

Guidelines for biodiversity



PRODUCED BY ECOGAIN 2020



AVOID



MINIMISE



RESTORE



OFFSET

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Sustainability concerning biodiversity



Our goal is to contribute to increased biodiversity by 2030 in all regions where we operate.

How we will achieve this goal

Our operations require land exploitation for exploration, mining, enrichment, processing, recycling and transport. We also own forest that we manage from a sustainability perspective.

In order to supply our operations while achieving our environmental goals, we operate in accordance with the mitigation hierarchy (figure 1), which is an accepted practice way to work with biodiversity.

Systematically working with biodiversity based on the mitigation hierarchy means that we evaluate if we can:

- Firstly, **avoid** any impact
- Secondly, **minimise** any impact that cannot be avoided with mitigation measures
- Thirdly, **restore** any impact by, for example, environmental remediation.
- As a fourth measure, **offset** any residual impacts. Offsetting should only be used if all other reasonable mitigation measures have been taken to avoid and limit any negative impacts. We offset for the impact our operations have caused and strive towards carrying out measures that create a net gain for biodiversity.

Sound knowledge and Scientific basis

Our procedures require a sound knowledge on natural habitats, ecological values and various plants and animals. We make decisions based on science by gathering relevant information at every step of the mitigation hierarchy. This means that we possess the knowledge and resources required to sustainably extract and produce metals. We gain knowledge by continually documenting, measuring and evaluating how our operations and proactive measures affect nature. In areas where knowledge is lacking we contribute to research initiatives.

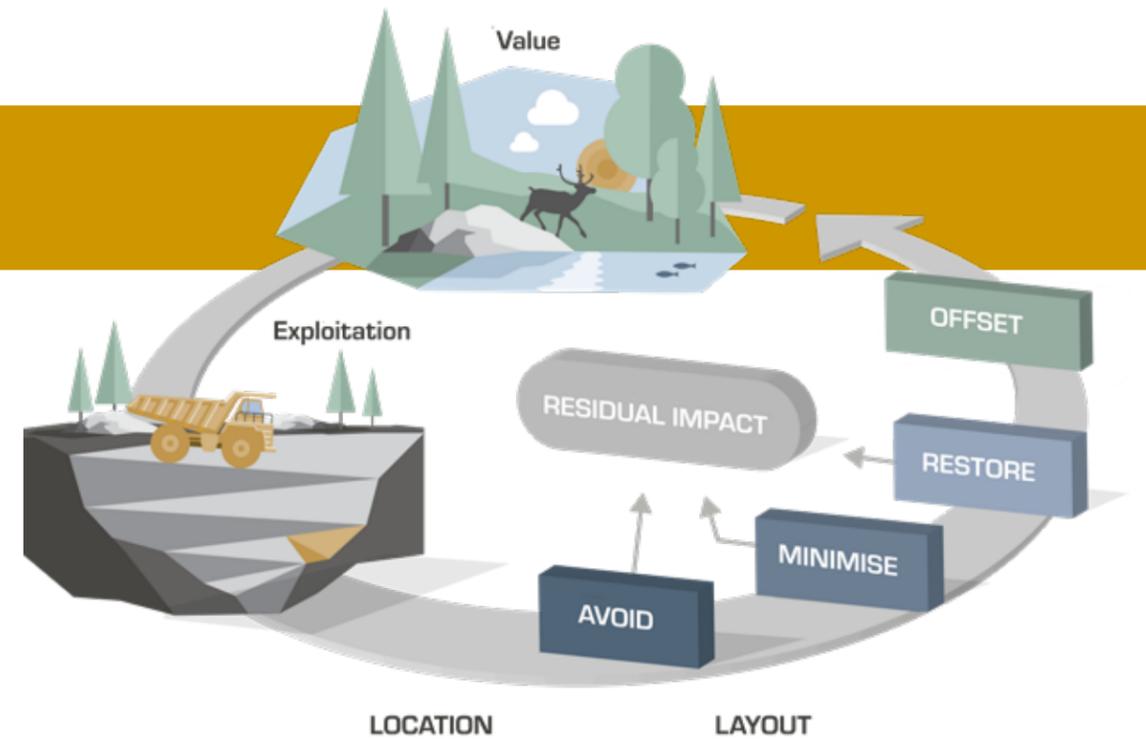


FIGURE 1 The mitigation hierarchy is a stepwise process that forms the basis for our work with biodiversity.

