its present position. In contrast, the nearby Hardanger fjord has been cut by glaciers into very recent time from a geological time perspective.

The oldest rocks in Norway are of Archaean and Proterozoic age, whereas the main areas are covered with thrust nappes from the Caledonian orogeny. Around Oslo, several rocks of Permo- to Carboniferous and Cambrian to Silurian constitute the famous Oslo Rift. Weathering processes, especially during and after the last Ice Age, have created unique shapes and features (figure 1).

Humans have interacted with the Norwegian landscape since the end of the last Ice Age. The first humans followed the retreating ice margin and settled according to the conditions of the land, but simultaneously initiated the exploitation of the landscape as a natural resource. From an economical point of view the Norwegian landscape plays an important role through the tourist industry. Furthermore, landscape-forming processes indirectly have a huge impact on society through the formation of natural resources and the cause of geohazards. The geological processes have also generated sites which have been included in the UNESCO World Heritage list. An excellent example is the UNESCO World Heritage site West Norwegian fjords. Other localities are important for education, whereas some are protected as natural monuments. Two areas, Magma Geopark at the southwestern coast, and Gea Norvegica geopark at the southeastern coast are also designated as Geoparks approved by UNESCO.

RAISING AWARENESS IS NECESSARY

However, geological diversity has not been appreciated as an asset neither for tourism nor nature managers. Unfortunately, the lack of geological knowledge is not recognised by the governments: *“they do not know that they do not know”*. Geological values and geoheritage are thus often neglected among policy makers, nature managers as well as the public.

Several initiatives are taken in order to raise awareness of the significance of geology. In 2008, the Geological Society of Norway (NGF), GeoPublishing and Geological Survey of Norway (NGU) carried out a common outreach project in order to promote various rocks typical for Norway. The initiative resulted in the election of a national rock for Norway. The election process turned out to be a success. 10 candidates were thoroughly presented, and several local initiatives were established in order to promote the candidates. Norwegians voted for Larvikite as their national rock, in close competition with 9 other commendable candidates. Among other things, the competition resulted in a book on Larvikite and the history of its use as building stone (Børresen and Heldal, 2009).

The public interest in the various candidates and in their influence on society was significant. Especially in communities hosting one of the candidates in their neighbourhood, the subject was high on the agenda. Encouraged by the success, another idea began to emerge among the coordinating organisations. Perhaps a competition with an election of a national geological monument would mobilise local communities in a similar way. The process of starting such an election began in 2009, and the election took place in 2010.

