



W H I T E P A P E R

# SUSTAINABLE MINING 2023

Mitigating the industry's environmental and ethical impacts



PREPARED BY INTENGINE.COM

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# SUSTAINABLE MINING IN 2023

When discussing sustainability as it relates to the mining industry, it's necessary to take a holistic approach. Here, we'll use a framework in which society at large, the environment, and its biodiversity are considered. This includes, but is not limited to, minimizing exposure to hazardous constituents, protecting water sources, respecting communities, as well as site reclamation.

As demand for mined materials increases, society expects an increasing level of environmental protection. The impact of mining on the environment is likely the most widely-known hindrance to a sustainable framework.

In some cases government regulation impedes sustainable action, particularly regarding mine cleanup initiatives. The industry must shift from the outdated reactivity model to one in which foresight, proper planning and proactivity are enacted. The extraction of resources affects everything from wildlife and water systems to local communities and those employed at or near the site. There are practical steps from which to achieve a more harmonious framework, and many mining companies today are leading the way. Various organizations have created mining sustainability standards which companies can use as goals for sustainability.



**STRONG COMMUNITY  
RELATIONSHIPS**



**COMMUNITY  
PROTECTION**



**MORE SUSTAINABLE  
PRACTICES**

**The mining industry is at a crossroads. With an expanding economy, the demand for extracted natural material grows, along with society's expectations regarding sustainability.**

**The last decade has seen a sharp increase in the awareness of our effect on the planet. Mining is seen in the eyes of many as an industry that is indifferent to the environment. Since we still rely largely on the material produced by the industry, we are presented with the opportunity to reframe the mining sector and make a commitment to decrease negative impacts while increasing sustainable ones.**



# SUSTAINABILITY IN MINING

**From the roads we drive along, to the computers we use, to the buildings we frequent, everyday many of us reap the benefits of the products sourced from material extraction.**

Mining drives an estimated more than 45% of the world's economic activity<sup>1</sup> and despite its environmental impacts, it's not something we can go without. As the world's population grows, more raw material will be required to meet our demands.

Sustainability in mining involves a multitude of integrative aspects. It requires positive relationships with the communities surrounding mine sites, thriving ecosystems, shared values with stakeholders, and a clear vision in the early planning stages. Sustainable practices must be integrated into every stage of the mining process in order to reduce negative impacts on the environment.<sup>2</sup>



Mining drives an estimated  
**45%+**  
of the world's economic activity<sup>1</sup>

Long-term societal success relies on strong relationships between industry, government and community. Moving toward sustainability in mining requires a new model, developed with stakeholders and community members with shared values at the foundation.

**Viewing mining as an industry that operates in a silo is not only an outdated perspective, but also one that neglects the deeply embedded nature of its effects on society at large.**

## Sustainable Mining Considerations



Reduction  
of energy usage



Proper mine closure  
and cleanup with  
restoration



Reduction  
of water usage



Conservation of  
natural resources  
where possible



Utilizing  
minimal land



Reduction  
in pollution



Mitigating Risks to  
Health of Workers<sup>2</sup>

# ENVIRONMENTAL IMPACTS

**A thriving ecosystem is necessary for thriving communities. Everything is connected, and a disparity in the health of the environment affects us all. Since the majority of mining activities take place within the natural environment, sustainability in this realm is imperative.**

**Mining companies can work to mitigate negative impacts on ecosystems, while also conducting activities in a way that promotes environmental health.**

One way this can be actualized is by aiming to leave a mining site better than before a project took place. This can also help ensure ongoing social licensing. More than ever before, the world is watching, and mining companies must adhere to increasingly strict environmental standards and regulations.



# Conservation of Biodiversity



Biodiversity is important and must be considered at all stages of a mining project. Local organisms can be affected by mining activity in a variety of ways; changes in stream direction affects aquatic life, new roads affect or prevent animal movement patterns, water or air quality changes can affect organism health, and habitats can be changed or destroyed. The first step in biodiversity conservation is understanding the local ecology before mining activities begin. One barrier to this are the limits in our awareness regarding the array of species which may exist within a given area. Local biodiversity values must also be considered. The mining industry is supporting initiatives in this area through actions such as partnering with and supporting organizations concerned with biodiversity, and gathering and sharing information regarding local biodiversity with government bodies.<sup>3</sup>

Prior to planning, baseline measurements must be taken to determine the status of biodiversity when free of disturbance. From here, potential effects must be outlined. An **Environmental and Social Impact Assessment (ESIA)**, is the process of assessing the baseline, assessing potential effects and their qualities, and determining the magnitude of impact as they pertain to species, population and habitat sizes and sensitivity of the ecosystem. If an area is considered sensitive, it should remain protected by restricting or limiting mining activities altogether. This respect for the environment must take precedence over a desire to acquire excavated material.

