



MINING WITH NATURE
Projects for **biodiversity -**
examples from the Swedish
mining and minerals industry

About this document

Report January 2021

This document presents examples of the mining and mineral industry's completed and ongoing work for biodiversity. The compilation of examples has been carried out by Ecogain on behalf of Svemin. Boliden, Cementa, LKAB, Nordkalk, and Zinkgruvan mining have contributed with information and pictures.

The work builds on the Mining with Nature roadmap funded by SIP SMI, Svemin, Boliden, and LKAB.

SWEDISH
MINING
INNOVATION



The Swedish mining and minerals industry's target is by 2030 to contribute to a biodiversity net gain in all regions where mining and minerals operations and prospecting take place.

This means that the industry will be investing further in developing innovative solutions for achieving sustainable land use in harmony with nature.



WORK FOR BIODIVERSITY - EXAMPLES FROM THE SWEDISH MINING AND MINERAL INDUSTRY

The Swedish mining and mineral industry works together as an industry to contribute to biodiversity net gain by 2030. Through the Mining with Nature roadmap, the industry has taken an important step in setting goals and proposing industry-wide working methods and solutions. However, the work to reduce the impact on and contribute to increased biodiversity values is not something new for the industry!

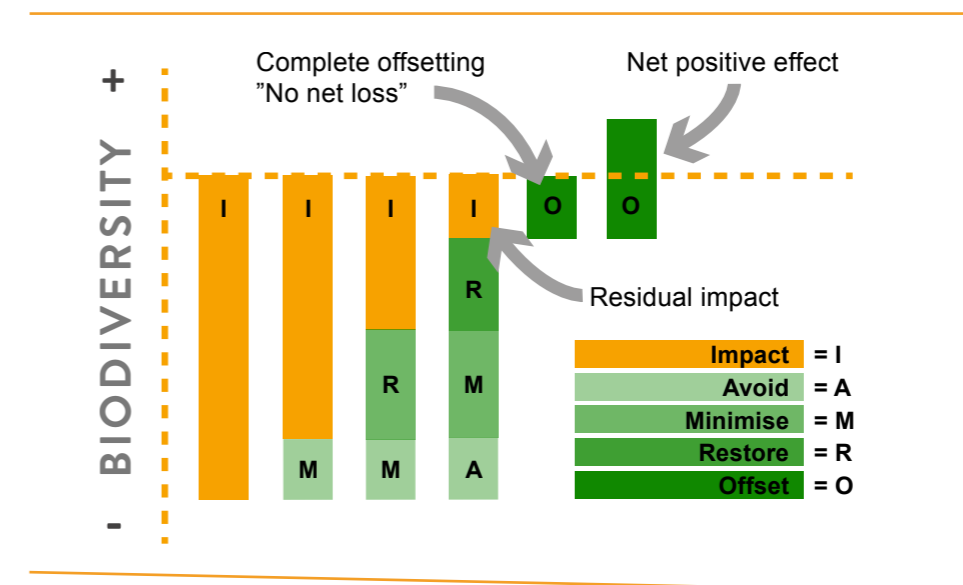
This brochure exemplifies both current and previous actions of how the mining and mineral industry actors aim to align their activities in harmony with nature. It is important to point out that several of the examples' working methods are common to all mining and mineral companies, even if not all companies are mentioned in the examples.

The mitigation hierarchy as a foundation

The mitigation hierarchy (figure 1)¹ is an internationally accepted way to work with biodiversity. Companies can gradually reduce their impact through the mitigation hierarchy to achieve no net loss (when no net loss occurs) or biodiversity net gain (when the overall impact becomes positive). Working according to the mitigation hierarchy means that:

- ▶ Firstly: **avoid** the impact
- ▶ Secondly: **minimise** the impact with various mitigating measures
- ▶ Thirdly: **restore** the impact through, for example, ecological remediation
- ▶ Fourth and lastly: **offset** for the residual impact

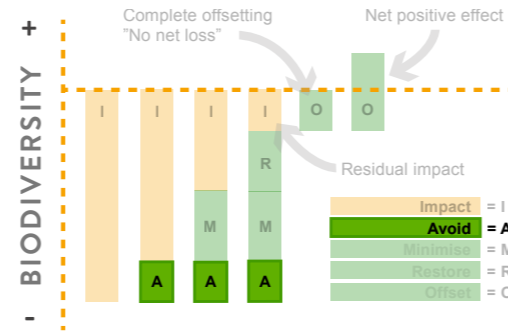
THE MITIGATION HIERARCHY



FIGUR 1 Mitigation Hierarchy is a stepwise process to reduce impact on biodiversity.

