IUCN
The World Conservation Union

ICMM
International Council on Mining & Metals

# Integrating Mining and Biodiversity Conservation

## Case studies from around the world

# Contents

# Foreword

Humanity faces the challenge of meeting the development needs of a growing population from a shrinking natural resource base. Achieving a balance while doing this requires better understanding and recognition of conservation and development imperatives by all stakeholders, including governments, business and conservation communities. This is a first step towards a more strategic and integrated approach to land use planning and management that helps societies make better-informed decisions.

Together, our organisations are moving in this direction through the IUCN-ICMM Dialogue. Launched in 2002 at the World Summit on Sustainable Development, the Dialogue aims to improve the mining industry's performance in biodiversity conservation.

In July 2003, a major workshop was organised under the auspices of the Dialogue at IUCN's headquarters in Gland, Switzerland. Several case studies from around the world were reviewed and discussed to lay the foundation for the development of good practice guidance for the mining industry. Those case studies and others are summarised in this publication.

The case studies illustrate how management tools, rehabilitation and restoration processes, together with improved scientific knowledge, can help conserve biodiversity. They also show that mutual benefits can result from stronger collaboration between the mining and conservation sectors, just as they demonstrate the issues on which we are still searching for common ground.

This publication shows how good practice, collaboration and innovative thinking can advance biodiversity conservation worldwide while ensuring that the minerals and products that society needs are produced responsibly. It is our hope that this report will inspire communities, companies, governments, NGOs and scientists to co-operate in developing more avenues for integrating mining and biodiversity conservation in ways that reduce conflict and costs and that recognise the rights and interests of all.

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# Overview:

## Why is Biodiversity Conservation Important?



by Izabella Koziell

Biodiversity sustains human livelihoods and life itself. An estimated 40 per cent of the global economy is based on biological products and processes. Biological diversity has allowed massive increases in the production of food and other natural materials, which in turn have fed the growth and development of human societies. Through close interaction and manipulation of biodiversity, humans have created thousands of new crop varieties and livestock breeds, with distinct development benefits. Biodiversity is also the basis of innumerable environmental services that keep us and the natural environment alive – from the provision of clean water and watershed services to the recycling of nutrients and pollination.

Biodiversity encompasses variety and variability. In other words, it refers to the differences within and between all living organisms at their different levels of biological organisation – gene, individuals, species and ecosystem. It is through the myriad interactions among and between these organisms and the biotic environment that the possibility for adaptation arises.

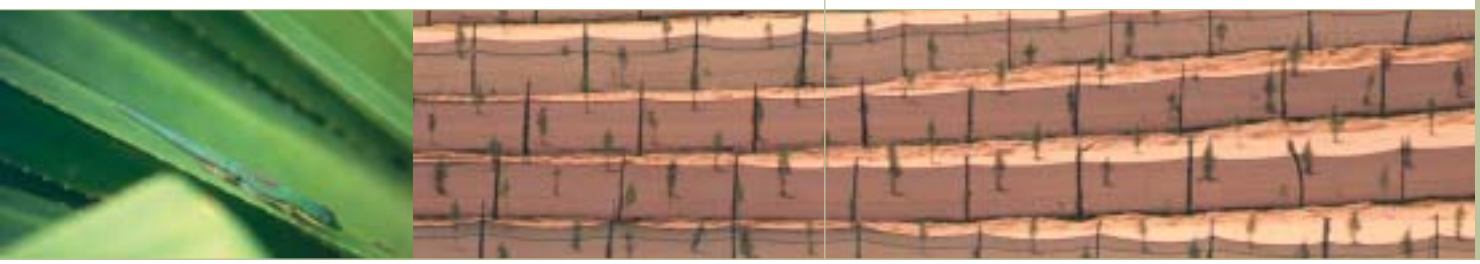
Maintaining the potential for adaptation is important because it allows organisms to adapt to modifications in the environment – such as climate change. It also allows farmers and breeders to alter and create new varieties by crossing genetic lines, thus boosting productivity and enabling the same species to be grown and produced across a huge variety of climatic and ecological conditions. Take, for example, a single crop such as wheat – the genetic diversity held within this crop and its wild relatives has allowed selective adaptation, enabling it to be grown successfully across a vast range of different climatic zones, from North America and Africa to Asia and Australia.

Biodiversity is therefore important because it offers choice not only from an evolutionary perspective but also from that of human development and survival. This has helped people manage change – it provides alternatives to fall back on when other resources happen to fall absent. It also enables people to adapt resources proactively to better suit new conditions.

Current pressures on and losses of biodiversity are threatening to undermine these choices and adaptive responses, however. The last few hundred years have witnessed a rapid increase in the rate at which biodiversity is being altered. As populations have grown and their consumption needs increased, so has the drive to extract more economically valuable resources more rapidly – be it minerals, timber or food. Natural habitats that harbour some of the world's most valuable biodiversity are being lost at ever faster rates and over progressively wider areas. And managed lands are undergoing increasing simplification – with large losses of agricultural biodiversity. The consequences of these changes and losses are already affecting some of the poorest communities in the world. But they will undoubtedly affect us all.

In order to conserve biodiversity, throughout history societies have protected areas they consider valuable. Conservation has taken many different forms, including setting aside land for national parks or sacred sites and imposing use restrictions on certain plants or animals (known as in situ conservation). Specific areas have most often been set aside for such reasons as their rare ecology (endemic or Red Listed species) or exceptionally high species diversity; their critical environmental services, such as watershed protection or evolutionary functions; or their continued use by indigenous peoples who are still pursuing 'traditional' lifestyles based on 'wild' resources.

As development pressures grow, areas containing unique characteristics have become ever more vulnerable to pressures from outside commercial interests or local inhabitants. Governments have found it increasingly difficult to maintain these zones as 'no-use' areas, particularly with limited funds and little prospect of the areas paying their own way.



Ex situ conservation activities have aimed to preserve certain species outside their natural habitat – such as in zoos, herbaria and botanical gardens. They have also aimed to ensure adequate access to genetic resources for the research and development of food, agricultural, pharmaceutical or cosmetic products. But most of these collections are found in industrial countries, far from their original source in the tropics, and the resources to maintain them are dwindling rapidly.

The pattern of declining support for biodiversity conservation has been to some extent countered by the Global Environment Facility and other smaller funding facilities. Yet the deficit remains large – and governments, particularly in developing countries, are unlikely to devote the necessary resources to conservation in the near or medium term. New sources of funding and new forms of partnership in biodiversity conservation are critically required. This is where the private sector, including the mining and minerals industry, can further develop a role.

A few of the larger mining companies have begun to take steps in this direction. Some have formulated biodiversity policies; others have taken innovative steps in planning, design and operations management. Evidence of such remedial actions is encouraging, yet they are largely restricted to a handful of major players. And within this group, some are doing more than others. Adopting 'biodiversity-friendly' practices remains challenging, especially for smaller companies and peripheral players. This is partly because governments, while perhaps committed on paper to biodiversity, have found it difficult to create the right incentives and apply the necessary regulations in a way that could encourage all players – from the individual miner to the largest company, as well as other economic sectors – to conserve biodiversity.

There is considerable potential benefit to be gained from stronger partnerships between the mining and conservation sectors. These partnerships must not neglect, however, to include governments and local communities – as the latter most often are the greatest losers, whether this follows a mining development or the establishment of a protected area. They are also often least able to articulate their needs and interests – being financially poor and politically marginalised.

While there are some successful partnerships emerging, there is still much work to be done to build the trust necessary to engage in more widespread collaborative action. Building strong and sustainable partnerships in conservation will require a carefully managed process that will provide the necessary space for building the confidence that can allow an extended dialogue on mining and biodiversity. Critical elements of such partnerships will include:

- improving the coherence of and access to information on biodiversity;
- reviewing and improving protected-area categorisation and classification systems;
- engaging in joint conservation and sustainable development projects;
- working towards more effective land use planning systems;
- pulling together, disseminating and implementing best-practice experience;
- instituting more rigour and independence in environmental impact assessments and environmental audits; and
- ensuring that finance agencies apply consistent best-practice criteria.

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# Perspectives

## on Mining and Biodiversity Conservation



### Indigenous peoples and the heritage of future generations

The activity of mining requires vigilance to ensure that the heritage of future generations – the biological as well as cultural heritage – is not adversely affected by the activities of today. The almost universal past experience of indigenous peoples with regard to mining is poor actions and poor accountability. If it is at all possible to change this experience, then to my mind the effort is worth it.

Indigenous cultures are inherently values-based and have highly systematic cultural traditions of ascertaining excellent, best, mediocre and bad practices in all aspects of life. Best practice represents the only responsible and ethical way forward. It plans for the direct and active participation of local indigenous communities in all aspects of the business of mining – from negotiation for access to the conduct of mining, environmental quality and the rejuvenation of any lands and waters affected. If there is a genuine desire to adopt best practice as a standard of the mining industry in its dealings with indigenous peoples, companies must be willing to conduct business differently.

One practical strategy for best practice is No-Go Zones. While no mining in 'protected areas' might appease environmental groups, in itself it will not appease indigenous groups. Not all mining sites are in protected areas or are rich in biodiversity, but they may well be rich in indigenous cultural and spiritual terms. Best practice could also include restoration, a standard consistent with liability that acknowledges the responsibility of a mining company to maintain the ongoing wellbeing – cultural and environmental – of the site during mining as well as to restore the site after mining has ceased.

**Aroha Te Pareake Mead**, Victoria School of Management, Aotearoa/New Zealand

### The World Heritage Convention

The 1972 World Heritage Convention is an international legal instrument for the protection of cultural and natural heritage of 'outstanding universal value'. With 178 governments having ratified the treaty as of May 2004 and 788 sites on the World Heritage List, the convention is an important instrument in heritage conservation.

Threats to the very survival of the world's heritage have increased over the last three decades as a result of neglect, poverty, civil unrest and military conflicts as well as ill-advised planning in many regions. These increasing threats demand improved implementation of the convention by the states that are party to it. They are encouraged to adopt a national policy that gives cultural and natural heritage a function in the life of the community and to integrate the protection of that heritage into comprehensive planning programmes.

One of the most important protective mechanisms of the World Heritage Convention is the List of World Heritage in Danger. The inclusion of properties on this list is intended to highlight the need for urgent attention by the whole international community. In the past, many World Heritage sites have faced threats to their values and integrity as a result of mining development projects and disasters.

While being vigilant in efforts to protect world heritage and always ensuring the protection of the 'outstanding universal values' of heritage sites, we must not ignore the opportunities for fostering conservation partnerships with seemingly unlikely allies. Since 2000, a constructive dialogue has taken place with the mining industry, including international meetings presenting case studies of World Heritage sites under threat, publications and presentation of results on web sites.

The ICMM statement on World Heritage sites as 'no-go areas' was widely recognised as a landmark commitment from leading companies in the mining industry. There are enormous conservation benefits from such co-operation and from sensitive, well-planned projects.

We have already gone some way in this dialogue between the mining industry and conservation. There is increasing interest not only in talking but in solutions to our everyday problems and to challenges in the field. An international conference is planned for 2006 on extractive industries and World Heritage sites.

**Mechtild Rössler and Guy Debonnet**, UNESCO World Heritage Centre

## What are the business opportunities and risks associated with biodiversity?

Governments, the public and NGOs are increasingly holding business accountable for its negative impacts on biodiversity. This emphasis on biodiversity as a key sustainable development challenge makes it an issue for business in two main ways.

First, society is progressively more sensitised to the issue and is voicing its expectation that business should shoulder its responsibility for the loss of biodiversity and make a positive contribution to its conservation. In order to win trust and maintain a licence to operate, companies will need to position themselves to be able to demonstrate they are responding to this expectation.

Second, companies, governments, investors, brokers and NGOs all point to biodiversity business risks and opportunities to which companies need to respond. Some already recognise the potential opportunities presented by demonstration of best practice on biodiversity – not only in greater motivation and support for company operations among staff and other stakeholders, but also in more efficient operations through this stakeholder support, faster permit and concession negotiations that produce both earlier revenues and considerable savings and the competitive advantage of favoured status as a partner. Conversely, companies and investors are increasingly acknowledging the business risks that inadequate management of biodiversity poses: costs imposed by liabilities and operating inefficiencies, difficulties in gaining access to land and resources, reputational damage, access to capital and the delays, costs and inefficiencies caused by disaffected stakeholders and employees. Together, these risks and opportunities offer a compelling case for best practice by companies on biodiversity, enabling them to protect shareholder value.

**Kerry ten Kate**, Insight Investment

## The role of the mining industry

The capacity of mineral development to contribute to biodiversity conservation is not intuitively obvious. Mining is an extractive industry and, by its very nature, can have significant direct and secondary environmental and social impacts. The negative legacy of past practices has created a deep level of mistrust of the industry in conservation circles and raised questions about the industry's role in society's transition to sustainable development.

As noted in the Johannesburg Plan of Implementation, minerals are essential to modern life and important to the economic and social development of many countries. Assured supplies will be required to meet the needs of the world's growing population and to help fulfil expectations of improvement in quality of life, notably in developing countries. If properly integrated into regional development and biodiversity conservation strategies, mineral-related investment can help alleviate pressures from poverty on biodiversity-rich areas as well as foster sustainable improvements in the health, education and the standard of living of national, local and indigenous communities.

