



PERSPECTIVE

ESG INCORPORATION IN MINING

JUNE, 2023

ESG PILLARS

ORIGIN AND
EVOLUTION
OF ESG

ESG CRITERIA
IN MINING
INDUSTRY

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ABOUT GEM

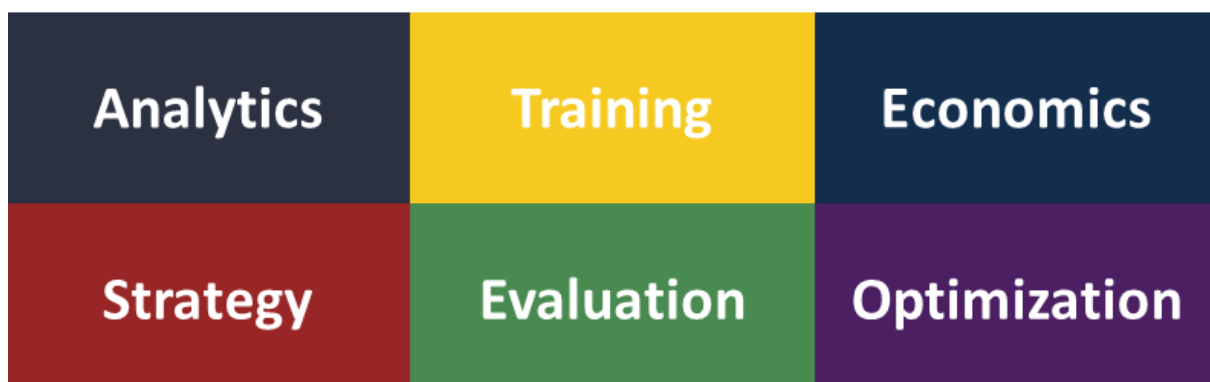
We are an industrial engineering company whose focus is to support the mining industry in management and economics. We have six business areas, which encompass all our experience, while we develop the most advanced tools applied in mining. With more than 14 years of experience and more than 400 projects successfully implemented worldwide.



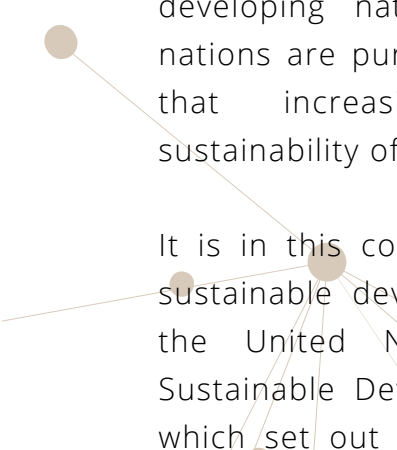
MISSION

We are a provider of industrial engineering products and services of excellence to the global mining industry. We seek to pave the way for the mining industry of the future, while maximizing the business value of our clients by improving their ability to make strategic decisions, through innovative services delivered effectively by a highly qualified professional team.

We have 6 business areas:



INTRODUCTION



The last 20 years have seen significant global growth, mainly facilitated by emerging economies (Picciotto, 2015). This growth has been mainly boosted by strategies focused mainly on the export of products and services, in developing nations, while developed nations are pursuing growth strategies that increasingly consider the sustainability of the projects involved.

It is in this context of the search for sustainable development that in 2015 the United Nations published the Sustainable Development Goals (SDG), which set out 17 goals to generate a sustainable future.

These goals become a new standard for all companies and organizations in the world, which not only seeks to grow, but to grow in a sustainable way and to reach the rest of the people.

In these same circumstances, we have seen the emergence of new interested parties or new stakeholders in the project evaluation or decision-making processes. Thus, in order to achieve sustainable development, it is no longer only the economic value that must be considered, but also the value for society, the community and the presentation of practices that mitigate environmental impacts.

This phenomenon is called the "democratization of the actors", because new actors emerge to be considered in decision making, such as the community, the environment and society, to name some of the main ones.

It is in this context that new paradigms emerge, in which new actors must be integrated, sustainable growth must be generated and new tools for evaluating projects must be developed.

These new paradigms together have been referred to as the "Triple Revolution" (Picciotto, 2015), in the way a project is evaluated and considered. Because a modern decision-making process must integrate a multi-criteria evaluation, in which society, community and environment are considered in the evaluation.

But factors such as society, environment and community need guidelines to be integrated by companies. This is why the ESG or Environment, Social and Governance pillars were created in 2004, through a joint effort between the United Nations Environment Program and the Global Reporting Initiative (GRI).

These factors allow measuring the degree of sustainability of an organization or project through specific KPIs and have been widely adapted in different industries.

This report will explain the evolution of project evaluation methodologies, up to modern evaluation methodologies that consider new objectives, such as including environmental and social obligations by organizations. In addition, it will introduce in more detail the ESG pillars and how they are considered in the mining industry.



