Daira Sabz
CONSULTING & ENGINEERING GROUP
Development & Sustainability

Green Mining: Sustainable Solutions for Present and Future Mining

Executive Summary

Mining has long been a critical industry, providing essential minerals for countless products. However, traditional mining practices have often led to significant environmental degradation, community disruption, and long-term ecological consequences. Recognizing these impacts, the industry is moving towards a "Green Mining" approach, which aims to balance resource extraction with environmental stewardship and social responsibility.

This white paper, prepared by Daira Sabz Consulting and Engineering Group, explores the principles, challenges, and solutions surrounding Green Mining. Drawing on our extensive experience in sustainable environmental consulting, engineering, and geotechnical expertise, we present a strategic framework for implementing eco-friendly mining practices that support industry resilience while preserving natural ecosystems.

Introduction: The Need for Green Mining

The growing awareness of climate change, biodiversity loss, and water scarcity is driving industries to reevaluate traditional operations. Mining companies, in particular, are under increasing pressure from regulators, investors, and local communities to adopt sustainable practices that minimise environmental impacts.



Figure 1 Mining extraction site

Green Mining represents a paradigm shift within the industry—moving from extraction-focused operations to processes that actively mitigate environmental harm, reduce carbon footprints, and integrate more responsible waste management systems. With effective planning and implementation, Green Mining can redefine resource extraction by reducing adverse impacts while ensuring profitable outcomes.

Principles of Green Mining

Green Mining is guided by core principles designed to address environmental, social, and governance (ESG) challenges in mining:

1. **Resource Efficiency**: Maximizing resource use efficiency to reduce waste.
2. **Reduction of Environmental Footprint**: Minimizing deforestation, habitat destruction, and pollution from mining activities.
3. **Waste Management and Recycling**: Implementing strategies for tailings management, reuse of byproducts, and recycling of mining waste.
4. **Water and Energy Conservation**: Utilizing innovative water management techniques and renewable energy sources to reduce the overall energy footprint.

5. **Community Engagement and Fair Practices**: Establishing transparent, community-



Figure 2 Principles of green mining

centered practices to ensure that local populations benefit from mining operations.

Challenges in Green Mining

Green Mining implementation faces several industry-specific challenges, including:

1. **Technological Gaps**: Many environmentally friendly technologies are still in the development phase, and their costs may limit adoption in smaller mining operations.
2. **Financial Constraints**: Initial investments for sustainable practices can be high, posing a challenge for companies operating in regions with limited funding opportunities.
3. **Regulatory Differences**: Varied environmental standards and regulations across regions can create inconsistencies in sustainable practices and compliance requirements.
4. **Community Expectations**: Mining can impact local communities, so managing community relations and expectations becomes essential.
5. **Skilled Workforce Requirements**: Transitioning to Green Mining requires specialized expertise in sustainable engineering and environmental science.



Figure 3: Green Mining Challenges

Daira Sabz Consulting's Approach to Green Mining

As a leader in Geotechnical and Mining, Road and Construction, and Environmental consulting and Engineering, Daira Sabz is committed to advancing Green Mining solutions. Our approach is multifaceted, focusing on the following key areas:

1.1 Environmental and Social Impact Assessments (ESIA)

- Conduct comprehensive ESIAs to identify potential environmental and social impacts before mining projects begin. These assessments include biodiversity studies, water and air quality evaluations, and social impact surveys.
- Engage stakeholders, including government bodies, local communities, and NGOs, in every step of the process to ensure transparency and alignment with sustainable goals.

1.2 Tailings Management Solutions

- Implement sustainable tailings management practices to prevent leakage and contamination. Techniques include dry stacking, tailings reprocessing, and the use of geosynthetic liners.
- Develop monitoring systems that detect tailings failure risks early and implement preventive measures to mitigate potential hazards.

1.3 Energy-Efficient Mining Technologies

- Encourage the adoption of renewable energy sources, such as solar and wind, to power mining operations and reduce greenhouse gas emissions.
- Introduce energy-efficient equipment and technologies, such as electric vehicles for transportation and automated machinery, to reduce energy consumption and operational costs.