Today, both onsite and offsite opportunities are being pursued by leading companies to enhance their contributions to biodiversity conservation. These include assessments and conservation of unique flora and fauna, research and development, support for protected area site management programmes and proactive community development programmes to provide sustainable economic and social benefits even after mine closure. A number of companies have also established partnerships with conservation groups, and these are beginning to deliver real on-the-ground conservation outcomes.

The challenge is to ensure that mining is part of the solution that enables better outcomes for biodiversity conservation and sustainable development.

**Andrew Parsons**, International Council on Mining and Metals

## Increased awareness of biodiversity conservation

Mining is often viewed as more damaging to the environment than other developments. In part, this is due to the legacy of industry environmental neglect, and in part it is due to the very nature of mining. By definition, a portion of land and its biodiversity must be removed – at least for a period of time – to allow the extraction of minerals. This unique relationship between mining and conservation is what makes the concept of certain 'no-go' areas of unique or fragile biodiversity important.

A world without mining is unlikely. In many parts of the world people depend on mining for the essentials of life. These range from the very basics, such as salt and fuel, to the needs of modern life, such as mobility, housing, health, and communications. While in some places it may be necessary to give up mining in the interest of biodiversity conservation for posterity, often it need not come down to an either/or question: either mining or biodiversity conservation.

The mining industry is increasingly aware of these difficult issues. Leading companies have demonstrated in several places that the negative impacts of their operations can indeed be anticipated and then mitigated or minimised. And more examples are emerging both of compensation for inevitable biodiversity losses through offsets and of companies achieving net biodiversity benefits. Yet many people still feel this is too little too late. The challenge before society and the mining industry in particular is how islands of excellence can be expanded to match the required global effort.

The growing interest of society in conservation and emerging success stories from around the world signal hope for a future characterised by both a richer biodiversity and access to the mineral resources we need. A sustained industry commitment and collaboration between industry, civil society and governments can make this dream come true.

**Mohammad Rafiq**, IUCN – World Conservation Union

# Management Tools 7

# Canada's mineral and energy resource assessments

**Summary**
In Canada, the Mineral and Energy Resource Assessment (MERA) enables federal departments and the territorial governments to co-operate in conducting needed assessments in advance of determining boundaries for national parks on lands whose resources are administered by the federal government. Unbiased research scientists develop mineral deposit models, collect geoscience information and play an important role in communicating results to stakeholders and policy-makers.



## Background

Canada's national parks and other protected areas are created mainly to protect biodiversity, specific species and wildlife habitat; to preserve ecological integrity; and to ensure public access to outstanding natural areas for recreation and tourism. Protected areas are critical to the long-term health of society, while stimulating and maintaining the economy. Mining is also recognised as critical to the wellbeing of the economic and social fabric of Canada; mineral and energy resources constitute more than 30 per cent of Canada's exports.

Although mineral activities are prohibited in many protected areas and all national parks, under the Whitehorse Accord of 1994 decisions to withdraw any lands from mineral activity must be based on all relevant technical, environmental, social and economic information. This includes information on mineral potential that is gained through unbiased mineral resource assessments.

## The MERA Process

The Mineral and Energy Resource Assessment process, established in 1980, is the primary means whereby the Department of Indian and Northern Affairs Canada, Parks Canada, Natural Resources Canada (NRCan) and the territorial governments co-operate in conducting mineral and energy resource assessments. Because MERAs are done before national parks are established in Nunavut, the Northwest Territories and the offshore of Canada, the assessment process is an integral part of establishing a national park.

| Sequence of Steps in Conducting a MERA | |
|---|---|
| **1** | Parks Canada informs the MERA Working Group of natural areas under study. |
| **2** | MERA Working Group provides available information on potential natural resources. |
| **3** | Parks Canada selects a potential park area. |
| **4** | Geological Survey of Canada (GSC) sets Terms of Reference for the mineral and energy resource assessment. |
| **5** | Senior MERA Committee approves the Terms of Reference, with revisions if necessary. |
| **6** | Parks Canada informs public that a MERA will be conducted for the area of interest. |
| **7** | Parks Canada prepares documents for Senior MERA Committee and the public on natural and cultural resources of the area and social and economic implications of the proposed park. |
| **8** | GSC undertakes mineral and energy resource assessment, including field and laboratory analyses to bring information base up to modern standards. |
| **9** | GSC rates the mineral and energy potential of the area. |
| **10** | Territorial government conducts a hydroelectric power assessment, if necessary, and presents results to Senior MERA Committee. |
| **11** | The Minerals and Metals Sector of NRCan and other members of the MERA Working Group prepare comments on strategic and economic value of resources of the area to the territory and to Canada. |
| **12** | Parks Canada presents a park proposal to the Senior MERA Committee. |
| **13** | MERA Working Group presents technical reports and recommendations on a proposed park boundary to the Senior MERA Committee. |
| **14** | Senior MERA Committee makes recommendations to the Minister of Indian Affairs and Northern Development on a Government of Canada negotiating position toward park establishment. |
| **15** | Parks Canada consults with the general public on the park proposal. |
| **16** | After negotiations with any affected Aboriginal/Inuit group, the Minister of Indian Affairs and Northern Development may recommend a change in the withdrawn lands to reflect the negotiated boundary and to set up some interim rules on land use while the Parliamentary procedure runs its course. |

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Federal geoscientists are essential to the MERA process. Unbiased research scientists develop mineral deposit models, collect the geoscience information necessary as part of resource assessments and play an integral role in providing stakeholders and policy-makers with the results. The experts' national and international knowledge of mineral deposit and hydrocarbon analogues (such as mineral deposit models and petroleum play histories) is required to translate geoscientific data into assessments of resource potential. The field programmes conducted by the federal scientists bring a consistent level of expertise and adapt national methods of mapping and of geochemical and geophysical surveying to specific areas of interest.

## First Phase of a MERA

MERAs are conducted in two stages: preliminary research and, if more information is needed for a final decision, comprehensive field and laboratory studies followed by data analysis. In the first phase, scientists follow five distinct steps:

- Clearly define the study area in partnership with the other government agencies to ensure that the objectives do not change part way through the assessment. Also, geologic units and processes are not necessarily confined to areas defined by politics, climate, drainage or other natural events. MERA study areas are commonly larger than the park proposal.
- Compile geoscience data from existing sources. Typical data collected at this stage from previously completed work would include bedrock geologic maps, quaternary geology maps (surficial cover), geophysical survey data, geochemical survey data and mineral deposit/occurrence data.
- Establish potential deposit types that may occur within the study area.
- Establish 'conceptual models' for these deposit types.
- Prepare an initial assessment of resource potential based on the data collected. Once it has been established which deposit models are suitable, the potential for occurrence of these deposit types in the study area is assessed. Seven categories are defined, from very low potential to very high.

Based on the results of Phase I, a Senior MERA Committee makes one of four recommendations. The advantages of a park could outweigh the value of potential non-renewable resources within the study area and thus the committee would recommend that the park be created. The study area could have too much non-renewable resource potential to be considered for a national park, and another candidate area should be chosen. Park creation could proceed but boundaries would be modified to exclude areas of high mineral potential. And last, more information could be required before a final decision is made, so a Phase II study would be recommended.

## Second Phase

In Phase II, the highest priority for the work plan is to ensure that knowledge of the bedrock and surficial geology is current and comprehensive. Due to the current limits on government resources and the logistical challenges of non-destructive fieldwork in pristine remote areas, geological mapping is usually thematic and targeted. Scientists use geospatial and geostatistical tools to normalise results over the study area, systematically go through a check list of deposit types and their essential characteristics and subjectively determine the potential of each deposit type for each resource assessment domain. Of course, resource assessments are a snapshot in time based on existing, incomplete knowledge. Though cost and time constraints preclude it, ideally it would be best to re-evaluate each area at regular intervals to reflect changes in data availability and so on.

## Conclusions

Improved geological knowledge increases policy-makers' confidence that parks can be established without seriously compromising future non-renewable resource development. Overall, the MERA process has been an effective tool for sustainable development by encouraging balance, coordination and partnerships involving Canada's mineral and energy industry, agencies creating protected areas for environmental objectives, and individuals and organisations representing various stakeholder groups, especially the local residents of the lands in question.

# Exploration in a biodiversity hotspot

**Summary**
Exploration is a process whereby a continual stream of projects, varying in maturity, are examined, advanced and either developed or passed up. Anglo American's experience at the Skorpion zinc mine in southern Namibia demonstrates that company personnel and stakeholder representatives can together develop an Environmental Management Plan that minimises the impacts of exploration and rehabilitates the land when exploration is complete.



## Background

New mineral deposits are needed to replace the resources depleted by mining. Exploration is a process whereby a continual stream of projects, varying in maturity, are examined, advanced and either developed or passed up. Exploration is sustained by establishing a pipeline of projects ranging from area selection in the earliest stage to more advanced deposit delineation.

**The Four Stages of Exploration**

**Area Selection:** large tracts (typically at least 100,000 hectares) are reviewed through desktop studies and airborne surveys, with limited reconnaissance visits that include geological traversing and collecting of some surface geochemical samples; impact zero to low

**Target Generation:** a reduced area (~10,000 hectares) is explored (usually within a year) by airborne surveys, geological mapping, ground geophysics and surface geochemical sampling; typically fewer than 10 in field team; impact low

**Target Testing:** a reduced area (~1,000 hectares) is evaluated over several field seasons by more intense ground testing, with some drilling; up to 25 people in exploration camp; due to ground disturbance from road clearing and some noise and dust from drilling, impact moderate

**Deposit Delineation:** a very small area (less than 100 hectares) is explored over several years; more than 50 people on site; activities include close-spaced drilling, road and vegetation clearing and bulk sampling of mineralised material; impact moderate to high

In September 2000, Anglo American plc announced that it would develop the Skorpion zinc mine and refinery near Rosh Pinah, in southern Namibia. The deposit is approximately 85 kilometres north-east of Oranjemund and 25 kilometres north of Rosh Pinah. Construction of the open-pit mine and plant commenced in 2000 and first production occurred in April 2003. At full capacity, the mine will produce 150,000 tonnes of zinc metal a year. Ongoing exploration for zinc is being conducted in the surrounding area mainly by means of drilling on a broad grid basis and by sampling rock chips and cores.

## Stakeholder Concerns

Southern Namibia is recognised as one of the world's top 25 biodiversity hotspots. It is the only arid hotspot environment, and over 10 per cent of the plant species there are found only in the Sperrgebiet area. Of particular importance are the indigenous succulents Mesembryanthemaceae, known as 'mesembs'.

The main concern of the Namibian Ministry of Environment and Tourism (MET) is that the Sperrgebiet habitat is extremely sensitive and cannot rehabilitate itself and that exploration may cause irreparable damage. They wanted the impacts of exploration to be minimised and the land restored to a near-original state for future uses, such as ecotourism.

In addition, MET had concerns over unrestricted exploration for all commodities in the region, conflict between government pro-development and conservation lobbies, poor track discipline and drilling techniques, the collecting of plants and wood and the poaching or disturbance of animals. Delays in rehabilitation and the turnover of exploration staff could also mean the loss of environmental knowledge.

## Agreeing on an Environmental Management Plan

The Skorpion Mine Environmental Management Plan (EMP) addressed exploration issues, and a specific Exploration EMP was developed. In addition, and in conjunction with other stakeholders, a Rosh Pinah Environmental Forum was formed in late 2000 to develop site-specific plans for exploration areas. Stakeholders in this process included Anglo American exploration staff, a consultant retained as external auditor, the Chief Warden of Sperrgebiet, staff from the Namibian Ministry of Mines and Energy and a botanist from the National Botanical Research Institute in Windhoek.

The exploration methodology required wide-spaced, rotary air blast drilling, which had potential impacts on the environment. A field visit was arranged for the external environmental consultant and the Chief Warden so they could discuss the drill programme and suggest ways to minimise any possible impacts. In addition, rehabilitation options for unavoidable damage were suggested.

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Skorpion zinc mine, 2003

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This process led to an agreement to, among other actions, restrict drill site access to single tracks on grid lines; use wide, low-pressure tyres and lightweight drill rigs; ban camping within the Sperrgebiet; rehabilitate all drillsites and access tracks; and monitor the drillers' environmental conduct daily.

A more specific management plan set prevention and protection as the first objective. It highlighted pollution control (dust suppression), reporting and biannual audit commitments and layout design of new tracks to avoid track and drill damage. In addition, field crews were trained to recognise endangered plant species.

The second management objective was rehabilitation of unavoidable environmental damage. A team of four was dedicated to full-time rehabilitation of drill sites and access tracks. They levelled and raked all disturbed ground (harrow in places) and collected and disposed of drill materials (chips, muds, pegs, pipes). They also replanted and watered species from surrounding areas.

As part of the follow-up, site visits were conducted with all stakeholders, 'before-and-after' photographs were taken and biannual audits were conducted with full reporting. Spot checks were held, and formal sign-off was given to previously affected areas.