One example of this is the termination of the mines in Australia's East Coast in the 1980's due to the sensitive nature of these areas. When a company hasn't exercised responsible mining practices, government or community interference sometimes occurs to protect sensitive areas. This was the case in Shelburne Bay, when the planned removal of two dune systems was underway. The Commonwealth government declared this as an area to be conserved, terminating all activity and cancelling all leases. Subsequently, members of the **International Council on Mining and Metals (ICMM)** have agreed to avoid mining in World Heritage Areas.<sup>3</sup>

During the development and construction phase, biodiversity conservation relies heavily on proper management of contractors, ensuring adherence to the company's **Environmental Management Systems (EMS)**. Important factors in the EMS are consideration of vegetation protection, pest control, limited wildlife disruption and waste organization. Impacts on wildlife can include disruption in movement through things like new roads, water pollution, and road kill from new traffic. Determining natural animal movement is necessary

in planning for a new road location, after which factors such as speed limit signs and rumble strips can be added as safety measures. Machinery should also be assessed for potential harm and cleaned when necessary.<sup>3</sup>

Often, mining takes place in remote or rural areas, on land which is relied on heavily by the surrounding community. In locations where residents depend on biodiversity and the ecosystem, conservation considerations are given precedence.

Once mining activities are complete, reclamation of the affected land can minimize effects on fauna by reducing habitat fragmentation. Mining can impact the grazing patterns of animals, and site management must consider this in the planning stage. Existing weeds can become more pervasive or new species can be introduced, negatively impacting the area. These can be dealt with through identifying problem species and implementing control plans. Aquatic ecosystems are greatly impacted by habitat structure, which can be altered through mining activity. Changes in stream direction, eradication of niches through sedimentation, and changes to water quantity can harm aquatic organisms negatively. When we alter water sources, we alter the homes of countless creatures.<sup>3</sup>

# Airborne Contaminants, Noise & Vibration



Since air quality can change throughout the exploration stage and onward, air quality consultants should be referred to for guidance. The exploration stage does not usually produce significant emissions; however, measures can be taken to mitigate the impact of mining activities on communities through such things as watering dusty roads and planning the timing of drilling, transporting and excavation.<sup>3</sup> Dust generation is common, and airborne dust can be mitigated through dust monitoring devices, which can provide information regarding the level of dust being produced, sending an alert to operators, from which action can be taken.<sup>3</sup>

Noise and vibration can also have an effect on the community and the environment. The human impacts of noise pollution are often underestimated. **The World Health Organization (WHO) states that excessive traffic noise is a factor around 3 per cent of heart-disease-related deaths.**<sup>4</sup> This issue is exacerbated when mining takes place in densely populated areas. Blast overpressure is of particular concern when neighbours are in close proximity. This can be dealt with by modelling a blast before it occurs, taking into consideration atmospheric conditions and distance to local residents. The timing of a blast is important, and foresight through modelling is necessary.<sup>3</sup>

*A mining company working in a highly populated part of Victoria, Australia provides a good example of noise management. Here, local noise restrictions threatened the continuation of mining activities. After much trial and error, the company had success implementing noise attenuating materials on the walls of the container in which the drilling occurred. This included sound deadening paint, sound absorbing foam and a sound barrier. Once implemented, no noise complaints were received. Proper planning in collaboration with acoustic experts prior to site set-up, can support mining companies in addressing noise issues.*<sup>3</sup>

**Successfully managing noise pollution requires measuring the average level of background noise in a community to set a baseline.** With the help of acoustic experts, safeguards can be implemented to ensure noise doesn't exceed extreme levels, while keeping the community informed and involved, and having a clear means by which local residents can file complaints if necessary. Much of noise and vibration mitigation involves monitoring and limiting noise levels, speaking with neighbors about their concerns, and addressing them if needed.<sup>3</sup>



# Water Management



Clean water is a basic human need, and any impact of mining activities on local water quality should be taken seriously. Local communities should be informed about a company's water usage plans, just as mining companies should understand the local values and activities relating to water usage. Water-related plans should also be fully reviewed with catchment authorities and stakeholders. Managing water involves creating a Water Management Plan (WMP), which states a company's intentions regarding water usage while identifying all potential water-related issues that could arise throughout the mine's life.<sup>3</sup>

Water usage can pose problems when not done efficiently. In some locations, a hierarchy of water usage is enacted, regardless of contracting agreements. This hierarchy can include environment, industry, local community and agriculture. In rural areas, where community water use is more direct, values play a larger role in the water considerations.

It is imperative that water sources be protected at all costs. Mining companies can refer to local water quality guidelines in their geographic area as well as local legislation for risk management regarding water. Risk management in this light must involve water quality monitoring, so as to detect any changes before they cause harm. Reagents must also be monitored, these include hydrocarbons, degreasers and sewage material. This is particularly necessary during rainfall, when these materials are more likely to end up in natural water sources.<sup>3</sup>

Mining can affect water sources through an alternation in water quality. Water sources which are relatively low on the landscape often receive the runoff of mining activity. Heavy metals and other hazardous material can enter into a water stream and travel to large water sources. Aquatic animals can also be affected by changes in their areas of passage. Water quantity of natural water sources can change when natural flow features of groundwater/runoff are disrupted.<sup>3</sup> Mitigation of negative water effects can include constant water quality monitoring after baseline is determined, monitoring of water usage and implementation of a water management plan. Since impact can continue post mine-closure, monitoring should continue after reclamation is complete.