1.4 Water Conservation Techniques

- Employ water recycling methods to maximize water reuse and reduce the need for freshwater extraction.
- Develop sustainable water management strategies to prevent contamination and ensure that surrounding water bodies remain unaffected by mining activities.

1.5 Community-Centered Planning and Support

- Establish programs that prioritize local hiring, education, and health initiatives, ensuring that communities benefit from nearby mining projects.
- Develop long-term plans for site reclamation and land restoration, transforming former mining sites into green spaces, forests, or agricultural land for community use.

Case Study in Green Mining

Daira Sabz Consulting has partnered with mining companies to implement Green Mining practices. Below are highlights from a recent project demonstrating our commitment to sustainable solutions:

Project 1: Aynak Copper Deposits[1], Afghanistan

- **Scope**: Provided environmental and social impact assessments and developed management plans for social and environmental sustainability.
- **Outcome**: The outcome would be reduced pollution risks, improved community relations, and ensured compliance with Afghanistan's environmental regulations.



Figure 4 Daira Sabz staff measuring environmental parameters

Strategic Framework for Green Mining Implementation

Based on our industry expertise, Daira Sabz Consulting has developed a strategic framework for Green Mining that includes the following steps:

1. **Baseline Studies**: Conduct environmental and social baselines to assess the existing conditions of the mining site.
2. **Stakeholder Engagement**: Engage all relevant stakeholders in a transparent dialogue process to foster trust and collaboration.
3. **Sustainability Planning**: Develop a sustainability action plan covering resource management, water and energy use, and community engagement.
4. **Monitoring and Adaptation**: Establish monitoring systems to assess environmental impacts and adjust practices based on real-time data.

[1] Mes Aynak Copper Project: ESIA, Baselines & ESMP | Daira Sabz Group

5. **Closure and Reclamation Planning**: Design post-mining land-use strategies to restore the environment and create sustainable post-mining benefits for the community.

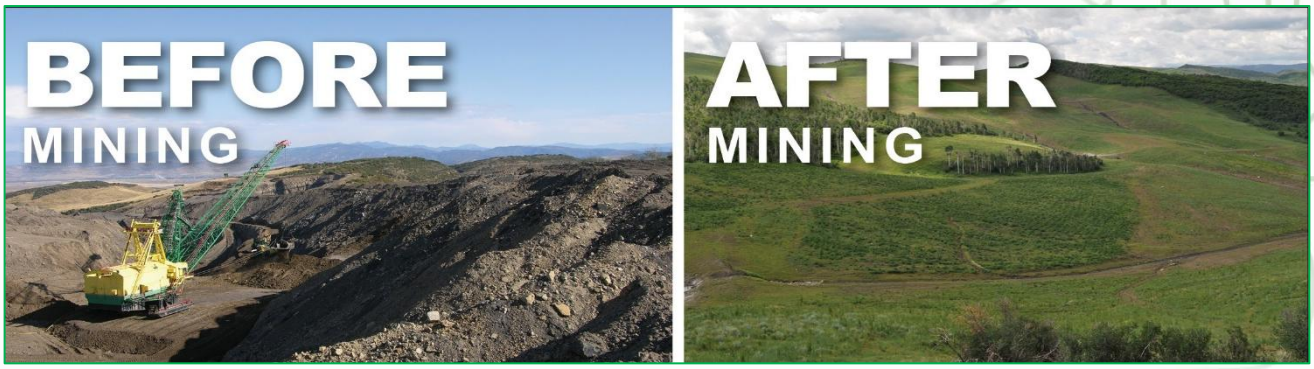


Figure 5 Mine clsoure; before and after

Conclusion

Green Mining is not just a trend; it is a necessary evolution in the mining sector that addresses the pressing environmental and social challenges facing our world today. Through innovative strategies and community-centred approaches, mining companies can reduce their environmental impact while ensuring economic viability.

Daira Sabz Consulting and Engineering Group is ready to help mining companies achieve their Green Mining goals. Our expertise in environmental consulting, sustainable engineering, and stakeholder engagement makes us a trusted partner for companies committed to environmental stewardship and social responsibility. By choosing Green Mining, companies can secure a sustainable future while meeting the demands of a changing world.

Contact us:

info@dairasabz.com
www.dairasabz.com