# Using the Mitigation Hierarchy for Mining Projects in the Pacific Island Countries & Territories

Guidance note

*The mitigation hierarchy is an iterative best-practice approach to limiting and managing negative impacts of mining projects, helping to balance environmental and social needs with development priorities.*

## Mining in the Pacific region – an overview

In the Pacific Islands Countries and Territories (PICTs), there are three broad types of terrestrial mining: alluvial, open-pit and underground. There are several large mines in Papua New Guinea (PNG) and New Caledonia, and a few medium-sized mines in the Solomon Islands and Fiji, mostly open-pit. Phosphate mines, which were hugely significant to small islands such as Nauru, are largely exhausted, but feasibility studies continue on Makatea, French Polynesia. Alluvial mining is currently restricted to artisanal diggings in PNG and the Solomon Islands. Deep sea mining is being actively investigated at a number of sites in New Zealand, PNG and elsewhere in the region but not yet proved to be feasible, partly because of the unknown impacts on marine environment; a recent brief on the industry by IUCN[1] shows the vast majority of current global exploration activities to be within the PICTs region.

Mine exploration infrastructure at the Waisoi project, Fiji—see case-study

## What are the potential impacts of mining ?

Whilst mining brings economic development, mines and associated activities (such as building access roads and other infrastructure) cause direct and indirect impacts on the environment, specifically to natural habitats and species (biodiversity). Reductions in the area and quality of natural habitats affect local communities reliant on ecosystem services (including water, food, building materials) and the native plants and animals which are an intrinsic part of Pacific Islanders' culture and heritage.

Direct impacts on biodiversity resulting from mining activities include: land clearance, which causes large-scale and often irreversible habitat loss; habitat degradation for example due to acid mine drainage or contamination; species disturbance due to dust, noise and light pollution; and, habitat fragmentation due to linear infrastructure such as roads, railways or powerlines supplying the mine site.

Indirect impacts are those induced by the project, such in-migration where large numbers of people move to live close to a mining site in the hope of jobs. More settlements and resources are needed to support the increased population, which leads to increased clearance for gardening and building materials, and increased hunting, fishing and gathering. Construction of mine roads can also increase access to previously inaccessible land.

Porgera Gold Mine (open-pit), Papua New Guinea. Image © Zijin Mining

Vatukoula Gold Mine (underground), Fiji. Image © VGM

[1] https://www.iucn.org/resources/issues-briefs/deep-sea-mining

# Using the mitigation hierarchy to limit impacts of mining projects on biodiversity

## What are the potential impacts of mining on biodiversity?

### HABITAT LOSS

This is one of the **major impacts** of mining on biodiversity. Open-pit mining requires **land clearance**, causing **direct loss of natural habitats.** Indirect impacts from in-migration of people in search of economic benefits can greatly increase habitat loss (and degradation).

Habitat clearance at Goro Nickel Project, New Caledonia. Image © mining-technology.com

### HABITAT DEGRADATION

Mining activity can reduce habitat quality in several ways. For example, the quality of aquatic habitats can deteriorate due to **acid mine drainage, erosion, sedimentation and the release of untreated tailings**. In turn, this can have **toxic effects** on plants and animals including fish and birds. These impacts can also extend to estuarine and coastal systems. **Dust** from mining activity can also cause degradation to terrestrial natural habitats, both within and outside the project site.

Linear mine infrastructure, Hidden Valley, Papua New Guinea. Image © Papua New Guinea Mine Watch

### HABITAT FRAGMENTATION

Building access **roads and other linear infrastructure** to connect the mining site can **create barriers**, limiting species movements or blocking their access to essential resources (e.g. water). There is often an edge-effect into the remaining vegetation, and roads open up access for small-scale logging, agriculture and hunting.

### SPECIES DISTURBANCE

Disturbance from mining activities (e.g. **noise, vibration, light and presence of people**) can interrupt animal communication, movement, feeding and reproductive behaviour. In-migration of people can cause much greater disturbance.

