

MAPPING NORWAY FOR 250 YEARS - Maps give Power

Leikny GAMMELMO, Janne JOHNSEN, Karsten LIEN, Sidsel KVARTEIG, Norway

Key words: Map, Mapping, History, Power, Surveying

SUMMARY

Maps can be described as tools to understand the world. Maps are often made by surveyors and cartographers, but earlier also by tourists and explorers. Their work was carried out in rain and sunshine, with pen and paper, and until today with GPS, satellites, and computer technology. They gave us a tool to understand the world and develop our surroundings.

In 2023 the Norwegian Mapping Authority celebrates its 250 years jubilee. A journey of 250 years of mapping Norway. It began as a mission to map the area close to the border with Sweden. The army needed maps and drawings of fortifications and strategically important areas. It was the military and national interest in knowing the situation along the Swedish border, which was the background for the German officer in the Danish-Norwegian army, Heinrich Wilhelm von Huth, being commissioned to be responsible for the mapping in Norway. He is therefore considered the first Director-General of what we today call the Norwegian Mapping Authority, when this was formed in Christiania (Oslo) in 1773.

At the end of the 17th century and into the 18th century, certain private individuals took the initiative to map Norway. It was not until the establishment of the Mapping Authority in 1773 that this work was formalized. In this sense, maps are a useful tool in the FIG 2023 saying “protecting our world, conquering new frontiers”. Mapping has old roots from the Egyptians and Babylonians. Sailors and traders created the need for maps, on their journeys out on sea. Major trading and shipping nations have in turn made great efforts as cartographers. Today we use new technology mapping our surroundings. In Norway laser scanning of the sea and harbours is important to make the journey of today’s sailors safe. It gives opportunities, and initiatives to make a model for how Norwegian ports can become digital and automated.

The mapping of Norway has been carried out for more than 250 years, nevertheless, the year in which General Heinrich Wilhelm von Huth issued our first national survey plan is a natural starting point for the article. The aim of the article is to shed light on parts of this history and emphasize the importance of maps, also in the context of power. The power that lies in the knowledge of where to find, the knowledge of geographical information.

MAPPING NORWAY FOR 250 YEARS - Maps give Power

Leikny GAMMELMO, Janne JOHNSEN, Karsten LIEN, Sidsel KVARTEIG, Norway

1. INTRODUCTION

Maps can be described as tools to understand the world. Maps made by surveyors and cartographers, but earlier also by tourists and explorers. Their work, carried out in rain and sunshine, with pen and paper, and until today with GPS, satellites, and computer technology, has given us tools to understand the world and develop our surroundings.

Mapping has old traditions from the Egyptians and Babylonians. Sailors and traders created the need for maps on their journeys out on sea. Major trading and shipping nations have in turn made great efforts as cartographers (Munthe 1958).

In 2023 the Norwegian Mapping Authority celebrates its 250 years jubilee. A journey of 250 years of mapping Norway. It all started with a mission to map the land close to the border with Sweden. The military needed maps and drawings of fortifications and strategically important areas. For Norway it was said to be “troubled times” and the military interest in knowing the situation along the Swedish border, was the background for the German officer in the Danish-Norwegian army, Heinrich Wilhelm von Huth, being commissioned to be responsible for the mapping in Norway. He is therefore considered the first Director-General (Kartverket 2022a).

Mapping of Norway have been carried out for more than 250 years, nevertheless, the year in which General Heinrich Wilhelm von Huth issued our first national survey plan is a natural starting point for the article. At the end of the 17th century and into the 18th century, certain private individuals took the initiative to systematically map Norway. It was not until the establishment of “Norges Grændsers Opmaaling”, today the Norwegian Mapping Authority, in 1773 that this work was formalized. The aim of the article is to shed light on parts of this history and emphasize the importance of maps, also in the context of power. The power that lies in the knowledge of where to find, the knowledge of geographical information.

The research question lies in searching for similarities of mapping 250 years ago and today; How can maps and mapping contribute to "protecting our world" and technology contribute to "conquering new frontiers"? – Frontiers in this context are the knowledge and power that lies in the maps and the use of them. The research methodology is foremost a literature search, nonetheless, conversations with professionals form an important starting point for finding literature, use the literature and discuss findings.

2. MAPS AND MAPPING

According to the International Cartographic Association (ICA) a map “is a symbolized representation of geographical reality, representing selected features or characteristics, resulting from the creative effort of its author’s execution of choices, and is designed for use when spatial relationships are of primary relevance” (ICA 2003). A map is made by a cartographer or with cartography. Which, in short, is said to be the “art, science and technology of making and using maps”. The long definition describe cartography as “a unique facility for the creation and manipulation of visual or virtual representations of geospace – maps – to permit the exploration, analysis, understanding and communication of information about that space” (ICA 2003). Using these definitions, a map represents a certain place, what we can find there, it is georeferenced, and we can use it to tell a story, give information or manipulate in analyses to see what will happen if “we do this or that”. The map reflects the interests of the cartographer and/or whoever commissioned the creation of the map (Jones 2023). Figure 2 illustrates a map that was commissioned and is an example of the client's influence on what should and should not be included.