# REGULATION IN THE MINING INDUSTRY

**The promotion or hindrance of sustainable mining practices lies in environmental regulation. Here, we'll refer to in-depth studies conducted in Sweden, Norway, Finland and Russia as a framework in assessing the level and effect of environmental regulation on the mining industry.**

**The gaps that exist in implementing practices designed to protect the environment need to be harmonized.**

In Sweden, the environment is heavily considered in the mining permit acquisition process. Potential impacts are assessed prior to permit grants, with the health of the environment and quantity of extraction in mind. When a permit is granted, the operation phase requires supervision to ensure compliance with the limits of the permit.<sup>6</sup> The permits needed to mine in Sweden include an exploration permit, which grants permission to explore an area for minerals, giving a company exclusive rights to an area, and a mining concession. Before a mining concession is granted, an Environmental Impact Assessment (EIA) must be done to consider all aspects of the environment. Next, an environmental permit sets the condition limits, for example the amount of emissions allowed as a result of mining activities.<sup>6</sup> The environmental permit must be accompanied by the EIA, showing impacts and mitigation plans. In addition to these, building and land allocation permits determining which portion of the land can be used for ore processing are required.



Ultimately, the legal framework gives precedence to the mining company. Only in rare cases would an EIA have the ability to prevent a mining project from happening. The primary issue with the legal framework in Sweden is that the Mineral Act is in favour of exploitation and is in contradiction to the environmental code, which supports its protection. In 2023 the parliament in Finland passed a change to its mining law, giving local residents more control in approving new mining areas.<sup>30</sup> In Russia, there is a law on ecological expertise designed to protect the environment, but upon inspection, this is only applied when a conservation site or an area on the continental shelf is involved. Otherwise, it hasn't been applied to mining applications. At first glance, the legal framework seems to support environmental protection, though there are gaps in implementation of desires to protect the environment, which need to be harmonized. This framework calls for self-regulation of mining companies.

In Sweden, Norway and Finland, only mining projects that reach a size threshold require an EIA assessment, although this isn't the case in every country. In Russia, most mining projects fall within the legislation that requires an EIA. Currently only projects affecting the continental shelf or conservation areas are required to undergo one, and when it is required, there is no public hearing. In Sweden, an EIA is required along with the application for exploitation concession (mining license), which is a step in the right direction. Different situations see different priority placed on the aspects involved in achieving sustainable mining. For instance, when a certain area is host to a large mineral deposit, environmental and social considerations might not be so great. On the other hand, in some cases mining is not an option due to pressing social or environmental factors.<sup>30</sup>

Social Impact Assessments (SIA) are not mandatory in Russia or Sweden. In these countries, an EIA looks at effects of mining on the environment and living beings, but does not necessarily take into account social considerations. The social perspective needs to be incorporated more into the EIA considerations by making a separate requirement for an SIA. The SIA can then be utilized as a self-regulation tool, allowing for broader applicability. SIA requirements and self-regulation can allow for the full scope of affected communities to be taken into consideration prior to mining activities.

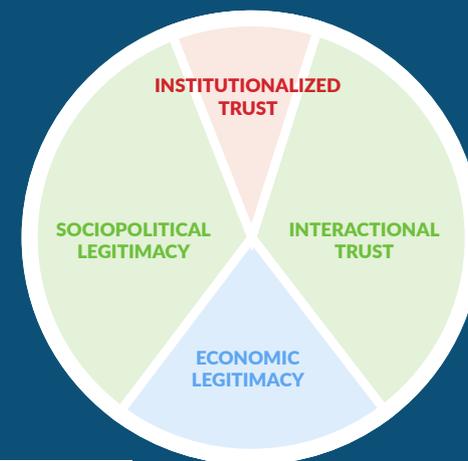
## Social License to Operate

**A Social License to Operate (SLO), broken down into levels is: “economic legitimacy as the base; socio-political legitimacy and interactional trust in the middle tier; and institutionalized trust at the highest level.”**

In Sweden, Norway, and Finland, SLO is not part of the conversation. In cases like these, self-regulation, and a desire to create a positive relationship with the local community is required. When monetary incentive is not applicable, other forms of incentive to use an SLO can be applied. In some cases, the rights of a mining company trump those of the local Indigenous communities surrounding a mine. When this occurs, the self-regulation of a company to obtain an SLO can be helpful to avoid problems and protect the livelihoods of the surrounding community. To attain sustainability where the Indigenous peoples and the industry are concerned, self-regulation of mining companies and law adjustments are necessary. Self-regulation can also add to the sufficiency of public regulation. This can help deal with issues of enforcement, even when protective laws are in place.

### LEVELS OF SOCIAL LICENSE

*with the four factors that determine the proportions of stakeholders at each level*



*“Fruits of a Dialogue  
between Theory and Practice”*



## WASTE AND MINE CLEANUP

**Often, once the extraction process is complete, the mining site is abandoned. This can lead to environmental damage through factors such as heavy metal discharge into water sources.**

One appropriate example of this is the variety of mines set up at the High Ore Creek near Helena in Montana. After decades of mining projects extracting gold, lead and silver, tailings were left which affected the creek, as it turned orange and ran into the Boulder river.<sup>8</sup> When this water was tested with live fish, all of them died within 72 hours.<sup>9</sup> Testing done by the state found high levels of arsenic, zinc and lead in the creek. Situations such as these require funding to clean up. In this case, Montana's Mine Waste Cleanup Bureau took responsibility for cleaning up these mine tailings thanks to \$2 million of funding from the Bureau of Land Management's Abandoned Mine Land program (AML).<sup>8</sup> Other mine sites have yet to receive such attention.

After extraction, valuable metal must be separated from rock. This process involves chemicals or smelting, which creates a large amount of waste, as well as the following challenges:



- **Heavy metals** can affect soil through contamination, making it sterile or lowering its productivity.