EVOLUTION OF PROJECT EVALUATION METHODOLOGIES

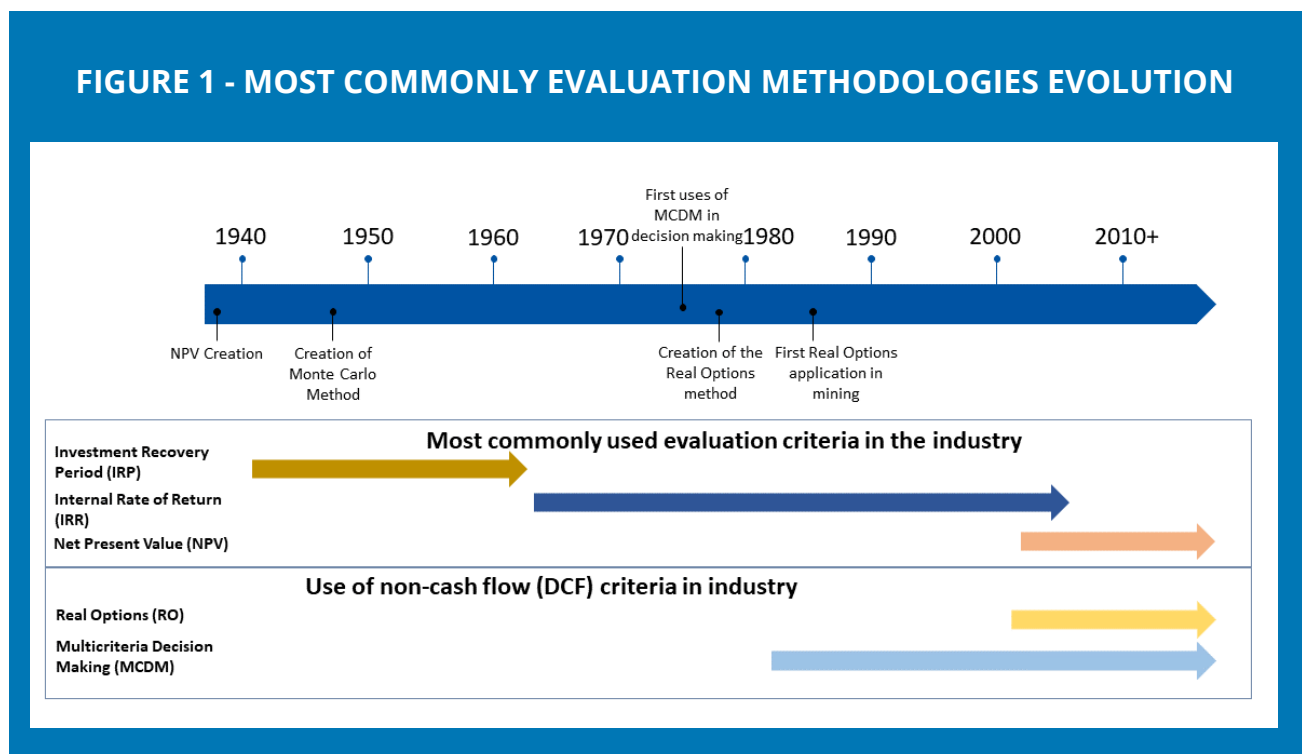
The methodologies used in project evaluation are not static over time, but have been changing throughout history. The understanding of how to make the right decisions regarding whether or not to carry out a project or how to materialize it, is something that has undergone important changes as the objectives and tools available to companies have changed.

At the end of the 1960s, the metric most used by companies to evaluate their projects was the Payback Period (Mao, 1970), because of its simplicity and because it is aligned with the objectives of the project owners. However, if we review the 2000s, there is an important trend to use the Net Present Value (NPV) to evaluate projects (Ryan & Ryan, 2002), mainly due to the improvement in technology, making more complex evaluation tools (spreadsheets) more accessible, and advances in the area of "Decision Theory".



In the literature there are several metrics or methodologies to evaluate projects. The best known ones correspond to: Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period, Real Options (RO), Profitability Index (NPVI), Value at Risk (VaR) and Multicriteria Decision Models (MCDM). All these metrics or methodologies present advantages and disadvantages with respect to the rest, although there is currently a consensus among academics to favor the use of NPV and Real Options, over other alternatives (De Andrés & De La Fuente, 2014).

For this report GEM conducted a literature review of the evolution of the most used evaluation criteria. The result of this review is shown in **Figure 1**, which shows the evaluation criteria most used by the mining industry in each period and at the same time presents the massive incorporation of non-cash flow based criteria, such as Real Options and Multi-Criteria Decision Models.



Source GEM: Based on Andres & de la Fuente (2014), Ryan & Ryan (2022) and Siziba & Hall (2019)

Figure 1 shows that between 1940 and the mid-1960s, Payback Period was the main evaluation method used for projects. Later, the IRR became the most widely used criterion until the mid-2000s. One of the advantages of the Payback Period is that it is an easy to compute and explain measure, which can give an idea of the project's risk. On the other hand, the IRR is a measure that allows making projects comparable to each other, and fits better with the thinking of managers in terms of rate of return.

