KEMENTERIAN SUMBER ASLI, ALAM SEKITAR
DAN PERUBAHAN IKLIM

Green Practices Guideline for

MINING SECTOR

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GREEN PRACTICES GUIDELINE FOR

MINING SECTOR

Malaysian Green Technology and Climate Change Corporation

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LIST OF ABBREVIATIONS

3R	Reduce, reuse and recycle
CCS	Carbon Capture and Storage
CH4	Methane
CO2	Carbon Dioxide
COP26	The 2021 United Nations Climate Change Conference
CSR	Corporate Social Responsibility
EEV	Energy Efficient Vehicles
EFB	Empty Fruit Bunches
EMGS	Energy Management Gold Standard
EPF	Employees Provident Fund
EPR	Extended Product Responsibility
EQA1974	Environmental Quality Act 1974
ESG	Environment, Social, and Governance
EToU	Enhanced Time of Use
EU	European Union
Evs	Electric Vehicles
FGV	Felda Global Ventures
GBI	Green Building Index
GDP	Gross Domestic Product
GERO	Gross Domestic Expenditure on Research and Development
Gg	Gigagrams
GHGs	Greenhouse Gases
GJ	Giga Joule
GLIC	Government-linked Investment Companies
GMP	Good Manufacturing Practice
GTMP	Green Technology Master Plan
HFCs	Hydrofluorocarbons
HHI	Herfindhal-Hirschman Index
HR	Human Resources
ICE	Internal Combustion Engine
IPP	Independent Power Producers
ISO	International Standard Organization
MDGs	Millennium Development Goals
MEPS	Minimum Energy Performance Standard
MGTC	Malaysian Green Technology and Climate Change Corporation
MITI	Ministry of International Trade and Industry
MSIC	Malaysia Standard Industrial Classification
MT	Metric Tonne
MW	Megawatt
MWh	Megawatt-hour
MyCREST	Malaysian Carbon Reduction & Environmental Sustainability Tools
MyOrganic	Malaysia Organic
MySDG Fund	Malaysia Sustainable Development Goals Trust Fund
N2O	Nitrous Oxide
NEA	National Energy Awards
NEEAP	National Energy Efficiency Action Plan
NF3	Nitrogen Trifluoride
NGV	Natural Gas Vehicles
NGO	Non-Governmental Organizations
NRPAs	National Research and Development Priority Areas
NRW	Non-revenue water
OHSAS	Occupational Health and Safety Assessment Series
PASS	Green Performance Assessment System
PFCs	Perfluorocarbons
POME	Palm Oil Mill Effluent
PRF	Permanent Reserve Forest
PV	Photovoltaics
R&D	Research and Development
RE	Renewable Energy
SDGs	Sustainable Development Goals
SF6	Sulfur Hexafluoride
SME	Small and Medium Enterprises
SO2	Sulfur Dioxide
SOP	Standard Operating Practice
SPAN	Suruhanjaya Perkhidmatan Air Negara
UNIFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
WELPS	Water Efficient Product Labelling Scheme

LIST OF TERMINOLOGIES

CARBON PRICING	The implementation of a tax or fee, or a cap-and-trade system on the carbon content of fossil fuels or on their carbon dioxide emissions. It is a tool mechanism that harnesses market forces to lower their emissions by switching to more efficient processes or cleaner fuels
CARBON TAX	A fee imposed on companies and organizations that emit carbon from the burning of coal, oil or gas. The main goal of carbon tax is to reduce the emission of greenhouse gases to the atmosphere.
CIRCULAR ECONOMY	An economic system that ensures the maximum use is extracted from resources and minimum waste is generated for disposal. It is a model of production and consumption that keeps materials, products and services in circulation for as long as possible by reusing products rather than disposal at end-of-life and then extracting new resources.
CLEANER PRODUCTION	The process of effectively using resources and energies, thus minimizing the waste generated from the process
ECO-DESIGN	A concept that consider and actively minimize the environmental impact of a product across its entire lifecycle, from material extraction and supply to end of life. It may also be known as the ISO/TR 14062 standard for environmental management in product design.
EFFICIENT	Achieving maximum productivity with minimum wasted effort or expense.
WASTE	Waste includes any matter prescribed to be scheduled wastes, or any matter whether in a solid, semi-solid or liquid form, or in the form of gas or vapor which is emitted, discharged or deposited in the environment in such volume, composition or manner as to cause pollution.
GREEN	Any activity or concept that seeks to increase the degree by which the processes of the manufacturing industry meet environmental standards and deepen their integration within a circular economy.
GREEN MANUFACTURING	Reflects a new manufacturing paradigm which implements various green strategies and techniques (technology and innovation) to become more efficient. It includes generating processes with low environmental impacts, and processes that are productive with reduced waste and contamination. It is a multi-measure strategy to reduce an environment-polluting waste created during manufacturing activity.
INDUSTRY	Activities which are described in Section C (Manufacturing) of Malaysia Standard Industrial Classification 2008
MANUFACTURER	Any person or company that assemble or make a product, enclose or pack that product in any container in a form suitable for administration or application, labelling of the container and the carrying out of any process in the course of any of the foregoing activities.
WASTE HIERACHY	A ranking system used for the different waste management options according to which is the best for the environment. The most preferred option is waste prevention, followed by reuse, recycle, recover and the least preferred is disposal.