According to Jones (2023) there are different driving forces for mapping:

1. Religion – in the sense of show “the God's creation”
2. Navigation – at sea and on land
3. Trade – mapping of trade routes and map production for sale
4. Knowledge of the world – as in scientific curiosity or economic benefit
5. Territorial power – visual control, legal control over resources and trade, taxation, border crossing or state building
6. Military power – for defense and warfare

These forces are seen in the early maps with drawings of sea monsters, resources, churches, and the marking of especially high mountains, among other things. Mapping of resources can be crucial in the sense of knowing where to do mining or when to carry out logging. A map is always a representation, it gives a selective picture of the world depending on the map's purpose, scale, and use of symbols (see figure 1).

Early Ptolemaic Maps of Northern Europe includes Norway (Jones 2023), but Carta Marina is often said to be the first time Norway was placed on a map. Carta Marina was drawn by Olaus Magnus and published in Venice in 1539 (see figure 1). An impressive map covering the Nordic countries. The map told a story of the geographical areas and people who had been lost to the Catholic church. In the map he made it clear that these countries had both resources and people (Hagen 2020). It was a common understanding that these northern parts of the world were an ice desert with no inhabitants and just a white spot on the map of Europe, Carta Marina changed this understanding. Figure 2 is the first folio-map of Norway alone. It is named “Norvegia Regnum” and made by Joan Blaeu, published in his Atlas Maior in 1662. It was made on request by king Christian IV. This made it possible for the Danish-Norwegian king to visually see what was in his territorial power. The first map of Norway drawn and issued by a Norwegian was “Kongeriget Norge” by Ove Andreas Wangensteen in 1761.



Figure 1: A section from the first printed map, *Carta Marina*, of the Nordic countries, by Olaus Magnus 1539. The University Library in Tromsø - 1999. License: Public domain.



Figure 2: *Norvegia Regnum* by Joan Blaeu 1662. Accessible from: https://lokalhistoriewiki.no/wiki/Norvegia_Regnum,_Vulgo_Nor-Ryke .

3. THE NORWEGIAN MAPPING AUTHORITY

This chapter will give, in short, an overview of the Mapping Authority. Chapter 4 will provide some of the history of mapping land and sea areas of Norway.

In the beginning the name was “Norges Grændsers Opmaaling”, with different combinations of mapping Norway through the years, in short NGO. From 1980 the official name is “Statens kartverk”, in English the Norwegian Mapping Authority. In the following NGO will be used when writing about the time before 1980, and the Mapping Authority for the time after.

The Mapping Authority is the oldest technical agency in Norway and carries a long tradition and ability to adapt, to fulfill its mission for the society. In the beginning the mapping of Norway had a military purpose. The foundation was in the year 1773 and the first NGO Director-General, was Heinrich Wilhelm von Huth. He was in this position until 1805. Many of the following Director-Generals have been of military rank.

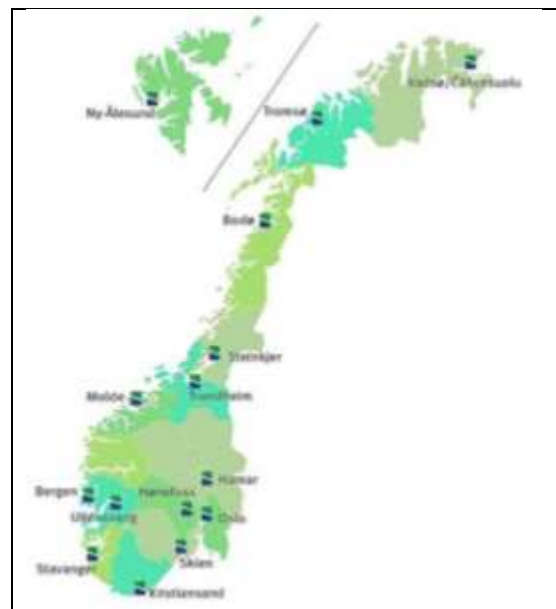
Christiania, later Oslo, was the location of the main office in 1773. From 1880 to 1980, the main office was located in St. Olavs street 32, Oslo. Then, in 1980 the Mapping Authority moved to Ringerike, Hønefoss, which is also the location today. The formal opening of the building took place at 17. September 1980 by King Olav V.