Finally, NPV became the most widely used option in the industry from the mid-2000s to the present.

Although the above are still the most used criteria today, they have started to be used in conjunction with Real Options Models and Multi-Criteria Decision Models, in order to generate more robust and flexible decisions.



MODERN METHODOLOGY FOR PROJECT EVALUATION: MULTI-CRITERIA ANALYSIS

In the article "The 5th Wave" (Picciotto, 2015), the evolution of project evaluation and how it affects decision making, from its creation in the 1950s-1960s to the present time, is analyzed. **Four waves are identified: rationalist, participatory, neoliberal and evidence-based.** The fifth wave of evaluation, according to its author, is emerging, driven by new pressures and actors in society that prioritize social and environmental value, converging to a multi-criteria evaluation method.

The current global operating environment is marked by changing wealth patterns, inequality, systemic risk, climate change and where new actors have become highly relevant. In this context, it is necessary to integrate social, environmental and business sustainability criteria in decision making.



The need to integrate new criteria has led to the use of **ESG pillars (Environmental, Social and Governance pillars)** in the assessment. These pillars provide a clear guide of criteria for quantifying and reporting indicators by company, are associated with various economic benefits and have been widely integrated in several organizations.

Considering the nature of the decision to be made, where it is not only required to decide with respect to the economic value, but also to integrate other variables such as social and environmental variables, it is critical to use a decision making model that considers multiple criteria. This is why it is necessary to use **Multi-Criteria Decision Models (MCDM)**, which seek to support multi-criteria decision making and generate an evaluation framework that achieves consistency in its results, where the outcome is similar if the input variables vary slightly.

Therefore, the choice of the model to be used in the evaluation is important. Each model has its advantages and disadvantages with respect to the others. Some are more biased than others, while some are more consistent than others. There are different multi-criteria analysis methodologies, the best known and most used are:



"It is necessary to use **Multi-Criteria Decision Models (MCDM)**, which seek to support multi-criteria decision making and generate an evaluation framework that achieves consistency in its results, where the outcome is similar if the input variables vary slightly".

a) Weighted Sum Model (WSM): a simple and commonly used methodology in which alternatives are evaluated based on a weighted sum of their performance on each criterion.

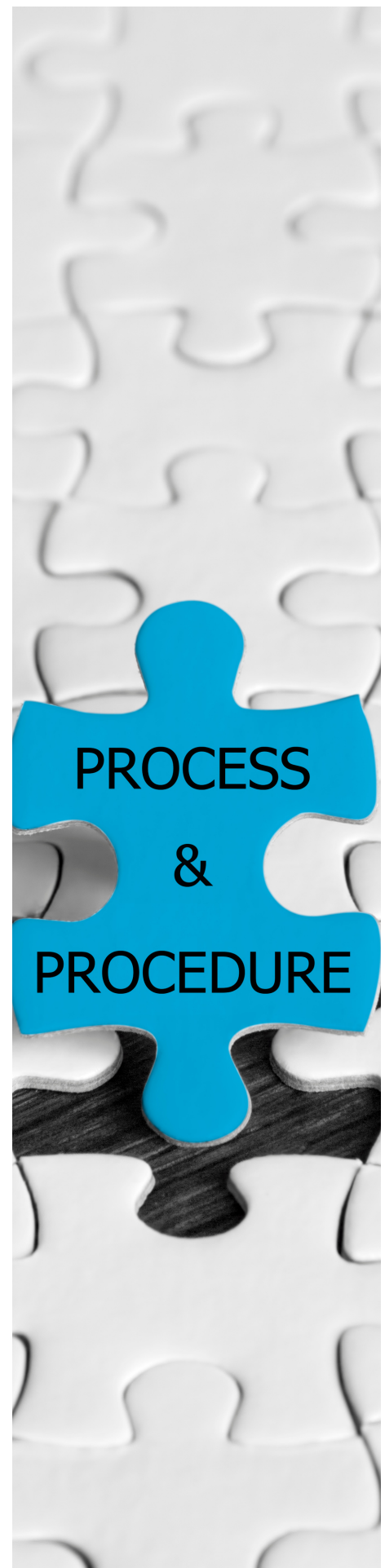
b) Analytic Hierarchy Process (AHP): a popular methodology that involves dividing a decision problem into a hierarchy of criteria and sub-criteria, and then using pairwise comparisons to determine the relative importance of each element in the hierarchy.

c) Multiple Attribute Utility Theory or Technique for Order Preference by Similarity to Ideal Solution (TOPSIS): a methodology that involves dividing the alternatives into feasible and infeasible sets, and then ranking the feasible alternatives according to their relative performance.

d) Simple Additive Weighting (SAW): a methodology that involves assigning weights to each criterion and then evaluating alternatives by adding their scores on each criterion, weighted by the importance of that criterion.

e) Simple Multi-Attribute Rating Technique (SMART): The key difference between SMART and other multi-criteria analysis methodologies is that SMART does not involve assigning numerical weights to the criteria. Instead, the method relies on subjective judgment to evaluate the criteria and assign scores.