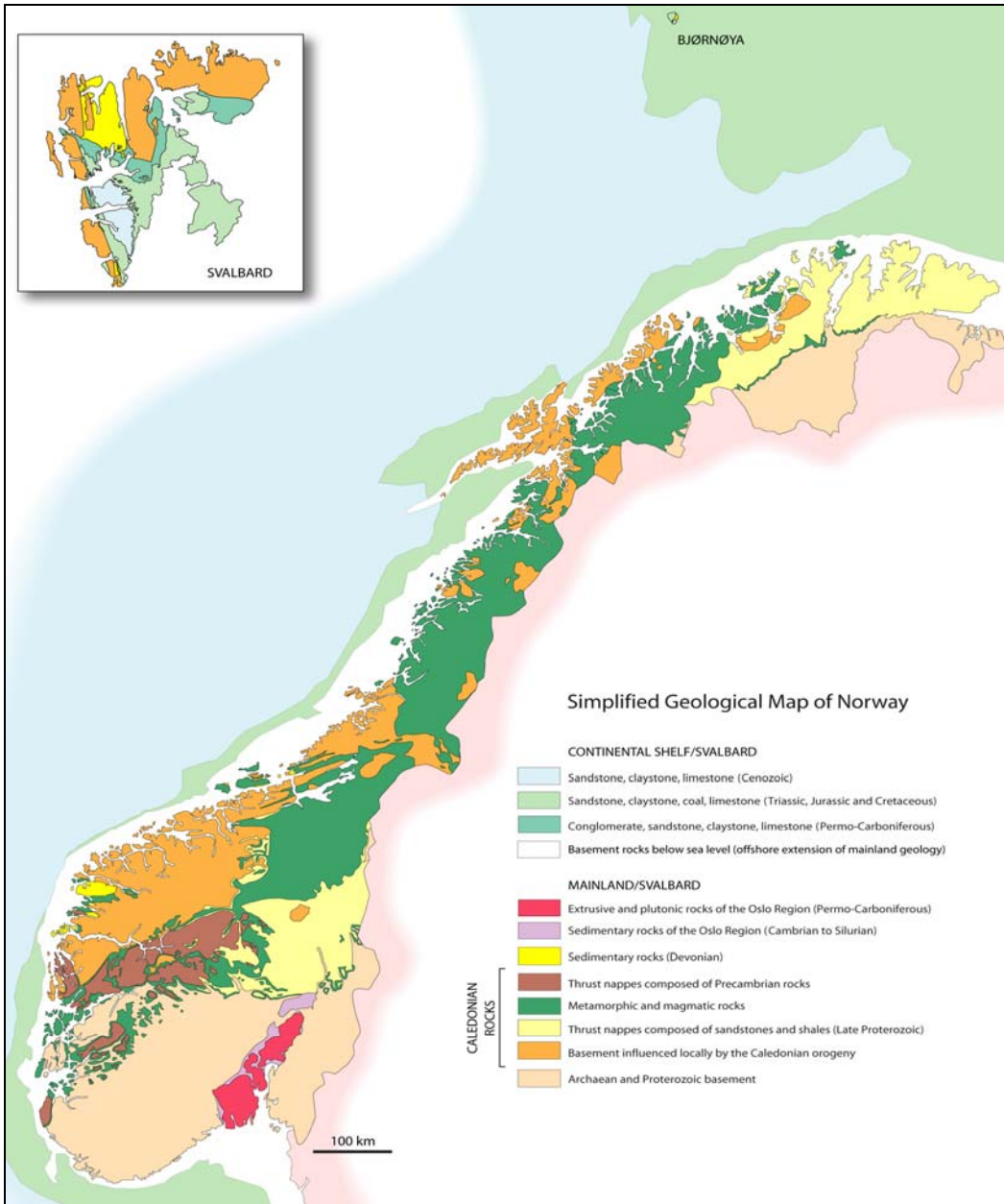


Figure 1. Simplified Geological Map of Norway (Source: Solli and Nordgulen, 2006)

THE PROCESS AND CRITERIA FOR SELECTION AND THE CANDIDATES

Everyone was invited to nominate their favourite candidate for a national geological monument. Approximately 100 proposals were submitted. A jury, made up of representatives from the geological community as well as tourist and trekking organisations, made a shortlist of 10 candidates. The jury emphasized that the candidates should be:

- Representative, i.e. tell a significant piece of Norway's geological history,
- Instructive, i.e. it should be possible to communicate this story to laymen in a popular, non-scientific manner,
- Attractive, i.e. the place should represent a nice trekking destination.

After the shortlist was presented, everyone could vote for their favourite candidate. After a hectic and busy election period, the jury officially recognised the result and a winner were awarded as a national geological monument.

The selection of 10 commendable candidates from 100 submitted proposals was a demanding process for the jury. However, the shortlist ended up with a selection of sites widespread both geographically and thematically (table 1). A short description of the 10 chosen candidates will be given, in random order.

Grønligrotta is a part of a carstic cave system in Nordland. **Torghatten** is a monolithic mountain with a huge, characteristic cave running through the mountain. **Bigganjarga** is an area of exceptional scientific interest. It is basically an old moraine, but dating back to 700-650 million years, it is used as an indicator of an early glaciation of our planet, referred to as Snowball Earth. **Leka** is a spectacular island with an ophiolite complex. It is a well-preserved, tilted part of oceanic crust, exhibiting a cross-section from sea floor to mantle rocks. **Jutulhogget** is a large canyon, created by melting water from the deglaciation of a massive inland glacier covering most of Norway during the last Ice Age. The **Pulpit Rock** is a monolithic flat plateau with a 600 meter vertical drop to the Lysefjord. The fjord and the surrounding mountain sides, including Pulpit Rock, owns its existence to the glacial period. The same goes for the **Geiranger fjord**, which is an archetypical fjord landscape, carved out by glaciers. The area is also on UNESCO's World Heritage List. The hill **Kolsås** displays some of the geological features important for the Oslo area. The predominant rock is rhomb porphyric lavas from a permian rifting in the Oslo area, constituting a Permian analogue to today's African Rift Valley. **Jomfruland** moraine ridge is a typical and iconographical evidence of an advancing glacier. Today, glaciers are not in abundance. But the **Jostedalsbreen** glacier, the largest in Norway, is an evidence of changing climates and the erosional processes taking place today. Here, the result of recent processes can be witnessed and interpreted in order to understand landscape features elsewhere (table 1).