In 1872 NGO became a department in the General Staff under the Ministry of Defence. In 1948 NGO is transferred to the Ministry of Transport. In the 1960`s Norway started with economic mapping and a department working with economic mapping was established. In 1973 NGO was transferred to the Ministry of Environment and in 2014 to the Ministry of Local Government and Regional Development. In 1977 the county offices were established.

The Mapping Authority's area of responsibility includes Norway's land, coastal and marine areas. This also includes the coast around Svalbard and Jan Mayen, within the Norwegian economic zone. Figure 3 illustrates the location of the main office in Hønefoss, and the county offices. The Mapping Authority has an earth observatory in Ny-Ålesund on Svalbard and a customer center in Ullensvang in Hardanger.

The Norwegian Hydrographic Service has operator responsibility for the international electronic nautical chart service, Primar.

Figure 3: Norway with the division into counties and location of the main and county offices, 2020.



4. MAPPING NORWAY

Mapping the national borders

As stated in the introduction chapter it all started with a mission to map the land close to the national border with Sweden. The military needed maps and drawings of fortifications and strategically important areas. It was the military and national interest in knowing the situation along the Swedish border. This mapping is one example of military power as a driving force.

For the military authorities, a military academy was established in Christiania in 1750, called "The Free Mathematical School". It was the precursor to today's Norwegian Military Academy. Here, the students were taught, among other things, land surveying and drawing (Kartverket 2022a). In an early instruction from 1775, on what to draw and describe making maps, from lieutenant colonel von Stricker, shows the importance of mapping for military purpose. It was to be brought up where there were narrow passages in the terrain, where enemy troops had broken in, previous skirmishes, where posts had been placed and redoubts had been built (Harsson and Aanrud 2016:505).

Norway has national borders with Sweden, Finland, and Russia, and some agreements is dated even before the NGO was established. National borders can be defined by “mutual agreements between the political entities that reside in those areas; the creation of these agreements is called boundary delimitation” or a border treaty (Border 2023).

The so called “Svenskegrensa”, the border between Norway and Sweden is a 1 630 kilometers long land national border and is one of the longest continuous borders on land between two nations in Europe. The first border treaty with Sweden dates from 1661. The southernmost 25 km of the national border were described in considerable detail in this agreement and are thereby the oldest part of Norway's national border that was determined precisely.

The border between Norway and Finland is 736 kilometers long. It is a land and river border between three country cairn. The border was defined in a treaty in 1751 and in 1826.

The border between Norway and Russia consists of a 197.7-kilometer land border between South-Varanger, Norway, and Pechengsky District, Russia, and a 23.2-kilometer marine border in the Varangerfjord. It further consists of a border between the two countries' exclusive economic zones (EEZ) in the Barents Sea and the Arctic Ocean. The border line was defined by a treaty in 1826.

There have been several border reviews of the Norwegian border. In the declaration from 1847 between Norway and Russia it is said that it should be performed every 25 years. This also apply to the border with Finland and from 1933 with Sweden. Figure 4 gives insight to the daily life of the work with the border between Norway – Russia – Finland 1896-1897.



Land surveying at Golmesaive.



Camp at Jalve, nearby Tanariver.



“The last supper at Tana”



Camp at Jacobsvig.

Figure 4: Clearance of the national border between Norway and neighbouring countries. The pictures are taken during the border clearance between Norway – Russia – Finland 1896-1897. (Photos from the Norwegian Mapping Authority, probably taken by Mathias Andersen Ween)

The three country cairn, or in Norwegian “*teriksrøys*” is a meeting point of three countries. The western three country cairn, on the border with Sweden and Finland, is marked by a concrete cairn. The eastern three country cairn is marked by a stone cairn where Norway border Finland and Russia (see figure 5).



Figure 5: To the left, the three country cairn between Norway – Sweden – Finland. (Photo: The Norwegian Mapping Authority 2018). To the right, the three country cairn between Norway – Finland – Russia, Krokfjellet. (Photo: Johnny Andersen 2003)

Mapping the land

From 1773 mapping of Norway was done systematically. They made rectangle measurements, on a scale of 1:10,000 covering Østfold, parts of Oslo, Akershus and Hedmark right up to the south of Trøndelag, along the national border with Sweden. Together with measurements of other parts of Norway, these maps are an important historical source for local history work. These maps were measured in the period 1773-1813 (Rød et.al. 2023).

The rectangle measurements could also include properties and property borders. This is illustrated in the map in figure 6. Plane tables were used in the field, together with binoculars, compass, pencils, paper etc., it was placed with a view of the area to be surveyed.



Figure 6: Rectangular measurement with cadastral information 1805 (The Norwegian Mapping Authority's Historical archive).