The key to the choice of methodology is to look at the amount of data that can be collected, the ease of using the model, and the consistency needed to perform the evaluation, where the results of the model will support the final decision making.



ESG PILLARS

The acronym ESG is associated with the terms Environmental, Social and Governance. These terms are associated with factors that are used by investors to evaluate sustainability, as well as the ethical and social behavior of the company.

The Environmental factor relates to the impact on the environment, use of both renewable and non-renewable resources, and energy efficiency. The Social factor addresses social issues in workers' quality of life, the community, human rights, diversity and inclusion. Finally, the Governance factor refers to a company's management structures and practices, including corruption, due diligence, leadership and transparency. These factors are not only qualitative, but also quantitative.



These factors are not only qualitative, but also quantitative. Based on the literature review on the use of **ESG**, it was found that companies that present good numbers in this type of indicators tend to present: better financial results (Eccles et al., 2015; Marsh & McLennan, 2020), better reputation (Nielsen, 2018) and ease of access to new markets (Accenture, 2017), to name some of the most significant.

Better financial results are influenced by a greater ability to attract talent, improved reputation, greater ability to attract investors and customers.

This section will briefly describe the origin and evolution of the ESG pillars as well as some ESG metrics in the industry, with the objective of understanding the motivation and the scope of ESG.

ESG: ORIGIN AND EVOLUTION

ESG criteria emerged in 2004 through the report "Whom Cares Wins - Connecting Financial Markets to a Changing World" as a joint initiative between the United Nations Environment Programme and the **Global Reporting Initiative (GRI)**. The report provided guidelines for companies to incorporate environmental, social and governance factors into their operations, and to communicate their sustainability performance to investors and stakeholders, using the GRI sustainability guidelines.

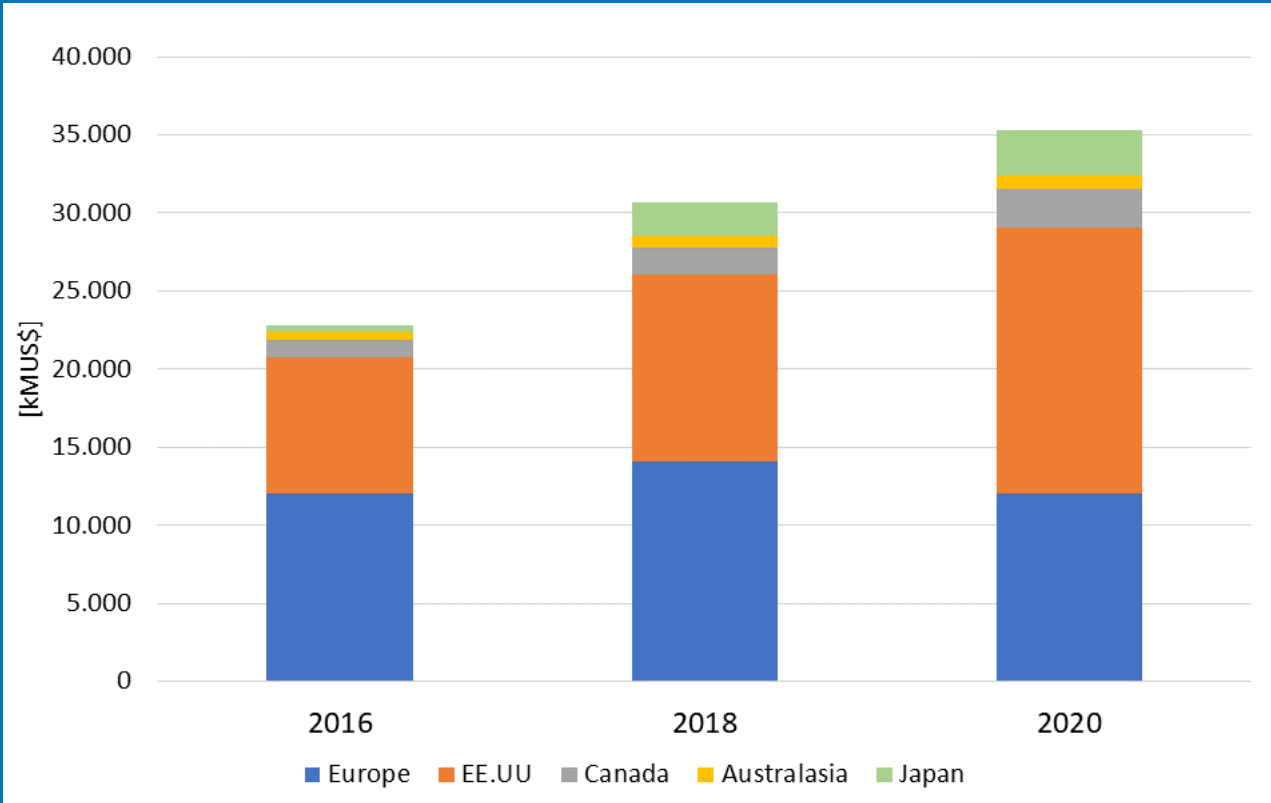
In 2011, the **Sustainability Accounting Standards Board (SASB)** was created with the mission of developing sustainable accounting standards. This would allow investors, lenders and other stakeholders to analyze, evaluate and compare different companies with similar evaluation criteria. This SASB reporting standard gives companies guidelines for reporting ESG indicators, identifying the most important KPIs in each industry and how they should be reported in financial statements. In this way it is possible to understand the economic, environmental and social impact of companies.