Collaboration with stakeholders

Our work builds on an understanding of and collaboration with other industries and stakeholders. This means that we initiate respectful cooperation and relations with local society. Through close dialogue and exchange of knowledge we strive towards creating a net gain for biodiversity and ecosystem services.

Monitoring and reporting

We monitor and report our biodiversity work at an operational level to show how well we are achieving our goal. From 2020 we will report the ecological values (habitats and species as well as protected sites) that are found within or close to our areas of operation. By doing this we will also fulfill the requirements for reporting in accordance with GRI (Global Reporting Index). There is currently no established method for evaluating biodiversity in connection with offsetting and restoration. Therefore, it is not at the moment possible to declare how well we are fulfilling our goal of increasing biodiversity values. We are cooperating with other sectors such as energy and forestry to develop an evaluation method that is acceptable for the industry and stakeholders, with an ambition that it should become established and implemented by 2030. We will therefore be developing our reports in accordance with a forthcoming established evaluation method.

Step 1 AVOID



The first step in the mitigation hierarchy means that Boliden evaluate ways to avoid impact. For example we do this by:

- Not carrying out prospecting or mining operations in World Heritage Sites
- Respecting legally protected natural sites and ensuring that new operations or changes to existing operations undergo permitting procedures in accordance with the values this nature protection relates to
- Gather knowledge on the site's ecological values using:
 - Mapping studies
 - Consultation with authorities, environmental experts, land owners and other stakeholders
 - Surveys
- In project development evaluate the most suitable location and layout
- Evaluation of adaptive measures in time and space in order to:
 - Avoid sites and environments with protected species
 - Avoid disturbing breeding birds and other animals
 - Avoid vehicle track damage in streams, wetlands and forests
- In forestry management avoid felling in forests of high ecological value
- Avoid using invasive species and other exotic species that risk becoming widespread
- Maintain green areas and green infrastructure at operating sites, for example, trees and shrubs



Aitik: Sound knowledge through surveys

"We are proud that we not only carry out desk-based studies, but also investigate several field parameters and hold consultations with all stakeholders from the early planning stage" says Anders Forsgren, project manager for the development of new mines. Prior to the extension of the sand dam at Aitik we carried out extensive ecological surveys within 7-8 sites to produce a sound basis of knowledge on biodiversity and land-use. "This knowledge is vital for selecting the right site" continues Anders.

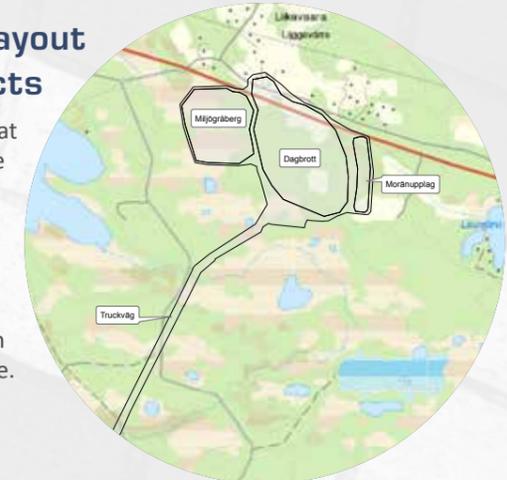


Consultation: The path towards striking a balance for siting

The most important part of striking a balance between different stakeholder interests is producing background material and enabling dialogue, both internally and with stakeholders. "The process itself is the key. By discussing and establishing trade-offs with all stakeholders we obtain the best decision basis and create a mutual understanding for the trade-offs that form the basis for the final layout" says Anders Forsgren, project manager for the development of new mines.