- **Air pollution** from dust or tailings.



- **Acid drainage:** acidity or heavy metals can enter water streams, killing organisms.



- **Breaking of dams/impoundments.**<sup>8</sup>

**Reclamation involves returning a mine site to the pre-mining state. The National Research Council outlines reclamation as involving:**

- Reducing the slopes on the edges of waste rock dumps and heaps to minimize erosion,
- Capping these piles and tailings piles with soil,
- Planting grasses or other plants that will benefit wildlife or grazing stock and help prevent erosion,
- Directing water flow with French drains and other means to minimize the contact of meteoric water with potentially acid-generating sulfides in the dumps, heaps and tailings piles,
- Removing buildings; and eliminating roads to minimize unnecessary future entry by vehicles.”<sup>10</sup>

We must find a solution to encourage mine site cleanup while also focussing on future prevention of environmental damage. The first question is who should fund the cleanup? This is sometimes difficult to establish. Often the government is left with the responsibility, leaving it in the hands of the taxpayer. Cleanup is expensive, and with the astounding number of abandoned sites, (38,991 across the U.S.)<sup>31</sup> it is estimated that 34% of these sites have records of mineral production with materials such as arsenic, copper and lead putting human and environmental health at risk. <sup>31</sup> “After the mining activities are completed, federal policy seems to disappear, and reclamation becomes a patchwork of local arrangements and accommodations and economic pressures.”<sup>12</sup> Sometimes the uncertainty regarding mine site cleanup leads to incentive toward overseas projects.<sup>13</sup> In the United States, there are even some federal laws which disincentivize the cleanup of mine sites.<sup>31</sup>

**Reclamation projects can cost hundreds of thousands of dollars. When acid drainage is required, that number can surpass \$1 million.<sup>8</sup>**



**Clean Water Act:**  
Pollution is prohibited into the U.S. waters from point sources

### **A. Regulation**

In the U.S., past law required that a causal relationship between mining activity and environmental damage be proven. In the mid-20th century, mining polluters began to be held accountable.<sup>8</sup> Today, under the Clean Water Act, pollution is prohibited into U.S. waters from point sources.<sup>14</sup> Discharges are permitted however, if one acquires a **National Pollutant Discharge Elimination System permit.**<sup>15</sup> Importantly, liability under this act is placed upon current landowners as the effects of the law are retroactive, making current landowners responsible for all damage regardless of when the damage occurred.<sup>16</sup> This creates problems as landowners, even if attempting cleanup from past events, can be charged for the existing damage on their land.

The **Comprehensive Environmental Response, Compensation and Liability Act** of 1980 (CERCLA), also known as the Superfund law, is the most substantial environmental cleanup regulation in the United States. Sites considered dangerous to the environment are eligible for funding from Superfund.<sup>8</sup> Since cleanup is so expensive, funding is reserved for sites meeting the ‘most dangerous’ criteria.



Retroactive liability disincentivizes the cleanup of old sites

### **B. Retroactive Liability**

Due to the retroactive nature of CERCLA and the Clean Water Act, the party deemed responsible for environmental damage is often not the one who caused the damage.<sup>17</sup> Retroactive liability also disincentivizes the cleanup of old sites, which can be done while an old site is re-mined. Re-mining old sites can produce benefits such as using re-mined coal for electricity and using clay waste to fill underground spaces.<sup>18</sup> Unfortunately, re-mining is discouraged by federal law, as mining companies are often concerned with re-disturbing previously mined land for fear of being held liable for pre-existing damage to the site. This causes operators to opt for mining new land, increasing the amount of land affected by mining.<sup>19</sup> Even the government is not exempt from this fear. Governments can also face charges when attempting to clean up an old mine site if the water quality does not meet the Clean Water Act’s standards.<sup>20</sup> This is made even more difficult because of the ambiguous nature of these criteria.<sup>21</sup> A possible solution is to eliminate liability for past pollution and holding companies liable for environmental damage only if they create pollution to a level exceeding those present when they bought the land. Unfortunately, there is no such law in the U.S. Anybody should be able to remediate without liability, which would increase the probability of voluntary cleanup. Another issue lies in the fact that citizen suits can be filed to enforce federal law. In the case of a party that wishes to clean up an old site, some groups believe that such suits should not be allowed, as they too act as a deterrent to voluntary cleanup.<sup>8</sup>



**5.9%**  
of non-coal mines  
receive funding

### C. Funding

In the United States, various sources are utilized to fund site cleanup, including those provided by the federal and state government. Despite this, the amount of funding available is not sufficient to clean them all. Noncoal mines are difficult to fund due to a requirement that a state must have reclaimed all coal mines before it can receive funding for a noncoal mine. The result is that only 5.9% of noncoal mines receive cleanup funding.<sup>22</sup> It is in the best interest of each individual community that mine sites be cleaned up. Therefore, state or provincial government funds should be fully utilized for cleanup programs.<sup>8</sup>