CONTENT

FOREWORD

Welcome to the Green Practices Guideline; a significant milestone in the ongoing implementation of the MyHIJAU Programme since 2012 as part of the Green Industry efforts outlined in the Twelfth Malaysia Plan. This programme is under the Ministry of Natural Resources, Environment and Climate Change (NRECC) and coordinated by the Malaysian Green Technology and Climate Change Corporation (MGTC).

Eight Green Practices Guideline were developed for the following sectors: Agriculture & Plantation, Construction, Manufacturing, Mining, Fisheries (Aquaculture), Livestock, Forest Operation, and Services. These guidelines serve as a comprehensive resource for the green industry, providing guidance on the adoption and implementation of sustainable practices at every stage of a company's production and consumption.

The development of these guidelines aligns with the National Green Technology Policy (NGTP) and the Sustainable Consumption & Production (SCP) direction, aiming to promote the use of green technology among local manufacturers, producers, and suppliers, particularly small and medium enterprises (SMEs). By incorporating green practices, we can foster a culture of sustainability and contribute to the government's vision of green development in Malaysia.

These guidelines not only emphasize the importance of integrating green practices in an organisation's business operations but also provide a roadmap for industry players in their pursuit of green technology adoption. By adhering to these guidelines, businesses can tap into the potential of the green sector, explore green product and service offerings, and enhance their operations by incorporating sustainable practices.

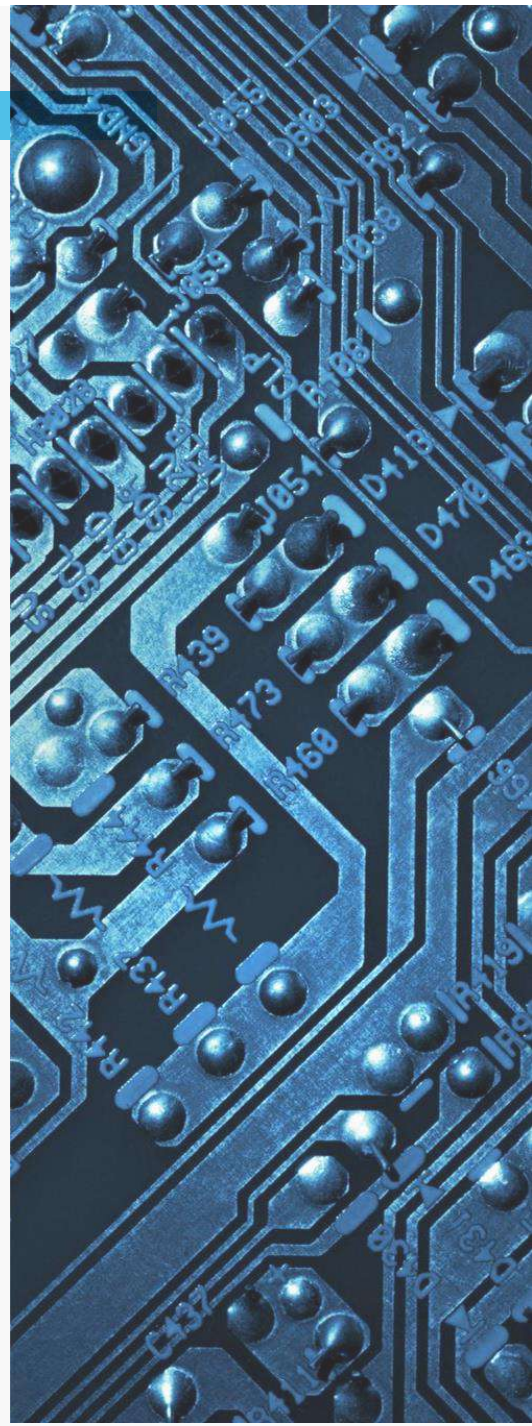
In line with SDG 12.6, which advocates for the integration of sustainable practices and information sustainability into the reporting cycle, these guidelines outline the requirements that industries, companies, and organisations should follow. They are designed to be a valuable reference for all stakeholders, facilitating the government's objective of promoting and implementing green development initiatives.