Liikavaara: Adapted layout to avoid impacts

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. The results of advanced modelling, taking into account both short-term and long-term effects, showed that the best alternative at Liikavaara was to transport the acidifying gangue to the gangue deposits at Aitik and to deposit the environmental rock on site at Liikavaara. This involves a considerably smaller industrial site, that the sites of highest ecological value are avoided, and the opportunity for a better remediation with a reduced risk of metal leaching in future.



Voluntary provision: Avoid felling in forests of high ecological value

We leave at least 10 % of our forest land to nature conservation. In areas of high ecological value, conservation NGOs are invited to provide advice on felling measures and which areas are important to conserve or manage. Prior to felling, consultations are held with Sámi villages, who must always approve our plans before any felling takes place. "It's a pleasure working with Boliden's high ambitions for forest management" says Robin Fahlesson, forest and land coordinator.

Step 2 MINIMISE



Impacts on ecological values that cannot be avoided are minimised using various measures.

At Boliden we use various mitigation measures, for example:

- Using the best possible technology for minimising the risk that hazardous substances reach the surrounding environment
- Reduce dust production around our areas of operation
- Consultation with authorities, environmental experts, local land owners, local businesses, interest groups and contractors to design and develop mitigation measures
- Develop and utilise technical solutions to minimise impacts on sensitive natural habitats
- Maintain green areas and green infrastructure at our areas of operation, for example, trees and shrubs
- Successively exploit land, which allows time to carry out mitigation measures as well as restoration and offsetting measures.
- As far as possible adapt measures in time and space on order to:
 - Avoid sites and environments with protected species
 - Carry out measures outside the flowering season for sensitive plants
 - Avoid disturbing breeding birds and other animals
 - Avoid vehicle track damage in streams, wetlands and forests
- Gather dead trees and other plants and seed banks when clearing sites, to use when other sites need restoring
- Gather knowledge on sensitive species that our operations affect
- Gather knowledge from monitoring the measures we carry out
- Implement our biodiversity work in land exploitation plans, environmental management systems and forestry plans

Exploration: minimised impact through adapted off-road driving

"To minimise the impact on the natural environment when exploration requires off-road driving, we always use existing tracks and already affected land as far as possible", says Cecilia Forsell, project manager. "As much as we can we limit off-road driving in sensitive environments."

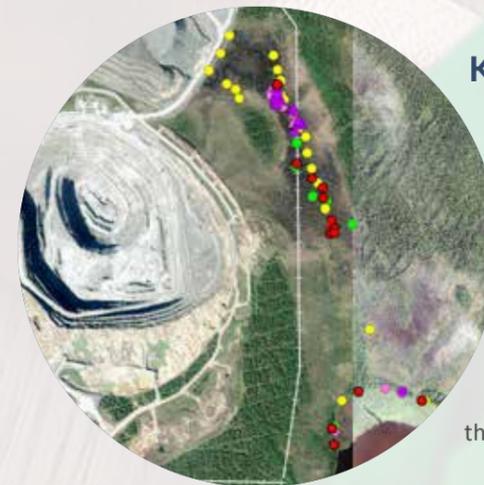
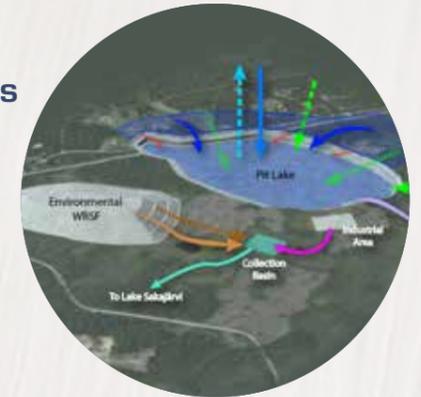


Tara: Creating and promoting species richness at an industrial site

Tara is an example of how an industrial site can offer living space for many species. The vegetation thrives in the unused parts of the site. *"We have let the flowers, wild grass and bushes grow. I love showing that our industrial site is so species-rich. There are a lot more species than in the surrounding intensively managed farmland"* says Oliver Fitzsimons, senior environmental engineer. The site is also regionally important for birdlife. Tara's sand dam boasts the largest swan population in eastern Ireland.