## Lessons Learned

Large tracts of ground have been returned to their original state at minimal cost, including over 90 kilometres of tracks created by other parties before the current exploration phase. The exploration objectives were achieved within budget, and the rehabilitation provided additional local employment opportunities. The level of environmental awareness and regard for the importance of biodiversity by all exploration staff increased considerably, and an excellent relationship of trust developed between Anglo American and MET staff.

Through dialogue and an openness to admit failings, very high standards were set and achieved. It is clear that environmental protection and remediation solutions do not have to be high-tech. A continuing relationship with consultants after the EMP was drafted provided continuity and added credibility to the efforts to retain biodiversity.

Southern Namibia is one of the world's top 25 biodiversity hotspots

Rotary air blast rig in the Sperrgebiet of Namibia

# Improving coverage of biodiversity in EIAs

**Summary**
Environmental impact assessments (EIAs) are used widely to integrate environmental, economic and social concerns into decision-making processes. But they often address biodiversity issues in only a general way, without baseline surveys or consideration of possible indirect or cumulative impacts of a proposed project on biodiversity in an area. Companies can play an important role in improving the coverage of biodiversity concerns in EIAs.



## Background

The Convention on Biological Diversity provided strong support for the development of impact assessment techniques especially related to biodiversity. Although EIAs have traditionally addressed biodiversity issues, they have been generic in nature. Often, they did not consider non-protected species, different levels of biodiversity, structural and functional relationships within biological systems and between biophysical and socio-economic systems, potential indirect and cumulative impacts and possible mitigation measures, possibilities for enhancement or the concerns of communities and other biological resource users. In addition, they commonly lacked proper baseline surveys or data, the use of relevant scientific literature, clear criteria for assessing impact magnitude and significance and plans for post-project monitoring.

## Taking Biodiversity into Account

In order to take into account various aspects of biodiversity, an environmental impact assessment should:

- consider all the relevant levels of biodiversity – bioregional, landscape, ecosystem, habitat, communities, species, populations and (when appropriate) individuals and genes;
- consider connections between the levels of biodiversity by looking at structural and functional relationships (such as connectivity, fragmentation and disturbance, hydrologic and demographic processes) and their relationship to biodiversity study areas likely to be affected by different impact types;
- collect more detailed abundance and distribution data on certain aspects of biodiversity without necessarily surveying everything in detail, but focusing on key biodiversity receptors;
- consider the full range of potential impacts, including indirect, cumulative and induced impacts;
- consider the social dimension – the importance of community and indigenous knowledge of local biodiversity aspects, traditional uses of resources and habitat and stakeholder participation; and
- set out clear criteria to judge the extent, magnitude and importance of impact.

## The Importance of Starting Early

Ideally, assessments should be done at the exploration stage. However, the inherent redundancy of the process (only 0.1 per cent of targets represent potentially economic mineral deposits) means that there is resistance to spending survey money when the odds are that the area will be released with no further interest. On the other hand, early knowledge of critical biodiversity issues in a given project would provide very pertinent insights and should have some weight in the decision balance of the sustainability of the development project. (In fact, some money could be saved by stopping the project at an early instead of a later stage.) It is important to distinguish between the different stages of exploration and when an EIA is most likely to be triggered. General understanding of biodiversity issues in an area before bidding on exploration licences can be important.

An important step in gaining an understanding of how the system might be changed by a proposed project is to survey existing conditions – the baseline environment. The baseline survey should provide the necessary information on the site-specific environmental setting of the project. It should cover the different seasons, migrations, breeding and so on and should be, if feasible, long enough to establish pre-project trends. One important challenge in assessing baseline conditions is the limited time frame for a thorough assessment. Biodiversity field surveys require sufficient time and resources. And to be of significant value in the EIA, survey work needs to be initiated early in the process. There should be scope to take as long as necessary and appropriate to cover aspects such as migrations, breeding seasons, rainy seasons and so on.

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### Six Important Roles for Companies

Companies should **demonstrate a high-level commitment** to the integration of biodiversity aspects into decision-making processes and to the maintenance and enhancement of important and protected habitats and species. They should commit to addressing biodiversity at ecosystem, species and genetic levels as appropriate and to integrating associated social aspects.

The interrelationships between biological/ecological systems and human systems should be identified and the impacts on these relationships addressed in a local, regional, national and international context. In **adopting an ecosystem approach**, ecosystem functions and structure should be maintained.

The **diversity of species or richness of ecosystems at the future project site should be understood**, alongside related cultural and social aspects. Impact assessments should identify if a site is important and why. Does it contain or lie within a protected area? Is it a sensitive or vulnerable site with high biodiversity values? Is it a site of cultural importance? There should also be recognition of and respect for specific local biodiversity values and uses as well as for local, traditional and indigenous knowledge of the area.

Impact assessment should be viewed as a process, not a product. **Direct, secondary and cumulative impacts on biodiversity should be assessed** in a phased approach, both early in the project and throughout the life of the mine. Impact assessment should also take into account social, economic and health impacts. The open and iterative process should actively seek and allow time for stakeholder input. Biodiversity data gathered in baseline studies, impact assessments and subsequent monitoring should be shared with and validated by stakeholders, including local communities, academics, conservation organisations and other companies.

**Impacts on biodiversity should be avoided wherever possible, minimised where they cannot be avoided, and mitigated where there are residual impacts**. During the development phase of a project, there should be a rigorous assessment of all options, including 'do nothing'. Offsets may be useful in mitigating residual impacts, and preference should be given to in situ offsets that are aligned with local, regional, national and international conservation strategies and goals and that bring a net positive benefit for biodiversity conservation.

Last, companies can manage risk around biodiversity and maximise positive contributions by **working in partnership with government, communities and others**. Community involvement in biodiversity assessment should be implemented at an early stage, and sufficient time should be allowed for government, industry and other stakeholders to understand, evaluate and discuss biodiversity concerns throughout the process.

# Integrating biodiversity into environmental management systems

**Summary**
An effective Environmental Management System (EMS) requires the preparation of documented system procedures and instructions to ensure effective communication and continuity of implementation. As part of that process, the possible positive and negative impacts of an operation on the region's biodiversity should be included in the EMS's register of Environmental Aspects and Impacts. Management programmes need to be developed for any potentially significant negative impacts.



## Background

Mining often occurs in or near sensitive natural environments, so biodiversity protection needs to be a key part of the operation's environmental management programme. Impacts resulting from exploration and mining operations can be widespread or confined, direct or indirect, permanent or transient, and positive or negative. In addition, interactions between mining operations and local communities can multiply or offset biodiversity impacts.

## Possible Biodiversity Impacts of Mining

The amount of damage done to local biodiversity during mining or the enhancement of it that is accomplished will depend on:

- how well the potential impacts were foreseen during baseline surveys, environmental impact assessment and project development;
- how well the impacts are managed during exploration, operational mining, rehabilitation and closure; and
- whether the rehabilitated land, infrastructure and management are sustainable after mining has gone.

Examples of direct negative effects are fairly obvious: damage or clearing of native vegetation leading not only to direct losses but also to fragmentation of habitat; rainfall runoff from disturbed land leading to soil erosion, turbidity, siltation or pollution of local streams; introduction or spread of weeds (including agricultural and commercial exotic species), pests and diseases of native flora and fauna; alteration of groundwater levels through mine de-watering, resulting in vegetation impacts; and exposure of acid-generating rock or subsoil that leads to contamination of waterways with acid and mobile metals.

Indirect negative impacts often involve interactions between the mining operations, its workforce and local communities. Many examples of this relate to an operation's opening up access to remote regions, to migration and settlement of people in the region, and to the impacts these people have on the local biodiversity. Some types of mining might also restrict access to land that was previously used by local communities – uses that may have been linked to traditional subsistence livelihoods or to recreational uses in affluent societies. Either way, pressures for these land uses can be transferred to new undisturbed lands, with subsequent impacts on biodiversity.

Yet mining can also contribute positively to biodiversity outcomes beyond the impacts or activities of the operations, through a wide range of programmes such as:

- regional flora and fauna surveys;
- education and training;
- research funding;
- sponsorship of community environmental groups or projects; and
- local and regional economic developments that have biodiversity spin-offs.

Many of the negative impacts listed above can be avoided or can even result in positive biodiversity outcomes if appropriate consultation with regulators and local communities is undertaken and if planning and management are applied. Engagement, collaboration and cooperation between government, local communities and mining companies are all critical for optimum biodiversity outcomes to be realised. An example of a positive outcome is mine rehabilitation designed to produce a fuelwood plantation, agroforestry or grazing land.

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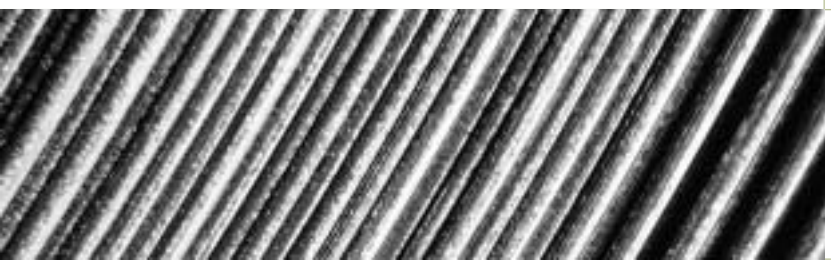



## Environmental Management Systems

In essence, an Environmental Management System (EMS) can be considered:

- a tool to improve environmental performance;
- a means of systematically managing an organisation's environmental affairs;
- the part of an organisation's overall management structure that addresses immediate and long-term as well as direct and indirect impacts of its products, services and processes on the environment; and
- an ordered and consistent way for organisations to address environmental concerns through optimisation of resource allocation, transparent assignment of responsibility and ongoing evaluation of practices, procedures and processes – with a focus on continual improvement.

All the likely positive and negative impacts of mining on biodiversity can be integrated into an operation's EMS as items in the Aspects and Impacts Register. Ideally, this will be developed in consultation with stakeholders or will at least take their views into consideration. Any potentially significant impacts must have management programmes developed to deal with them.

It is important to note that biodiversity integration should not be about creating a system that competes with what already exists within individual companies or the rest of the industry. In order to effectively integrate biodiversity considerations into decision-making and activities, a company should not need to adopt an entirely new suite of systems or practices. These should instead be integrated into a company's ongoing management systems and operations. In this way they will build on systems already widely used within the industry.

One of the most widely used systems is ISO 14001. Developed by the International Organisation for Standards, this specifies requirements for an EMS to enable an organisation to formulate a policy and objectives that take into account legislative requirements and information about significant environmental impacts. It applies to the environmental aspects that the organisation can control and over which it can be expected to have an influence. It does not itself state specific environmental performance criteria.

## Integrating Biodiversity

In terms of biodiversity, the company should prepare a register of relevant legal regulations and voluntary practices, including corporate standards and environmental guidance and codes of practice published by professional and industrial bodies the organisation belongs to, such as ICMM. The register might also include:

- information on protected areas and their legal status;
- listed vulnerable species and risk of impacts in areas of operation; and
- Biodiversity Action Plans for the areas in question.

If there are significant potential impacts on biodiversity that could arise during or following major accidents or emergencies, the company should undertake a more detailed risk analysis, identifying vulnerable resources and sites and drawing up plans for emergency preparedness and contingency measures for each potential impact. This is particularly relevant if the project is in or near a sensitive biodiversity area.

In cases where biodiversity is a significant aspect of one or more projects, biodiversity criteria may also be incorporated in existing performance contracts in order to emphasise the focus on biodiversity within line management.



# Rehabilitation and Restoration 17

# Ecological reclamation that maximises biodiversity gains

**Summary**
The rehabilitation of mined land can largely be considered as ecosystem reconstruction – the re-establishment of the land's ability to capture and retain fundamental resources. In rehabilitation planning, it is imperative that goals, objectives and success criteria are clearly established so that the task can be undertaken in a systematic way, while realising that these may require some modification later. Biodiversity gains are a realistic objective within rehabilitation planning models whether topsoil is available or not as an ecological tool. When mines are not isolated from surrounding communities or are located in relatively heavily populated areas, community requirements also need be taken into account when selecting rehabilitation goals.



## Background

The direct impacts of mining disturbance to land surfaces are usually severe, with the likelihood of the destruction of biodiversity within natural ecosystems through the removal of natural soils, plants and animals. But mining is a temporary land use: the mineral deposit is finite and eventually exhausted. The major goal of sustainable rehabilitation is therefore the maintenance of land use options for future generations.

Mine closure and rehabilitation also need to take into consideration the long-term effects of acid mine drainage (AMD) and the need to rehabilitate in a manner that reduces the generation of AMD to acceptable levels. In conditions where the long-term risks of AMD are significant, the design of rehabilitated profiles may need to be modified to minimise the entrance of water or air.

Social factors should be considered, too, in practical restoration planning when a mine is not isolated from surrounding communities or is in a relatively heavily populated area. In such cases the rehabilitation objectives need to be defined in close consultation with local communities, as these are the people who will have to use the rehabilitated land in perpetuity after the company is gone.

In many parts of the world the social and legislative context of mining now requires some form of land rehabilitation goals to have been established for after a mine closes, and these are often determined prior to granting planning and operating permits for a new mine. Rehabilitation considerations are now incorporated into mine planning and have become a major factor governing mining operations, waste disposal and site closure. Yet there remains a considerable legacy of poor reclamation practices that, at best, have not provided any successful ecosystem development – and certainly no consideration of biodiversity losses and gains.