As we embark on the Twelfth Malaysia Plan, with a strong focus on accelerating green growth, these guidelines emerge as a catalyst for practical and effective green practices across the industry. By prioritising environmental, social, and governance (ESG) elements in decision-making processes, companies can significantly reduce their negative impact on the environment while increasing productivity and long-term profitability.

Although Malaysia's contribution to greenhouse gas emissions stands at 0.7 percent, the government remains committed to reducing GHG emission intensity by 45 percent relative to GDP by 2030. This commitment aligns with our aspiration to become a low carbon nation. By embracing green practices and incorporating knowledge about the benefits and applications of green technology, the industry can play a pivotal role in achieving this goal.

We hope that these Green Practice Guidelines will serve as a foundation for industry-wide understanding and adoption of sustainable practices. By embracing the principles outlined within this guide, businesses can gain recognition as leaders in the green industry and contribute to a cleaner, greener, and more sustainable future for Malaysia.

Let us join hands in the pursuit of a thriving green industry and a better world for generations to come.



ABOUT THE GUIDELINE

The Green Practices Guideline was officially endorsed by the Ministry of Environment and Water in 2021 as part of the Twelfth Malaysia Plan (RMKe-12) under SDG 12.6. This particular goal aims to promote the adoption of sustainable practices and the integration of sustainability information into the reporting cycle of businesses.

This governmental initiative strongly aligns with Malaysia's commitment to fostering green technology policies and driving sustainable development across various industries and businesses within the country.

The initial implementation of the Guideline primarily focuses on enhancing exposure, perception, knowledge, and capacity building regarding green resources, processes, and technologies. Collectively known as "green practices," these measures are intended to drive positive changes within the industry.

The envisioned outcome of implementing green practices in the industry is the promotion of cleaner, more efficient, and environmentally-friendly operations, processes, and premises throughout Malaysia.

Key Points:

Mandate: The Ministry of Environment and Water granted approval through the Twelfth Malaysia Plan (RMKe-12) in 2021.
Green Policy: The Guideline supports the advancement of green technology policies to facilitate sustainable development within industries and businesses in Malaysia.
Purpose: To provide guidance and recommendations for manufacturing industries in the implementation of green practices.
Approach: The Guideline emphasizes the optimization of natural resource consumption, energy usage, and water management, while concurrently reducing toxic emissions and waste generation.
Optimize: Focus on optimizing the consumption of natural resources, including raw materials, water, energy, and land use.
Circularity: Encourage the adoption of circular economy principles by increasing the reuse, recycling, and reduction of materials, energy, and water.
Reduce: Place emphasis on reducing the emissions of toxic or hazardous waste.
Implement: Promote the utilization of innovative green technologies to enhance processes and operations.

CHAPTER 1
INTRODUCTION

1.1 About the Sector

The mining sector in Malaysia plays a crucial role in the nation's economy, with the extraction and utilization of valuable mineral resources. Malaysia boasts a diverse range of minerals, including metallic, non-metallic, and energy minerals. These minerals have a significant impact on the country's gross domestic product (GDP), contributing 6.2% of Malaysia's GDP in 2021, according to the Department of Statistics Malaysia.

Mining operations in Malaysia have the potential to position the country as a prominent hub for the development of the mineral industry. The industry's contribution to economic advancement cannot be overstated, as it serves as a catalyst for the growth of other sectors. For example, metallic minerals support the development of metallurgical industries, such as iron and steel, which in turn provide essential inputs for construction and manufacturing.