In 1805 the, what we call “military mapping”, is combined with economic mapping and in 1814 it continues with topographical surveying with civil status. During the first period of economic mapping, 1805-1813, two types of maps were to be made. One for military purposes and one with cadastral purposes such as property boundaries and land use (Harrison and Aanrud 2016:270). An instruction was prepared with, among other things, descriptions of terrain image and use of map symbols. Original measurements for parts of the same areas as the rectangle maps and the rest of the country, were later measured in the period from 1817 onwards, on a scale from 1:20,000 to 1:100,000 (Rød et.al. 2023).

Figure 7 is a section of the result of the second period of economic mapping, a project started in the 1960’s. The state entered as a financing and controlling party in the establishment of economic mapping departments in the counties in 1962. Economic mapping should have a main chart series covering the inhabited areas of the country on a scale of 1: 5,000. The main purpose was to cover economic interests. The field work was done by NGO. The construction of the maps was carried out by private companies (Harrison and Aanrud 2016:167).

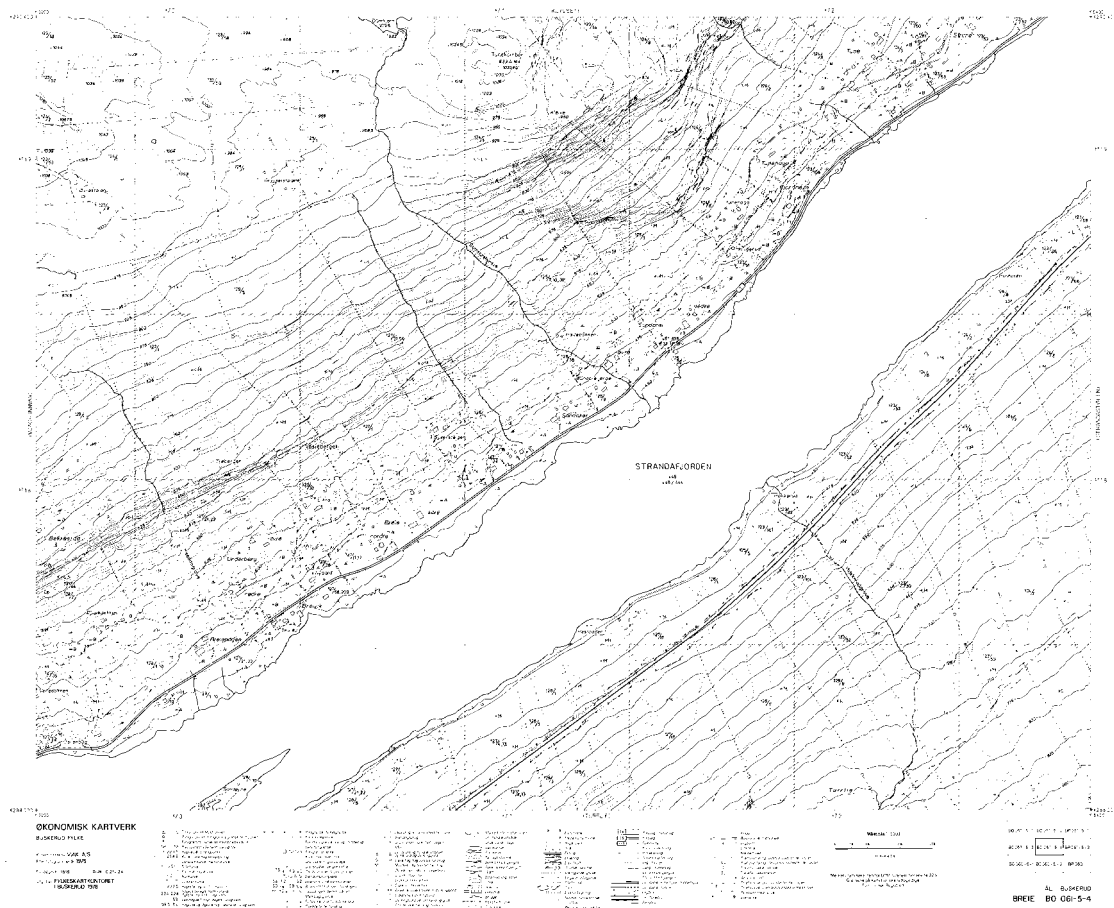


Figure 7: Section of economic mapping (1. gangs ØK) Map sheet from Ål in Buskerud (The Norwegian Mapping Authority's Historical archive).

