Rehabilitation and Reclamation

Applying the Mitigation Hierarchy

Sustainability of Mineral Resources and the Environment

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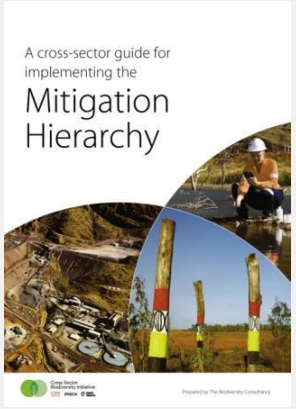
Outline

- Brief introduction to the Cross Sector Biodiversity Initiative & Tools
- Components of the Mitigation Hierarchy
- Examples of Preventive measures
- Examples of Remediative measures
- Full life of a mine Rehabilitation & Restoration project

CSBI Tools & Guidance

Biodiversity Baseline Data Collection [880+ downloads]
Introduces good practices in baseline data collection - from baseline design to implementation

Mitigation Hierarchy Guide [550+ downloads]
Reviewing ESIA against best practice with regards to implementation of the mitigation hierarchy.



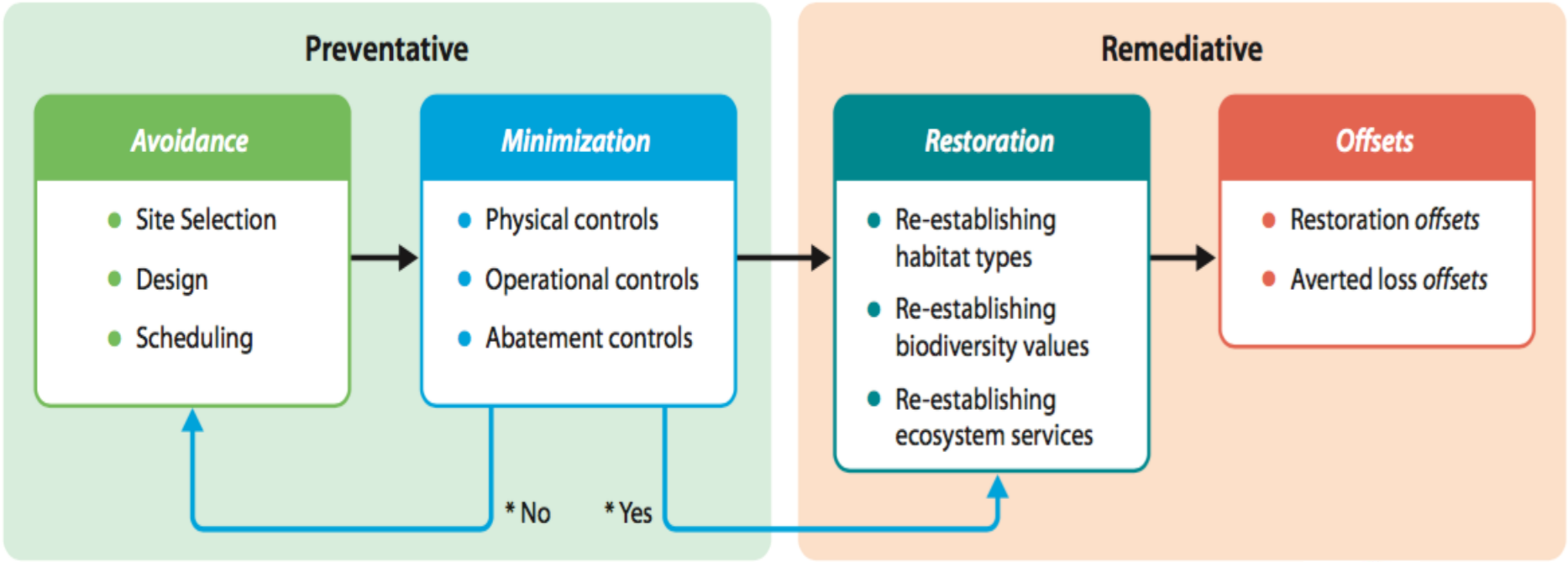
Timeline Tool [1000+ downloads]
Help projects focus on what is relevant at the time of starting project financing.