¹ The mitigation hierarchy was developed by BBOP (Business and Biodiversity Offsets Programme) and has gained large international acceptance. Read more here: <https://www.forest-trends.org/bbop/bbop-key-concepts/mitigation-hierarchy/>

EXAMPLES OF MEASURES TO AVOID IMPACT



LKAB: Gathers knowledge and weighs different interests

"The mitigation hierarchy is always with us whenever we exploit land. The first step is to avoid negative impact," says Annika Zachrisson, project leader at LKAB. In order to map which natural values that exist in the area, we conduct field surveys of natural values and birds. The impact on biodiversity is then weighed against other values, such as national interests and impact on the reindeer husbandry, to find a solution that has the smallest total impact. An example is to decide how large and how high the deposits can be. A higher deposit requires less land but has a larger effect on the landscape. "That's why we work with illustrations and look at how different alternatives alter the view of the landscape," tells Annika.



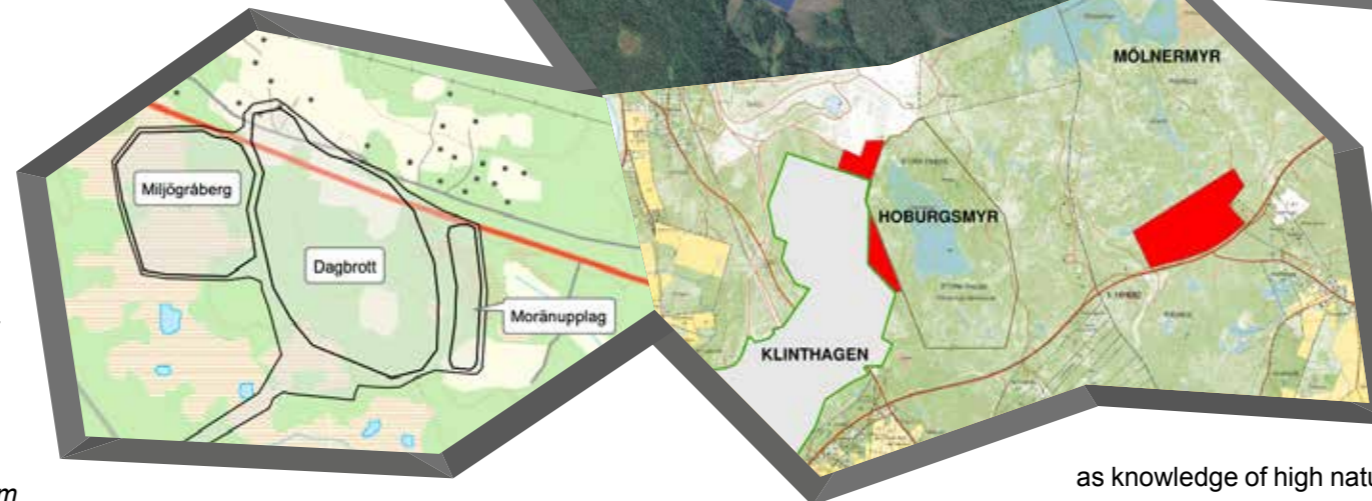
Cementa: Adapts mining with regard to biodiversity

When planning future mining, Cementa adapts mining plans, which, among other things, map natural values and biodiversity. "In Slite, for example, we avoid claiming land before good conservation status of species can be ensured," says Karin Comstedt Webb, sustainability manager at Cementa. "We work long-term with experts to be sure that all our measures are based on a scientific basis. This knowledge is central to ensuring that the

business can be conducted in harmony with good nature conservation and, where possible, we have ambitions to strengthen the biodiversity," Karin continues.

Boliden: Adapts layout to avoid impact

During the work with planning for extraction of the Liikavaara deposit at Aitik, many different layouts of the industrial site and gangue deposits were investigated. "We carried out advanced modeling, taking into account both short-term and long-term effects," says Anders Forsgren, project manager for the development of new mines. The results showed that the best alternative at Liikavaara was to transport the acidifying gangue to the gangue deposits in Aitik and deposit the environmental rock on site at Liikavaara. "This involves a much smaller industrial area, the areas with the highest natural values are avoided, and provides the opportunity for better remediation with a reduced risk of metal leaching in future," Anders continues.