Table 1. Shortlist of 10 eligible candidates for geological national heritage

Place	Feature
Grønligrotta	Karstic cave
Torghatten	Glacial erosion,
Bigganjarga	Tillite
Leka	Ophiolite
Jutulhogget	Canyon
Pulpit rock	Fjord
Geirangerfjord	Fjord
Kolsås hill	Permian rocks
Jomfruland moraine	Quaternary accumulation
Jostedal glacier	Recent process



Figure 2. Leaflet showing the different candidates (Geological Society of Norway, 2010)

THE SELECTION PROCESS AND THE WINNER

Several other stakeholders took part during the process. The Norwegian Trekking Organisation (DNT) as well as the Norwegian Broadcasting Corporation (NRK) expressed interest in the concept. An important outcome was that the main election process took place on a very popular website run by DNT and NRK (Friluftsliv for alle.), instead of on a less-visited website visited mainly by geologists, as originally planned. The candidates were presented in leaflets (figure 2), articles, on the web and even on television. During

September 2010, the election process was thrilling, with lots of local mobilisation around the country. The ranking on the list switched constantly, and it was a close race between several candidates. However, in the end, one candidate stood out as a winner. Leka ophiolite complex won the voting contest, and the jury approved the result. Thereby, Leka was awarded as the national geological monument of Norway. The result was presented on television, and the mayor of Leka received a certificate at the biannual Norwegian geological meeting in January 2011.

Leka is an island approximately halfway between the southernmost and northernmost point of the Norwegian coastline. This is the only place in the country where you can literally make a journey from the sea floor and into the mantle. From a geological point of view, it dates back to the Caledonian orogeny in Silurian-Devonian, 400-500 million years ago. From a long distance, the brown to yellow colours of the rocks on the island is a characteristic feature. Numerous legends offer different explanations on the origin of this unique and dramatic landscape. According to geologist, though, the colour is caused by oxidation of iron from the ultramafic rock. Together with adjoining sequences of gabbro, dolerite dykes, pillow lavas and pelagic sediments, this constitutes an ophiolite sequence, i.e. a complete cross-section of the oceanic crust from below mocho to the sea floor. Due to folding, the sequence is tilted. This means that one can literally walk on a trail from mocho to sea floor. Together with a beautiful landscape of a surrounding archipelago, carved out by glaciers and frost weathering, Leka exhibits an area of outstanding geological heritage (figure 3).



Figure 3. View from Leka, the winner of the competition Norway's National geological monument
(Picture by Halfdan Carstens)

FURTHER WORK

After having received the award, the mayor of Leka municipality gave a keynote speech at the biannual Norwegian geological meeting in January 2011. According to his speech (unpubl.) the local governments and stakeholders will use the momentum to promote Leka even further as an excellent destination for geotourism, while also keeping in mind that the area needs protection.

One of the planned products from the election is a book. In this, we plan to present and celebrate the Norwegian geoheritage in general, and the national geological monument in particular.

The competition and its outcome has led to new initiatives. GeoPublishing, in cooperation with NGU and NGF, has launched a website (Geoportalen. no.) based on Google Maps, with links and coordinates to interesting geological localities in Norway, spanning from buildings with ornamental stones, to landscapes and geomorphological features. The site is based on the principles used in GeoCaching. The public is encouraged to upload and share their own findings via Smartphones. In addition, NGU is putting up a web mapping service displaying areas of significant value as geoheritage sites. The service is meant for policy makers, land-use planners, environmental consultants and other stakeholders.

CONCLUSIONS

Public outreach is an important way to draw attention to geological processes, structures and resources, as well as geologically interesting areas. As for protecting and highlighting selected objects, local participation and local stakeholders is essential. That is to say local initiatives addressing local geoheritage is better than national, top-to bottom initiatives, even if the latter may be more relevant and precise from a scientific point of view. The process of election of a geological national monument has shown that there is a inherent interest for geological heritage among the general audience.

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Submitted:
29.07.2011

Revised:
27.10.2011

Accepted:
31.10.2011

Published online:
01.11.2011