Mine infrastructure lit up at night, New Caledonia. Image © David Becker/SLN/ERAMET

### INTRODUCTION OF INVASIVE SPECIES

Invasive (non-native) species are a threat to biodiversity because they often **out-compete or eat native species**. Invasive species can be **accidentally introduced** to the mining site via equipment and materials brought in from other locations. If not managed properly, invasive species have the potential to extirpate local species. This risk is especially serious on islands, where local endemic species have limited natural defences against invasive species.

The brown tree snake colonised Guam from stowaways in ship or plane cargo, and exterminated 10 of the 12 forest bird species. Image © National Park Service, US Dept. of Interior

### LOSS OF ECOSYSTEM SERVICES

Loss or degradation of habitats and species also affects people's livelihoods and wellbeing. Communities depend on ecosystem services—the benefits that they derive from the environment—including clean water, food, fuel and natural medicines. This is particularly important in the Pacific Islands given the number of people depended on natural resources and the lack of alternative resources.

# Using the mitigation hierarchy to limit impacts of mining projects on biodiversity

**0. Enhance Positive Impacts** > **1. Avoid** > **2. Minimise** > **3. Restore** > **4. Offset**

## What is the mitigation hierarchy?

As described in the separate Guidance Note, the mitigation hierarchy is a four-step tool used to limit the negative impacts of projects. Steps 1, 2 and 3, **Avoid**, **Minimise**, and **Restore**, are designed to reduce the significance and extent of residual impacts. **Offsets** are a last resort, used to manage any residual impacts that are still significant after Avoidance, Minimisation and Restoration. An additional first step is to enhance any positive impacts

## Why should mine projects use the mitigation hierarchy?

The mitigation hierarchy is the global best practice standard for impact management, and is a funding requirement of the International Finance Corporation (IFC), World Bank, and 94 other financial institutions in 37 countries that have adopted the Equator Principles[2] The negative impacts of mining can lead to loss of public and government support for a project, resulting in delays, increased costs, and reduced investment.

Many mines in PNG have been delayed or temporarily closed by local communities protesting about the loss of ecosystem services as well as grievances regarding financial compensation for such losses. Applying the mitigation hierarchy throughout the mine project life cycle not only ensures good environmental performance, but improves the likelihood of a 'social license to operate' and increases project cost-effectiveness overall.

## Applying the steps of the mitigation hierarchy to a mine project

As a general rule, there are fewer options and higher costs associated with the later steps of the mitigation hierarchy, so particular emphasis needs to be given to avoidance and minimisation. The application of the mitigation hierarchy across the lifespan of a mining project is illustrated on the next page, highlighting the most important mitigation actions at each stage. Applying the hierarchy sequentially[3] helps ensure residual impacts are as low/small as possible, thereby minimising the scale and cost of any offset actions required.

## More information:

- The Cross Sector Biodiversity Initiative (CSBI) Timeline tool provides a framework to help coordinate schedules of project development, biodiversity impact assessment, and financing.
- A Cross-Sector Guide by The Cross-Sector Biodiversity Initiative (CSBI) provides practical guidance on the implementation of the mitigation hierarchy.
- Good Practice Guidance for Mining and Biodiversity published by the International Council on Mining and Metals (ICMM) provides in-depth information on how to develop a sustainable mining project.
- A Guideline for Mining and Biodiversity issued by the South African National Biodiversity Institute gives a unique government perspective for the implementation of Mitigation Hierarchy within the mining permitting process.
- The Biodiversity Offset Design Handbook and Appendices by BBOP can guide the offset planning process.
- To check investments made against offset plan, the Biodiversity Offset Cost-Benefit Handbook by the BBOP can provide useful information.

## Specific to the PICTs region:

- Under the *Restoration of ecosystem services and adaptation to climate change (RESCCUE)* project, stakeholders have identified provisional roadmaps for strengthening mitigation hierarchy and offsets implementation in the region, based on a systematic review of the national offset policies and practices that exist to date.
- SPREP's Strengthening environmental impact assessment: Guidelines for Pacific Island Countries and Territories.