While the mining sector presents valuable economic opportunities, it is essential to ensure the sustainable consumption and production of mineral resources. Sustainability considerations are crucial to support the industry's long-term growth without causing significant harm to the environment and society. Investments, both foreign and local, are important for the industry's development. However, it is equally important to balance economic gains with sustainable mining practices that minimize environmental impacts.

Efforts have been made to streamline the management of the mineral-based industry in Malaysia and promote sustainable growth. Green and sustainable practices have been introduced to encourage responsible mining operations. By adopting these practices, mining companies can protect their assets, drive technological innovation, explore new market opportunities, and address the changing needs of the industry.

In the context of energy and emissions, the mining industry in Malaysia, like its global counterparts, faces challenges in reducing its carbon footprint. Energy consumption remains a major contributor to greenhouse gas (GHG) emissions, and the industry must take steps to transition to greener energy sources and improve energy efficiency. By optimising resource usage, exploring renewable energy options, and reducing emissions throughout the mining process, the industry can contribute to Malaysia's goals of reducing GHG emissions.

Mining operations also impact the environment through air pollution, soil and water contamination, biodiversity loss, deforestation, and erosion. The industry must adhere to stringent regulations and implement effective monitoring and mitigation measures to minimize these environmental risks. Proper land management practices, from exploration to closure and rehabilitation, are essential to minimize the ecological footprint of mining activities.

The mining sector in Malaysia recognises the importance of adopting green practices to ensure the industry's long-term sustainability. By embracing environmentally friendly technologies and practices, the industry can mitigate environmental impacts, improve resource efficiency, and contribute to the country's overall sustainability goals. Additionally, green mining practices can enhance the sector's reputation, attract socially conscious investors, and create a positive socio-economic impact on local communities.
The mining sector in Malaysia holds tremendous potential for economic growth, but it must be accompanied by a strong commitment to sustainable practices. By prioritising green mining initiatives, promoting renewable energy adoption, minimising environmental impacts, and adhering to stringent regulations, the industry can strike a balance between economic development and environmental stewardship. Through responsible mining practices, Malaysia's mining sector can contribute to a greener future while safeguarding the country's valuable mineral resources and the well-being of its people.

1.3 Scope and Application

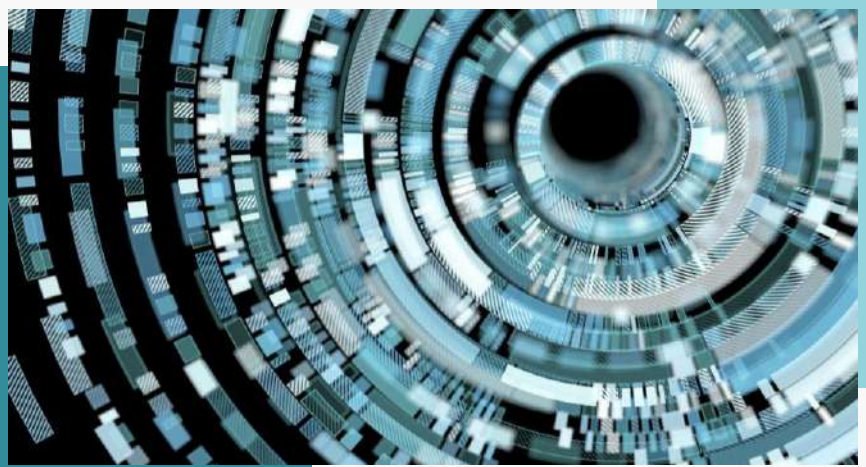
The scope of this guideline for the mining sector in Malaysia is designed to be comprehensive, covering all stages of the mining value chain. It encompasses activities from upstream to downstream, including exploration, drilling, mining, rehabilitation, mineral processing, waste or residue management, refining, and distribution.

In Malaysia, the mining industry plays a significant role in the nation's economy and is a key contributor to its gross domestic product (GDP). This guideline is developed to align with national objectives, including the Green Technology Master Plan, which aims to promote sustainable development and the adoption of green practices across various sectors.

By implementing the recommendations and actions outlined in this guideline, the mining sector in Malaysia can contribute to the objectives of the Green Technology Master Plan. The adoption of green practices throughout the mining value chain will help improve environmental sustainability, reduce carbon emissions, and enhance resource efficiency.