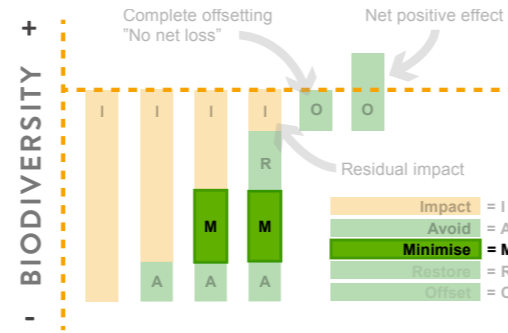
Nordkalk: Avoids prospecting and mining in areas with high biodiversity

Nordkalk avoids prospecting in areas with high natural values. "For example, on Gotland, there are many areas we have refrained and divested over the years," says Tua Welin, environmental manager at Nordkalk, Sweden.

Even before Nordkalk began to work with the mitigation-hierarchy more strictly, avoidant measures were applied

as knowledge of high natural values became known. "On Gotland, we ceased exploration near the Mölnernmyr wetland. We have also sold the land at Hoburgsmyr, which today is protected as a Natura 2000 area, and we have set aside a protection zone against the wetland", Tua continues.

EXAMPLES OF MEASURES TO MINIMISE IMPACT



Boliden: Adapts off-road driving at prospecting sites

"We limit off-road driving in sensitive natural environments as far as possible when we carry out prospecting," says Linnea Hisved, permit officer at Boliden. For prospecting that requires off-road driving, Boliden always uses existing driveways and already affected land as far as possible to minimise the impact on the natural environment.

LKAB: Minimises impact by reducing emissions and land use

Developing protective measures to reduce the impact of their discharges into water is an ongoing work for LKAB in Kiruna. "By minimizing emissions, we can minimise the impact on species and natural environments, for example, in watercourses next to our operations," says Liselotte Olausson, section manager at LKAB.

LKAB also conducts extensive sampling in watercourses to follow up on how the operation affects the environment and build knowledge about where it is most important to focus the work. LKAB also works to minimise the impact by developing the mining method to mine with less impact on the surface area. "Another way we work to minimise the impact on biodiversity during operation is to gradually build up the gangue deposits to ensure that we do not use more land than we need," continues Annika Zachrisson, project manager LKAB.

Nordkalk: Minimises impact in areas with high nature values

Early in the process, Nordkalk collects facts about areas of high natural value. "In this way, we can minimise negative impacts in sensitive areas such as Ingaberga, where we know that there are high natural values," says Håkan Pihl, Sustainability Director at Nordkalk. In Ingaberga, protection zones have been set aside to minimise the impact on species worthy of protection. Nordkalk uses information about sensitive areas in the long-term systematic work for natural values around its deposits.

Boliden: Builds knowledge of how the business can coexist with rare species

In Kevitsa, Boliden contributes with scientific knowledge on the rare species smew, moor frog and the moss *Dichelyma capillaceum* and their habitats. "By building up this knowledge we can run and develop our operations whilst minimising our impact on these species," says Johanna Holm, environmental permits manager. With monitoring programmes and surveys Boliden has followed the development of these species over time and can demonstrate clear results. Around ten pairs of smew ducks breed each year in the nest boxes we set up by the lake near the mine. Ten new sites for *Dichelyma capillaceum* moss have been

found, significantly further north than was previously known. And moor frogs have been shown to live side by side with the mining operations without being disturbed by the loss of water flow machine noise.

Zinkgruvan Mining: Minimises loss of flow in a stream with a technical solution

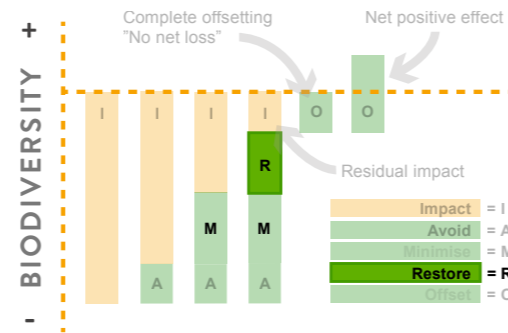
When Zinkgruvan Mining needed to expand the sand deposit Enemossen with Enemossen Östra, parts of the catchment area of the stream Björnbäcken had to be exploited. Parts of Björnbäcken's immediate area have high natural values, with many rare species of mosses and lichens that depend on the water flow in the stream. With a smaller catchment area, the water flow in Björnbäcken periodically becomes too low for these species. Therefore, Zinkgruvan pumps water to the stream Björnbäcken from a nearby lake during the growing season so that the water flow will be sufficient for the species.