In 2015, the **Sustainable Development Goals (SDG)** emerged, providing a framework for countries, companies and individuals to implement sustainable development. In 2021 the CEO of BlackRock publishes a letter to investors, where he emphasizes the need for companies to act in the rapid adaptation of ESG criteria, using frameworks such as SASB or TCFD (Task Force on Climate-Related Financial Disclosures), stating that if they are not adopted, they will be eliminated from the funds to be invested.

Recent years have seen significant growth in the reportability of ESG criteria through companies, to the extent that funds managing sustainable assets have grown to manage a total of \$35.301 trillion, as shown in **Figure 2** (GSIA, 2021).

FIGURE 2. AMOUNT OF SUSTAINABLE INVESTMENT ASSETS UNDER MANAGEMENT BY FUNDS



Source GEM: Based on GSIA (2021)

Note: The value of assets is expressed in billions of U.S. dollars. Global assets are based on data reported by Europe, the United States, Canada, Australia, New Zealand and Japan for the purposes of the 2016, 2018 and 2020 GSIR

ESG METRICS

The ESG (Environmental, Social and Governance) pillars present multiple areas from which KPI can be obtained, some of these important areas to mention are: pollutant emissions, biodiversity, renewable energy, water use, waste, safety, human rights, labor relations, ethics, transparency, etc.

Due to the varied areas where performance can be measured in the ESG pillars, the SASB (Sustainability Accounting Standards Board) metrics specified in the mining industry are presented to reconcile the most important areas and the KPI used to measure them.

Table 1 specifies the topics or areas that are measured in the SASB reporting framework in the mining industry and at the same time specifies KPIs that can be used to measure these topics.

TABLE 1. METRICS AND TOPICS INCLUDED IN THE SASB FRAMEWORK FOR MINING

TOPIC	UNIT	EVALUATION METRIC
Greenhouse gas emissions	Metric tons CO ₂ -e (ton)	Scope 1 Gross Global emissions
Air quality	Metric tons CO ₂ -e (ton)	Atmospheric emissions of CO, NO _x , SO _x , PM ₁₀ , Hg, Pb, and VOCs
Energy Management	Gigajoules (GJ), Percentage (%)	(1) Total energy consumed, (2) Percentage grid consumption, (3) Renewable percentage
Water management	Thousands of cubic meters (m ³), Percentage (%)	(1) Total freshwater withdrawn, (2) total freshwater consumed, percentage of each in regions with high or extremely high water stress, (3) total freshwater withdrawn, (4) total freshwater consumed, percentage of each in regions with high or extremely high water stress
	Number	Number of non-compliance incidents associated with water quality permits, standards and regulations
Waste management & Hazardous materials	Metric tons sold (ton)	Total weight of non-mineral wastes
	Metric tons sold (ton)	Total weight of tailings produced
	Metric tons sold (ton)	Total weight of waste rock
	Metric tons sold (ton)	Total weight of hazardous waste
	Metric tons sold (ton)	Total weight of recycled hazardous waste
Biodiversity impacts	Percentage (%)	Percentage of (1) proven and (2) probable Reserves near conservation status or endangered species sites
Security and human rights	Percentage (%)	Percentage of (1) proven and (2) probable Reserves near conflict areas or indigenous lands
Communal relations	Number	Number and duration of non-technical delays
Labor relations	Percentage (%)	Percentage of active workforce covered by collective bargaining agreements, broken down by U.S. and foreign employees
	Days	Number and duration of strikes and lockouts
Ethics and transparency	Metric tons sold (ton)	Production in countries at the 20th percentile or below the Corruption Perception index

Source GEM: Based on SASB (2017)

Table 1 lists some of the metrics that a mining company should measure if it adheres to the SASB framework. These include multiple areas and provide a guide for deciding what elements a company should measure in that area.

The SASB (Sustainability Accounting Standards Board) Framework is intended to help companies around the world identify, assess and report on ESG issues that are of interest to investors.

The indicators presented in **Table 1** present a level of duality in that they can be used as (1) evaluation metrics, which report on project performance and are used to make strategic decisions about projects, or (2) management metrics, which are indicators that report on operational performance, can be measured on an ongoing basis as the project is carried out, and can measure elements such as project progress, efficiency, emissions, operating expenses and revenues.



MINING INDUSTRY CONTEXT WITH RESPECT TO ESG

In recent decades, society's concern has increased in different areas, such as care for the environment, the company-community relationship, and corporate transparency.