Furthermore, the guideline provides a framework for the mining industry to align with the national goals of the 12th Malaysia Plan and the aspiration to achieve net-zero greenhouse gas emissions by 2050. It supports the country's commitment to the Paris Agreement and the global effort to combat climate change.

By embracing the principles and practices outlined in this guideline, the mining sector in Malaysia can improve its environmental performance, reduce its ecological footprint, and enhance its overall sustainability. This will not only contribute to the objectives of the Green Technology Master Plan but also strengthen the industry's competitiveness in the global market by demonstrating its commitment to sustainable and responsible mining practices.



1.3 Motivation to Sustainabilit

01 Environmental Stewardship:

Mining and minerals companies have a responsibility to be environmentally responsible. Adopting sustainable practices allows them to minimize their ecological footprint, reduce pollution, and conserve natural resources. Demonstrating environmental stewardship showcases a commitment to safeguarding ecosystems and supports global efforts to combat climate change.

02 Cost Savings and Efficiency:

Sustainability practices often result in long-term cost savings. Energy-efficient processes and equipment, waste reduction, and water conservation can lower operational expenses, enhancing financial resilience. Embracing sustainable supply chain practices improves resource efficiency, reducing material and transportation costs.

03 Market Demand and Reputation:

Consumers increasingly prioritize environmentally friendly products. Embracing sustainability in the mining and minerals sector allows companies to tap into the growing market demand for eco-conscious and socially responsible products. A strong commitment to sustainability enhances reputation, builds trust with stakeholders, and fosters brand loyalty.

04 Regulatory Compliance and Market Access:

Sustainability practices align with and exceed environmental regulations. Proactively complying with regulations and anticipating future requirements helps companies avoid fines and legal issues. Adhering to sustainability standards opens access to international markets with stringent environmental requirements, expanding reach and export opportunities

05 Innovation and Competitiveness:

Sustainability drives innovation, prompting exploration of new technologies and processes. Companies investing in green technologies and products gain a competitive edge. Sustainable practices foster creativity and problem-solving, enabling businesses to stay ahead in a rapidly evolving global economy.

06 Employee Engagement and Productivity:

Commitment to sustainability boosts employee morale and engagement. Working for environmentally responsible businessess is a source of pride for employees. Companies prioritizing sustainability attract and retain top talent, leading to increased productivity and job satisfaction.

07 Resilience to Climate Risks:

Incorporating sustainability practices builds resilience to climate-related risks. Strategies to mitigate and adapt to climate change impacts, such as extreme weather events or supply chain disruptions, ensure business continuity and protect assets in the mining and minerals sector.