### D. Damage Mitigation

Financial incentives designed to mitigate environmental damage can help with the issue in the future. One option is placing a tax on the amount of damage or pollution created. The current CERCLA tax in the U.S., taxes petroleum companies based on their production, not their level of damage. This creates a disincentive toward controlled emissions. Coal mining companies are taxed in the same way. This framework can be improved on by directly taxing the amount of pollution produced, creating a sense of urgency in operators in their desire to keep environmental harm to a minimum. Another feasible option is to require that a mining company post a bond prior to activity. If set at the right amount, post-mine cleanup could be covered, while ensuring that the amount is not too low as to encourage site abandonment.<sup>8</sup> In the U.S., the **Surface Mining Control and Reclamation Act** does require such a bond for coal mining.<sup>23</sup>

An effective, long-term solution entails cooperation between various parties such as the mining company and the affected community. One example of this is the Sunnyside mining site in Colorado. After multiple failed attempts to mine this site, Sunnyside Gold Corporation made their attempt in 1985. The earth gave out, affecting a creek connected to the site, and potentially the Anamus river into which the creek runs. Together, the company and the state came to a conclusion; “The company can plug the mine and shut down the treatment plant, and as long as the water quality in the river doesn’t get worse over five years of continued sampling, the company has no more liability.”<sup>24</sup> Additionally, the company helped to clean up other mining sites, free from liability.<sup>8</sup> This changed the way many view mining relations, as it serves as an example of cooperative effort in protecting our environment.

### E. Circular Economy

A circular economy is a system where materials are used to their greatest potential for the longest amount of time, thereby minimizing waste and maximising value. With an estimated 100 billion tonnes of waste being produced per year by 3,500 of the largest mining operations in the world,<sup>25</sup> the amount of waste produced far outweighs that of valuable, extracted material.

Many companies in the industry are moving toward a circular economy with the reprocessing, repurposing and reclamation of resources. Often, valuable material is left amongst mining by-product, making re-sifting through this material an important step.

Through new processing technologies, base metals, platinum group metals, and sometimes materials such as gold, can be extracted from mining waste. While the material is being processed, the waste portion can be sanitised, helping to prevent acid mine drainage which occurs when the sulphides oxidise. Finding valuable material in mining waste can also minimise the number of new ore digs, allowing for more land to be left untouched. A circular economy benefits not only the environment but the communities within it.



Monetary  
deterrence from  
environmental  
damage can help  
with damage  
mitigation



**100 billion tonnes**  
of waste being  
produced per year by  
3,500 of the largest  
mining operations

# COMMUNITY

**A holistic perspective that addresses community impact is necessary when considering the role of the mining industry within a functioning and expanding society.**

KIN challenges the mining industry to “think beyond a ‘Life of Mine’ to a ‘100-year’ plan that considers at the outset, the social, economic and environmental legacy of resource development for not just the mine, but the local community and whole region around the ore body.”<sup>1</sup> Creating a long-term plan early on is important. The commonly utilized framework often involves a reactionary response to environmental or societal impact when attention is drawn to it post-event. Proactivity and foresight of potential negative impacts are necessary for the industry to evolve. This change must be integrated at all levels within an organization.

## Two types of licenses are required to allow for mining:

One is a legal license, attained through approval by relevant authorities in an area, the other is a social license. The social license is attained when the affected communities approve of the legal license, and of the mine moving forward with its plans.

Mining is often viewed negatively by communities. This is partially due to the mainstream media’s focus on the environmental harm caused by the industry. This can be alleviated when mining companies communicate with, provide information for, and train local parties, creating more trusting relationships between community and industry.

Local residents must always be considered in the mining plan. Communities that are not informed regarding mining activities are more likely to disapprove of them. This communication can be facilitated through a community consultation program, whereby the community can be involved in the planning.<sup>2</sup> Here, the public/affected communities can offer perspective on what is important to them in regards to sustainability.

**Public involvement before any action is taken will build trust between the community and the industry, making an SLO more likely.<sup>6</sup>**





## MOVING TOWARDS SUSTAINABILITY IN MINING

**Mining is on the world's radar, more than ever. While the demand for metals and materials increases, so does the need to protect the environment from further harm.**

The International Council on Mining & Metals (ICMM), put together a set of guiding principles which companies can use as a standard. Members of the ICMM's consultation group are expected to meet certain environmental standards. Compliance is verified on-site and involves credible assurance and transparent reporting.<sup>26</sup>

## The International Council on Mining and Metals' 10 Guiding Principles Categories:



Ethical Business



Sustainable Decision Making



Human Rights



Risk Management



Zero Harm, as the Ultimate Goal



Environmental Performance



Conservation of Biodiversity



Responsible Production



Social Performance



Stakeholder Engagement<sup>26</sup>

**Using these principles as a guideline can provide a framework from which sustainability can be achieved. These principles, coupled with external validation of a company's progress ensures credibility in the industry.<sup>26</sup>**

The Kellogg Innovation Network (KIN), an organization committed to global solutions, calls on the mining companies of the world: "We are calling for courage to reset the way we operate and to be willing protagonists in redefining our future- it is time for us to lead and it is time for us to act."<sup>1</sup> In 2012, KIN hosted a conference in Brazil with the goal of uniting perspectives from those involved in the industry. Contractors, suppliers, researchers, non-profits, and more teamed up with mining trailblazers to create new ideas and reach for new perspectives, in an attempt to develop a novel approach from which sustainability in mining can be actualized. A new framework must involve cleanup of detrimental effects from the past, identifying current negative impacts with a plan to minimize them, an increase in positive effects, and a long-term plan involving that considers all parties, which expands beyond the life of the mine.<sup>1</sup> KIN's proposed framework provides a succinct starting point for mining companies around the world. The framework involves becoming aware of the current position of mining, and consciously choosing a new, more sustainable direction for the future. Some of the most relevant guiding principles for the new proposed framework include:<sup>1</sup>

- Shifting from mining as an isolated extractive industry to resource development,
- Reactive risk management to proactive sustainability,
- Linear thinking to innovative, integrated leadership,
- Moving from short term capital to long-term benefit.<sup>1</sup>

With the guidance of organizations such as KIN, the industry is beginning to shift into a new paradigm.

