



DHI SOLUTION

MINING— DHI & GEUS

Safe operations and minimised environmental impact

SOIL AND WATER ENVIRONMENT AND MINING INDUSTRY

Soil and water resources are important factors in the mining industry, e.g. in relation to landslides, contamination of soil and water and use of water for the operation of a mine. But mining activities may end up negatively influencing the quality of the local environment, including ground and surface water. The Danish consortium established by DHI and the Geological Survey of Denmark and Greenland (GEUS) helps address these and many other challenges across all different phases of mine development - from exploration and planning to design, operation and ultimately mine closure, decommissioning and remediation.

Our services comprise:

- Exploration and mineralogy
- Hydrological/groundwater/surface water modelling
- Water supply security and reuse of water resources
- Soil and sediment impacts
- Environmental geology and mine tailings
- Mapping, forecasting and early warning systems
- Climate change impacts and adaptation
- Water quality and quantity monitoring



Our services and solutions are based on the assessment of actual risks and impacts, thereby reducing the operational risks and enhancing safety of the company, staff and environment. In addition, downtime reduction and optimisation of approval and operational processes (including ore processing), further reduce costs, increase revenue and improve public reception as well.

MONITORING AND SURVEY

Mining can severely affect and pollute the surrounding surface waters - either directly, e.g. through dust, discharge, run off, or through groundwater. Heavy metals used in mining are the major cause of concern for the aquatic environment. However, processes like chemical extraction are also equally dangerous. To evaluate potential pollution and their effects on the environment, it is essential to assess the baseline conditions, and at the same time to closely monitor potential changes.

SUMMARY

CLIENT

Authorities, mining companies, contractors and consultants

CHALLENGE

- Sustainably managing water resources and environmental impact Mitigating negative impacts
- Evaluating the environmental effects of mining activities and reducing waste and pollution
- Preparing for climate change
- Reducing risks for humans and the environment
- Optimising mine design and procedures

SOLUTION

Hydrological, hydrodynamic and ecological modelling in combination with environmental geology and services provided by our in-house laboratories helps track contaminants from mines, evaluate their effects as well as suggest mitigation and remediation measures. We also provide comprehensive solutions by combining geochemistry with our mineralogy services.

VALUE

- Minimised risk of operations
- Reduced environmental impacts
- Improved environmental safety (inside and outside the mining area)
- Reduced downtime
- Faster project approval due to better background assessments
- Savings from reduced downtime and environmental remediation

The Danish consortium offers services within:

- Baseline environmental studies
- Remote sensing, 3D mapping for prediction and assessment of environmentally sensitive areas
- Environmental Geology and Economic Geology
- Compliance and effective monitoring
- Waves/currents/water levels
- Biological surveys, processing and bioleaching
- Mineralogy, soils and sediments

ENVIRONMENTAL ASSESSMENTS AND HUMAN HEALTH

Environmental Impact Assessment and Environmental Risk Assessment are two crucial exercises linked to mining and DHI has over 20 years of experience in performing both. We also provide consultancy services for mitigating measures to reduce the impacts of mining as much as possible.

Our environmental services include:

- Environmental Impact Assessment [EIA]
- Environmental risk assessment [ERA]
- Assessment of impacts from Hazardous substances
- Acid mine drainage or acid rock drainage
- Monitoring of environmental pollution
- Monitoring and mitigating pollution problems related to mine tailings

A particularly sensitive environmental impact of mining is to human health.

Our expertise provides the basis to evaluate the direct effects of substances such as dust, chemicals or radioactivity, as well as the more indirect intake of contaminants through drinking water and food.



MINE WASTE

Mine waste needs to be taken proper care of, for both operating as well as abandoned mines. Leakage of toxic substances is a typical example, which has caused severe problems in various parts of the world. We will provide you with the requisite support for characterisation, treatment and recirculation/reuse of mine waste. Our expertise in monitoring and sampling provides the basis for characterising contaminations and documenting the effects of intermissions and remediation initiatives. Our modelling tools can simulate the movement of pollutants from surface into groundwater and vice-versa. With the results provided by our in-house laboratory, we tailor-make our solutions to best suit our individual clients. Our knowledge and expertise coupled with

concrete results from research help form the base for assessment of the potential pollution, protection and remediation strategy.

Shipping of mining products: Port facilities

Since a large part of the world's mineral resources are shipped around the globe, it is important to be able to provide optimal port facilities, both in terms of mooring facilities and in designing harbours with minimal disturbance from waves, currents and winds.

Amongst others, our marine services comprise of:

- Monitoring and survey
- Ports and terminal design support
- Mooring analyses
- Geological and environmental impact
- Dredging requirements
- MetOcean forecasts
- Marine outfall

CLIMATE CHANGE

Climate changes may alter the plans for how to operate a mine in the future. DHI is capable of assessing such changes to the water environment, studying changes in precipitation and groundwater interaction, sea level rises and other climate change factors. Such services will enable the mining company to develop their mining operations in a climate-proof way.



THE DANISH CONSORTIUM - DHI AND GEUS

In conclusion, the Danish consortium can support you all the way from exploration to shipment of the products, and provide a strong base for economically effective and sustainable mining.

DHI

DHI is an independent, international consulting and research organisation advancing technological development and competence in the fields of water environment and health. With almost 30 offices in 150 countries, DHI is a world-recognised organisation offering a wide range of solutions. (www.dhigroup.com)

GEUS

Geological Survey of Denmark and Greenland has a long standing expertise within the arenas of exploration, environmental geology, monitoring geochemistry and hydrology. GEUS has experience with projects and co-operations worldwide. (www.geus.dk)

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