## Keeping Biodiversity in Mind

Ecological restoration is about a broad set of activities – enhancing, repairing or reconstructing degraded ecosystems – and about optimising biodiversity returns. In essence, the restoration of mined land is based around ecosystem reconstruction. It is usually a question of re-establishing the ability of the land to capture and retain fundamental resources – energy, water, nutrients and species.

Ecological restoration with biodiversity benefits in mind must involve an orderly set of considerations that promote successful procedures and practices. Often these practices, although based on similar general considerations, will need to be innovative because of unique circumstances in each area and ecosystem. Restoration objectives must be formulated from a detailed knowledge of the basic structural and functional characteristics of natural ecosystems. While the very concept of restoration may imply reinstating the pre-mining ecosystem, the practical context of any site demands that the following be considered: speed of attainment, economics (or cost-benefit), achievability and long-term stability with ongoing management at a reasonable cost.

| **The Terminology of Mined Land Rehabilitation** |
|---|
| **Reclamation:** the general process whereby land surface is returned to some form of beneficial use |
| **Restoration:** reclamation that is guided by ecological principles and promotes the recovery of ecological integrity; reinstatement of the original (pre-mining) ecosystem in all its structural and functional aspects |
| **Rehabilitation:** progression towards the reinstatement of the original ecosystem |
| **Replacement:** the creation of an alternative ecosystem to the original |

Rehabilitation of an exploration drill site

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## Topsoil: A Strategic Resource

Restoration planning models recognise that for most mine reclamation programmes over the last 30 years, an overriding consideration has been whether topsoil has been retained or lost. This will, in all probability, determine how quickly a pre-mining ecosystem can be restored with its biodiversity regained, and whether such a restoration goal is actually realistic and sustainable. Topsoil is a strategic resource that should be conserved if at all possible. Thus its removal, storage and replacement have been subject to a great deal of technical research in recent times in an effort to protect the physical and chemical properties and the biological processes of this valuable natural resource. Restoration practices where topsoil has been retained focus more on the spatial and temporal factors affecting species colonisation and establishment; the criteria for monitoring and assessing success, particularly in the longer term; and the restoration of natural indigenous ecosystems and biodiversity values.

In the restoration of sites where topsoil has been lost, the major ecological challenges are still related to the interactions between plant species and substrate – that is, revegetation. Yet in these cases faithful restoration of original ecosystems is rare. Mining substrates vary considerably in their physical and chemical attributes, but they tend to inhibit natural colonisation, and further succession may be restricted because of metal toxicity, infertility or acidity. Slow natural succession has sometimes been promoted as a reclamation option, but this is usually politically unacceptable in an era when closure planning is becoming an everyday expectation. The principal restoration options in the absence of topsoil are the ameliorative approach (improving the physical or chemical nature of the site), and the adaptive approach (careful selection of species, cultivars or ecotypes).

## Judging Success

The development of measurable criteria for judging restoration success has proved difficult, but standards are usually derived from the particular community and ecosystem characteristics desired as restoration objectives. Three general success guidelines have been proposed for a restored ecosystem:

- self-regulation for some set period of time, which entails having the structural and functional attributes persist in the absence of whatever subsidies, such as fertilizer or seeding, were needed during the initial implementation;
- achievement of the design criteria – that is, the restoration goal and objectives – established before restoration was undertaken; and
- the absence of any observable adverse effects in the larger ecological landscape.

From these criteria, it can be seen that it is absolutely necessary to have restoration objectives that have unambiguous and technically feasible operational definitions, that are ecologically sound, scientifically valid and socially relevant, and that are receptive to measurement and prediction. The ecosystem characteristics measured are usually those related to the composition, structure and pattern of the vegetation as a key component of the biodiversity pool. It is notable that some important structural measurements of biodiversity are usually left out. In particular, the soil biotic community and animal species numbers are not usually measured, even though they can often provide important indications of long-term productivity and successional pathways.

Namibian springbok

# Restoring a forest after bauxite mining

**Summary**
An innovative improvement programme in Australia over two decades has achieved a significant milestone in mine rehabilitation: re-establishment of forests of young jarrah (a eucalyptus found in Western Australia) with as rich a selection of indigenous plant species as the surrounding native forest.



## Background

Alcoa World Alumina Australia operates two bauxite mines at Willowdale and Huntly in the Darling Range of southwestern Australia, 80–140 kilometres south of Perth. The Huntly mine is the largest bauxite producer in the world. The mine pits range in size from one hectare to tens of hectares. Alcoa has been rehabilitating its bauxite mines since 1966; today some 550 hectares are mined and rehabilitated annually. The technology of rehabilitation has been improved continuously over the years – from plantations of exotic pine trees to a sophisticated state-of-the-art rehabilitation programme.

Alcoa's aim after bauxite mining in these areas is to re-establish all the pre-existing land uses of the forest: conservation, timber production, water production and recreation. Re-establishing a jarrah forest on the mined areas that is as similar to the original forest as possible was determined to be the best way to achieve this goal.

## The Jarrah Forest

The jarrah forest is renowned for its diverse flora, being one of the most plant-species-rich forests in the world outside of tropical rainforests. It has a high conservation value, is the basis of a major sawmilling industry and is widely used for recreation pursuits. Restoring botanical richness is thus seen as an important component of re-establishing a jarrah forest.

A jarrah forest contains at least 784 plant species. Alcoa's research and monitoring showed that among the vegetation types mined by the company there were approximately 300 plant species. Monitoring of rehabilitated bauxite mines found that the long-term vegetation of the site was controlled by the species first established there. The vegetation and the individual plant species are very resilient to natural forms of disturbance, so it is important to establish the correct flora early on.

## A Good Record – But Not Good Enough

Efforts to improve plant richness in rehabilitated mines commenced in the mid-1970s, when the first studies were made of the seed content of forest soils. Ways to preserve seed viability in the soil and to separate the seed-rich topsoil from the remaining overburden were soon developed. In the late 1980s Alcoa started to monitor botanical richness in rehabilitated mine areas regularly. In 1990 the company recorded 65 per cent as many plant species in newly rehabilitated areas as in adjacent native forest – and this was using best-practice rehabilitation methods of the time. The company's determination to do better than 65 per cent led to a 10-year research and development programme to improve rehabilitation practices.

Alcoa developed and implemented many innovative practices and technologies in the areas of seed treatment, seed application, topsoil handling, mine planning and native plant propagation. Collaborative projects to develop the science further were established with academic staff and students.

## The Rehabilitation Process

The rehabilitation process starts with shaping the mine pit to produce a landscape that blends with the surrounding forest. Seeds of local plants are spread throughout the rehabilitated mine pit. Nursery-grown plants are also added, in the case of species for which seed is not a viable method of establishment.

Research in the late 1970s and the 1980s established that directly returning topsoil to a rehabilitated area greatly increased botanical richness. But planning for direct topsoil return can be complex, and operational constraints can result in topsoil being stockpiled. So part of the challenge was to improve planning processes and to implement plans to maximise the direct return of topsoil. Improvements had to be made at all stages of rehabilitation. This involved refining existing practices, developing new practices, developing better mine planning tools, developing new technology and further increasing environmental commitment.

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*Gompholobium knightianum* readily establishes from the returned topsoil

Five important components of Alcoa's approach to restoring the jarrah forest are worth noting:

- Identify opportunities to improve the number of plant species.
- Select research projects. Some projects were major investments, with the involvement of universities and other research organisations; other research took place solely within Alcoa.
- Build the infrastructure and equipment. In the development phase, infrastructure such as a micropropagation laboratory was built, and equipment such as mechanical seeders and large-scale soil screens were designed and constructed.
- Track changes to botanical richness. Monitoring occurred every year using a scientifically based sampling regime.
- Set clear targets. Stating an objective for the rehabilitated areas – to restore a functional jarrah forest ecosystem that matched the pre-mining land uses – was a significant step forward for the company.

## A Restored Forest

The programme started with five-year improvement milestones. The first milestone was to achieve 80 per cent of forest-species richness. When this was accomplished, a new milestone was set for 2000 – that on average 100 per cent of the indigenous plant species found in representative jarrah forest sites would also be found in a 15-month-old rehabilitation, with at least 20 per cent of those found being from a recalcitrant-species priority list.

Alcoa reached its goal. In 2000, at the two operating mines at Huntly and Willowdale, the company achieved an average of 100.7 per cent – in other words, all the rehabilitated areas had on average the same number of indigenous plant species as found in nearby jarrah forests. The goal now is to maintain this good record and thus the botanical richness of the area after mining there.

Plants of recalcitrant species grown from cuttings at Alcoa's Marrinup nursery

Part of the Huntly mine in 1980

The same view in 2001

# The conservation of littoral forests in Madagascar

**Summary**
QIT Madagascar Minerals is planning to mine titanium-rich sands in the coastal plains of south-eastern Madagascar. Based on clearly defined and agreed upon objectives, conservation programmes have been put in place and monitoring programmes have been established to verify the efficiency of the conservation measures on the genetic, population, ecosystem and socio-economic levels. The human population is included at all levels and at all stages of the project, ranging from the villages affected by the pending mining operation to the company's participation in the regional development plan and in fund-raising for socio-economic development outside and beyond the actual mining operation.



## Background

Madagascar has been identified as one of the world's 25 biodiversity hotspots, with very high species richness and high degrees of endemism – the occurrence of species found nowhere else. Among the country's various threatened ecosystems, littoral forests along the sandy coastal plain have been accorded very high conservation priority.

QIT Madagascar Minerals (QMM) – a Malagasy company jointly owned by Rio Tinto plc, UK, and the Malagasy State, represented by the Office des Mines Nationales et des Industries Stratégiques de Madagascar – intends to exploit heavy mineral sands over an area of about 6000 hectares along the coast in southeastern Madagascar over the next 50–70 years. These sands are a source of titanium dioxide. Most of the proposed mining area consists of heavily degraded ecosystems. But major deposits are also located underneath some of the last remnants of littoral forest. These forests are under severe pressure from the local populace, who depend on them for wood and charcoal for cooking and construction. Domestic and regional consumption of wood led to a loss of 60 per cent of the littoral forest cover between 1950 and 2000.

## Conservation Zones in the Midst of Mining

In light of the pressures on the littoral forests in the area of interest, QMM sought to establish a comprehensive environmental programme. Its conservation and monitoring programmes are based on biodiversity surveys that identified species of special concern for conservation and on a comprehensive database on the use of natural resources by local communities.

Conservation zones on the order of 500 hectares will be established within the mining path (230 hectares have already been set aside), and another 250 hectare zone will be added outside the actual mining area. These conservation zones will serve as the centre points for recolonisation of restored habitats.

## Three Main Subgroups

Based on feedback and new information, three key subgroups are working on the main issues identified as needing attention: Flora and Restoration, Fauna and Habitat and Rehabilitation. The activities are carried out by the QMM's Environmental Conservation Unit in collaboration with the universities of Antananarivo and Tulear as well as several universities and scientific institutions outside Madagascar.

The primary goal of the rehabilitation component is to cover the needs of the local human population for natural resources. By doing so – for example, by planting industrial forests that can be used for charcoal production – some of the pressure on the natural forest ecosystems is eased.

The subgroups in charge of the maintenance and restoration of native ecosystems also include direct interactions with the local communities. They are involved with the development of beekeeping, training women in weaving, using reeds from restored marshes, and establishing circuits for ecotourism.

Women harvesting reeds in a two-year-old restored wetland

Identification of a tagged lemur during monitoring

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QMM's workers in the nursery

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**Examples of Tasks of Subgroups of QMM's Environmental Conservation Unit**

### Flora and Restoration Subgroup

- Conduct basic botanical research (survey and monitoring)
- Research in situ and ex situ seed conservation
- Research phenology, seed harvesting and germination (seed bank)
- Conduct simulated restoration trials (littoral forest, wetlands)
- Investigate littoral forest extention (buffer zone)
- Conduct flora survey and monitoring in ecosystems outside mining zone
- Participate in watershed restoration and dune stabilisation

### Fauna and Habitat Subgroup

- Coordinate zoological research (survey and monitoring)
- Elaborate biodiversity monitoring plan
- Manage conservation programmes (translocation, captive breeding, habitat restoration) for important animal species
- Establish conservation zones (with Flora and Restoration Subgroup)
- Develop ecotourism (fauna and flora circuit)
- Promote alternative activities with communities (ecotourism, beekeeping, handicrafts)

### Rehabilitation Subgroup

- Conduct trials and research related to the technical side of reforestation with exotic trees – fast-growing species, experimental plantations, large-scale plantations
- Train communities on natural resource management
- Set up co-management process with communities and regional authorities in the mining areas
- Elaborate community agreements and co-management documents
- Coordinate 500-hectare plantation programme off-site, ahead of mining
- Promote improved woodstoves and the use of eucalyptus charcoal

The main task of the Flora and Restoration Subgroup and the Fauna and Habitat Subgroup, however, concerns the maintenance and restoration of the original biodiversity and communities. This includes approaches on five different levels:

- On the community level, they study ecosystem structures and ecosystem functions. For this, they document species and distributions and they study species interactions (pollination, seed dispersal, phenology, succession, decomposition and so on) in relation to abiotic conditions, habitat degradation and fragmentation.
- On the population level, the dynamics of selected species are monitored in fragmented habitats. The population dynamics are related to the presence of introduced species and their role as possible competitors or vectors for disease transmission.
- On the species level, ecological aspects of habitat requirements and the physiological consequences of living in different habitats are studied for important species (such as local endemics or umbrella species).
- On the genetic level, the present genetic constitutions of different populations are documented with coding and non-coding genes.
- On the individual level, the genetic constitution (represented by the major histocompatibility complex) is linked to parasite resistance and its implication for population dynamics.