This has led companies to consider the positive and negative impacts derived from their management. At the same time, investors, shareholders and stakeholders are also becoming more demanding of companies to make changes in pursuit of the new paradigms.

ESG indicators, as explained in the previous section, **seek to measure the impact and externalities generated by projects and/or operations.**



It should be noted that the indicators in the case of a project or operation are not necessarily the same. For example, the NPV economic indicator is used to determine the net present value of a project under evaluation. However, NPV, in general, is not measured while the operation is under development; rather, other indicators are measured to monitor performance (Project Management Institute, 2017). In fact, there is an opportunity to manage NPV during project execution, but usually what is done is to perform an Expost Analysis to compare and evaluate the projected NPV vs. the actual NPV of the project.

Therefore, although it is important for the project to know the future flows, for the operation itself it may be more important to focus on being efficient during day-to-day operation, so NPV is not the best indicator to measure the management of the operation. Similarly, a distinction must be made between ESG indicators for evaluating a future project and ESG indicators for managing the operation, primarily because they serve different purposes.

This chapter will document the state of the art in the industry concerning ESG indicators, with special emphasis on the mining industry and the efforts made in this area.

It should be noted that the ESG indicators that are mainly used and presented in the industry correspond to indicators that measure the management of the operation. In some cases, indicators or KPIs arising from ESG may be considered, but they are not always a priority in project evaluation. However, there is an opportunity to incorporate such indicators into evaluations and gain an advantage in the race for sustainability.

Companies have been reporting some ESG indicators, especially in the publication of annual sustainability reports. Both mining and non-mining companies report similar indicators, so a first finding is that there is no great difference between the indicators by sector. The following is a list of the main indicators reported by the companies, with a brief description.

1) CO₂ emissions intensity: It is the amount of CO₂ equivalent over the amount of ore, fine or sales of the company.

2) Energy intensity: The amount of energy over the amount of ore, fines or sales of the company.

3) Inland water use intensity: Amount of inland water used over the amount of ore, fines or sales of the company.

4) Percentage of renewable energy use: Percentage of renewable energy in relation to total energy used.

5) Workforce parity: Percentage of female workers in relation to total workers.

6) Social investment: Amount of money invested in local communities, either in programs or direct aid.

As it indicated on **Table 2** presents the main ESG indicators reported by the largest copper-producing companies worldwide. These data were obtained from company sustainability reports and company websites, for more details see the sources of the tables. A check mark represents that the company is reporting the indicator in its sustainability reports or other reports, while a red cross represents that the company is not reporting the metric in question in these documents.

Intensity indicators help to understand how efficient companies are in their operation by reporting how much CO₂ they emit and how much energy and water they use per 1 ton of ore, fine or per million dollars of sales. This way of measuring emissions and resource use is being widely used and has the advantage that comparison with other companies is simple. It should be noted that companies may have the data to calculate these metrics, but are not generating or tracking them because they have not given them the necessary importance.

Table 2 shows that First Quantum Minerals (Canada), FreePort-McMoran (United States) and Teck (Canada) report a considerable number of ESG indicators. The companies that report the least number of indicators are KGHM and Rio Tinto.

Table 2 shows the indicators reported by some of the largest copper producing companies with a strong presence in Chile. From the table it can be seen that the four companies registered in the table present the majority of the ESG indicators. Additionally, when comparing **Table 2**, it is observed that the companies with presence in Chile report the same indicators as First Quantum Minerals, Freeport-McMoran and Teck and more indicators than KGHM, Rio Tinto, Zijin Mining and Glencore.

From this it can be seen that the companies operating in Chile are well positioned with respect to the international situation and that there is a concern on the part of the companies and stakeholders to advance in sustainability with a mining of the future.

TABLE 2. ESG INDICATOR REPORTABILITY COMPARISON

KPI	UNIT	FREEPORT-MCMORAN (2021)	FIRST QUANTUM MINERALS (2021)	GLENCORE (2021)	KGHM (2021)	RIO TINTO (2022)	TECK (2021)	ZUIJN MINING (2021)	SOUTHERN COPPER (2020)	AMSA (2021)	ANGLO AMERICAN (2022)	BHP (2022)	CODELCO (2021)
Intensity CO ₂ eq emissions	$\frac{CO_2 \text{ eq. } [Mt]}{\text{Tone of Copper } [kt]}$	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
Energetic intensity	$\frac{\text{Electrical consumption } [\frac{Wh}{kt}]}{\text{Tone of Copper } [kt]}$	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓
Inland water intensity	$\frac{\text{Water consumption } [\frac{m^3}{kt}]}{\text{Tone of Copper } [kt]}$	✗	✓	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗
Renewable energy proportion	$\frac{\text{Renewable energy } [\frac{Wh}{Wh}]}{\text{Total energy } [\frac{Wh}{Wh}]}$	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
Labor force parity	$\frac{N^{\circ} \text{ Female workers}}{N^{\circ} \text{ total workers}}$	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
Workforce training	Training investment	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓
Social security	N° de accidents	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
Social investment	MUS\$	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓

Source: Own elaboration

NEED TO INTEGRATE REPORTING AND ESG ELEMENTS

Although there is a tendency for companies to measure and report ESG indicators, there is a need to have standardized indicators at the industry level. This is due to the fact that companies currently have different ways of reporting the same indicator. This makes comparison between companies impossible.

