



INTERGOVERNMENTAL FORUM  
on Mining, Minerals, Metals and  
Sustainable Development

# GUIDANCE FOR GOVERNMENTS: ENVIRONMENTAL MANAGEMENT AND MINING GOVERNANCE

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## THE IMPORTANCE OF ENVIRONMENTAL MANAGEMENT IN MINING

The responsible management of natural resources and ecosystems—including soils, plants, animals, water and air, and the services they provide—is central to the efforts of any society seeking to become more sustainable. The health of these resources, ecosystems, and services underpins the health of communities and economies and must be protected and supported for any society to thrive in the long term.

In this context, mineable deposits appear in locations both convenient and inconvenient. They can be close to or distant from human settlements and water sources; they can be surrounded by arable lands, breeding grounds, migration corridors, and ecologically sensitive

areas; and they can be in areas prone to fierce storms, unstable hillsides, and seismic activity. Mining these deposits will always impact the environment and its resources to a greater or lesser extent. The active and sustainable management of these ecosystems and natural resources before, during, and after mining will help avoid negative impacts where possible (which may mean excluding mining in certain cases), can minimize them elsewhere, remediate as necessary, and improve when feasible. Conversely, a failure to effectively manage the impacts of mining on the environment can not only threaten the continued viability of operations but can also undermine the relationships between a mining company, affected communities, and all levels of government.

This guidance document is designed to help IGF member states implement the IGF's



Mining Policy Framework (MPF). It focuses on the role that national governments can play in ensuring the effective and sustainable management of the environment and natural resources by the mining sector, using the legislative, regulatory, and policy tools and mechanisms at their disposal, including, in particular, Environmental and Social Impact Assessments (ESIAs) and Environmental and Social Management Plans (ESMPs). The guidance spans the mine life cycle, looking at what governments must do before, during, and after mining to ensure that the environment and its natural resources are continuously well managed. Drawing from the MPF, it highlights the key issues, benchmarks, and standards in four main areas of environmental management in mining—water, biodiversity, waste, and emergency preparedness and response—and the role of governments in ensuring that each is effectively managed in support of sustainable development.

## WATER MANAGEMENT

Access to water is a critical issue for mining. Competing demands for water resources—from the mining sector, from agriculture, from households, from other industries and sectors, and for conservation and leisure—ensure that governments will always play a critical role in water management throughout the life of a mine, not only at the site itself but across watersheds and potentially beyond national borders. When poorly managed, water can be a source of grievance and conflict around mining operations, and while water use and management may receive the greatest attention in arid regions—where mining competes with community needs for drinking water and irrigation—it is a crucial issue in most jurisdictions. And its importance is only likely to increase in the context of climate change.

The overall objective of a government's approach to water management is to protect

the availability and quality of water for its population and its ecosystems, now and for future generations. This requires balancing competing demands for water while ensuring access to safe drinking water and sanitation. Within a mining context, governments must not only govern the extraction of valuable water resources, but also oversee water use, water discharges, and water quality. The advantage of governments doing this is that they can manage water at the watershed level and regional scale, where it is easier to effect the changes needed to meet sustainability goals.

Broadly, the MPF requires governments to do the following to manage the water issues associated with mining:

- Have appropriate environmental management standards in place for the use of surface and groundwater. These standards must be strictly monitored and have appropriate penalties should they be compromised.
- Require that mining entities ensure that the quality and quantity of mine effluent streams discharged to the environment—including stormwater, leach pad drainage, process effluents, and mine works drainage—are managed and treated to meet established effluent discharge guideline values.
- Require that mining entities ensure that water-leaching or percolating waste dumps, tailings storage areas, and leach pads have equivalent protection.
- Require that mining entities have in place practices and plans that minimize the likelihood of impacts beyond the mining site, particularly potential transboundary impacts.

Water management in mining is complex and incorporates a range of disciplines and components, including water rights, use, controls, quality, treatment, and conflict. And while new technologies and knowledge have





greatly improved mine water management, considerable challenges remain—some of which may extend beyond national borders. It is important for governments to have an overall understanding of the potential water management risks and issues present in their mining sectors, and to obtain expert advice and assistance as and where needed for effective control and governance through all mine phases. This includes water use in the post-mining transition, when responsibility for long-term management reverts to government. Using a risk-based framework that considers risks, their likelihood, and their consequences to determine water management priorities is typically a good place to start, given the broad range of risks that can arise around water management in the mining sector.