As these activities are evaluated and modified periodically, they will provide the quantitative bases for long-term monitoring of the conservation success of a large mining operation in a developing country while using and actually anticipating the standards formulated to achieve 'best practice' in mining operations.

# Renewing vital wetlands in Australia

**Summary**
Revive our Wetlands is a major environmental initiative implemented by BHP Billiton and Conservation Volunteers Australia (CVA) to address the ongoing loss of wetlands throughout Australia. Using CVA's expertise in attracting and managing large groups of volunteers, in the initial three years the programme provided practical assistance, resources and training to communities around 100 selected wetlands. Trained wetlands officers provided much-needed support to local conservation groups, parks and wildlife services, schools and private landholders. The programme has been so successful that the partners have since developed a second phase for Revive, taking it to the end of 2006.



## Background

The origin of Revive our Wetlands dates back to 2000, when BHP Billiton and Conservation Volunteers Australia (CVA) began researching environment issues of mutual interest and critical need. The company and CVA – the largest non-profit practical conservation organisation in Australia – wanted to develop a partnership programme through which they could exchange skills, knowledge and resources and achieve a positive and measurable impact within three years.

## Target Areas

Wetlands are among the most important life-support systems on Earth and are vital for ecological sustainability. Wetlands provide critical habitat for waterbirds, fish, amphibians and hundreds of plant species. They also serve vital ecological, social and economic functions such as filtering pollutants from the water supply, curbing flooding and controlling erosion.

Yet scientists estimate that more than half of Australia's wetlands have been destroyed since European settlement through, for example, changes in land and water use, loss of native vegetation, invasion by exotic weeds, degradation by introduced feral animals and increased pollution from agriculture, development and recreational use. Developing a programme to help reverse this loss was identified by CVA as a worthwhile initiative and one likely to be of interest to the company. Water management is an important aspect of all BHP Billiton businesses, and many of the company's mines are close to wetlands that must be conserved. Furthermore, in some instances wetlands can be incorporated in the rehabilitation plans for closed mines.

The areas targeted in the Revive programme include coastal wetlands, river systems, lakes, watercourses, alpine marshes and floodplains. The goal was to implement a rehabilitation programme in line with the strategies set out in the Federal government's Wetland Policy and Implementation Plan.

## Developing the Programme

A partnership team with representatives of BHP Billiton and CVA was formed to manage the programme. A pilot project was established in Queensland at the Townsville Town Common, a renowned conservation park and habitat for migratory birds, which had become severely degraded. Efforts to achieve ongoing sustainability and management of the site produced encouraging results, and the Revive programme moved into the implementation phase.

The partners spent 12 months planning and developing the programme. By working with local land groups, environment agencies, councils, state governments and wetlands consultants, 100 wetlands sites were selected as needing attention. A national coordinator was appointed to the programme, along with nine wetlands officers located around Australia. A public awareness campaign was launched, and thousands of volunteers were brought into the programme – including students, families, seniors, other interested community members and BHP Billiton employees.

The communications system that was set up included an interactive web site, a regular newsletter and an annual progress report to key stakeholders – government bodies, environmental NGOs and community groups. An international wetlands expert was appointed to monitor the programme and report on environmental outcomes each year.

## Results of First Three Years

Between 2000 and 2003, some A$1.5 million of financial assistance and more than 17,000 volunteer days were contributed to the revitalisation of 100 of Australia's most significant wetlands. During the three year Revive programme, CVA engaged and managed thousands of volunteers – including students, families, seniors, BHP Billiton employees and other interested community members – in locally based wetlands conservation activities.

Volunteers engaged in wetlands protection

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### Revive our Wetlands Results for 2000-03

- 17,000 volunteer days
- A$1.5 million in financial assistance to rehabilitate 100 wetlands
- 30,000 plants propagated
- over 190,000 native seedlings planted
- 740 hectares of weeds controlled
- 50 kilometres of new fences erected
- 300 kilograms of carp removed
- 80 kilometres of walking tracks maintained
- 50 kilometres of fencing erected
- 8 kilometres of new tracks constructed
- 96 flora and fauna surveys
- over A$900,000 in additional funding leveraged from government and other sources
- more than 500 media articles raising awareness of the issue
- 30 per cent of projects continuing without CVA assistance
- 9 new wetlands officers trained and employed

In December 2002, Revive our Wetlands received the Australian Prime Minister's Award for Excellence in Community Business Partnership (in the national large business category). In July 2003, the programme received The Australian Financial Review Magazine's Corporate Partnership of the Year Award and won the Science, Environment, Health and Education Category.

## Plans for the Future

Revive our Wetlands aims to become a sustainable programme, so local communities are being given the resources and practical skills to continue wetlands protection and conservation in the future. As many as 30 per cent of the Revive projects are already operating without CVA assistance.

BHP Billiton and CVA are extending the programme for at least another three years. Between 2004 and 2006, BHP Billiton will provide a further A$1.5 million, and additional funds will be sought through new funding commitments from the Federal, state and local governments and other sponsors. Using the lessons of the first three years, the programme's target is to invest 15,000 more volunteer days to enhance biodiversity value and improve water quality at 10 priority wetland locations across remote, regional and urban Australia. In addition, practical assistance will be provided to existing community efforts at a number of the original Revive sites.

'Revive' teams are assisting to restore habitat of threatened frogs

CVA provides resources, skills and guidance to assist local communities to protect selected wetlands

Through the programme, volunteers are engaged to help at 'Revive' sites around Australia

# A privately protected wetland in Chile

**Summary**
In the Coquimbo region of central Chile, the Los Pelambres copper mining company manages the Conchalí Lagoon as a Nature Sanctuary near its port installation. The site hosts a rich biological diversity of flora and fauna and is a key staging area on the migratory route of neotropical birds and those migrating between the continents. In February 2004, the lagoon was added to the Ramsar List of Wetlands of International Importance. The company is working with the local community to encourage ecotourism and to use the site for environmental education activities.



## Background

In 1997, the Los Pelambres copper mining company acquired a wetland – the Conchalí Lagoon – 4 kilometres north of Los Vilos on the northern coast of central Chile, in the Coquimbo region. The site is located near the company's port installation, which is used to ship copper concentrate from the Los Pelambres mine. It is a wetland of regional, national and international importance due to its rich biological diversity, its interesting land and water flora and fauna and the fact that it is a key staging area on the migratory route of neotropical birds and those that migrate between North and South America. The habitat is influenced by two important ecoregions: the Atacama-Sechura Desert and the Chilean Matorral (scrubland).

## A Rich Diversity of Species

A creek feeds fresh water to this brackish coastal lagoon, and during periods of high rainfall the barrier island is flooded and the lagoon becomes an estuary. Saltmarshes are mainly composed of coastal salt grass, alkali seaheath and *Sarcocornia peruviana*. There are coastal dunes, coastal shrub-steppe vegetation and coastal Mediterranean shrub – the last of which is a high conservation priority.

The white-faced ibis, endemic Chilean mockingbird, and Tropidurid lizard are noteworthy species at the site. Five endemic fish species are found. In addition, the two species of swan living in Chile have been recorded at Conchalí Lagoon. Both species merit conservation attention, especially the coscoroba swan, and the lagoon forms the northern territorial limit of this endangered species.

## Unusual Protection

When Los Pelambres purchased the site in 1997, the environmental permit associated with the facility indicated that the wetland area should be protected. The company realised that just fencing it off to protect the area from the cattle and dogs roaming there would not be enough. So the site was cleaned and fenced and a full restoration process began.

In 2000, the site was declared a Nature Sanctuary, making the Conchalí Lagoon the only privately protected wild area in the region. Footpaths, observatories and information panels have been placed to attract ecotourists and to provide areas for environmental education. The mining port nearby has a contingency plan in place to avoid impacts on the site, and there are no major threats currently affecting the area.

The company now manages approximately 34 hectares as the Sanctuary. On 2 February 2004, Chile designated this Santuario de la Naturaleza Laguna Conchalí as its eighth entry in the List of Wetlands of International Importance maintained by Ramsar, the secretariat of the Convention on Wetlands. This intergovernmental treaty provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are presently 141 Contracting Parties to the Convention, with 1,387 sites on the list of wetlands of importance, covering nearly 123 million hectares.

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The Conchalí Lagoon is a key staging area on the migratory route of neotropical birds

## Local and Regional Partners

The Nature Sanctuary and Ramsar site status were obtained with active help from the regional environmental authority CONAMA (the National Environmental Commission) and from CONAF, the National Forest Corporation, which prepared the main documents and followed the process closely.

The nearby town is involved in the project through a group of students who work on weekends as tour guides. New interest in the lagoon will be encouraged by the construction of a small building that will house exhibitions and information about the site. This will enhance the work with the community, as more people will get involved with the area.

Conchalí Lagoon is the only privately protected wild area in the region

The reserve has coastal dunes and coastal Mediterranean shrub, which is a high conservation priority

The site was declared a Nature Sanctuary in 2000


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# Scientific studies 29



# Studying a botanical gold mine

**Summary**
New Guinea is botanically the most diverse region in the Asian tropics. Of particular significance are the high levels of endemism on the island – the occurrence of species found nowhere else. Studies of the wealth of biodiversity in the Lorentz World Heritage Area – the largest reserve in South-east Asia – have been constrained by its remote location and difficult logistics within the park. But botanical surveys of nearby areas within the PT Freeport Indonesia project area are supplying valuable information concerning the diversity within the Lorentz. These studies also provide information that Freeport uses during reclamation of overburden and tailings areas.



## Background

At 2.35 million hectares, the Lorentz World Heritage Area (WHA), located in the Indonesian Province of Papua on the island of New Guinea, is the largest reserve in Southeast Asia. Its remote location and difficult logistics within the park greatly limit research there, and few detailed botanical studies have been made in the Lorentz since exploration of the area in the early 1900s. One major source of ecological information essential for sustainable park management comes from studies in nearby areas within the PT Freeport Indonesia (PTFI) Project area. This information is directly applicable for understanding the biodiversity of the Lorentz WHA.

## Biodiversity in Freeport's Area of Work

Over many years Freeport has funded a series of comprehensive surveys of the area's biodiversity. The first studies were conducted as part of a major expansion. In addition to lowland, montaine, subalpine, alpine and nival plants, detailed surveys have included aquatic and terrestrial insects, freshwater fishes, amphibians, reptiles, birds and mammals. This work produced an 11-volume series describing the effort and its results. Subsequent work has included surveys of plants, estuarine fishes and invertebrates, birds and mammals and butterflies of the area. These surveys have involved scientists from a number of major Indonesian academic and scientific institutions, with assistance from internationally respected organisations such as the Royal Botanic Gardens, Kew, the Smithsonian Institute, the Bishop Museum and the Australian National Museum.

## Plant Project

As with the rest of southern New Guinea, the PT Freeport Indonesia Project area supports one of the highest plant diversities identified in any region of the world. This diversity occurs within a 120-kilometre range, from the south coast on the Arafura Sea to the ice-capped summit of Mt Jaya – as wide a range of plant habitats as found from the equator to the poles.

The Plant Project was initiated following the comprehensive plant work done as part of the Grasberg expansion. The original objective of the Plant Project, involving the Royal Botanic Gardens, Kew, was to collect all the vascular plants in the Freeport Project area and produce a comprehensive species list.

With the high diversity encountered, the detailed museum collecting has taken more time than anticipated and so far has been mostly focused on high-altitude flora. With more than 650 species of vascular plants in the alpine and subalpine zone, the diversity of the high-altitude flora already exceeds that of the flora of Ireland. Included are many endemics recorded only from Mt Jaya (the highest peak between the Himalayas and the Andes), the province of Papua, or the island of New Guinea. The collections include many species that are not yet represented in the Herbarium Bogoriense or at the Royal Botanic Gardens, Kew or other herbaria.

Actual figures for the diversity of plants in Freeport's work area are not available, but preliminary studies and collections indicate a probable diversity of 8,000-8,500 plant species. Because of its large area, plant diversity in the Lorentz WHA is anticipated to be even greater.

## Assistance in Reclamation

The development of the Grasberg pit has resulted in overburden being deposited in highland overburden placement areas immediately surrounding the Grasberg, and tailings being deposited in the designated tailings deposition area, both operated under Government of Indonesia approval. Concurrent with the increased production associated with the Grasberg and underground operations development, PTFI substantially expanded its environmental commitments.

Freeport's commitment to reclaim overburden and tailings areas is aided by the detailed studies of the local flora. In addition to information useful in the eventual reclamation of disturbed areas, potential applications of results from these botanical studies are enormous. The studies include research with applications related to theoretical problems, taxonomic problems, local speciation patterns, and important conservation issues.

