

## EDITOR'S PAGE

### NATURE CONSERVATION AND SUSTAINABLE MINING

The combination of a diversity of life forms and their interactions with each other and with the rest of the environment has made the Earth a uniquely habitable place for humans. Biodiversity sustains human livelihood and life itself. The United Nations proclaimed 2010 to be the International Year of Biodiversity, and people all over the world are working to safeguard this irreplaceable natural wealth and to reduce biodiversity loss. This is vital for current and future human well-being. Biodiversity is 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 to pollination. These so-called ecosystem services include (Millennium Ecosystem Assessment, 2005):



- soil formation and maintenance of soil fertility (through nutrient cycling);
- primary production through photosynthesis, as the supportive foundation for all life;
- provision of food, fuel and fibre;
- provision of shelter and building materials;
- regulation of water flows and maintenance of water quality;
- regulation and purification of atmospheric gases;
- moderation of climate and weather;
- detoxification and decomposition of wastes;
- pollination of plants, including many crops;
- control of pests and diseases; and
- maintenance of genetic resources.

In addition to these essential ecosystem services (classified, by the Millennium Ecosystem Assessment (2005), as supporting, provisioning and

regulating), biodiversity is also of value for aesthetic, spiritual, cultural, recreational and scientific reasons. The intrinsic value of biodiversity stems from a non-utilitarian philosophy that views biodiversity as intrinsically valuable in its own right, irrespective of its contribution to human well-being. More tangibly, in some parts of the world (particularly in those with low agricultural productivity), the survival of many people depends on biodiversity.

While our understanding of the value of biodiversity has improved in recent years, so too has our appreciation of significant threats to it. The current pressures on and related losses of biodiversity are threatening to undermine the ecosystem services we all depend on. Over the past 50 years, many ecosystems have been degraded more rapidly and extensively than at any time in history. Habitat loss through changes of land use, in particular the conversion of natural ecosystems to cropland, continues to be the biggest direct cause of biodiversity loss. Already, more than half of the Earth's 14 terrestrial biomes have had between 20% and 50% of their total area converted to cropland (Millennium Ecosystem Assessment, 2005). Unsustainable use of ecosystems and over-exploitation of biodiversity continue to be major threats. Many species are used by humans to fulfil basic needs. Many species are in a state of decline because they are being used at unsustainable levels or are being harvested in such a way that threatens the ecosystems on which they depend.

As populations have grown, so has the demand for food, timber, fuel and other natural materials. While many of the world's peoples have experienced economic and social gains over this period – in which the increasing demand for minerals has played an important role – the consequences of biodiversity changes and losses have profoundly affected some of the poorest communities.

The threats to biodiversity are compelling. Unless they are addressed in a holistic manner, which takes social and economic as well as scientific considerations into account, the benefits of ecosystem services will be substantially diminished for future generations. Furthermore, the next 50 years could see a further acceleration of the degradation of ecosystem services unless action is taken to reverse current trends. This is incompatible with the concept of sustainable development, which integrates economic, environmental and social considerations in order to improve the lives of the current generation and ensure that future generations will have adequate resources and opportunities. Sustainable mining is not a new approach or concept in resource consumption. It is a holistic approach for dealing with a complex, interlinked set of factors that determine the net societal worth of a project.

Mining has the potential to affect biodiversity throughout the life cycle of a project, both directly and indirectly. Direct or primary impacts from mining can result from any activity that involves land clearance (such as access road construction, exploration drilling, overburden stripping or tailings impoundment construction) or direct discharges to water bodies (riverine tailings disposal, for instance, or tailings impoundment releases) or

to the air (such as dusts or smelter emissions). Direct impacts are usually readily identifiable. Indirect or secondary impacts can result from social or environmental changes induced by mining operations and are often harder to identify immediately. Cumulative impacts occur where mining projects are developed in environments that are influenced by other projects, both mining and non-mining.

The potential for significant impacts is greater when mining occurs in remote, environmentally or socially sensitive areas. Due to the continuing demand for minerals, the depletion of resources in readily accessible areas and changing technologies and economics in the mining sector, mining is increasingly being proposed in remote and biodiversity-rich ecosystems that were previously unexplored and undeveloped for minerals.

The principles of sustainable mining are well defined by various groups, but the challenges for meeting the principles are great and complex. Many of the challenges facing sustainable mining are challenges that public opinion makers and government officials will have major roles in overcoming them. As technical leaders and educators we do have influence on how the challenge of mining and minerals beneficiation can be less threatening to the local environment.

At the World Summit on Sustainable Development (Johannesburg, 2002), the International Union for the Conservation of Nature (IUCN) and the International Council on Mining and Metals (ICMM) launched a joint dialogue on mining and biodiversity. The purpose of this initiative was to provide a platform for communities, corporations, researchers, NGOs and governments to engage in a dialogue to seek the best balance between the protection of important ecosystems and the social and economic importance of mining. In May 2003, the ICMM Council approved a set of sustainable development principles and committed its corporate membership to measure performance against them. One of the principles explicitly addresses the conservation of biodiversity.

The 10 sustainable development principles are (Good Practice Guidance for Mining and Biodiversity, 2006) to:

1. implement and maintain ethical business practices and sound systems of corporate governance;
2. integrate sustainable development considerations into the corporate decision-making process;
3. uphold fundamental human rights and respect cultures, customs and values in dealings with employees and others who are affected by our activities;
4. implement risk management strategies based on valid data and sound science;
5. seek continual improvement of our health and safety performance;
6. seek continual improvement of our environmental performance;
7. contribute to conservation of biodiversity and integrated approaches to land use planning;

8. facilitate and encourage responsible product design, use, re-use, recycling and disposal of our products;
9. contribute to the social, economic and institutional development of the communities in which we operate;
10. implement effective and transparent engagement, communication and independently verified reporting arrangements with our stakeholders.