Components of the mitigation hierarchy

Cross Sector Biodiversity Initiative

IPIECA ICMM International Council on Mining & Metals EQUATOR PRINCIPLES

Can potential impacts be managed through remediative measures?



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Example of Avoidance

Avoiding disruption to caribou migration in Canada

AREVA's Kiggavik uranium mine project in Nunavut, Canada, is being designed to *avoid* impacts on migratory caribou. The mine site was selected to *avoid* known caribou water crossings where traditional knowledge indicated that caribou may be more sensitive to changes in direction while migrating. *Avoidance* through scheduling will also be implemented. Only a winter road, operating in seasons of low sensitivity for caribou, will be used to supply the mine, while road activity will be halted or managed (e.g. by grouping of trucks to reduce frequency of potential disturbance) during caribou movements or migration. Road design and construction (material and embankment height) will incorporate wildlife-friendly features to facilitate caribou movement across the landscape.

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Example of Minimization

Minimizing the impacts of gold mining at two special areas of conservation in Sweden

In principle, every mining project will include actions taken to *minimize* the negative impact on biodiversity through physical and operational controls and through discharge treatment.

One example of a comprehensive strategy to *avoid* impacts on biodiversity can be found at a gold mine in Västerbotten, Northern Sweden. Here the orebody, and therefore the mine itself, is situated within the catchment area of a designated Natura 2000[46] area north of the mine site, a stream with a protected population of freshwater mussels. To *minimize* any impact, all water from the mine site is collected, treated and pumped south over the watershed to another catchment area. Further south is another Natura 2000 area, and to *avoid* impacts at this site the concentration limits in the southern discharge point have been set at very low levels.

Example of Restoration

Seed storage facilitates *restoration* of native and endemic flora and fauna in Greece

S&B Industrial Minerals S.A. has undertaken more than 35 years of systematic work and research on land *rehabilitation* in Greece. This has been applied at their major quarries at Milos and Fokis, highlighting the value of knowledge about, and access to, locally adapted species.

At Milos, only native plants are now used in reclamation, owing to the distinct soil type and harsh climate with high temperatures, long drought periods and strong winds. As well as being adapted to the specific soil, native plants have a dormant period in summer and thus need no watering during the typical six-month period of hot, dry weather. Many are also adapted to the saline water and frequent fires characteristic of the island.

Fokis by contrast is a mountainous area, partly in the pseudo-alpine zone. Since 2010, only endemic plant species have been used in rehabilitation work, including the rare *Acer heldreichii* and other species from the pseudo-alpine zone.

So far more than 1.5 million plants have been produced for reclamation at the two plant nurseries of S&B located at Fokis and Milos. Recreation of habitat for native fauna and flora has made substantial progress. Independent studies, sponsored by the Ministry of Environment and carried out by the Department of Biology of the University of Athens, showed that there was no significant difference in the faunal diversity observed between the quarry site on Milos (Chivadolimni) and an undisturbed reference area.