In 1992 an agreement was formed to carry out mapping projects. It was called “Geovekst” and is a cooperative effort for the joint financing, establishment, and maintenance of basic geospatial information. It is based on a framework agreement between the Norwegian Mapping Authority, Directorate of Public Roads and the former Norwegian Association of Local and Regional Authorities, Norwegian Energy Providers’ Trade Association, the Norwegian Telecommunication Administration, and the Ministry of Agriculture. Several other parties have acceded to the cooperation over time. The parties join specific local project agreements based on the framework agreement. This cooperation is coordinated by the Mapping Authority with assistance from the Geovekst Forum, where all the key parties participate. The parties are the joint owners of the data established through the cooperation (KMD 2018:31). The Mapping Authority is the secretariat for Geovekst and coordinates the geodata collaboration centrally and in the counties. The Mapping Authority also leads the Geovekst forum (Kartverket 2022c).

Mapping the sea

In 1785 NGO undertakes the coastal mapping of southern Norway. The mapping of coastal areas and the sea is a part of NGO until 1932. This year Norway’s Maritime Mapping Authority is separated as its own institution. In 1958 it moves to Stavanger, which is still the main office of the Hydrographic Service. The assemble, was, as already mentioned, in 1986.

Mapping of ports and the sea routes was important for shipping and trade, such as transporting timber and knowledge of the seas that it had to be transported to and from. Navigation on sea could be dangerous and knowing where to sail was at that time, as today, vital for marine safety. Figures 8 and 9 illustrate some of the early coastal charts from the coast and sea routes.

A part of mapping sea area was the land toning, illustrated in figure 10. Drawing detailed land tones has been an important part of marine mapping ever since the national sea survey started at the end of the 18th century, until the end of the 20th century (Kjerstad 2021). Land toning is how the contour of the coast fades far out from the sea or a characteristic image in the ship's berth. Land toning is often depicted in sailing descriptions. They are for information purposes. In particular, land tones were useful in earlier times to bring ships safely to the coast.



Figure 8: Coastal chart from Møre and Romsdal 1:75.000, by Niels Andreas Wibe and Carl Frederik Grove, 1788 (The Norwegian Mapping Authority's Historical archive).

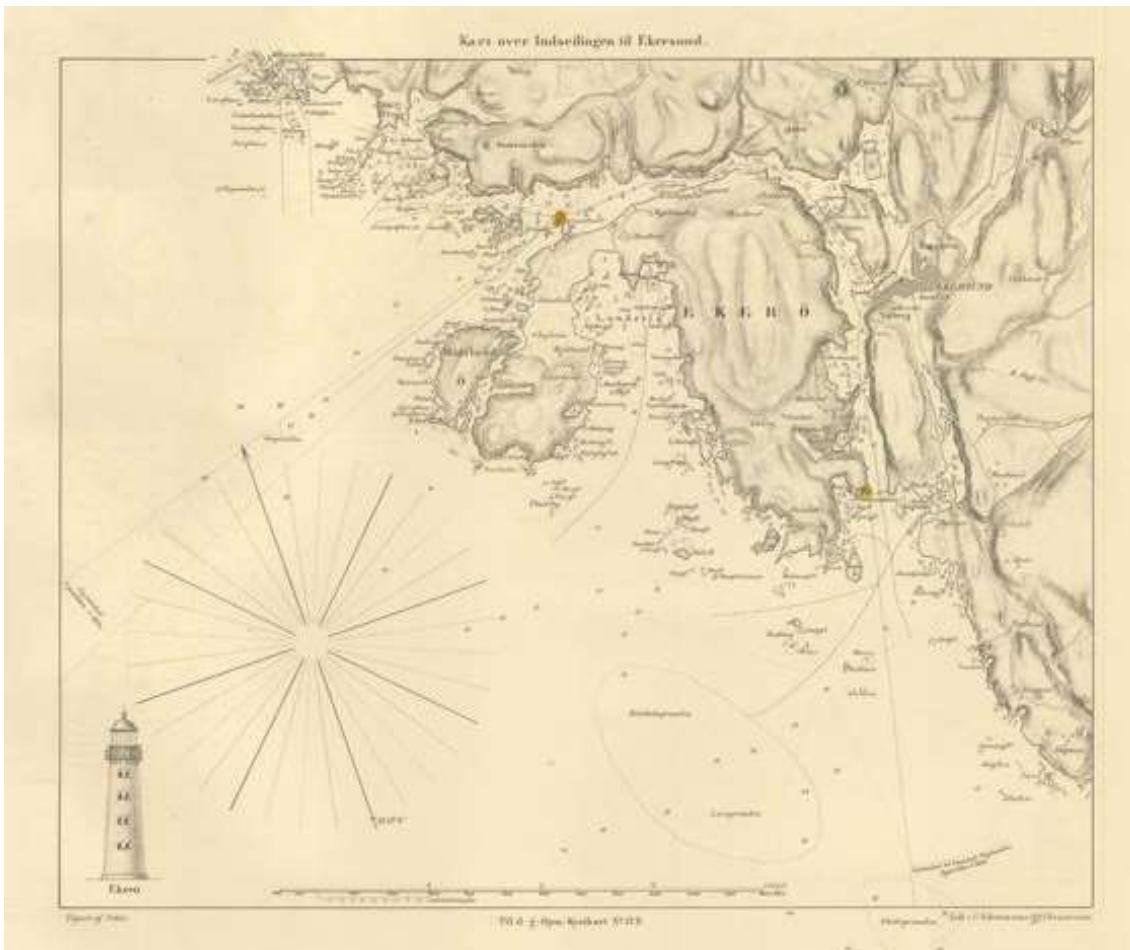


Figure 9: Entry point for Egersund, in West-Agder 1:20.000, by Schie, 1862 (The Norwegian Mapping Authority's Historical archive).