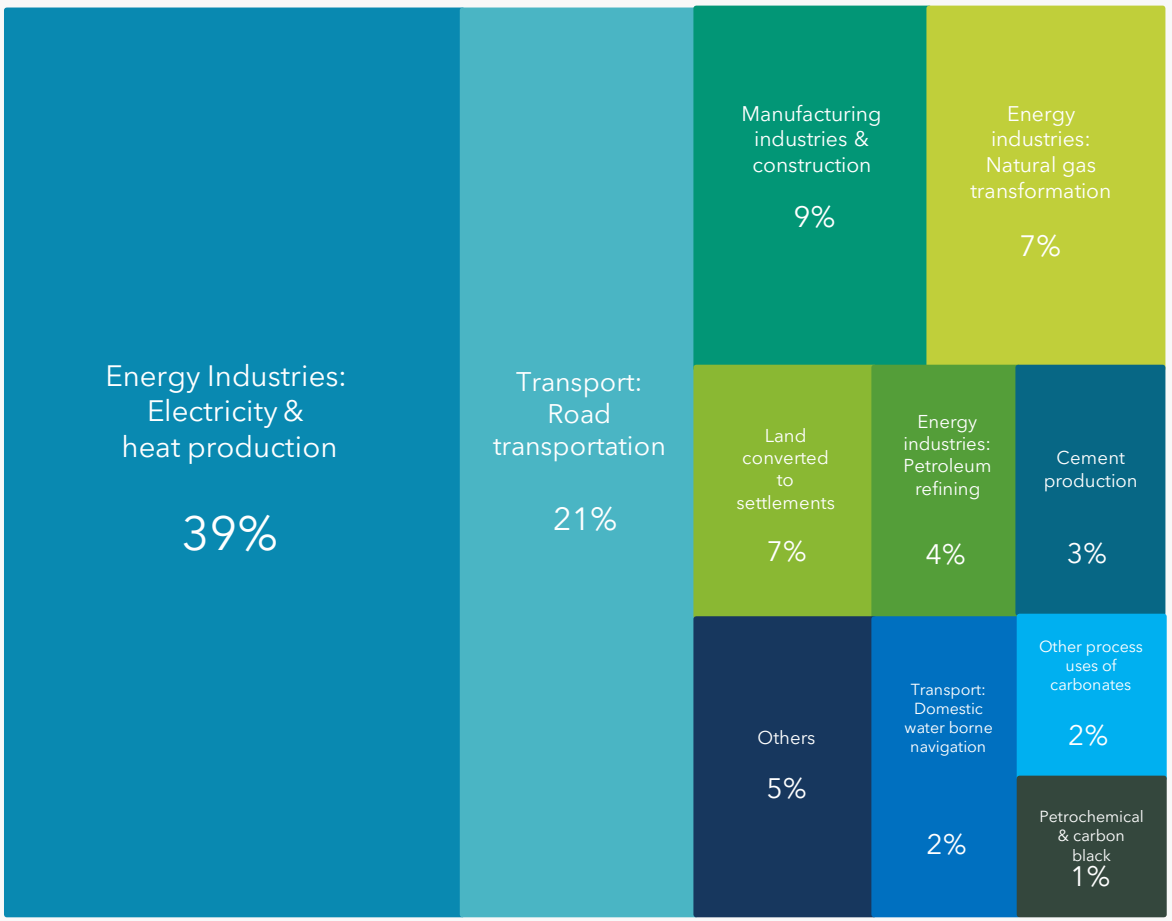
1.3.1 Climate Change

Climate change stands as one of the most formidable challenges of the 21st century. Central to addressing this challenge is the recognition that economic development must not come at the expense of the environment, and that controlling greenhouse gas (GHG) emissions is crucial to mitigating the impacts of climate change for the well-being of present and future generations.

Currently, Malaysia contributes 0.7% to global GHG emissions, with the manufacturing and construction industries ranking as the third largest sources of emissions (Malaysia BUR3 UNFCCC Report, 2020). As part of its commitment to climate action and green technology, Malaysia aims to become a low-carbon nation by 2050. This includes an unconditional commitment to reduce GHG emissions (against Gross Domestic Product: GDP) by 45% by 2030 compared to the 2005 level.

This national aspiration provides an opportunity for businesses and businesses in the mining and minerals sector. It opens up possibilities for:
Economic Instruments: New economic instruments are being developed to support the industry in decarbonizing their operations. These instruments facilitate the adoption of sustainable practices, enabling companies to reduce their carbon footprint while remaining competitive.
ESG Portfolio and Sustainability Reporting: Strengthening their Environmental, Social, and Governance (ESG) portfolio and sustainability reporting becomes increasingly important. Embracing green practices aligns businesses with global sustainability goals, enhancing their reputation and attracting environmentally conscious investors.

The issues of climate change and environmental protection are vital to Malaysia's survival. The government, through its ministries, departments, and agencies, has undertaken various measures and initiatives to address these issues. These efforts encompass three major themes: energy, waste, and forestry.
Central to these efforts is the avoidance of carbon emissions. As businesses in the mining and minerals sector face a world that is increasingly conscious of carbon, implementing green practices in current processes and operations becomes the logical next step. By embracing sustainability, companies can ensure their survival and performance in an environmentally conscious world



RENEWABLE ENERGY

Fit-in-Tariff

Mechanism under the Renewable Energy Policy & Action Plan to catalyse generation of Renewable Energy (RE) up to 30MW in size.

Emission avoidance
460.52 Gg Co2eq

Hydropower

Hydropower is posed to play an increasingly important role in meeting Malaysia's energy & climate goals.

Emission avoidance
6,535.99 Gg Co2eq

NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP)

This plan was introduced targeting the residential commercial & industrial sectors. Key initiatives under NEEAP:

- 5 star rated appliances
- Minimum Energy Performance Standard (MEPS)
- Co-generation
- Energy audits & energy management in buildings & industries
- Energy Efficient Building Desing

Emission avoidance
458.02 Gg Co2eq

ENERGY EFFICIENT VEHICLES (EEVs)

Malaysia aims to become a regional hub for energy efficient vehicles (EEVs) through strategic investments & adoption of high technology. The EEVs include fuel-efficient internal combustion engines (ICE) vehicles, electric vehicles, hybrid & alternative-fueled vehicles.