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[2] Equator Principles Association Members and Reporting (Aug 2018)

[3] In practice, applying the MH is not a strictly linear and sequential process, it is often an iterative process that repeats certain stages in order to bring the project design within economic, regulatory or stakeholder-values constraints (e.g. projects will often need to go through a series of avoid and minimise iterations to ensure that they have prevented an acceptable amount or type of impacts).

# Using the mitigation hierarchy to limit impacts of mining projects on biodiversity

## Applying the steps of the mitigation hierarchy to a mine project

| Project phase | Screening and pre-feasibility | Feasibility and ESIA | Construction and Operation | |
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| **Stage of the mitigation hierarchy** | **1. AVOID** | **2. MINIMISE** | **3. RESTORE** | **4. OFFSET** |
| **Objective** | **Select sites and design projects that avoid impacts to areas with important biodiversity** | **Minimise impacts through micro-siting and operational controls** | **Return impacted areas to a natural state or stakeholder agreed land-use** | **Achieve no net loss or gains for habitats and species that have significant residual impacts** |
| **Approach** | **Define study areas within the landscape for each potential mining operation**<br>↓<br>**Assess biodiversity values in study areas**<br>↓<br>**Evaluate environmental costs and benefits of alternative sites and design options**<br>↓<br>**Select option that avoids impacts** | **Undertake ground surveys in important biodiversity areas within the study area**<br>↓<br>**Use results to inform detailed project design and control measures**<br>↓<br>**Assess scale of potential impacts after avoidance and minimisation;**<br>**If impacts cannot be managed, reassess options** | **Gather data prior to vegetation clearance on habitat type and condition**<br>↓<br>**Store top soil and trial restoration methods**<br>↓<br>**Undertake progressive restoration as disturbed areas are no longer required for project operations**<br>↓<br>**Quantify residual impacts and offset requirements** | **Feasibility studies to select offset site(s) with similar habitats and species to the mine site, where conservation actions are technically, politically, and socially viable**<br>↓<br>**Develop management plans and form partnerships to implement conservation actions**<br>↓<br>**Monitor outcomes and adaptively manage mitigation actions to achieve biodiversity goals** |
| **Key actions** | • The best option for biodiversity may not always be possible especially if mining resources are scarce.<br>• If risks are identified that are environmentally or socially unacceptable, mining should not take place ('**no-go**').<br>⇒ Place infrastructure **outside** important sites e.g. Key Biodiversity Areas or sites of cultural importance<br>⇒ Re-route roads and pipelines to **avoid** sensitive features e.g. wetlands, wildlife corridors<br>⇒ Schedule operations to avoid impacts to sensitive species e.g. breeding season | • Minimisation opportunities exist throughout the mining life cycle.<br>• Minimisation is frequently implemented through control measures identified during ESIA design including:<br>⇒ Physical controls: e.g. barriers to control access to project roads and minimise habitat loss and degradation<br>⇒ Operational controls: e.g. to spray water to reduce dust and minimise air pollution and habitat degradation<br>⇒ Abatement controls: e.g. minimise aquatic habitat degradation by treating wastewater before discharging to the environment | • Restoration to achieve a natural vegetation state can be challenging.<br>• Native species should be used to maximise restoration success. Restoration in the Pacific Islands may be costly with reduced feasibility as there are relatively few nurseries where endemic plant species are grown). Key requirements for restoration:<br>⇒ A good information base, including detailed baseline data, reference sites and tested restoration methods<br>⇒ Defined restoration goals and planning<br>⇒ Robust monitoring - cooperation with local academic and government institutions is good practice and helps strengthen stakeholder relationships | • Mining projects often have No Net Loss, or net gain biodiversity goals.<br>• Offsets require long-term investment to achieve real biodiversity gains on the ground.<br>• Finding a comparable offset site on small islands can be challenging, emphasizing the importance of avoiding and minimizing impacts to reduce offset requirements.<br>⇒ Consider offset principles e.g. the Business and Biodiversity Offset Programme (BBOP)<br>⇒ Involve stakeholders during planning, implementation and monitoring<br>⇒ Develop a robust monitoring program to track biodiversity losses (mine site) and gains (offset site) |