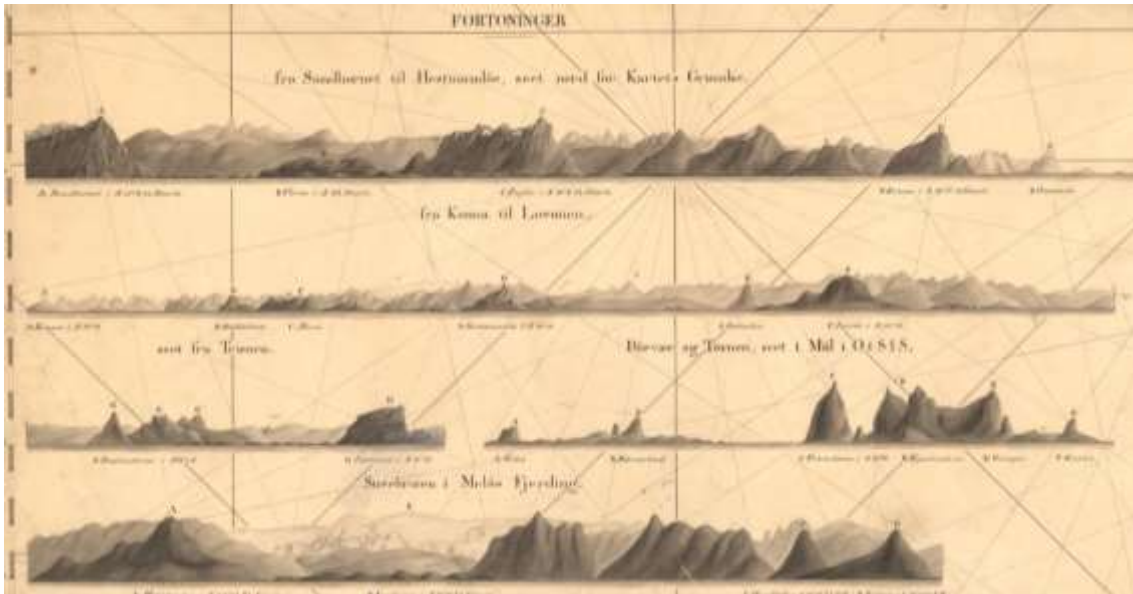


Figure 10: Section of land tones from a map of the Norwegian coast from Dönnæsöe to Fleina and Sandhornet of the Norwegian coast, 1836 (The Norwegian Mapping Authority's Historical archive).

During the second world war (1940-1945) the Germans mapped special areas that were considered important waterways, as well as secure anchorages for convoys and hiding places. The German hydrographers delivered professionally high-quality work.

Today it's possible to get reliable electronic navigational charts (ENC) as a contribution to marine safety and efficiency at a global level. PRIMAR is an international collaboration dedicated to providing consistent and reliable ENC service and operate on a non-profit basis by the Norwegian Hydrographic Service in close cooperation with Electronic Chart Centre AS. Their goal is that mariners, anywhere in the world, can obtain fully updated ENCs for all shipping routes and ports around the globe (PRIMAR).

The Mareano Program, which started in 2005, represents a cross-sectoral cooperation on the mapping of Norwegian sea and fjord areas. It's a program for mapping depth, seabed conditions, biological diversity, types of natural environments and pollution in the sediments in Norwegian sea areas. The program aims to answer questions about the physical environment, biological diversity, and biological resources in the sea areas (KMD 2018:33). The program is managed by the Institute of Marine Research, the Geological Survey of Norway, and the Norwegian Mapping Authority. It is funded by the Ministry of Trade, Industry and Fisheries and the Ministry of Climate and Environment (MAREANO).

Mapping of harbour data and marine base maps in the coastal area contribute to better knowledge about the coastal marine areas and harbour infrastructure. Detailed data on terrains and infrastructure on land and at sea are fundamental for ensuring safe and efficient traffic and for upscaling intelligent transport systems (Meld. St. 22 (2020–2021):46).