Liikavaara: Technical solutions minimise impacts

During the planning of new mining extraction at Liikavaara several measures have been identified for minimising impacts on the surrounding environment. One example is to collect the water from the industrial site and pump it to the treatment system at Aitik. *"Our comparative analyses showed that it was better for the natural environment than treating the water on site"* says Anders Forsgren, project manager for the development of new mines.



Keivitsa: Field data provides knowledge on species and their habitats

At Keivitsa we are contributing 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 machine noise.

Green forestry plans: Implementing biodiversity work

Biodiversity work is implemented in forestry through green forestry management plans, that contain green comments for each forestry stand. *"In the green comments we write what we can do, for example, leave some tall standing trees to contribute to mixed aged stands or carry out prescribed burning"* says Robin Fahlesson, forest and land coordinator. *"The local forestry board assists with recommendations on how we work with mires and streams in our forests."*



Step 3 RESTORE



When it is not considered possible to avoid or minimise impacts on the environment Boliden works with restoring the ecological values that are affected or have previously been affected. For example we do this by:

- Planning for ecological restoration and remediation early on in projects
- Consultation with stakeholders
- Carrying out ecological remediation at old mine sites
- When required mitigate damage to the environment that have been caused
- Using conservation management measures in our forests
- Continually gaining knowledge on ecological remediation and restoration through cooperation with local stakeholders and university-based research groups
- Making natural areas accessible with facilities and signs

Examples of methods for creating and recreating ecological value:

- When remediating old mines and industrial sites, create natural habitats that contribute to local biodiversity, for example, meadows, broadleaf forests and wetlands
- Carry out controlled burning for conservation
- Increase the proportion of broadleaf trees in coniferous forests
- Increase the amount of dead wood in forests
- Veteranisation of trees in what will be natural forests
- Reestablish ground lichens
- Create wildfowl wetlands
- Create structures that benefit insects, for example, sandy patches and insect hotels
- Promote species adoptions
- Combat invasive species



CURRENT

Gillervattnet sand dam and strip mine at Boliden: Remediation with focus on people and nature

Planning for a value-adding remediation began at an early stage in the technical remediation of Gillervattnet sand dam and the old strip mine at Boliden. "Site visits and citizen dialogues have resulted in objectives for creating attractive areas for local residents whilst they develop a rich biodiversity", says Isabell Lundberg from the remediation project.



OBJECTIVE



Näsliden: Old mine becomes a well-visited meadow

During a supplementary remediation of the gangue deposits at Näsliden we carried out measures for improving the site's value for biodiversity and recreation. "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."

Wildfowl ponds: Restoration measures in forestry

Historically, large areas of Sweden's wetlands have been drained. This means that wildfowl ponds and wetlands are extremely scarce in the forest landscape. We therefore actively works with restoring wildfowl ponds as part of its conservation work. The results for birdlife have been immediate. "It's fascinating to see how the birdlife is drawn in", says Robin Fahlesson, forest and land coordinator. "If you go there in spring when the ice melts it's full of birds."



Increased knowledge on reindeer lichen establishment

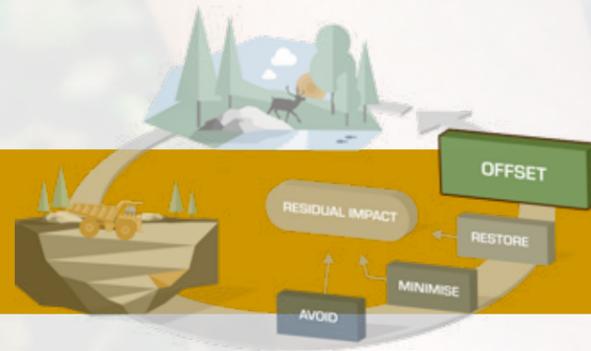
Our sustainability work also includes projects that focus on cooperation between several stakeholders, such as reindeer herders. We finance research on how to best establish ground lichens during reclamation. Anders Forsgren, project manager, states that "since we exploit new land we have to be able 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".