Drawing on international standards and practices, there are a number of key actions that governments can take to effectively manage water resources around mining:

1. Prior to mine permitting, develop water management policies and programs at the watershed level.
2. Prior to mine permitting, set mine effluent criteria and receiving water objectives.
3. Through the ESIA review and mine permitting process, review the plans and set conditions for water use and discharges.
4. Through the ESIA review and mine permitting process, review and approve mine water management plans.
5. During construction, operation, and closure, monitor and evaluate mine water management performance.
6. During construction, operation, and closure, enforce compliance to protect water resources.

## BIODIVERSITY

Activities across the mine life cycle—from exploration through the post-mining transition—can have significant direct, indirect, and cumulative impacts on the natural world. From land-use change and deforestation to pollution, greenhouse gas emissions, and the unintended introduction of invasive species, there are many ways in which mining operations can influence local and national biodiversity and ecosystem services. Many of the impacts of mining on biodiversity are unavoidable and must be carefully considered as communities and governments balance their development priorities with their conservation needs. However, through collaborative planning, implementation, and monitoring and evaluation, these stakeholders can work with mining companies to ensure that economic value is generated with no net loss to biodiversity. In the best-case scenario, when properly planned and implemented, mining activities could even lead to a net gain for nature over the life of the mine.

Biodiversity is, most simply, the variety of life on earth, in all its forms and interactions. It is closely related to ecosystem services, though important distinctions should be made between the two. Biodiversity can be thought of as the “stock” that sustains human life and livelihoods through the ecosystem services that it provides; that is, the processes through which the environment produces benefits useful to human populations.

Conserving and protecting biodiversity and ecosystem services have grown in importance for both governments and mining companies, in recognition of the role that biodiversity can play in supporting economies and operations and in maintaining the well-being of surrounding communities. In response, companies are increasingly working with partners to find ways that they can avoid,



minimize, and restore any negative impacts their activities have on biodiversity and offset those residual impacts that cannot be avoided.

Governments have a strong role to play here as well. Through their legal and policy frameworks, the MPF requires governments to avoid and minimize potentially adverse effects of mining on biodiversity by:

- Requiring that mining entities submit environmental management programs and updates for approval prior to permitting and whenever there are significant process or operational changes during the operating life of the mine.
- Identifying, monitoring, and addressing potential and actual risks to and impacts on biodiversity throughout the mining cycle.
- Requiring that mining entities conduct monitoring on a continuous basis based on national standards and the conditions of the operating permit, compile and submit performance assessments to government, and publish regular reports that are readily accessible to the public.

As a result of the close relationship between ore bodies and unique environmental conditions, and in order to maintain good relationships with mine-adjacent communities, companies are starting to think about how they can design, build, operate, and close their mines in a way that results in no net loss (NNL) to biodiversity over the life of the mine, or—more positively—results in a net positive impact on biodiversity over time. One useful framework for achieving this is the Mitigation Hierarchy, which helps guide companies in reducing the significant negative impacts of their operations on priority biodiversity. It is based on the iterative application throughout the project's life cycle of four sequential steps: the preventive steps of avoidance and minimization, and the remediative steps of rehabilitation/restoration and offsetting.

Governments, when considering the merits of a proposed mining project, will have to weigh the economic and development needs of the country and the local community against its conservation and environmental goals. However, active collaboration on biodiversity management and protection among governments, companies and local communities is increasingly seen as a win–win–win. Governments can follow certain good practices as they move toward improving the protection of biodiversity and ecosystem services:

1. Develop and adopt a national policy on biodiversity.
2. Integrate biodiversity considerations—including the Mitigation Hierarchy—into their national legislation and regulations, including requirements for ESIA's and ESMP's.
3. Establish and maintain adequate institutions for biodiversity protection.
4. Provide clear guidelines to the mining sector on biodiversity management, including offsets.
5. Establish mechanisms and requirements for sharing information on biodiversity and ecosystems, and for reporting on how companies are implementing their biodiversity commitments.
6. Allocate adequate funding to support the implementation of their biodiversity policy and enforcement of their legal and regulatory requirements on biodiversity.