1984 1991 2000 2009

Source: S&B Minerals

Example of Offset

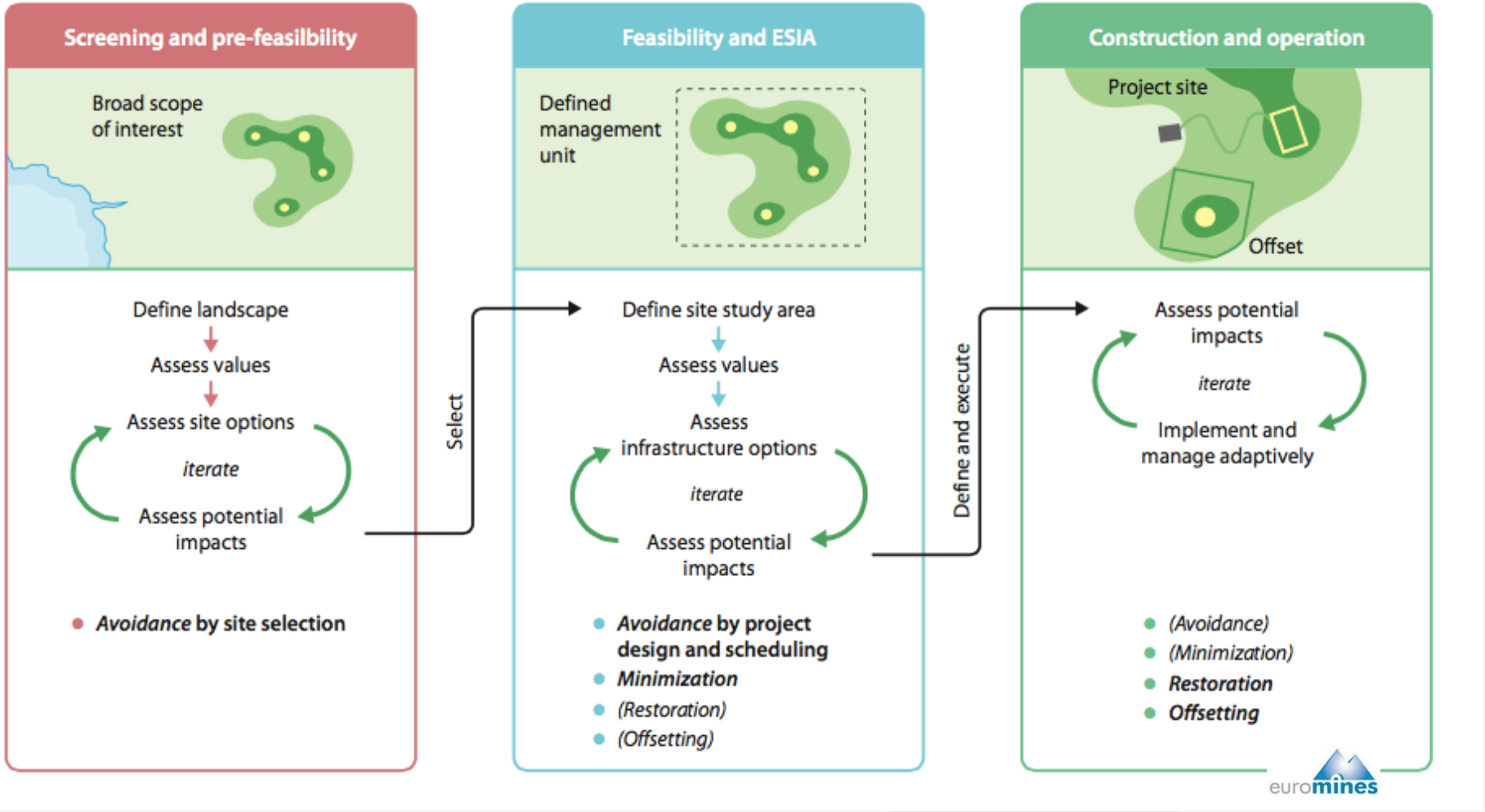
***Compensation* for lost natural values at an open-pit iron-ore mine in Sweden**

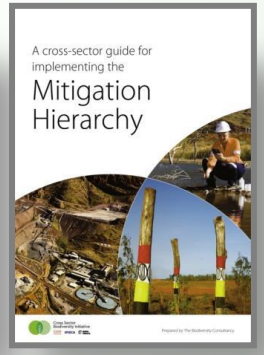
When LKAB received its environmental permit for its new Mertainen mine, one of its conditions was compensation of any losses of natural values that could not be avoided, minimized and/or restored. The company's compensation plan aimed for No Net Loss of natural values and included the use of Offsets in adjacent forest and wetlands exhibiting similar ecosystems and species diversity. Restoration Offsets will include measures to increase dead wood content, restore degraded wetlands and traditional mire haymaking and controlled seasonal burning to restore native species diversity. An Averted Loss Offset has also been agreed with locals to delay timber harvesting from 424 hectares of forest for the next 50 yrs.