Increased knowledge on remediation of industrial land

In Tara we cooperate with several universities on land remediation. PhD students are working on projects focussing on soil ecosystems and how soil properties affect the vegetation. This knowledge is important for planning and carrying out a successful remediation.



Step 4 OFFSET



With land exploitation it is difficult to avoid loss of biodiversity. When reasonable mitigation measures have been taken to avoid, minimise and restore impacts on the environment, Boliden offsets to compensate for the residual impacts on valuable natural environments, animals and plants. We do this for example by:

- Planning for biodiversity offsetting early on in projects
- Carrying out biodiversity offsetting with an ambition to provide a net gain to biodiversity
- Make offsetting areas accessible using signs

We are aware that certain values cannot be fully offset. On the other hand, offsetting is an important tool for creating a net gain in biodiversity. Therefore, we work towards:

- Continually gaining knowledge on biodiversity offsetting through monitoring and cooperation with local stakeholders and university-based research groups
- Contributing towards producing nationally accepted measurement methods for biodiversity
- Contributing to the development of a system for habitat banking. The purpose of habitat banks is to offset measures that should be in place before an impact has occurred, to prevent any temporary loss of ecological value

Examples of methods and focus for offsetting can be:

- Restoration measures at a previously impacted natural site (see section on restoration) that would not otherwise have been carried out
- Promotion of particular species, for example, protected or umbrella species that are impacted by operations
- Gathering ecologically important structures (e.g. large, old and dead trees and ground vegetation) and place these at strategically chosen sites for increasing biodiversity



Liikavaara: Offsetting for wetlands and reindeer herding

In the permit application for the new mine at Liikavaara we investigated which sites and measures could offset the residual impact of operations. Offsetting is focussed on restoring wetland and forest to benefit reindeer herding.

Aitik:

Offsetting of old-growth forest

Offsetting the extension of Aitik's sand dam is one of the few major offsetting projects that have been carried out in Sweden. "A challenge with the permit for the sand 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.

We 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 we have created paths and viewpoints.



Gaining knowledge on ecological offsetting measures

In cooperation with the Swedish University of Agricultural Sciences (SLU) we are carrying out a long-term research project on how species respond to 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".

GLOSSARY

Biodiversity – Biological diversity. The variability among living organisms from all sources, including 'inter alia' terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems. (Definition according to the United Nation's Convention on Biological Diversity).