# Using the mitigation hierarchy to limit impacts of mining projects on biodiversity

## Case Study—Waisoi Project, Namosi Joint Venture, Fiji

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| **Project location** | 35 km north-west of Suva, Viti Levu, Fiji |
| **Project details** | As of 2018, an open pit / underground mine, processing plant and waste management facility are under study. This would produce a copper concentrate for export for about 25 years. |
| **Project biodiversity standards and targets** | The project aims to meet Newcrest's Environmental Standard on Biodiversity Management, IFC Performance Standard 6 and other best practice e.g. International Council on Mining and Metals (ICMM) Good Practice Guidance for Mining and Biodiversity and BBOP's principles for biodiversity offsets. |

### Biodiversity value(s)

The project is situated in lowland rainforest, which is relatively undisturbed except for human activities such as logging, cattle grazing, agriculture and mineral exploration along the main river valley. The project area of influence also includes upland rainforest and cloud forest which support a relatively high abundance and diversity of endemic and conservation significant species. Project surveys have recorded 35 flora species of conservation significance, including two species classified on the IUCN Red List as critically endangered and two as endangered. An additional 31 species are listed on the Schedule of the Fiji Endangered and Protected Species Act and Bill or are considered to be endemic. Fourteen species of vertebrate listed as Threatened or Near Threatened species by IUCN are considered to have potential to occur in the study area. The Sovi Basin Protected Area is located to the northeast of the study area. Overall, this represents exceptionally high biodiversity values for a Pacific island.

### Potential impacts on biodiversity

Impacts to eight species are predicted to be of high significance: three plants, one of which is the IUCN Critically Endangered conifer *Acmopyle sahniana,* and five vertebrate species including a potentially undescribed tree skink. Impacts on 8 plant, three vertebrate and two invertebrate species are assessed as having a moderate impact. The project would cause the loss of habitat and a reduction in population for all of these species.

### Applying the mitigation hierarchy

**Avoidance**

New technology and innovation is being used to reduce the overall project footprint, potentially reducing the footprint by 60% and confined to one catchment, e.g. no tailings storage facility. More detailed surveys of key biodiversity features such as *Acmopyle* will be taken within the revised footprint, with the intention of positioning infrastructure to avoid as many individual plants as possible.

**Minimisation**

- Best practice management for construction activities (e.g. vegetation clearance).
- Restricted access along the Mine Access Road for non-Project activities (e.g., logging); and limiting in-migration.
- Implementation of comprehensive quarantine, weed and pest management procedures.
- Maintaining buffers of intact riparian vegetation between disturbed areas and watercourses.

**Restoration**

- Progressive rehabilitation as the mine proceeds.
- Sequencing the mining to facilitate rehabilitation (e.g. the east pit will be mined before the western underground block cave, so that western cave material can be backfilled into the east pit to enable rehabilitation).
- Threatened plant species included in revegetation plans. Investigating the potential to propagate *Acmopyle* trees.

**Predicted Residual Impacts**

Direct impacts include the clearance of lowland rainforest habitat for threatened flora and fauna. This has not been quantified, pending revision of the footprint design (for example, the original footprint would impact about 17 individual *Acmopyle* trees, but the revised footprint will impact fewer). Risks include increased feral predators and spread of invasive weeds.

**Offset**

Preliminary investigations have been undertaken on an offset strategy for the Project. This includes guidance on how to select offsets and the types of offset actions. This will be progressed when the final project design has been confirmed.

This guidance note has been developed as part of the RESCCUE project.
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