Cold weather (Arctic) Engineering for mining

COWI Mining services

- Engineering consultancy and construction design (including buildings, roads, ports, airports, runways, tunnels and facilities)
- Legislation and permitting processes
- Environmental impact assessment (EIA)
- Social impact assessment (SIA)
- Navigational safety investigation (NSI)
- Geoscientific investigations
- Green energy solutions
- Sustainability compliance
- Management of wastewater and hazardous waste

COWI

Airport Expansion and Design

Airports in Greenland

COWI carried out design of three airports in Greenland with the expansion of the existing airport in Nuuk, and construction of new airports in Ilulissat and Qaqortoq.

The projects included constructing runway, construction of apron area, and site development, extension of the existing access road, establishment of new parking area and relocation of utilities.

The expansion of the new airport in Nuuk (picture) was opened by the end of November 2024.

Project period: 2017–2023
Client: Kalaallit Airports Holding A/S

Photo: Inuplan A/S

COWI

Improving Harbour Activities in Nuuk

Nuuk Port masterplan and trawler-terminal

In 2009 COWI prepared a masterplan for the expansion of the port in Nuuk. The harbour included a new container port, a deep-water harbour and a cutter quay. It includes areas designated for offshore activities and related service industries in addition to facilities for the fishing industry, such as cold storage, processing and other related facilities.

From 2022-2024 COWI was responsible for delivering all services in the planning phase of the port expansion with a 200-300 m long trawler terminal located south of the existing container terminal. Port layout and concepts for quay structures were prepared together with a construction program and construction budget.

Project period: 2009-2024

Client: Kommuneqarfik Sermersooq (Nuuk), Greenland

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COWI

Pier design, Southwest Greenland

Floating bulk pier design, Greenland

For the Seqi Olivine Mine loading facility, COWI in 2005 designed a temporary mooring system for bulk carriers in the inner part of Fiskefjorden. Taking into account wind velocity, the solution featured a layout with three bollards on the shore and three anchored mooring buoys in the water at depths of 25-35 metres.

Considering the need for speedy completion and subsequent easy decommissioning, it was decided to use standard ship anchors and standard ship anchor chains for the mooring buoys, thus providing a simple and cost-effective solution.

Project period: 2005
Client: Seqi Olivine A/S

COWI

Mary River iron mine in Nunavut, Canada

Upgrading of existing facilities and infrastructure at Milne Port including a new Freight Dock, Causeway, and a new quay wall will increase the capacity of the port from 4.2 to 12 million tonnes of iron ore per year.

Key components of the project included a causeway to provides access to the new ore dock, foundations for ship loaders, conveyors and gangways, along with the quay wall itself including mooring point structures and capstans, fenders and fixation system, among other details.

Project period: 2018-Ongoing
Client: Baffinland Iron Mines Corp.

Photo: Baffinland Iron Mines Corp.

COWI

Photo: Greenland Resources Inc.

Malmbjerg Molybdenum project, East Greenland

Consulting on various disciplines listed below on the Malmbjerg Molybdenum Project. The International Agency named molybdenum as a critical mineral for the green energy transition in 2021.

- Scoping for EIA and SIA
- Critical Habitat mapping
- Sustainability Compliance
- Navigational Safety Investigations (NSI)
- Onshore biological baseline sampling
- Renewable energy generation/Wind and solar study
- Waste water from tailings deposit

Project period: 2020-Ongoing
Client: Greenland Resources Inc.

COWI

COWI
IN GREENLAND

COWI is a leading global consulting group that creates value for customers, people and society through our unique 360° approach. Based on our world-class competencies within engineering, economics and environmental science, we tackle challenges from many vantage points to create coherent and sustainable solutions for our customer.

Our Greenlandic experience ranges from environmental and socioeconomic projects to more technically advanced land development and construction and infrastructure projects including geotechnical, geophysical and geological consultancy to the private and public sector in Greenland.

COWI's track record includes more than 500 projects in Greenland since 1940. In the past ten years, we have not only provided traditional engineering consultancy on buildings, roads, ports and airports. We have also worked on projects creating socio-economic value in energy, transport planning and urban development, as well as environmental value in the fields of mining, wastewater, natural resources management and hazardous waste. Through the years has COWI been advisor on almost every major military facility, civil airports, and harbours in Greenland.

COWI

As an example, COWI carried out the calculations on the cableway in the historic former Lead/Zinc mine in Maarmorilik, West Greenland (see picture above, Maarmorilik mine cableway, Courtesy of GEUS).

COWI works closely together with local Greenlandic partners for the mining and infrastructure sector and has also assisted other consulting companies and regulatory bodies with specific tasks such as modelling of airborne pollution, tailing deposits, geophysical surveys etc.

Since 2017 COWI has been working on the design of the upcoming airports in Ilulissat, Nuuk and Qaqortoq and at the moment COWI is consulting on other infrastructure and construction projects in Greenland and for mining companies.

COWI have conducted planning strategies for Greenlandic municipalities with focus on how infrastructure projects can fit into the unique landscape. COWI has conducted more than 50 local plans for the four municipalities in Greenland.