Cemента: Far-reaching measures balance mining and nature conservation

Cemента's factory in Slite has applied for an extended mining permit at File Hajdar - an area that is close to the limestone quarry used today. Cemента designed their application for a mining permit to minimise the impact on nature and critical species such as the butterfly marsh fritillary.



EXAMPLES OF RESTORATIVE MEASURES



LKAB: Restores old tailings dam to create natural values

When an area no longer is used for operations, LKAB carries out ecological restoration. This is often a long-term process and can involve maintenance measures over a longer time. An example is Vitåfors' old tailings dam, where LKAB carries out restoration, focusing on several different environments and working methods. *"We have focused on biodiversity and worked a lot with the large scale shaping of the area,"* says Sandra Lindgren, project manager at LKAB. *"We work, for example, with using the right soil material to get the desired vegetation and to create microhabitats such as stone mounds, dead wood, shrubs, and clearings,"* Sandra continues. In Vitåfors, the measures are followed up with various indicators to ensure that the areas are developed towards the different objectives.

In addition to ecological values, LKAB also focuses the restoration work to provide land for reindeer grazing and social values.



Nordkalk: Improves the brown trout's spawning conditions

The stream Klinthagenbäcken on Gotland is a spawning area for brown trout. Through various measures in the stream, Nordkalk has worked to improve its spawning conditions. *"We have added large stones and built stone beds,"* says Tua Welin, environmental manager at Nordkalk, Sweden.

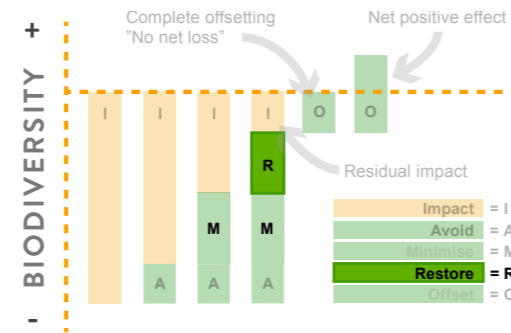
"This improves the flow and facilitates the brown trout's ascent up the stream," Tua continues.

Cementa: Builds a new stream and creates natural pastures

The stream Hållsdammsbäcken flows next to Cementa's operations in Skövde. When Cementa was to expand the mining area, the stream needed to be redirected. Cementa conducted thorough investigations focusing on creating as natural a stream as possible and minimizing the impact on the Natura 2000 area into which the stream flows. The work was carried out together with ecologists, geohydrologists, contractors, and a local school. Through regular surveys, Cementa ensures that the measures have achieved the desired result. *"Hållsdammsbäcken is a good example of how it is possible to move a stream and avoid damage to the Natura 2000 area downstream of our operations,"* says Karin Comstedt Webb, sustainability manager at Cementa.

At the operations in Skövde, Cementa has also restored a meadow by planting selected plants. *"In this area, we bring in sheep in the summer to promote species favored by grazing,"* Karin continues.

EXAMPLES OF RESTORATIVE MEASURES



Zinkgruvan: Creates meadow land to minimise dusting

Biodiversity can also be improved in industrial areas in operation. Zinkgruvan is now carrying out a project to establish meadows within the industrial area. The fields will be multifunctional as they contribute to biodiversity, reduce dusting in the area and make Zinkgruvan a more beautiful place for its employees and visitors. Information signs have been set up to inform why the meadows have been laid out and how they contribute to increased biodiversity. "We want to bring nature back to the area," says Charlotte Odenberger, environmental manager at Zinkgruvan.



Boliden: Old mine becomes well-visited meadow

During supplementary remediation of the gangue deposit in Näsliden, Boliden implemented measures to increase the area's values, both for biodiversity and as a recreational area. Among other things, selected species have been planted. "To come to Näsliden and talk about the technical remediation will be very different when the ecological remediation has been carried out to make the whole place look much nicer" says Marie Lindgren, project manager. "It's important for us to be able to show how we have completed the circle, by creating a technically stable long-term solution whilst the site is visually appealing, accessible and good for biodiversity."