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The Modified Ajkwa Deposition Area (background left) is the engineered, managed system for deposition and control of the tailings sediment from the mining operations

Five distinct vegetation zones are contained within the mining operation's project area. At high altitudes, overburden covers areas adjacent to the Grasberg complex. Here local species are used to establish a diverse alpine and subalpine plant community.

In the lowlands, management of the tailings deposition area requires reclamation that will use local species. Tailings may eventually affect areas of lowland rain forest, lowland swamp forest, mangroves and coastal forest contained within the deposition area. Successful reclamation management requires a detailed knowledge of the major plant species in the area. New areas of tailings deposition are already being colonised by local species through natural process; in addition, PTFI accelerates this process through assisted plant colonisation programmes. Research at the PTFI Maurujaya Reclamation Centre, in addition to field studies of plant growth, also contributes important information to the reclamation effort.

## Conclusions

There have been few detailed studies of the vascular plants in eastern Indonesia. The collection and inventory of species from PT Freeport Indonesia's Project area have greatly enhanced the value of national and regional herbaria and the living collections in the Botanic Gardens in Indonesia, allowing a better taxonomic understanding of the species collected from this poorly known region. Important for Freeport, the collections continue to provide information important for reclamation of overburden and tailings. The partnership's efforts also provide a better knowledge of the plant species of the Lorentz World Heritage Area, an important tool for the management and conservation of biodiversity there.

Scientists track plant growth in lowland mangrove areas

Native highlands species of grasses, mosses and shrubs are successfully grown on overburden placement areas. Overburden sites will be reclaimed after the end of mine-life

# Monitoring marine species diversity

**Summary**
In 1990, Minera Escondida Ltda. began operations in Chile at the world's largest copper mine. Part of the company's industrial installations are located next to the sea, so a programme to monitor the marine ecosystems was established when the facility opened. Studies of a key abundant species, the ascidian *Pyura praeputialis*, that is unique to the Bay of Antofagasta indicated that species diversity is higher inside the rocky shore of the bay than outside it.



## Background

Minera Escondida Ltda. (MEL), owner of the world's largest producing copper mine, began operations in December 1990. The mine site is in northern Chile's Atacama Desert, 160 kilometres southeast of the port city of Antofagasta, at 3100 metres above sea level. As part of its operations, MEL produces and transports copper concentrates through a 170 kilometre slurry pipe to the seaside at Punta Coloso at the southern end of the Bay of Antofagasta, 14 kilometres south of the city itself.

In 1990, MEL built a copper concentrate filtering plant and port facility for copper concentrates. The seaside industrial facilities were built at Punta Coloso, on approximately 21 hectares, with a fenced coastal marine concession and a coastline of some 3 kilometres. This concession operates as a preserved coastal area and is one of the few located in northern Chile. In light of that, for the 14 years since the mine opened MEL has run a marine environmental monitoring programme that has focused on the state of coastal ecosystems in and around Punta Coloso, in particular evaluating marine species diversity (macroalgae, invertebrates and fish). A key aspect of MEL's approach to its research on marine coastal systems in Chile has been publication of the results the company has obtained, which adds credibility and transparency to industrial operations.

## Watching a Unique Species

To monitor the condition of the coastal ecosystems, MEL compared conditions inside the Punta Coloso Marine Reserve, which is closed to the public, with conditions in adjacent coastal intertidal and subtidal areas, which are open to the public and to fishing activities, such as intertidal food-gathering and nearshore skin diving. Both of these resource-extracting activities are widely practised in the Bay of Antofagasta.

Researchers focused on the barrel-shaped ascidian (sea squirt) *Pyura praeputialis* as a biological indicator of conditions in the area. *P. praeputialis* is an 'autogenic bioengineer' that creates dense and extensive masses in the mid-low rocky intertidal fringes and the shallow subtidal area, down to about 5 metres. Autogenic bioengineers are species that generate long-lasting structures that modify the resources used by associated species – thus they influence key ecological or physiological mechanisms, maintaining high levels of species diversity.

The species was selected due to its biological characteristics: it is abundant, dominant, locally fished for bait and food, an autogenic ecosystem bioengineer, an alien species and unique to the Bay of Antofagasta. *P. praeputialis* was introduced to the bay probably a few hundred years ago from Australia. Apart from this bay, plus approximately 8 kilometres of coastline south of the bay, the species is not found in other localities along the coast of Chile or South America. From the Chilean marine species diversity point of view, therefore, *P. praeputialis* is a unique species.

## Evidence of High Species Diversity

Over 14 years of monitoring *P. praeputialis*, researchers found that inside the rocky shore of the Bay of Antofagasta, at the lower mid-intertidal belt, this ascidian harbours 116 species of macro-invertebrates and algae – both inside its matrices and attached to the ascidians themselves. In contrast, in sites outside the Bay at the same tidal level, the number of macro-invertebrates and algae reaches only 66 species.

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The Punta Coloso Marine Reserve located in the Bay of Antofagasta

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Thus the monitoring programme led researchers to conclude that matrices of this ascidian increased species richness at intertidal local and seascape scales by providing novel habitats that are used by mobile macro-invertebrates that are free to move about and that otherwise would be excluded from this particular tidal level. Furthermore, it has been found that *P. praeputialis* provides nursery areas for juveniles – offering protection against predation for a large class of exploited molluscs, such as the gastropod 'loco' and keyhole limpets, and crustaceans, such as crabs. Another conclusion of the monitoring is that MEL's industrial activities in Punta Coloso have not had negative impacts on populations of *P. praeputialis* or rocky and shallow subtidal marine communities.

Overview of 'La Portada' in Antofagasta

Close up of 'piures' cuts. 'Piures' are removed for bait and food when the tide is low

*Pyura praeputialis* bed removed by waves and storms

# New Partnerships 35

# A community and business forum in Krygyzstan

**Summary**
The Community & Business Forum (CBF) was established to help build good relations between Kyrgyz communities and international business interests co-existing in the fragile and diverse natural environment of Kyrgyzstan. Ultimately, effective cross-sectoral dialogue and collaboration between business and local communities was facilitated. The CBF continues to operate independently to promote sustainable social, economic and environmental development in Kyrgyzstan.



## Background

In May 1998 a truck on the way to the Kumtor gold mine crashed and spilled sodium cyanide into Barskoon River. The strength of the local reaction resulting from this accident focused national and international attention on the need for increased dialogue between businesses and local communities.

As a result, the Community & Business Forum was established as a mechanism for facilitating dialogue between local communities and other stakeholders within the watershed of the Kumtor Gold Project. Funding was provided by the UK Department for International Development through the International Finance Corporation and the European Bank for Reconstruction and Development. Fauna & Flora International, a conservation NGO with considerable experience in the region, was selected to help set up the forum.

The CBF highlighted some pressing problems in the region, including poor access to credible information and a lack of accountability within and trust between different stakeholder groups.

## Pressures on Biodiversity

The inland location of Kyrgyzstan, combined with its terrain, gives the country an arid, continental climate. This small mountainous country has some of the tallest mountains in the world. The combination of landscape and extreme climate has resulted in an interesting and diverse range of plants and animals.

A range of endemic plant species has been recorded in Kyrgyzstan, including many bulbous plants such as tulips and Alliums. The southern forests support a range of wild relatives of species that have since been propagated – including apples, walnuts, apricots, tulips and onions. Animal life is equally diverse. The alpine lakes, visited by vast number of water fowl during migration, are particularly important. Three species of marmot are recorded in Kyrgyzstan including the threatened and regionally endemic Menzbier's marmot. Other herbivores using the high mountain pastures include ibex and the rare Marco Polo sheep, with its distinctive curving horns.

A number of problems threaten the unique and fragile environment of this country. Many are legacies of the Soviet era: extensive overgrazing and degradation of the fragile mountain pastures, use of forests as fuel for industry and pollution from both heavy metals and pesticides. In addition, a number of uranium mines remain unsealed, and radioactive tailings potentially threaten important watercourses. The Soviet system did institute a strong system of protected areas. Since 1991, however, the loss of government income has reduced expenditure on environmental protection and many protected areas now lack the resources to provide effective protection and enforcement against illegal activities.

## Profile of the CBF

The **Community & Business Forum** initially focused on the Kumtor Operating Company and neighbouring communities in the Issyk-Kul and Naryn regions. The Kumtor gold mine is one of the largest businesses in the country. It has large and widespread social and environmental effects and is therefore a good test case for how businesses in Kyrgyzstan may be able to bring sustainable benefits to surrounding communities.

The CBF's activities are guided by a Steering Committee of nine representatives from local and national NGOs, government and business. Day-to-day operations are handled by a staff of four Kyrgyz nationals.

CBF helped the public monitor the environmental and social impacts of Kumtor by:

- identifying specific areas where further scientific investigation was required and collating other sources of information where necessary;
- reviewing key documents and making the findings public, including the company's Annual Report and Emergency Response Plan; and
- identifying aspects of Kumtor's activities where the environment or public wellbeing was potentially at risk and then raising these issues with the company.

The development of co-operatives is leading to a resurgence in traditional crafts such as felt-making, and improving employment prospects

Image: ©Juan Pablo Moreiras/FFI

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CBF also helped to make information available to the public by:

- building a collection of useful reports, books and materials, including those produced by Kumtor, in a resource centre;
- providing regular updates to the public about Kumtor through various workshops and newsletters; and
- working with the company to make information accessible in appropriate formats.

CBF also facilitated relationships by:

- promoting visits to the mine site by key groups of concerned individuals, including the Steering Committee, NGOs based close to the mine and teachers;
- liaising with communities close to the mine and other concerned individuals and then raising their concerns with Kumtor; and
- identifying mechanisms for businesses other than Kumtor to support and assist local communities close to the mine to meet their own needs.

## Small Grants Programme

In addition to promoting effective dialogue between the mine and local communities, the CBF was ideally placed to provide local people with a chance to articulate their own needs, which were predominantly requests for social and economic development assistance. These were addressed through a pilot small grants programme (SGP) in 2001 funded by a private donor. The scheme helped nine local NGOs address needs identified by local communities in the watershed of the mine. Following the pilot scheme's success, funding from the Sigrid Rausing Trust (UK) extended the SGP into other districts of the Issyk-Kul and Naryn regions. Grants of between $500 and $2,500 were made to innovative local NGOs for projects that contributed directly to environmental protection, social and economic development and problems affecting women in the community.

Seventy-six local NGOs have since been supported by the SGP for projects in communities in all districts of Issyk-Kul and Naryn provinces. Projects have included development of local agricultural businesses, from poultry farming to yak breeding, and the sustainable collection of medicinal plants.

From its initial beginning as a discussion forum focused on a mine accident, the CBF has evolved into an independent organisation that now supports sustainable development and the conservation of Kyrgyz wildlife and landscapes and that provides local communities with a way to raise awareness of their needs and to have a stronger voice at national and international levels.

## Lessons Learned

- A participatory approach to project development and implementation meant that the CBF acted to meet expressed local needs and achieved local ownership.
- The CBF was adaptable and used a wide range of different approaches to achieve results that exceeded expectations.
- Facilitation by a neutral but active third party provided an effective mechanism to engage all key stakeholders.
- The involvement of a wide range of actors was important for increasing the project's scope and effectiveness.
- Site visits and meetings that involved community representatives and credible local NGOs allowed more effective and accepted monitoring and review of environmental performance.

Partnership and dialogue are highly complex and slow. Yet the benefits of incorporating differing and even conflicting perspectives are clear. The lessons learned in the CBF include that it is important to build on existing initiatives, to provide appropriate information, to create space for discussion, to build trust through action on the ground, to embrace both positive and negative unexpected outcomes and to take a holistic approach – understanding both biodiversity and mining in terms of wider issues, context and history.

Making a traditional Kyrgyz felt
Image: ©Juan Pablo Moreiras/FFI

# Restoring Australia's arid lands

**Summary**
Arid Recovery is an ecosystem restoration initiative based in the South Australian outback and dedicated to the restoration of Australia's arid lands. The project has established a 60 square kilometre fenced reserve from which all feral cats, rabbits and foxes have been eradicated in order to provide an area of complete protection into which locally extinct mammals can be reintroduced. Arid Recovery is a unique example of a highly successful four-way partnership between industry, government, education and community.



## Background

Since European settlement, more than 60 per cent of the mammal species in Australia have become locally or completely extinct, while many remaining species are threatened. Ground-dwelling birds have also become locally extinct or endangered. The decline of native fauna and flora can be traced to overgrazing by rabbits and domestic stock and predation from introduced animals like the feral cat and fox. Overgrazing by domestic stock and rabbits has enormous effects on arid zone vegetation: long-lived trees and shrubs are prevented from regenerating and are being replaced by short-lived annual and weed species.

In late 1996, the Rabbit Calicivirus Disease (RCD) reached the Roxby Downs region, and rabbit numbers – which had been as high as 600 per square kilometre – plunged to less than 10 per square kilometre in a short time. Rabbits had been the most serious threat to local biodiversity through both their herbivory and the high numbers of feral predators that they supported. Rabbit population reductions through RCD provided a window of opportunity to try to eradicate both rabbits and feral predators from a defined area and work to restore the arid land. A steering committee was formed and found support in the wider community for this new project. A four-way partnership – which in 1997 became Arid Recovery – was formed by WMC Resources Ltd, the University of Adelaide, the South Australian Department for Environment & Heritage and a new group called Friends of Arid Recovery.