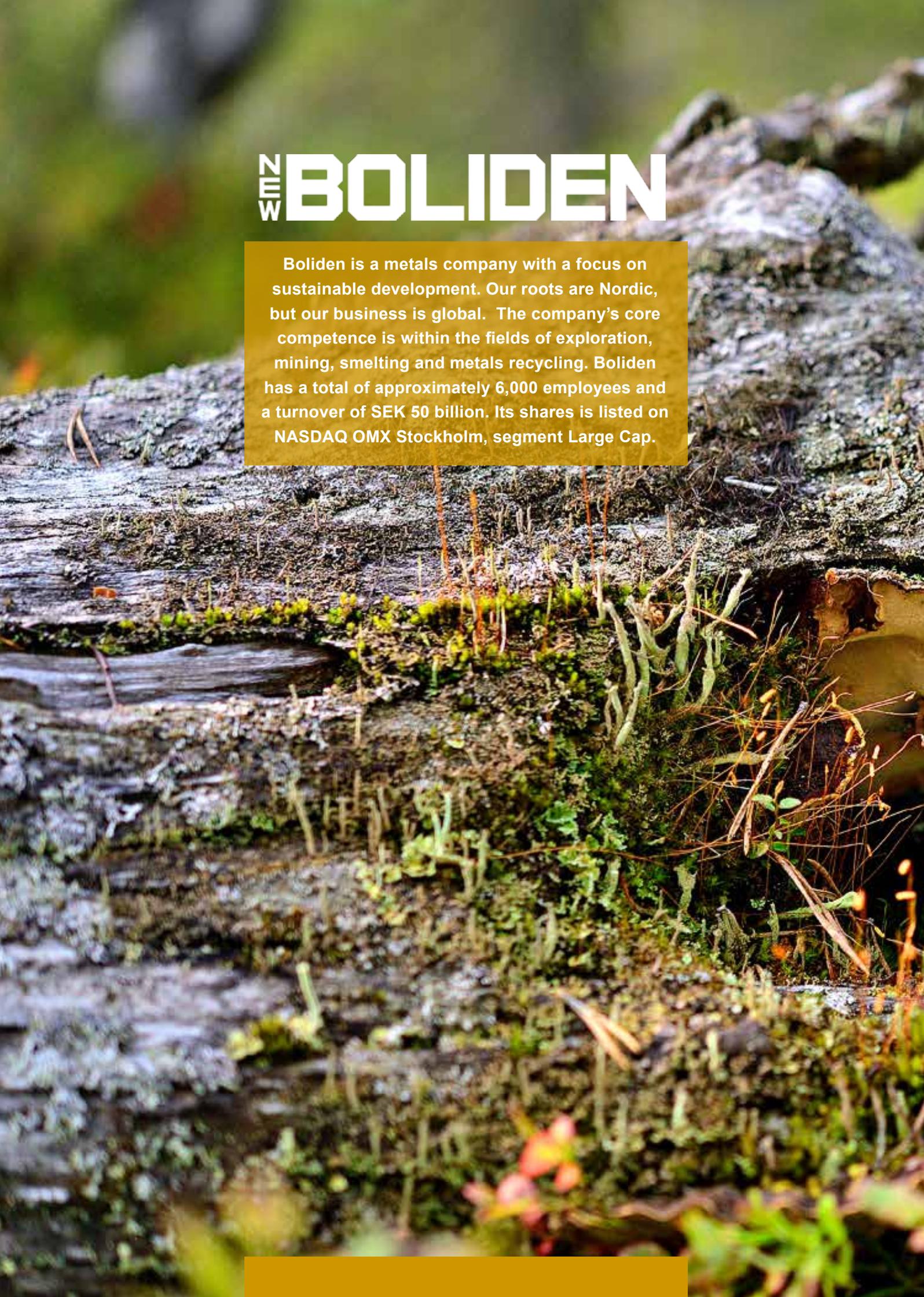
Biodiversity net gain – To achieve an increased value for biodiversity means that a project's or operation's negative impact on biodiversity is balanced, by a significant margin, through active measures such as biodiversity offsetting or various nature conservation measures in the same region. These measures could be focused on improving habitats or green infrastructure. These improvements need to be measurable and require that the conditions for biodiversity have been estimated both before and after they have been implemented.

Ecological value – Importance for biodiversity, i.e. sites/structures that contribute to a diversity within species, between species and between ecosystems.

Ecosystem services – All the products and services that natural ecosystems provide for humans and that contribute to our welfare and quality of life.

Mitigation hierarchy – Framework of four steps for dealing with risks and potential impacts on biodiversity and ecosystem services; avoid, minimise, restore, offset.

Veteranisation – A method of creating characteristics on middle-aged trees that are important for biodiversity and that are usually only found on old trees; cavities, loose bark, dead branches and trunk damage.



WORLDWIDE **BOLIDEN**

Boliden is a metals company with a focus on sustainable development. Our roots are Nordic, but our business is global. The company's core competence is within the fields of exploration, mining, smelting and metals recycling. Boliden has a total of approximately 6,000 employees and a turnover of SEK 50 billion. Its shares is listed on NASDAQ OMX Stockholm, segment Large Cap.