Contribution to conservation of biodiversity and integrated approaches to land use planning includes:

- respect for legally designated protected areas;
- dissemination of scientific data on and promotion of practices and experiences in biodiversity assessment and management;
- support of the development and implementation of scientifically sound, inclusive and transparent procedures for integrated approaches to land use planning, biodiversity, conservation and mining.

IUCN and ICMM have developed the Good Practice Guidance for Mining and Biodiversity (2006) for providing the mining industry with the steps required to improve biodiversity management throughout the mining cycle.

By implementing this guidance, mining companies should be better placed to:

- identify and evaluate biodiversity;
- understand the interfaces between their activities and biodiversity;
- assess the likelihood of their activities having negative impacts on biodiversity;
- develop mitigation measures for potential impacts on biodiversity and rehabilitation strategies for affected areas; and
- explore the potential to contribute to biodiversity enhancement or conservation.

Despite the significant potential for negative impacts on biodiversity from mining operations, there is a great deal that companies can do to minimize or prevent such impacts in areas identified as being appropriate for mining. There are also many opportunities for companies to enhance biodiversity conservation within their areas of operations. Being proactive in the assessment and management of biodiversity is important not only for new operations but also for those that have been operating for many years, usually under regulatory requirements that were less focused on the protection and enhancement of biodiversity. When setting rehabilitation objectives for biodiversity, mining companies should always take into account the management requirements that will be needed to sustain conservation values in the long term, responsibilities for implementation and character of funding the costs of management.

Engagement of potentially affected communities and other stakeholders in biodiversity conservation is fundamental to the success of biodiversity initiatives. Engaging the community and other stakeholders with an

objective of developing trust, respect and partnership, aimed at keeping the community informed of a mining company's operations, is essential to the success of a sustainable project. It should be recognized that stakeholders may have different and possibly conflicting interests in, perspectives on and priorities for biodiversity and its management. Stakeholder engagement has an important role to play in developing an understanding of the interfaces between mining and biodiversity and in assessing potential negative impacts. When developing mitigation measures or biodiversity conservation initiatives, attention must be given to respecting cultures, customs and values; to recognizing and engaging local communities as stakeholders; to participating in the social, economic and institutional development of communities; and to mitigating negative impacts.

Many mining companies in the world have achieved remarkable results in re-establishing native ecosystems, where cost or other site-limiting factors make this impractical. Other objectives that still provide biodiversity values should be considered.

Examples include (Good Practice Guidance for Mining and Biodiversity, 2006):

- revegetation using important functional species (for erosion control, for instance, or nitrogen fixation), species with aesthetic value, and any local species important for biodiversity conservation is practical to establish, while guarding against the introduction of exotic/non-native species that could proliferate without adequate controls;
- situations where other land uses such as the production of foods, medicines or cultural values are a priority – in these instances, re-establishment of biodiversity values may be a secondary but compatible objective;
- re-establishment of key species, such as rare or threatened plant species, or development of habitat suitable for the recolonization of rare or threatened fauna species; and
- rehabilitation that is stable, sustainable and includes the use of native species where possible.

At first glance, mining landscapes are seen as areas in which mining has destroyed vegetation and living soil layers. In reality, they harbour valuable and significant nature conservation potential because the conditions found in mining landscapes rarely occur in cultural landscapes untouched by mining. This is why in many cases nature conservation activities are aimed at saving the structures that have evolved in these areas over time.

From a nature conservation standpoint, rehabilitation should ideally focus on integrating nature conservation goals into plans for other post-mining uses. Recreation plays a key role here: visitors to the sites can experience at first hand the special scenic attractions and impressions created by post-mining landscapes. But with a range of tourism initiatives planned for the region, there is evidence of tension evolving between certain tourism trends and nature conservation needs. Often local administrations especially are

relying on tourism to boost the local economy. This set of circumstances provides the incentive for a further research and development project designed to produce a set of criteria and strategies to achieve sustainable recreation and tourism in post-mining landscapes.

To promote sustainable schemes of mining of oil shale in opencast mines, innovative multifunctional uses and comprehensive post-mining physical planning in the Estonian oil shale basin is needed. The criticism of the physical, landscape planning practice, applied concerns, on the one hand, about the prevention of post-mining impacts, and, on the other hand, longer-term integrated strategic planning. A larger area makes it possible to diversify post-mining landscapes by master planning and using landscape architecture in a more integral way, by defining various functions, diversity, connectedness, functional contrasts feasible to the given artificial landscape forms and elements. For the areas where mining has been completed, a thematic general plan should be drafted, debated publicly and issued jointly by authorities (Sepp, Roose 2009, Towards multifunctionality of mining landscapes in the Estonian oil shale basin: typologies, assessment and planning. In: Oil Shale Vol.26).

Mining is, was and shall continue to be the cornerstone of human civilization. Mining will be sustainable when it generates revenues and operates in harmony with society and the environment. Unless the resource inventory could be continually enlarged through massive spending on exploration and new technology, sustainability will be a far cry (Ghose, 2009, Technology vision 2050 for sustainable mining, In: Procedia Earth and Planetary Science). Setting aside any ethical or moral considerations, which are increasingly the subject of corporate policies, it is important for companies to address biodiversity for a variety of sound business reasons. Many mining companies have adopted an increasingly sophisticated approach to managing biodiversity as part of their commitments to establishing and maintaining a social or functional licence to operate.

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The member of *Oil Shale* Editorial Board