RECENT PROJECTS IN GREENLAND

Industrial facility project in West Greenland, including among other things:

- Infrastructure and port design incl. pre-Feed and 3D visualization
- Geophysical survey (GPR) and geological mapping
- Environmental baseline sampling for Environmental Impact Assessment (EIA)
- Permitting process for land allocation
- Topographic survey (drone)

Botanical survey, East Greenland

Mineral exploration project in East Greenland, including:

- Environmental baseline sampling and permitting process for EIA
- Social Impact Assessment (SIA)
- Navigational Safety Investigation (NSI) for shipping
- Seismic refraction survey for mining project

Other infrastructure projects in West Greenland:

- Nuuk Harbour expansion project, design basis
- Airport development in Ilulissat, Nuuk and Qaqortoq including engineering design
- Design of mooring system for bulk carriers for a mining project

COWI SERVICES IN GREENLAND

PERMITTING

COWI has vast experience within Greenlandic legislation and permitting processes in relation to the mining sector and other industries operating in Greenland. COWI can help mining projects during the various permitting phases from the exploration to the exploitation phase. The EIA and SIA documents needs to be delivered in Greenlandic, Danish and English as well as development of the Impact Benefit Agreement (IBA) between the mining company and the Government of Greenland.

ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

The permitting process for EIA in Greenland follows a number of steps from the Scoping and Terms of Reference, public consultation, White Paper and in the end the final EIA report. COWI has a large group of experienced people working on the permitting process, planning and executing terrestrial and marine environmental baseline sampling programs in the field for the EIA.

SOCIAL IMPACT ASSESSMENT (SIA)

Like for the EIA, COWI has been supporting the mining industry in Greenland with consulting on the SIA process. The process also follows the Scoping and Terms of Reference, public consultation, White Paper and final SIA report but also includes a Benefit Impact Plan (BIP) as basis for developing the Impact Benefit Agreement (IBA). Baseline data in this regard can be acquired from arranging public information meetings, stakeholder interviews and engagement, and so forth. COWI has this experience in Greenland and the SIA is of equal importance as the EIA, in order to be granted a mineral exploitation licence in Greenland.

NAVIGATIONAL SAFETY INVESTIGATION (NSI)

Sailing on the inland and outer territorial waters off Greenland (i.e., up to 3 nautical miles from the baseline) is regulated by The Danish Maritime Authority (DMA). To be granted a mineral exploitation licence by the Mineral Resources Authority (MRA) under the Government of Greenland, the licensee must fulfil a number of conditions related to the activities and operation. It has been agreed between the MRA and the DMA that one of the conditions is that the applicant – prior to being granted an exploitation licence – must have carried out a navigational safety investigation (NSI) of the conditions in the operational phase in connection with navigation and calls at ports, facilities, anchorages, icing conditions, ice class vessel requirements, emergency response, etc. in the exploitation area. The purpose of the investigation is to illustrate that navigation can be carried out in a safe manner.

GEOSCIENTIFIC INVESTIGATIONS

COWI can provide geoscientific support to the mining industry including related onshore and marine infrastructure development based on geophysical surveys, interpretation of geoscientific data, geological mapping, geotechnical investigations, and drone surveys.

COWI has carried out geophysical surveys with the purpose of characterizing the underground both for planning of future mines and for optimization of existing mines. Recent surveys in Greenland includes refraction seismic, Ground Penetrating Radar (GPR) and other types of geophysical data collection to map permafrost or bedrock conditions for infrastructural planning for mining projects.

COWI can also provide services within processing and interpretation of geophysical data collected from the air, e.g., gravemetric, magnetic and electromagnetic-data and can subsequently prepare a geological model of the results. Integrated geological and geophysical investigations (in many cases combined with geotechnical investigations) will reduce the costs and contribute to the most cost-effective solution.

- Geophysical surveys
- Data interpretation and reporting
- Geological mapping and modelling
- Geotechnical investigation
- Geohazards evaluation and mitigation
- Aerial mapping from drones

GPR survey, West Greenland

BRIDGES, TUNNELLING AND MARINE CONSTRUCTION

COWI are among the leading consultants within complex infrastructure design with particular strongholds within bridges, tunnels and marine structures. COWI has extensive international experience in all aspects of water construction, ports and coasts, and we are of course ISO 9001 certified. Marine terminals, ports, development of coast / waterfront, artificial islands, breakwaters, and special marine structures are our core area, including togmoles, floating terminals and bulk terminals, from planning, investigation of fittings, hydraulic surveys, analysis, feasibility studies, sketch design and main design, tender documents, contracting and contract management.

Together with our customers, we deliver infrastructure solutions at all levels of scale and complexity. To optimize the processes and results, we utilize state-of-the-art design technologies within Building Information Modelling and visualization like Virtual Reality and Augmented Reality.

Throughout COWI's history, bridges have been one of our primary services. Today we count a number of the world's highest and longest bridges amongst our most visible accomplishments. Our bridge engineering services cover the entire lifecycle of a bridge, from planning and design to operation and refurbishment or decommissioning.

COWI have been involved in the construction of all manner of tunnels around the world, and in all types of soil. Our services cover the entire lifecycle of a tunnel, from feasibility studies to the operational phase and finally refurbishment.

Recently COWI prepared a master plan for the expansion of the Nuuk Harbour for the Kommuneqarfik Sermersooq. The harbour should hold a new container port including a deep-water harbour and a cutter quay.

Since 2020 COWI has been advisor in the design phase along with several other studies related to an industrial harbour in South-West Greenland.

For further information
please contact:

NIELS STRUFE
Leading Project Manager
Environment,
Health and Safety

PHONE +45 56 40 00 00
MOBILE +45 41 76 56 37
EMAIL nlst@cowi.com

KRISTIAN BLOCH GRUBE
Project Manager
Geology and Geophysics
Wind Energy and
Renewables

PHONE +45 56 40 00 00
DIRECT +45 41 76 71 29
EMAIL krge@cowi.com

COWI A/S
Company Reg. no.: 4462 3528
Parallelvej 2
2800 Kongens Lyngby
Denmark
www.cowi.dk
www.cowi.com

Together with customers, partners and colleagues, we shape a future where people and societies grow and flourish. We do that by co-creating sustainable and beautiful solutions that improve the quality of life for people today and many generations ahead.