# MEASUREMENT & ACCOUNTABILITY

**Measurement is made easier with information and standards provided by organizations dedicated to supporting sustainable mining practices.**

The Mining Association of Canada (MAC) developed a standard called Towards Sustainable Mining (TSM), intended to aid mining companies in monitoring their environmental impact through the application of tools and indicators. Companies who are members of the program report their progress on each indicator annually in TSM Progress Reports.<sup>27</sup>

This allows for sustainable performance to be measured while driving toward further progress. TSM involves an independent **Community of Interest (COI)** panel, which oversees TSM, for objective validation and credibility. The COI is made up of individuals with expertise or interest in areas including labour, economic & community development, environmental health, international development, finance, aboriginal affairs, and society in general. The COI advisory panel is consulted by the Canadian mining industry, overseeing TSM reporting.<sup>27</sup>



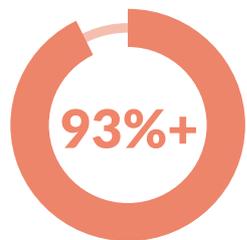
## THE TSM STANDARD

The TSM standard defines principles which, when followed, encourage community engagement, leading the world in sustainability and a commitment to the health and safety of individuals involved in a project. TSM outlines protocols made up of the following categories: community, energy efficiency, and environmental stewardship. Each of these protocols involves a particular set of indicators, against which a mining company can measure and report on its performance in those areas, with the intention being improvement in all areas every year. This process begins with a yearly self-assessment, as a company assigns itself a letter grade for each indicator. To ensure validity of these grades at the mine site, every three years the company's conduct is reviewed by an external source. In addition to this, a number of companies are selected yearly to present their validated grades, and are given the opportunity of acquiring a letter of assurance through the COI's post-verification review. With the use of this process through TSM, Canada's mining industry leads the way in being the first in requiring external substantiation of sustainable performance at the mine site.<sup>32</sup>

The first category, **COMMUNITIES AND PEOPLE**, includes the following subcategories: Aboriginal and community outreach, health and safety, preventing child or forced labour, and crisis management. Canada's mining industry saw some large improvements in these areas from 2006-2022. The second category, **ENVIRONMENTAL STEWARDSHIP** includes tailings management, water stewardship and biodiversity conservation.

### Environmental Stewardship 2022

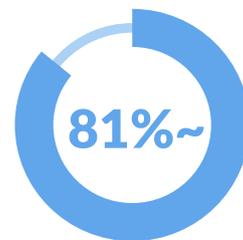
*(tailings management, water stewardship and biodiversity conservation)*



**BIODIVERSITY  
CONSERVATION**



**TAILINGS MANAGEMENT**  
of mining companies achieving  
the highest grade



**ENERGY  
CATEGORY**

*These numbers have risen significantly in the last 10 years.<sup>32</sup>*

**TSM offers awards to companies that are excelling in their commitment to sustainable mining.**

In 2023, the New Gold's New Afton Mine won the **TSM Community Engagement Excellence Award** along with the Diavik Mine.<sup>33</sup> Leadership awards are granted when a company meets or surpasses a high grade in all categories after external verification. This initiative can and is growing beyond Canadian borders. TSM shares their information with companies in other countries, and there are currently seven countries including Finland, Norway, Argentina, the Philippines, Spain, Brazil and Botswana.

# SUSTAINABLE MINING CERTIFICATIONS & STANDARDS

**MAC is just one of the many organizations that has created mining-related standards. In addition to the TSM, The Responsible Minerals Initiative acts as a resource hub for mining companies.**

**The Responsible Minerals Initiative (RMI) provides tools and information to aid in decisions made within the mining industry.<sup>28</sup>**

**RMI offers the following assurances:**

- Risk Readiness Assessment,
- Downstream Companies,\*
- RMAP.

*\*To be included on the list of Downstream Companies, a company must participate in the RMAP process (Responsible Minerals Assurance Process), which involves being evaluated against related standards.*

**RMI defines the following standards:**

- Cobalt Refiner Due Diligence Standard,
- ITA-RMI Assessment Criteria for Tin Smelters,
- Global Workplace Responsible Sourcing, Environmental,
- Health & Safety Due Diligence Standard for Mica Processors and Joint Due Diligence Standard for Copper, Lead, Nickel and Zinc, Gold Standard, Tin and Tantalum Standard, and the Tungsten standard.<sup>29</sup>

The RMI has over 400 member companies involved, with all companies seeking to meet regulatory as well as best practice standards.

**The Initiative for Responsible Mining Assurance (IRMA), outlines best practice for industrial scale mining, defining a standard.**

**IRMA standards includes the following aspects:**

- Business Integrity,
- Planning for positive Legacies,
- Social and Environmental Responsibility.