## Aims of Arid Recovery

When Arid Recovery was established, the new partners agreed on the following as their aims:

- to facilitate ecological restoration of arid ecosystems;
- to provide transferable knowledge, information and technology for broad-scale environmental management of Australia's arid lands; and
- to apply the principles developed to demonstrate how mining, pastoralism, tourism and conservation organisations can work together to achieve tangible benefits from sustainable ecological outcomes.

## Project Coverage and Successes

The project started small, with construction of a 14 square kilometre fenced reserve. After four expansions, the protected area now covers 60 square kilometres. The next expansion will take the reserve to 86 square kilometres.

After thousands of hours of staff, student and volunteer labour, all cats, rabbits and foxes were eradicated from the entire reserve. This created an area of complete protection into which four locally extinct species were reintroduced:

- Greater Stick Nest Rat, *Leporillus conditor*
- Burrowing Bettong, *Bettongia lesuer*
- Greater Bilby, *Macrotis lagotis*
- Western Barred Bandicoot, *Perameles bougainville*

Each of these reintroductions was successful, and all four species are now living and breeding within the reserve. The numbers of existing native species in the fenced area have also increased, and there are now three times as many small mammals inside the reserve as there are outside. A comprehensive plant monitoring programme has also demonstrated considerable recovery of the reserve's vegetation.

## Staffing and Support

Each of the four partners provides direction and support through representation on the steering committee. The Arid Recovery Team consists of committee members and project officers. Arid Recovery supports two full-time positions (one Project Coordinator and part-time Project Officers). A scientific advisor publishes outstanding research and provides support for the Project Coordinator. WMC Resources also provides the support of an administration and publicity consultant.

Arid Recovery is rapidly becoming a centre for arid zone ecological research and regularly attracts researchers from various locations and backgrounds. Scholarship programmes are also run throughout the year, and the group is an active participant in WMC Resources' Summer Vacation Student programme.

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Building a fence around the Arid Recovery reserve

Image courtesy of WMC Resources

The project depends heavily on volunteers, both from the local community of Roxby Downs and from the wider scientific and environmental community. Each step in the creation and maintenance of the Arid Recovery Reserve would not have been possible without the thousands of hours of work donated by volunteers. In recognition of this, in November 2001 the S.A. Great Regional Award was given to the Friends of the Arid Recovery Project. The award was for Science and Environment, in recognition of an outstanding contribution to the environment in South Australia.

## The Work Continues

One of the goals of Arid Recovery is to serve as a demonstration site for broad-scale feral species control, so the team is constantly working to develop more effective and economical control methods. Initiatives include the development of remote telemetry-operated cat traps that are located around the outside of the reserve, participation in aerial cat baiting trials and research into more effective means of rabbit control. To improve awareness of the initiatives researched at Arid Recovery, a viewing platform and above-ground/below-ground viewing hide have been constructed within the Reserve, along with interpretive signage at the viewing platform and along a self-guided walking trail. Walking tours of the reserve, run by Friends of Arid Recovery volunteers, commenced in 2003 and are extremely popular.

## Conclusions

The Arid Recovery Reserve is unique in many ways. It is the largest non-coastal area in Australia that is completely free of feral cats, rabbits and foxes, and it is surrounded by a fence that has never been breached by either cats or foxes – guaranteeing the safety of all animals within from these predators. The project is also unique in that it is specifically dedicated to arid zone conservation. Few other conservation projects target arid areas due to the low population base and inaccessibility, even though Australia's arid zone is one of the most degraded environments in the nation.

The Greater Bilby – one of the locally extinct species reintroduced into the reserve
Image courtesy of Erica Meles

A Stick Nest Rat
Image courtesy of Hafiz Stewart

A viewing hide to improve awareness of the Arid Recovery initiatives
Image courtesy of Seonie Lyon

# Stakeholder involvement in defining a national park boundary

**Summary**
The lands set aside for a proposed Tuktusiuqvialuk National Park in Canada's western High Arctic included much of the critical habitat of the endangered Peary caribou herd. Yet a mineral and energy resource assessment found a very high mineral and hydrocarbon potential in many of the areas used by the caribou. The Canadian Nature Federation approached the Mining Association of Canada (MAC) to determine whether mining companies would waive their interest in Bathurst Island in order to protect the caribou. After some discussions with its members, MAC suggested that one part of the eastern side of the island be excluded from the proposed park but agreed to support a moratorium on exploration and development throughout the area until the Peary caribou herd was no longer considered at risk of extinction.



## Background

In the early 1970s, the Canadian government pledged to establish at least one national park in each of 39 natural regions in the country. In 1996, in line with this National Park System Plan, lands were withdrawn on the northern half of Bathurst Island in the western High Arctic. Withdrawing lands allows the government to study the feasibility of a proposed national park. It also puts a freeze on new mineral development permits or other leases within the area.

The study revealed the importance of the proposed park area as critical habitat for endangered High Arctic Peary caribou. The population of caribou on Bathurst Island declined 96 per cent in just three years – from 2800 animals in 1994 to fewer than 100 in 1997. The apparent cause of the decline was severe winter and spring weather. As Peary caribou are found uniquely in Canada, the Canadian government has the lead responsibility for their protection and survival.

At the same time, a Mineral and Energy Resource Assessment (MERA) of the proposed park site established a high mineral potential for the area. There was a very high potential rating for lead-zinc mineralisation for the Cornwallis Fold Belt on northeastern Bathurst Island, especially within Thumb Mountain and Blue Fiord formations. Moderate to high potential was found for sedimentary exhalative sulphide (Sedex) deposits on the northeastern portion of the island, along with high potential for gypsum, rock salt and potash throughout the entire study area.

The apparent conflict between caribou habitat and mineral development made it difficult for federal government departments to reach consensus on a preferred park boundary.

## A New Partnership

Hoping to advance the Northern Bathurst Island Park process, the Canadian Nature Federation (CNF) approached the Mining Association of Canada (MAC) to determine its views on the economic feasibility of the assigned mineral potential in the study area and to see if it could agree that the conservation value of the habitat for Peary caribou outweighed an uncertain mineral development potential.

MAC agreed to examine the MERA report and to consult with its board and its member companies.

Over 14 months, CNF, MAC, and relevant federal government departments explored the issue. MAC provided an opportunity for CNF to meet with a senior Cominco executive to explain the habitat requirements of Peary caribou and the potential conservation implications of mining activities for caribou recovery.

## Reaching Consensus

The result was a CNF-MAC consensus position on a park boundary. MAC endorsed the inclusion of the Governor General Islands, except for Cameron Island, in an eventual national park – but recommended that a portion of the Cornwallis Fold Belt on the east be left outside the park boundary. Other high mineral potential lands in the Cornwallis Fold Belt, not easily accessed from the east coast of Bathurst Island, were considered economically unfeasible.

Recognising the importance for Peary caribou of the entire eastern portion of the study area, MAC recommended a moratorium on mineral exploration and development even on lands excluded from an eventual park boundary until the Peary caribou are no longer considered to be in danger of extinction or their fate is otherwise determined. MAC also supported research and recovery efforts for the species and indicated an interest in continuing to work with CNF and responsible government agencies to explore how to undertake mineral exploration and development without adversely affecting caribou.

CNF and MAC have agreed to cooperate in finding a legal mechanism and land management regime that will protect the Peary caribou while the moratorium is in place.

The CNF-MAC consensus was submitted to the senior MERA Committee (representatives of federal and territorial departments), which was then able to develop a preferred federal government position on a park boundary.

Northern Bathurst Island
National Park

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## Next Steps

The next phase is for Parks Canada to approach the Qikiqtani Inuit Association to see if it is willing to enter into negotiations on an Inuit Impact and Benefit Agreement, as required by the Nunavut Land Claim Agreement, to establish Northern Bathurst Island National Park. It is important to note that neither CNF nor MAC has any role in these official negotiations. The outcome of these talks could include a park boundary that does not reflect the MAC-CNF consensus.

## Lessons Learned

This case study illustrates the value of working with various communities of interest when consulting on the establishment of new protected areas or other land use allocations. This was the first time MAC had become involved in discussions about the proposed new national park, although two of its member companies had been consulted earlier.

The consensus position was reached through pro-active means and avoided the kind of conflict between the environmental and resource sectors that has occurred in other land use processes where biodiversity and other natural resource interests have intersected. The collaboration process increased mutual understanding and respect between CNF and MAC and led to further co-operation.

In this case, an unusual partnership helped advance progress on a seemingly problematic park establishment initiative. The lessons learned are readily applicable to other protected areas and land use allocation consultation processes.

The area is critical habitat for endangered High Arctic Peary caribou

# The Bushmanland Conservation Initiative

**Summary**
Plans announced in 1999 to develop a zinc mine in South Africa were met by strong protests from environmental organisations and groups concerned about the possible impact on biodiversity in the area. Yet systematic conservation planning at both regional and local scales contributes to building the basis for effective engagement between mining companies and the organisations concerned about biodiversity conservation.



## Background

In 1999, Anglo American proposed opening the Gamsberg Zinc Project in Bushmanland, a large open pit mine on a quartzite inselberg (an island mountain) in the heart of a pristine biodiversity hotspot. The proposed 5.5 billion rand mine would create a hole some 2 by 3 kilometres wide and 600 metres deep – 200 metres deeper than the Kimberly hole. The mine would also create approximately one thousand jobs in an area with minimal economic resources. Unfortunately, the often-conflicting imperatives of development and conservation collided head-on soon after the company announced its intentions.

## Assessing Biodiversity Impact

The involvement of the environmental lobby and biodiversity groups in the Gamsberg Zinc Project began in 1999 during the environmental impact assessment done for the mine and associated infrastructure. The assessments undertaken for biodiversity were adequately detailed and even included an assessment of the 14 surrounding quartzite inselbergs in order to place the impacts of the proposed Gamsberg mine in a regional context. This analysis showed the Gamsberg to be the single most important site for biodiversity conservation in the region, since it contained 70 per cent of the unique fine quartz patch habitat as well as three new plant species and the largest populations of several threatened plant species.

While the biodiversity specialist studies were thorough, there was concern from the biodiversity sector that the global and national significance of the area had not been adequately recognised in the overall environmental assessment and that the proposed mitigation measures were inadequate. A conservation agency commissioned a fine-scale conservation plan to identify options for achieving conservation targets. This study was supposed to lay the basis for negotiation on mitigation measures to offset the impacts of the open pit, but a lack of trust between parties and the lack of precedent for such an initiative eventually led to a stalemate between Anglo and many of the conservation NGOs involved.

What Anglo was offering as compensation did not have the support of the majority of NGOs and biodiversity specialists in the region. Shortly after this unsatisfactory process, the mine project was placed on hold due to low zinc prices.

Having the project on hold was a blessing in disguise. It provided some breathing space between opposing parties, and two important developments during this time facilitated constructive engagement between the conservation and mining sectors in the region.

## Two Key Initiatives

In 2002, two independent initiatives kept the Gamsberg Inselberg and Bushmanland region high on the conservation agenda and created a foundation for all parties to work towards a better deal for biodiversity in the proposed mining operations in Bushmanland. The first was ICMM's Toronto declaration on biodiversity, in which Anglo committed to improved biodiversity practices, particularly around in situ conservation efforts. In Toronto, Conservation International urged Anglo to follow through with this commitment by establishing a partnership to ensure better investment in conservation initiatives linked to the Gamsberg mine.

The second initiative that increased support for the conservation of biodiversity in the Bushmanland area was the launch of the Succulent Karoo Ecosystem Programme (SKEP) in January 2002. SKEP evolved as a bi-national initiative that seeks to develop a strategy for conservation and sustainable land use in the region. Geographic priority areas are identified and actions recommended to focus conservation and development investment on the areas and activities that provide the greatest benefits to biodiversity in both the short term and over time.

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Patches of fine quartz pebbles provide a unique habitat for many locally endemic and critically rare succulent plant species

The planning phase of SKEP used a consultative and inclusive approach, combined with a rigorous scientific process to identify geographic biodiversity priority areas, to develop a 20-year Conservation and Sustainable Land Use Strategy for the Succulent Karoo hotspot. SKEP involved more than 60 scientific experts and 400 local stakeholders representing government, academia, NGOs, private-sector interests and local communities in a groundbreaking approach to conservation planning. Bushmanland was one of the nine broad priority areas within the region identified for conservation action – which again brought attention to the area as a biodiversity hotspot.

These two initiatives were both important in Anglo's understanding of its role not just in minimising impacts but also in playing a direct positive role as a custodian of large tracts of biodiversity.

## A New Partnership

During the SKEP planning process, the dialogue between biodiversity groups and Anglo continued, and an agreement was reached to establish a partnership project: the Bushmanland Conservation Initiative (BCI). This partnership between conservation NGOs, the mining company and local communities aims to establish a multi-owned protected area through a variety of innovative interventions and mechanisms that draw in local landowners. The protected area will achieve conservation targets for biodiversity features in this priority area through a multi-use approach (see box). The BCI will develop local conservation management capacity through training local community members as conservators within the project management team.