Companies should make efforts to generate standards because it helps to understand their strategic position with respect to the rest of the industry, in addition to helping investors and stakeholders to know the situation of the company compared to the rest.

On the other hand, even if a company's indicators are below the industry average, so there may be no incentive to report indicators, this could help focus efforts within the company and advance unified efforts. In addition, it is expected that standardization at some point in the future will be required of companies. This is because the ESG pillars will not be a differentiator, but rather, an industry minimum. In this sense, companies that plan and manage the necessary changes to comply with the new ESG standards will be better prepared to face the changes that will occur.

Figure 3 present some of the ESG indicators of the companies presented above. The companies that do not appear due to lack of information, either because they do not measure the indicator or because they do not report a specific value.

From **Figure 3** it can be observed the lack of existing standardization. For example, in the greenhouse gas emissions column, all of them show a decrease with respect to some base year of their own.

The CO₂ emissions intensity metric could help to understand the impact that exists in tons of CO₂ per ton of copper fines. The same is true for inland water consumption and social investment. In the case of tailings storage, each company highlights something different.

FIGURE 3. SUMMARY OF COMMITMENT TO KEY ESG VARIABLES IN LEADING MINING COMPANIES

	CODELCO	Freeport-McMoRan	GLENCORE	BHP	SOUTHERN COPPER	FIRST QUANTUM	KGHM	ANTOFAGASTA PLC	Zijin	AngloAmerican	RioTinto	Teck
GREENHOUSE GAS EMISSIONS	70% ↓ by 2030 (base year 2021) Zero by 2050	15% ↓ by 2030 (base year 2021) Zero by 2050	50% ↓ by 2035 (base year 2019) Zero by 2050	30% ↓ by 2030 (base year 2020) Zero by 2050	---	50% ↓ by 2030 (base year 2020) Zero by 2050	30% ↓ by 2030 (base year 2020) Zero by 2050	30% ↓ by 2030 (base year 2020) Zero by 2050	20% ↓ by 2030 (base year 2020) Zero by 2059	30% ↓ by 2030 (base year 2016) Zero by 2050	50% ↓ by 2030 (base year 2018) Zero by 2050	33% ↓ by 2030 Zero by 2050
WATER CONSUMPTION CONTINENTAL	60% ↓ by 2030 (base year 2021)	87% water use efficiency (base year 2021)	Varies according to mine location	29% ↓ by 2030 (base year 2017)	2021 74% of the water used was recirculated	5% ↓ in 2021 water used per ton of ore processed (base year 2020)	2 million invested for inland and groundwater protection/restoration	90% of the water used by 2025	10% ↓ by 2030	Zero by 2040	42% of water used in operations is recycled (base year 2018)	33% of water used in operations is recycled (base year 2021)
TAILINGS STORAGE FACILITIES	According to ICM 50% of the requirements would be met by 2021. (2-year plan to develop 4 reservoirs)	Global tailings standards—Priority No. 1	Commitment to prevent tailings storage tailings storage	Commitment to Global Tailings Management Industry Standard	In the process of implementing the Global standard for Tailings Management in Mining Industry (ICMM)	10/19 Active tailings storage (base year 2021)	45.7 million investment in development of new tailings storage facility	Tailings management	52 total tailings storage	53 total tailings storage	Tailings audits according to company standards	By 2021, 75% of tailings facilities compliant with GISTM standard
PERCENTAGE OF LOCAL WORKERS	59% Local labor (base year 2021) min 10% - to hire for new investment projects	99% of employees (base year 2021)	Varies according to mine location	8% in Australia by 2025 10% in Chile by 2026 20% in Canada by 2027	39.5% of workers are from local communities	94% of workers are locals (base year 2021)	---	39% of workers belong to local communities	---	5 Jobs created for each job in the operation to 2030	---	69% of workers belong to local communities (base year 2021)
INVESTMENT IN LOCAL COMMUNITIES	0,05% of pre-tax profits for social investment (base year 2021)	0,72% of total earnings invested in communities (base year 2021)	0,03% of total earnings invested in community programs (base year 2021)	0,31% of total profits invested in community initiatives (base year 2021)	2,2% of net income invested in social and philanthropic programs (2021 base year)	0,43% of total earnings invested in community programs (base year 2021)	---	0,66% of total profits invested in social projects	0,33% of total profits invested in social investment	0,33% of total profits invested in social investment (base year 2021)	---	0,82% of pre-tax profits invested in social investment (base year 2021)

Source: Own elaboration

NEED FOR INCORPORATING ESG CRITERIA

All of the ESG metrics that have been presented correspond to indicators used to manage the operation. Unfortunately, no evidence in the academic literature robustly presents that projects incorporating ESG indicators have been evaluated.