Source: LKAB

Components of the hierarchy

Timing….need to be applying the mitigation hierarchy throughout the life span of a development.





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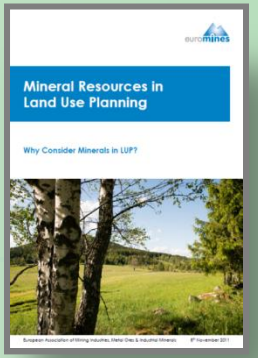

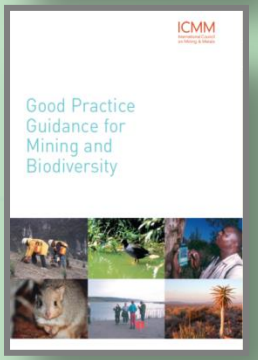

A state-of-the-art framework for managing risks and potential impacts related to biodiversity

In case of any questions please contact:

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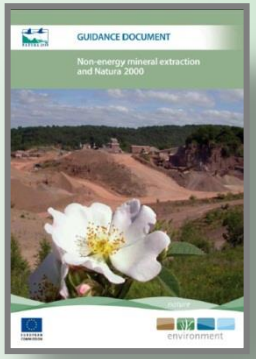

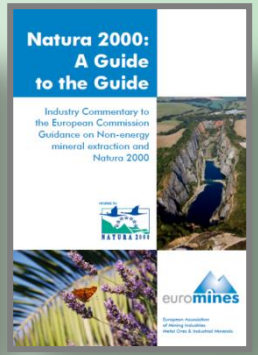

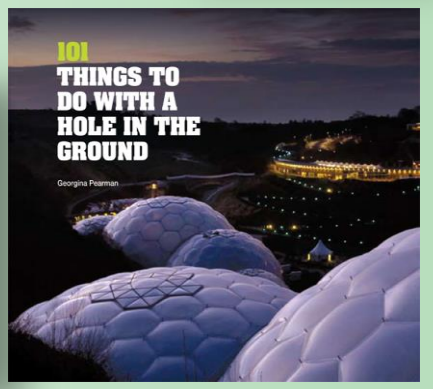

Avoidance

Definition

"Measures taken to anticipate and prevent adverse impacts on biodiversity before actions or decisions are taken that could lead to such impacts."

The practice of avoidance

- **Start early**, but don't stop: avoidance through the project lifespan
- **Think big**: understanding the project site within the wider landscape
- **Synthesize, map**, **discuss**: assessing BES values and sensitivities
- **Cost considerations**: is expensive avoidance worth it?
- Avoidance of indirect or cumulative impacts

Minimization

Definition

"Measures taken to reduce the duration, intensity, significance and/or extent of impacts (including direct, indirect and cumulative impacts) that cannot be completely avoided, as far as is practically feasible"

The practice of minimization

- **Start early**, but don't stop: minimization through the project lifespan.
- **Understand what's really needed**: investing in research to minimize more effectively.
- **Execute the plans:** ensuring that minimization is carried out effectively.
- **Check to see whether it's working:** establishing monitoring and an adaptive approach.

Restoration

Definition

"Measures taken to repair degradation or damage to specific biodiversity features and ecosystem services of concern (which might be species, ecosystems/habitats or particular ecosystem services) following project impacts that cannot be completely avoided and/or minimized."

The practice of restoration

- **Analyse constraints:** realistic goal setting
- **Assess trajectories:** evaluating performance criteria and success
- **Learn by doing:** the adaptive management approach

Offsets

Definition

"Measurable conservation outcomes, resulting from actions applied to areas not impacted by the project, that compensate for significant, adverse impacts of a project that cannot be avoided, minimized and/or restored"