### A Multi-use Landscape

- Areas under high protection
- Areas managed for extensive grazing
- Areas set aside for more intensive activities, including mining

The initiative aims to demonstrate best-practice lessons for the engagement between mining and conservation. Central to this is creating a culture in which mining not only minimises adverse environmental impacts within its operations, but also works to positively enhance in situ biodiversity conservation. Anglo has made an in-principle commitment to make a substantial contribution to the BCI. This will include setting aside the land surrounding the Gamsberg mine for conservation within the BCI.

## Conclusion

What began as a confrontation between mining and conservation gradually changed into a collaborative approach that included systematic conservation planning. This catalysed Anglo Base Metals' direct involvement in implementing conservation action that meets conservation targets. Without systematic conservation planning it would not have been possible to determine the impacts of the Gamsberg mine, suggest meaningful mitigating measures, build credibility of biodiversity goals or provide a way for the mining sector to contribute that adds directly to efforts to meet biodiversity conservation targets.

View from the Gamsberg mountain

# Providing environmental education for a community's children

**Summary**
Environmental education is provided in Brazil to schoolchildren at a centre built by Alcoa especially for this purpose near Poços de Caldas in the state of Minas Gerais. The project began with a need to survey local plant and wildlife for Alcoa's mine rehabilitation works. The company asked an NGO from Curitiba for help with a survey of birds; the company was so impressed with environmental education classes that the group ran each summer that it decided to set up a full-time centre. After 11 years of operation, the Centro de Estudos e Pesquisas Ambientais – Alcoa has provided environmental instruction to 65,000 youngsters.



## Background

Although Brazil is bestowed with a great diversity of animal and plant life, surveys and related scientific studies of its flora and fauna are rare in Brazil and confined to a relatively small number of regions and sites. People throughout the country – including schoolteachers and children – are generally unacquainted with local plant and wildlife. In fact, it is common for children to know more about African and Asian animals than Brazilian wildlife due to the influence of European and North American cultures. In the 1980s, environmental education in public schools was just being introduced to the curriculum, and there were few adequate teaching materials.

Alcoa saw an opportunity to contribute to environmental education in Brazil after it arranged for some surveys in connection with the rehabilitation of mined-out ore pits near the town of Poços de Caldas in the state of Minas Gerais. The company had been mining bauxite there since 1970 to supply ore for a mine-to-metal aluminium production facility. The town is 250 kilometres north of São Paulo and is Brazil's most popular inland resort centre due to its beautiful mountain setting, cool climate and hot springs.

To support mine rehabilitation, which started in 1978, a plant survey was initiated by the State University of Campinas and a bird survey was done by an NGO from Curitiba, the Society of Wildlife Research. This group also held environmental education classes in a city park for youngsters during their summer vacations. The classes were such a success that Alcoa decided to extend environmental instruction to local schoolchildren on a permanent basis at a nearby centre to be built for that purpose.

## Establishing the Centre

The Society of Wildlife Research planned the new venture. The Centro de Estudos e Pesquisas Ambientais – Alcoa (Alcoa Centre for Research and Studies on the Environment) was inaugurated in May 1993. It is located on an 18 hectare plot of land at an altitude of 1,400 metres, on an extension of the flanks of the 1,650 metre high mountain that overlooks the town.

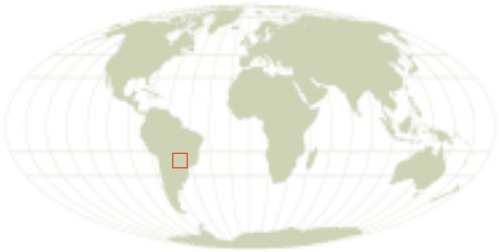
Alcoa did not want to cut indigenous forest in order to build the centre, so three buildings went up in what had been a non-indigenous commercial forest, using 99 per cent eucalypt timber and boards. One building is administrative and two are for classrooms, with space for a nature-studies lab. The only significant original surface contour disturbance was space for vehicle parking. An adjacent native gallery forest and sub-tropical rainforest were left undisturbed except for the installation of three nature trails for instruction.

The centre's main audience are children in the first eight years of the public school system. At the moment in this town of 150,000 there are 50 schools with this type of schooling – and 33,000 students.

## Getting a Close Look at Nature

The Society of Wildlife Research designed and produced educational materials and trained the first team of environmental instructors. Today three instructors and an intern operate the centre under the direction of the Environment, Health and Safety Department at the nearby Alcoa plant. Instruction consists of interpretive observations on nature trails and classroom sessions with lectures and 16 instruction kits developed by the NGO.

The kits describe data on the regional wildlife population – its 245 bird, 46 mammal and 21 reptile or amphibian species – the physical aspects of the region and local environmental issues, including mining, tourism, garbage and wastes, use of agrotoxics in agriculture and human health. A number of general environmental topics are covered as well, such as soil, water, and air interrelationships; waste recycling; the five human body senses as perceived from nature's elements; the organisation of living societies, such as bees; plant life; and Alcoa's responsibility to the community to support the sustainability of land and nature. Instruction is designed so that if children return to the centre throughout their school years they are exposed to materials designed to fit their age group. Today this material complements classes given in the public school system.



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Youngsters at Alcoa's purpose-built Centro de Estudos e Pesquisas Ambientais

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## Success in the Community

During the 11 years the centre has been open, 65,000 guests have visited the installation. The largest group by far has been local school youngsters – about 6,000 children a year. Each week six groups of 30–45 students and their science teachers spend three hours at the centre.

To extend the centre's work into the community, courses on regional flora and fauna are given in the regular classrooms, children receive albums to paste pictures of birds in and a contest is held in which schools receive waste materials that students have to put together in some sort of art form. In addition, twice each year 'Learning and Practising' sessions are held for a number of local schools: posters and scale models of environment-related subjects are shown, and skits and dances are presented on the stage.

The Centro de Estudos e Pesquisas Ambientais – Alcoa has become the most popular school outing for children in Poços de Caldas. For many of them, it is the only chance they have to be out in nature.

Instruction consists of interpretive observations on nature trails and classroom sessions with lectures and 16 instruction kits developed by the NGO

# Building biodiversity from tailings

**Summary**
The Tailings Management Project of Iron Ore Company of Canada (IOC) demonstrates how operational risk can be converted into opportunity. IOC identified the management of mine tailings as a chance to control risk to biodiversity; improve community relations and interactions with stakeholders; uphold company standards for environmental stewardship and responsibility; ensure compliance, particularly in the event of regulatory review; and anticipate legacy issues in the event of closure.



## Background

The Iron Ore Company of Canada owns and operates an iron ore mine at Labrador City, Newfoundland, in an area of valuable native ecosystems – an extensive system of lakes, wetlands and boreal forest. Environmental conditions provide an ideal habitat for a large number of songbirds, mammals, fish and waterfowl. A preliminary survey of the municipal area identified approximately seven areas that might be suitable for protected status, covering 13 square kilometres.

For 40 years, IOC discharged up to 23 million tonnes of fine-grained waste rock (mine tailing) into Wabush Lake. Although in compliance with regulatory requirements, the tailings had a significant effect on the physical and biological balance of the lake. Most notably, at times the disposal would result in a red hue over the 20 kilometre length of the lake, which diminished its recreational and ecological value, created the potential for the pollution of interconnected lakes, raised serious community concerns and created a significant legacy risk for IOC.

## The Tailings to Biodiversity Initiative

In response to regulatory changes and to the problems connected with the discharge of tailings, IOC created a number of partnerships with outside groups to investigate options for improved waste management. Following the evaluation of options, a strategy was devised with the local community and regulators to discharge tailings into an impoundment area in Wabush Lake. This presented the opportunity to reduce pollution and rehabilitate the lake. Restoration was conducted through the federal government's fish habitat compensation plan and the 'Tailings to Biodiversity Initiative' (TBI).

The TBI involves development of land forms and an artificial wetland, with the planting of a diverse variety of native vegetation. Low-lying areas will form a mosaic of wetland basins, riparian zones and uplands, which will provide a variety of habitats for native wildlife. IOC anticipates the artificial wetland will not only contribute to biodiversity conservation but also minimise operational costs and maximise the options for post-mine land use.

Early estimates of the costs of wetlands indicate that the project will be either cost-neutral or cheaper than traditional revegetation.

## New Partnerships

The focus on biodiversity management enabled IOC to engage with outside stakeholders and to generate strong partnerships with the community, government departments, environmental groups, universities and schools.

In the initial phase of the project, IOC encouraged stakeholder involvement through the formation of an advisory group that was set up to ensure that a transparent process was used to develop a strategy for environmental management. The group included the mayor of Labrador City and representatives from Memorial University of Newfoundland, the Fisheries Resource Conservation Council and Resource Futures International. With the supervision of the advisory group, stakeholders were engaged to develop management options for the tailing.

IOC formed a partnership with the Biodiversity Stewardship in Resource Industry Initiative (BSRI) to coordinate a team to investigate potential management options for the tailing. This team included consultant agrologists and engineers. Site assessments by BSRI and the research team confirmed that the potential existed to develop a mixed habitat of wetlands and upland areas on the mine tailing.

Commitment to a five-year project was established and additional partners – including the local community, the Canadian Wildlife Service, Memorial University and the Eastern Habitat Joint Venture (EHJV) were brought into the project.

The EHJV has also helped develop educational programmes. Discussions are taking place between IOC and local schools regarding the possibility of incorporating an education programme known as 'wild about wetlands' into the provincial school curriculum.

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Low lying areas will form a mosaic of wetland basins, riparian zones and uplands

## Unique Contributions

IOC has linked this project with a highly successful international programme known as the North American Waterfowl Management Plan. Through this, the Eastern Habitat Joint Venture has used IOC's investment in the TBI to unlock equivalent funding from the US government for the municipality. This collaboration and fund matching arrangement has helped IOC foster cooperation between the EHJV and the Labrador City municipality.

The TBI annual budget currently amounts to over US$100,000. It is anticipated that a further US$77,000 will be released in 2004. The project has given the Eastern Habitat Joint Venture and the North American Waterfowl Management Plan the power to leverage new corporate partnerships and programmes for wetland conservation. The project has broken new ground in Canadian environmental stewardship by incorporating wetlands biodiversity and conservation in an operational mine site.

The project has broken new ground in Canadian environmental stewardship

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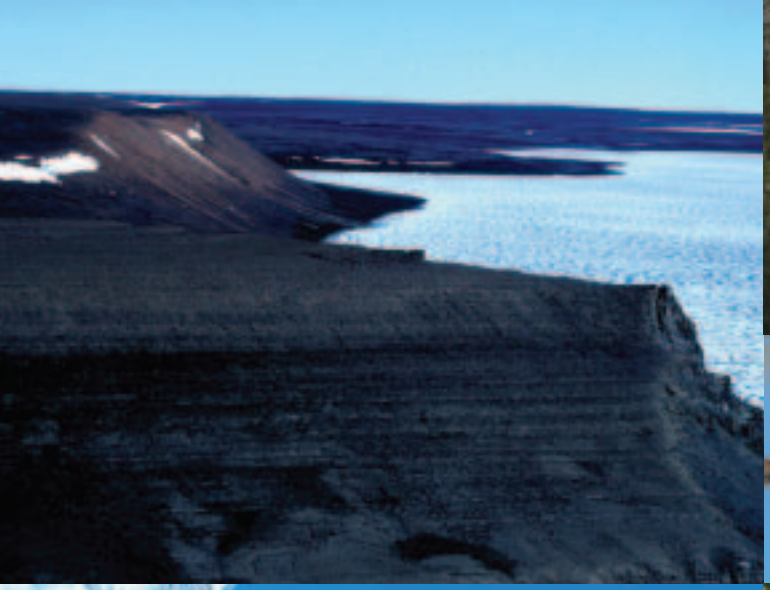











## IUCN – The World Conservation Union

Founded in 1948, The World Conservation Union brings together States, government agencies and a diverse range of non-governmental organisations in a unique world partnership: over 1000 members in all, spread across some 140 countries.

As a Union, IUCN seeks to influence, encourage and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

The World Conservation Union builds on the strengths of its members, networks and partners to enhance their capacity and to support global alliances to safeguard natural resources at local, regional and global levels.

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## ICMM – The International Council on Mining and Metals

The International Council on Mining and Metals (ICMM) is a CEO-led organisation dedicated to sustainable development. ICMM comprises many of the world's leading mining and metals companies as well as regional, national and commodity associations, all of which are committed to improving their sustainable development performance and to the responsible production of the mineral and metal resources society needs.

ICMM's vision is a viable mining, minerals and metals industry that is widely recognised as essential for modern living and a key contributor to sustainable development.

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## The IUCN-ICMM Dialogue

Set up in 2002 at the World Summit on Sustainable Development, the Dialogue aims to improve the mining industry's performance in biodiversity conservation and to raise mutual awareness and understanding between the industry and the conservation community.

The Dialogue provides a platform for communities, corporations, non-governmental organisations, and governments to discuss and seek the best balance between the protection of ecosystems and the social and economic importance of mining.

IUCN and ICMM have committed themselves to facilitating this discussion with the ultimate objective of enhancing the contribution of the mining industry to biodiversity conservation.