5. MAPPING THE FUTURE

Reviews of state boundary is still an important task. Ongoing review between Norway and Finland is to be completed in 2025, while the ongoing review between Norway – Sweden is to be completed in 2024. Common to the Norwegian – Finnish and the Norwegian – Swedish state boundary reviews are to determine and mark the border in the terrain and document where it goes. In the terrain, a five-meter-wide border corridor is cleared, border markers are repaired, national pointers are repaired if needed, brushed and painted, signs are put into place or repaired. The position of the border markers, national pointers and signs is measured with modern technology using GNSS, as shown in figure 11.



Figure 11: To the left a new heart stone is put into place and the yellow painting is refreshed. To the right Tor Erik Bakke is measuring the state boundary between Sweden and Norway with GNSS. (The Norwegian Mapping Authority 2022).

In 2020 the Norwegian Mapping Authority was given the award: National Geospatial Agency of the Year. In the statement it is said that “the Norwegian Mapping Authority is one of the few mapping authorities in the world that integrates hydrographic, topographic, land mapping, and registry data. The organization undertakes the registration of about 1.5 million properties and legal rights every year. Six million searches are performed on its registry platform every day. This reflects the significance of geospatial data in the country” (GW 2020). Today’s Director-General Johnny Well expressed in this context that this was a great recognition of the cooperation we have achieved in Norway, and which is the cornerstone of our strategy. It fits well with what the mapping Authority aspire to be (Kartverket 2021):

From ocean to land, and from outer space to the deepest ocean floors.

The Norwegian Mapping Authority’s field of work is extensive and diverse.

This is still what we do. In new ways, with new technology and with new collaboration partners. The data we collect is used in traditional and new ways. Open data and the re-use are important. The Government wants Norway to leverage the potential of data to enhance value creation, create new jobs, and to improve public sector efficiency. Better use of data is important if Norway is to succeed in the transition to a more sustainable society and a greener economy (Meld. St. 22 (2020–2021)).

Open data must have an open license so that it can easily be reused by anyone who wants to use it. It does not necessarily have to be free. Access to property data is free in Norway. This does not mean that everyone can access all data. Which data to access depends on who you are and the purpose of the disclosure. Among others, the Norwegian Mapping Authority, have been actively involved in the work on making open public data available.

According to the white paper (Meld. St. 22 (2020–2021):57) entrepreneurs want to spend their time on prototyping and adding value to their business models, ideas, and concepts rather than gaining access to and structuring data. It is particularly challenging for businesses to succeed with value-adding services based on public sector data from municipalities. Little standardization and varying municipal practices for making data available make it difficult. This does not apply to municipal geospatial data, which is regulated by the Spatial Data Act with the Mapping Authority as the national geospatial coordinator. In the strategy for the Mapping Authority the role as national geospatial coordinator is important. The Mapping Authority have sharing as an important part of our social mission.

Today we use new technology mapping our surroundings. For instance, laser scanning of the sea and harbours is important to make the journey of today's sailors safe. It gives opportunities, and initiatives to make a model on how Norwegian ports can become digital and automated (Kartverket 2022b).

Maps are of importance when it comes to the Sustainability Goals like #1 no poverty including security of land and ownership, #14 life below water, which also include the sea bedding and #15 life on land. Maps give power, power in different ways. Power to plan. Power to protect. The power that lies in getting knowledge of the surroundings. Open data; gives power to the people.

Standing on the shoulders of giants, we have been mapping Norway for 250 years and we will continue the work in the years to come!

REFERENCES

Border: Information in English from Wikipedia; page was last edited on 17. January 2023
Accessible from: <https://en.wikipedia.org/wiki/Border> [24. Jan. 2023]

- Border: Sweden-Norway. Page was last edited on 2. Dec. 2022. Accesible from: https://en.wikipedia.org/wiki/Norway%E2%80%93Sweden_border [24. Jan. 2023]
- Border: Finland-Norway. Page was last edited on 2. Dec. 2022. Accesible from: https://en.wikipedia.org/wiki/Finland%E2%80%93Norway_border [24. Jan. 2023]
- Border: Russia-Norway. Page was last edited on 17. Jan. 2023. Accesible from: https://en.wikipedia.org/wiki/Norway%E2%80%93Russia_border [24. Jan. 2023]

GW 2020 *National Geospatial Agency of the Year: Norwegian Mapping Authority* Geospatial World. Accessible from: [National Geospatial Agency of the Year: Norwegian Mapping Authority \(geospatialworld.net\)](http://nationalgeospatialagencyoftheyear.net) [20. Jan. 2023]

Hagen, Rune Blix 2020 *Olaus Magnus* i Store norske leksikon. Accessible from http://snl.no/Olaus_Magnus [31. Jan. 2023]

Harsson, Bjørn Geirr and Aanrud, Roald. 2016 *Med kart skal landet bygges: Oppmåling og kartlegging av Norge 1773–2016*. Ringerike: Statens kartverk