*Each category is a set of guidelines, used by auditors to determine whether a company is mining responsibly.*

**While it is up to individual companies to make sustainable decisions, standards and certifications act as both a resource and a means by which to validate implemented action. Sustainable action should be validated by measurement, standard achievement, and external validation.**

# CONCLUSION

**Society's dependence on the resources produced by mining isn't going away anytime soon, which is why sustainable solutions are essential. The environment is intricately connected to the mine site, putting the onus on companies to mine responsibly.**

**Monitoring baseline conditions of environment noise level, water quality, and biodiversity is a necessary first step when it comes to minimizing harm throughout a mine's life.** With this knowledge, adequate planning and foresight with proper safeguards must be implemented, creating a proactive solutions-based framework.

**Environmental regulation can hinder or promote sustainable action.** As demonstrated in the Sweden study, legislation coherence is necessary when supporting environmental protection. Mine cleanup is a crucial aspect of sustainable mining, as an abandoned site can have ongoing environmental effects.

**Mine reclamation should be supported by government regulation, but it requires substantial funding.** Proper waste disposal and processing can contribute to a circular economy with the repurposing of valuable material.

**Community engagement is not only important for SLO attainment, but is also inherent in sustainable mining.** Many organizations work to assist companies in best practice awareness through the measurement, implementation and validation of industry standards. Although the mining industry has a reputation for causing environmental harm, many companies lead the way toward a more sustainable future. Through awareness, planning, and best practice implementation, the mining industry is moving in the right direction.



# RESOURCES

1. KIN Catalyst. Reinventing Mining: Creating Sustainable Value, Introducing the Development Partner Framework. Evanston, IL.
2. Faur, F., et al., 2016. Solutions to Increase the Sustainability Level of Mining Activities. Research Gate. P. 240-250.
3. [Australian Centre for Sustainable Mining Practices, 2011. A Guide to Leading Practice Sustainable Development in Mining. Australian Government](#)
4. Safe M., 2009, Bad Vibrations, The Australian. January, 2009.
5. Batley, G.E., et al, 2003, A Practical Guide to the Application of the ANZECC/ ARMCANZ Water Quality Guidelines for the Mining Industry. Australian Centre for Mining Environmental Research, Brisbane, Queensland.
6. Koivurova, T., et al. 2016. Sustainable Mining, Local Communities and Environmental Regulation. Research Gate. P. 3- 55-57, 65, 70, 73-74.
7. [Boutillier, R.G. and Thomson, I., 2011. Modelling and Measuring the Social License to Operate: Fruits of a Dialogue between Theory and Practice.](#) (Accessed May 1, 2021)  
[Williams, R. and Walton, A., 2013. The Social License to Operate and Coal Seam Gas Development. A literature review report to the Gas Industry Social and Environmental Research Alliance. CSIRO, Canberra.](#) (Accessed April 22, 2021)
8. [Buck, S., et al. 2001. Cleaning up Mining Waste. Political Economy Research Center.](#) (Accessed April 20, 2021)
9. ID
10. [National Research Council, 1999. Hardrock Mining on Federal Lands. Washington, DC: The National Academies Press](#)
11. [Bureau of Land Management, U.S. Department of the Interior.](#)
12. Selcraig, B. This Reclamation Plan Uses Waste to Bury Waste, High Country News, Jan. 19, 1998.
13. [National Research Council, 1999. Hardrock Mining on Federal Lands. Washington, DC: The National Academies Press. Ch. 1.](#)
14. [Definition of "Point source"](#) (Accessed April 21, 2021)
15. [National Pollutant Discharge Elimination System \(NPDES\), United States Environmental Protection Agency.](#) (Accessed April 15, 2021)
16. The Ninth Circuit Held in American Mining Congress v. United States Environmental Protection Agency, 965 F.2d 759 (9th Cir. 1992)
17. [Hancock, Shelby. 2018. Third Circuit Holds Current Owners May Be Liable for Past Remediation Costs Under CERCLA. Synergy Environmental Inc. Newsletter.](#) (Accessed May 10, 2021)
18. [Bian, Z., et al. Environmental Issues from Coal Mining and their Solutions. Mining Science and Technology \(China\), Volume 20, Issue 2, 2010, P. 215-223, ISSN 1674-5264, https://doi.org/10.1016/S1674-5264\(09\)60187-3.](#) (Accessed May 7, 2021)
19. [Advancing Abandoned Mine Land Cleanup... With or Without Good Samaritan Legislation. April, 2019.](#) (Accessed April 2, 2021)
20. [Summary of the Clean Water Act. United States Environmental Protection Agency.](#) (Accessed April 14, 2021)
21. [Yu, Bobby, 2014. Criminal Ambiguity: Redefining the Clean Water Act's Mens Rea Requirements. Arizona Legal Studies Discussion Paper No. 14-08,](#)
22. Office of Surface Mining Reclamation and Enforcement. U.S. Department of the Interior. (Accessed April 24, 2021)
23. [Reclamation Bonds. Office of Surface Mining Reclamation and Enforcement. U.S. Department of the Interior.](#) (Accessed on April 19, 2021)
24. Ring, Ray. A Radical Approach to Mine Reclamation, High Country News, Jan. 19, 1998.
25. [Tyson, Rob. Circular Economics, Reprocessing Waste and Mining. The Northern Miner.](#) (Accessed on May 10, 2021)
26. Mining Principles. International Council on Mining & Metals. February 2020. London, United Kingdom.
27. [Towards Sustainable Mining, 2019 Highlights. The Mining Association of Canada \(MAC\). 2019.](#)
28. [Standards. The Responsible Minerals Initiative.](#) (Accessed May 10, 2021)
29. [The Responsible Minerals Initiative.](#) (Accessed May 10, 2021)
30. [Finland Tightens Mining Law as Demand for Minerals Surges](#) (Accessed Jun 7, 2023)
31. [Abandoned Mine Lands](#) (Accessed Jun 7, 2023)
32. [Environmental Stewardship: Aggregate Performance](#) (Accessed Jun 7, 2023)
33. [TSM Excellence Awards 2023](#) (Accessed Jul 5, 2023)