## WASTE MANAGEMENT

Mining typically moves and processes large amounts of materials to extract the target commodity, and during these processes produces excess, non-marketable material known as mine waste. This waste can include waste rock, tailings, dissolving solutions



from heap leaching, precipitates from water treatment and chemical recovery processes, and dust. Mine wastes typically have some mineralization that is reactive or that could be released from the rock when it is mined, crushed, and exposed to air and water. In combination with the process chemicals needed in the extraction process, there are risks of mining wastes releasing high concentrations of constituents that can be harmful in the receiving environment. In addition, large volumes of non-mineralized materials and excess materials from mineral processing need to be stored in perpetuity in man-made structures, such as tailings dams, that may have physical stability risks.

Waste management often extends well beyond mining operations into the post-mining transition, and the combination of the scale, duration, and magnitude of risk associated with mine waste, alongside recent high-profile accidents around tailings dams, mean that applying a high standard to its management is of utmost importance to companies, communities, and governments.

Given the potentially significant impacts of poor management of mine waste, governments have a central role to play in ensuring that these by-products of the mining sector are managed in an effective way. The MPF requires that governments:

- Ensure that structures such as waste dumps and tailings storage facilities are planned, designed, and operated such that geotechnical risks and environmental impacts are appropriately assessed and managed throughout the entire mine cycle and after mine closure.
- Require that mining entities design, operate, and maintain mine waste structures according to internationally recognized standards.

- Require that mining entities commission independent expert reviews and report to governments prior to development approval, when changes in design are proposed, and at regular intervals during the operating phase.

The overall objective of mine waste management is to ensure the long-term physical and chemical stability of all mine waste management facilities. Achieving this objective will protect communities and their water resources and ecosystems, while still supporting the mining needed in many areas to promote local economic prosperity.

As with many aspects of environmental management in mining, waste management should follow a risk-based framework to determine priorities. Waste management in mining is complex and incorporates a range of disciplines, including geology, geochemistry, civil engineering, and geotechnical engineering. In addition, engineered facilities need to incorporate site-specific design criteria for seismic conditions, local climate, and to accommodate climate change scenarios. It is important for governments to have an overall understanding of the potential issues and what affects them and to obtain expert advice and assistance where and as needed for effective control and governance through all mine phases. This includes once mining has finished and the mine has been closed, when responsibility for long-term management of facilities reverts to government. Climatic conditions and the impact of climate change on engineered structures and their systems also need to be considered when contemplating various operating and post-mining transition and closure conditions.

There are key actions that governments should take to ensure the effective and safe management of mine waste. Specifically, governments should:



1. Prior to mine permitting, develop mine waste management standards.
2. Prior to mine permitting, set specific standards for tailings dams.
3. Through the ESIA review and mine permitting process, review and approve the mine waste management plans.
4. Through the ESIA review and mine permitting process, require financial sureties for waste management facilities to manage government risks if the mining company cannot meet its obligations.
5. During construction, operation, and closure, monitor and evaluate mine waste management performance.
6. During construction, operation, and closure, enforce compliance to protect land and water resources, as well as worker and community safety.

## EMERGENCY PREPAREDNESS AND RESPONSE

Emergency preparedness, management, communications, response, and recovery are increasingly important in the mining sector. Emergencies, including both internal mine site accidents and external natural and social hazards, can affect operations, workers, and communities, and the impacts can extend well beyond the boundaries of a mine to the communities, rivers, wetlands, farms, and infrastructure that surround the site. Emergency events can also affect operations and communities across the mine life cycle, with the risks extending from construction and operations through mine closure and the post-mining phase.

National governments, working with companies, communities, and all levels of relevant authorities, must ensure that all potentially affected stakeholders identify and understand potential risks across the mine life cycle and

that they are well prepared to address and respond to them.

A strong culture of safety starts from the top of an organization, whether it be a government or a mining company. For a country, this culture starts with the government setting a strong example of safe practices and establishing expectations for safety throughout its legal framework. Emergency preparedness and response for mining are not just about what the mining companies put in place; they must be extensions of the regional and national emergency preparedness and response network. Putting in place a strong national culture of safety will not only support community health and well-being, but will help to attract mining companies and investors, as it reduces their risks and liabilities and helps protect their staff and assets.

Preparing for emergencies through formal programs—whether within a mining company, government or community—is above all else about prevention, and about working to protect populations and ecosystems. A series of high-profile accidents in the sector, including the Brumadinho tailings dam failure in Brazil and the jade mine collapse in Myanmar, combined with the increasing impacts of a changing climate, have underscored the need for national and local governments, mining companies, workers, and communities to work together to identify possible risks and develop, test, implement, and improve emergency preparedness before, during, and after mining.