Historical archive published by the Norwegian Mapping Authority, updated 7. february 2022. Accessible from: <https://kartverket.no/om-kartverket/historie/historisk-arkiv>

- Figure 6: <https://kartverket.no/om-kartverket/historie/historiske-kart/kart/#id=7269>
- Figure 8: <https://kartverket.no/om-kartverket/historie/historiske-kart/soketreff/mitt-kart?mapId=11225>
- Figure 9: <https://kartverket.no/om-kartverket/historie/historiske-kart/soketreff/mitt-kart?mapId=16216>

ICA 2003 *A Strategic Plan for the International Cartographic Association 2003-2011*
Adopted by the ICA General Assembly 16. Aug. 2003 Accessible from: [Informatiseringscentrum \(icaci.org\)](http://icaci.org)

Jones, Michael (2023) *Norsk og nordisk karthistorie – drivkrefter og milepæler?* Lecture held at a meeting arranged by the Norwegian Mapping and Surveying Museum. 15. Feb. 2023

Kartverket 2021 *From outer space to the deepest ocean floors* Article from 29. Jan. 2021 <https://www.kartverket.no/en/about-kartverket/what-we-do>

Kartverket 2022a *Slik kartla vi landet* Web article 11. Mar. 2022 Accesible from: [Slik kartla vi landet | Kartverket.no](https://www.kartverket.no/om-kartverket/slik-kartla-vi-landet)

Kartverket 2022b *Spektakulær skanning kartlegg Oslo hamn* Web article 13. Dec. 2022 Accesible from: [Grønt laserlys fra fly over Oslo havn | Kartverket.no](https://www.kartverket.no/om-kartverket/spektakulær-skanning-kartlegg-oslo-hamn)

Kartverket 2022c *Organisering av Geovekst-samarbeidet* Web article 27. Sept. 2022 Accesible from: [Geovekst-samarbeidet | Kartverket.no](https://www.kartverket.no/om-kartverket/geovekst-samarbeidet)

Kjerstad, Norvald 2021 *landtoning* i Store norske leksikon. Accessible from: <http://snl.no/landtoning> [25. Feb. 2023]

KMD 2018 *Everything happens somewhere. National geospatial strategy towards 2025*. Kommunal- og moderniseringsdepartementet Accesible from: [Everything happens somewhere \(regjeringen.no\)](https://www.regjeringen.no/no/tema/geografi/geografi-strategi-2025)

MAREANO *About MAREANO* Accesible from: https://www.mareano.no/en/about_mareano [25. Feb. 2023]

Meld. St. 22 (2020–2021) *Data as a resource The data-driven economy and innovation* Report to the Storting (white paper). Accesible from: [Meld. St. 22 \(2020–2021\) - regjeringen.no](https://www.regjeringen.no)

Munthe, Gerhard 1958 *Et gammelt Norges-kart* Accesible from: https://spesial.w.uib.no/?page_id=932 [22. December 2022]

Ginsberg, William B. *Maps and Mapping of Norway 1602-1855* More information and sample pages accesible from: <https://www.septentrionalium.com/BookPage2.html>

PRIMAR *About PRIMAR* Accesible from: [About | PRIMAR](#) [1. Mar. 2023]

Rød, Jan Ketil; Mæhlum, Lars; Skjørsæter, Erlend 2023: *Kartverket* i Store norske leksikon på snl.no. Accesible from: <http://snl.no/Kartverket> [25. januar 2023]

BIOGRAPHICAL NOTES

Leikny Gammelmo holds a master's degree and a Ph.D. in land management and law from the Norwegian University of Life Sciences (NMBU). She is a Chief Engineer working at the Norwegian Mapping Authority. Main working field is topics related to cadastre and cadastre regulation.

Janne Johnsen holds a master's degree in law from the University of Oslo. She is working at the Norwegian Mapping Authority. Main working field is supervision of the municipalities' work according to the Cadastre Act.

Karsten Lien holds a master's degree in physical geography from the University of Oslo. He is working with placenames at the Norwegian Mapping Authority.

Sidsel Kvarsteig holds a master's degree in cultural history from the University of Oslo. She is working at the Norwegian Mapping Authority as an archivist with main focus on historical maps and documents related to mapping.

CONTACTS

Chief Engineer, Dr. Leikny Gammelmo
The Norwegian Mapping Authority
NORWAY
Telephone: +47 32 11 80 00
E-mail: leikny.gammelmo@kartverket.no

Mapping Norway for 250 Years - Maps Give Power (11933)
Leikny Gammelmo (Norway)

FIG Working Week 2023
Protecting Our World, Conquering New Frontiers
Orlando, Florida, USA, 28 May–1 June 2023