# GLOSSARY

Abandoned Mine Land Program (AML) – USA,	<a href="#">p11</a>	The Mining Association of Canada (MAC) – Canada	<a href="#">p18</a>
Bureau of Land Management – USA,	<a href="#">p11</a>	Montana’s Mine Waste Cleanup Bureau – USA,	<a href="#">p11</a>
Clean Water Act (CWA) – USA	<a href="#">p13</a>	National Pollutant Discharge Elimination System permit – USA	<a href="#">p13</a>
Community of Interest Panel (COI) – Canada	<a href="#">p18</a>	The National Research Council – USA	<a href="#">p12</a>
The Comprehensive Environmental Response, Compensation and Liability Act of 1980, Superfund law (CERCLA) – USA	<a href="#">p13, p14</a>	Responsible Minerals Assurance Process (RMAP) – Canada	<a href="#">p21</a>
Downstream Companies List – Canada	<a href="#">p21</a>	Responsible Minerals Initiative Act (RMI) – Canada	<a href="#">p21</a>
Environmental Excellence Award – Canada	<a href="#">p19</a>	Responsible Mining Assurance (IRMA) – Canada	<a href="#">p21</a>
Environmental Impact Assessment (EIA) – Global term	<a href="#">p9</a>	Risk Readiness Assessment – Canada	<a href="#">p21</a>
Environmental Management Systems (EMS) – Global term	<a href="#">p6</a>	Social License to Operate (SLO) – Global Term	<a href="#">p10</a>
Environmental and Social Impact Assessment (ESIA) – Global term, Australia’s East Coast	<a href="#">p6</a>	Social Impact Assessment (SIA) – Global Term	<a href="#">p6, p10</a>
Exploitation Concession (Mining license)	<a href="#">p10</a>	Surface Mining Control and Reclamation Act (SMCR) – USA	<a href="#">p14</a>
The International Council on Mining & Metals (ICMM) – Australia’s Commonwealth government	<a href="#">p6, p16</a>	Towards Sustainable Mining Standard, (TSM) – Canada, Finland, Argentina, the Philippines, Spain, Brazil and Botswana	<a href="#">p18</a>
Initiative for Responsible Mining Assurance (IRMA) – Canada	<a href="#">p21</a>	TSM Community Engagement Excellence Award – Canada	<a href="#">p19</a>
The Kellogg Innovation Network (KIN) – Global	<a href="#">p17</a>	Water Management Plan (WMP) – Global Term	<a href="#">p8</a>
		World Health Organization (WHO) – Global	<a href="#">p7</a>

# ABOUT INTENGINE

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## WHAT MATTER TO US

### **The Power of Good**

Positive incremental changes in our everyday lives can lead to substantial transformations on a global scale.

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Respect, replenish and reuse the earth's resources to maximize its potential with the least impact.



# ABOUT INTENGINE

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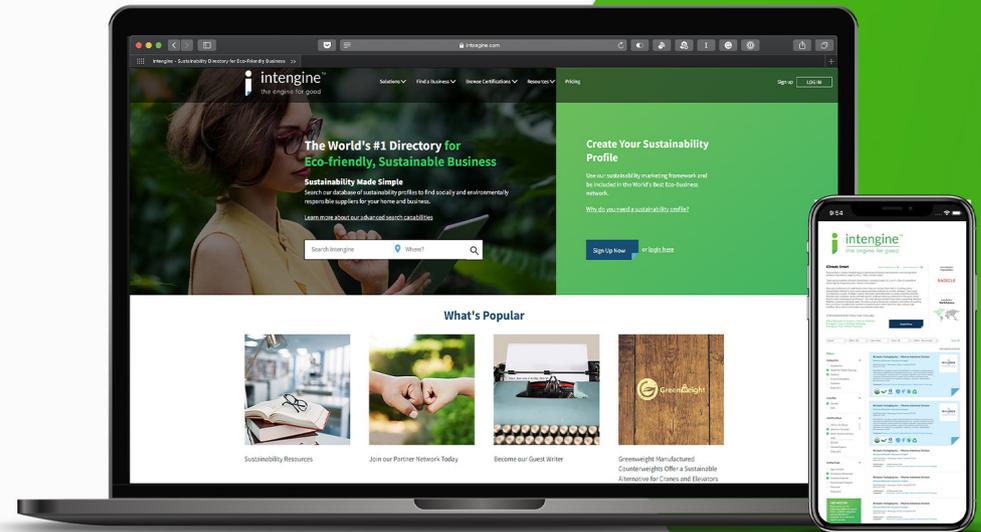
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