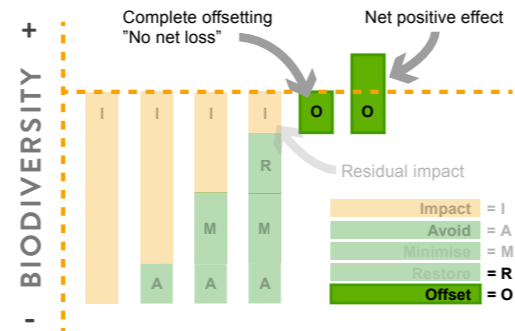
While planning for the remediation of the Gillervattnet tailings dam and the old open pit mine in Boliden, Boliden conducted a citizen dialogue with local residents and analyzed how the areas can best contribute to biodiversity. "This work has resulted in objectives that can create attractive areas for local residents whilst they develop a rich biodiversity," says Isabell Lundberg from the remediation project within Boliden.



Boliden: Increases knowledge on reindeer lichen establishment

Boliden's sustainability work also includes projects that focus on cooperation between several stakeholders, such as reindeer herders. Boliden finance research on how to best establish ground lichens during reclamation. Anders Forsgren, project manager, states that "since we exploit new land we have to be able to reclaim it in the best way. Much of our operation takes place in areas with reindeer grazing, and we want to enable future reindeer grazing on old mining sites".

EXAMPLES OF MEASURES TO OFFSET IMPACT



LKAB: Restores mires and forest areas

Since 2015, LKAB has the ambition that its operations should not contribute to a net loss of natural values. Therefore, LKAB works to evaluate the direct and indirect effects of the operations and offset the residual impact on biodiversity. Offsetting is usually implemented when new land needs to be used, but it can also be relevant when natural environments change due to changed groundwater flows resulting from ongoing operations.

LKAB's offsetting area in Mertainen is one of the largest in Sweden. In Mertainen, areas are protected and natural values are strengthened for 50 years. The conservation measures implemented in the area include increasing the amount of deadwood, by moving it from the area that is being exploited into the offsetting area, restore mires, carry out haymaking on mires, and controlled burning. "We work on the basis of a management and monitoring plan to follow up on how natural values develop over time in the area," says Stina Eriksson, section manager at LKAB.



Cementa in Slite has carried out Europe's most extensive survey of marsh fritillary and makes annual surveys to follow the population's development. With ecological expertise, Cementa has conducted studies on *Pulsatilla patens* to understand the species' ecology and find methods for propagation, migration, and measures to improve the habitat of the species.

Nordkalk: Improves habitats for butterflies

In Storungs Utmarker, Nordkalk works to improve butterflies' habitats through management and restoration measures to

offset the impact that arises from the operation. For example, through careful clearing, the overgrowth in the area is reduced. As mining has started in the immediate area, Nordkalk implemented long-term management to improve the connectivity between areas.

To follow up the effects, Nordkalk conducted field surveys of butterflies in 2016 and 2020. "It was great to see that the Apollo butterflies had recovered strongly in 2020 and were also found in the industrial area, at the old landfill area and the spare parts deposit", says Tua Welin, environmental manager Nordkalk, Sweden. "In this work, however, we see that it is important with long-term follow-ups, as the size of the butterfly populations depends on the weather and therefore varies greatly between the years," Tua continues.



Boliden: Raises natural values in mixed coniferous forests and researches the effect of the measures

Offsetting the extension of Aitik's tailings dam is one of the few major offsetting projects that have been carried out in Sweden. "A challenge with the permit for the tailings dam at Aitik is that there weren't any guidelines for what would be a good site for offsetting," says project manager Sofia Lindmark Burck. Boliden therefore carried out a major offsetting inquiry that revealed the best alternative to be two

offsetting sites that were adjacent to Leipipir ecopark. Offsetting focused on adding ecological value to sites that were not already of high ecological value. These sites now fill an important function both for the public and more broadly for nature conservation, since they connect the ecopark with other valuable natural sites. There are also recreational benefits as Boliden have created paths and viewpoints.

In cooperation with the Swedish University of Agricultural Sciences (SLU) Boliden are carrying out a long-term research project on how species respond to the offsetting measures. "It's really important for us, when we carry out future offsetting, that we know that these measures actually work," says Anders Forsgren, project manager, and adds that "above all it will benefit biodiversity when we learn how we can better carry out welfare building operations whilst conserving or even improving ecological values".



Read more at svemin.se/mineralbidraget

Svemin is the trade organization for mines, mineral and metal producers in Sweden. Svemin represents about 40 companies with just over 13,000 employees in production, prospecting and technology. Among the member companies are mining companies, prospecting companies, lime and cement companies, and machine and construction companies, respectively. The member operations are located throughout the country, of which the mines are located in northern Sweden and Bergslagen.

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