One cause of this may be that because the details of an evaluation of a project or series of projects are not publicly disclosed, so although ESG indicators may be measured, this is not being reported to the general public (Shenhar and Dvir, 2007). Another probable cause could be that there are other indicators that take on greater prominence when evaluating projects. For example, NPV or undiscounted cash flow, among others. Therefore, the decision criterion between doing or not doing the project or between doing one or the other project is given by the indicator with the greatest preponderance.

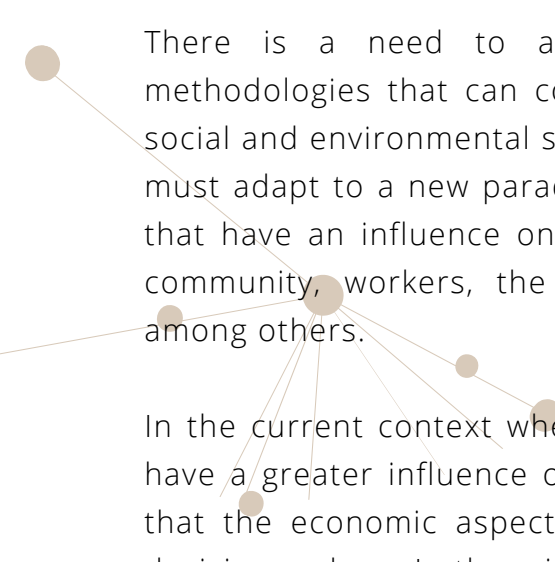
Currently, it is important not to rely solely on one criterion or indicator when evaluating a project because there are multiple dimensions that could affect the project in one way or another. Furthermore, just as NPV, Payback period or IRR provide different information, ESG indicators provide information on aspects that are important and were not considered before, such as environmental, social and governance areas. In order to solve this problem, multi-criteria analysis methodologies should be used to integrate multiple indicators and metrics in a project evaluation.



CONCLUSION



Based on the findings of this report, the industry is making progress in the inclusion of ESG criteria, which are increasingly requested by investors and customers. In addition to being more requested for the inclusion of criteria, there is evidence of a relationship between the reporting of ESG criteria by companies and 1) better financial results, 2) better social reputation (workers, community, investors and customers) and 3) ease of access to new markets.



There is a need to advance and implement modern project evaluation methodologies that can consider multiple criteria and dimensions, including the social and environmental spheres. As stated in Picciotto (2015), project evaluations must adapt to a new paradigm regarding the democratization of the stakeholders that have an influence on the project. These new stakeholders include the local community, workers, the environment, clients, investors, shareholders, banks, among others.

In the current context where stakeholders are more empowered, where they can have a greater influence on companies and projects, it is important to recognize that the economic aspect is not the only important thing to be considered by decision makers. In the mining industry of the future, ESG must be integrated with multi-criteria methodologies to improve the decision-making process. This will be key to implement successful projects not only from an economic point of view, but also from a social and environmental one.

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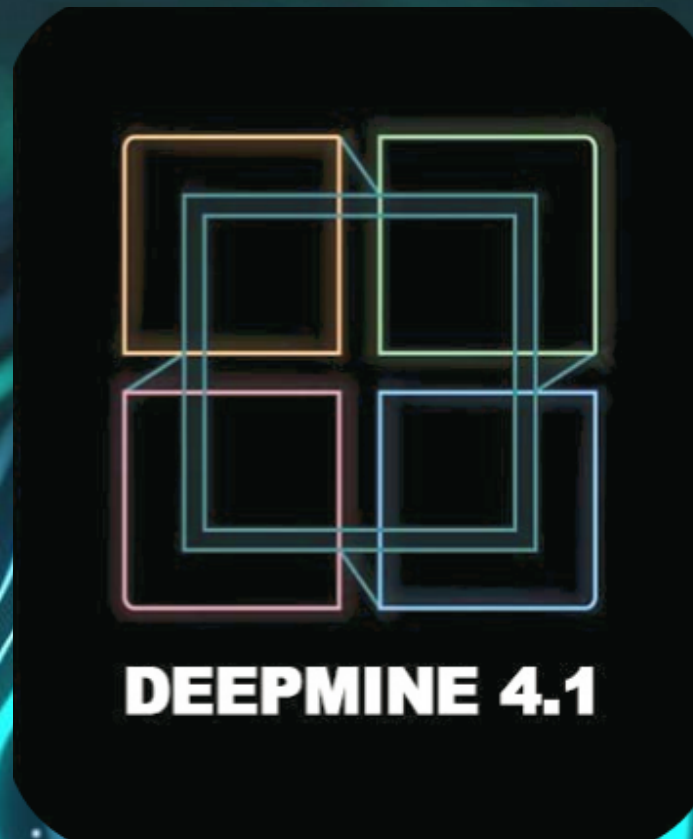
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