To this end, governments, working with companies and communities, must ensure that all potentially affected stakeholders identify and understand potential risks, that they communicate their efforts, and that these efforts lead to stronger recovery. They should require that mining companies operating in their jurisdiction develop and implement an emergency preparedness and response program, which should include:



- Requiring all mining operations to have an emergency preparedness and response program in place prior to commencement of operations, and ensuring that the program is comprehensive, meets current best practice standards, and is reviewed, tested, and updated on a regular basis. The program should include five principal components: risk assessment; prevention and preparedness; response plans; recovery plans; and crisis communication plans.
- Basing all elements of the emergency preparedness program on ongoing, inclusive consultation and cooperation with local communities, government, and other relevant stakeholders.
- Ensuring that monitoring of the effectiveness and responsiveness of the emergency preparedness program is conducted by companies in cooperation with communities and all levels of government.

## GAP ANALYSIS

In order to implement the MPF's guidance on environmental management, there are several things that governments must do before, during, and after mining to ensure that those operating in their mining sectors effectively manage water resources, protect biodiversity and ecosystems, properly store and dispose of waste materials, and prepare for and respond to emergencies. Using the legislative, regulatory, and policy tools at their disposal, governments can design, implement, and enforce a legal framework that supports responsible and effective environmental management in mining that protects communities, supports the private sector, and helps with the achievement of national environmental objectives and the UN Sustainable Development Goals (SDGs).

Conducting a gap analysis is an effective way for governments to identify their strengths, gaps, and opportunities in environmental management for mining, and to develop a path forward for achieving their environmental objectives.



## 1. Review the existing legal and regulatory frameworks

As a first step, governments should conduct a review of their existing legal and regulatory frameworks to understand what they are currently doing or requiring on all four aspects of environmental management across the mine life cycle, including in their ESIA and ESMP requirements. This information can be presented in a table listing, for example, everything that the government requires of proponents on water management before, during, and after mining, and so on.

## 2. Assess strengths, gaps, and opportunities

The country's existing legal and regulatory frameworks can then be compared to international standards and benchmarks. This comparison will help the government see how their legal frameworks on water, waste, biodiversity, and emergency preparedness compare to good international practices. This will help them to identify an initial list of their strengths, gaps, and opportunities for improving legal frameworks on environmental management. It may be, for example, that their requirements on water management before mining commences are largely in line with international standards, but that there are opportunities for further strengthening the laws, policies, and regulations that govern water during mining and after mine closure.

## 3. Identify priorities for reform and the risks of inaction

Looking at gaps and opportunities, the government can next identify the risks associated with inaction and the benefits of reform, and subsequently prioritize those actions it must take to minimize any risks, maximize any benefits, and strengthen its legal frameworks for environmental management. If, for example, the gap analysis reveals that there is significant risk to local communities as a result of inadequate requirements for developing emergency preparedness and response plans prior to permitting, governments may prioritize addressing this in the legal framework reform process.

## 4. Develop a roadmap

With a list of priorities in hand, the government can develop a roadmap for how it will adjust or reform its legal framework on environmental management to achieve its policy objectives and meet its international commitments. In this roadmap, the government will outline where changes in policy, law, institutions, capacities, and resourcing will be needed; the best legal instruments for making positive change; the steps that the government will follow to revise the legal framework; and a time frame for the process (changes to be made in the next 5 to 10 years, for example). This roadmap will help the government articulate how they will get from where they currently are to where they need to be. It should be developed in a participative way, to ensure that it reflects a variety of stakeholder perspectives and has their support. The roadmap should also reflect the roles and responsibilities of those that will implement it. It should also be feasible; the roadmap should adequately and realistically reflect the time, resources, and capacities needed from the government for this work and not be so ambitious that it ceases to be implementable.





## 5. Implement the roadmap

Once a realistic roadmap has been developed and adopted, the relevant parties can set about implementing it. This will likely require considerable resources and the participation of several different ministries, departments, and agencies, as well as the participation of relevant outside stakeholders.

## 6. Continuous improvement

The government should establish systems and capacities to continuously monitor and evaluate its legal framework on environmental management to ensure that it continues to meet international standards and benchmarks. Ongoing monitoring and evaluation efforts will allow the government to manage change and adjust frameworks as needed over time to reflect changing best practices and evolving knowledge.



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