Related policy:
The National Automotive Policy 2024

Emission avoidance
90.65 Gg Co2eq

GREEN BUILDING RATING SCHEME

Focus on promoting natural-gas vehicles in the public transport sector, in particular for taxis and buses.

Existing Standards:

- Malaysian Carbon Reduction & Environmental Sustainability Tools (MyCREST)
- Green Performance Assessment System (PASS)

Green certification:

- Green Building Index (GBI)
- GreenRE

Emission avoidance
143.47 Gg Co2eq

URBAN RAILED-PUBLIC TRANSPORT

The implementation of public transport initiatives is important to reduce the use of private vehicles on the road.

Existing plan:
- National Land Public Transport Master Plan
- The Tenth and Eleventh Malaysia Plan

Emission avoidance
212.93 Gg Co2eq

NATURAL GAS VEHICLES

Focus on promoting natural-gas vehicles in the public transport sector, in particular for taxis & buses

Benefits of programs:
- Lower retail prices
- Incentives
- Road tax reduction
- Import duty & sale tax exemption

Emission avoidance
114.77 Gg Co2eq

BIODIESEL

Biodiesel has received great attention as an alternative fuel, considering its abundant resources & environmental benefits.

Related policy & Acts:
- The National Biofuel Policy
- Malaysian Biofuel
- Industry Act

Emission avoidance
1,127.34 Gg Co2eq

OIL & GAS OPERATIONS

PETRONAS, as the national oil & gas company of Malaysia is committed towards a lower carbon footprint.

Emission reduction in oil & gas operations can be achieved through:

- Zero continuous flaring & venting in all operations for fugitive emissions
- Continuous improvement & plant efficiency in natural gas transformation
- Enhance improvement in plant efficiency of oil refining industries.

WATER PAPER RECYCLING

Target of 40% waste redirection from waste disposal sites:
- 22% through recycling
- 18% through waste treatment

Impact:
Increasing of recycling rate materials from 17% in 2015 to 21% in 2017

Related Policy:
- National Solid Waste Management Policy 2006
- Eleventh Malaysia Plan

Emission avoidance
3,937.76 Gg Co2eq

BIOGAS RECOVERY FROM PALM OIL MILL EFFLUENT (POME)

Biogas plays a crucial role in driving Malaysia that is moving towards adopting renewable energy & environmental sustainability
Target include equipping mills with biogas entrapment facilities to generate electricity for supply to the grid or for self-consumption

Impact:
As of 2017, out of 454 palm oil mills, 104 of them were fully equipped with biogas capture facilities10

Related Projects:
Entry Point Project – Developing Biogas Facilities at Palm Oil Mills
Related Programs
Economic Transformation Programme 2012

Emission avoidance
2,377.84 Gg Co2eq

AGRICULTURE

Malaysian Organics Scheme (SOM) or Malaysia Organic (MyOrganic is a certification that recognizes farms that practices good agricultural practices & organics farming based on Malaysian Standard MS1529:2015

Impacts:
253 farms have been certified with MyOrganic certification with an area of 2,045.60 ha as for now

SUSTAINABLE MANAGEMENT OF FOREST

Forest certification scheme that allow the annual allowable cut it the Permanent Reserved Forest (PRF) is capped at 8m3/ha for the period of tenth & eleventh Malaysian Plan.

Related Certification:
Malaysian Criteria & Indicators for Forest Management Certification 2001

Emission avoidance:
20,307.50 Gg Co2eq

CONSERVATION OF BIODIVERSITY & ECOSYSTEM SERVICES

Relevant initiatives:
Malaysia's Protected Area (PA) Network

Target:
Increase the PA to at least 20% by 2025

Impact:
PA increased from 2.757 to 3.171 million ha between 2014 & 2016

FOREST ENRICHMENT PROGRAMMES

Aim:
Improve degraded forests sequestration capacity
Enhance connectivity between forests through two distinct initiatives

Examples:
Central Forest Spine (CFS) Programme in Peninsular Malaysia
Heart of Borneo (HoB) Programme in Sabah & Sarawak

1.3.2 Circular Economy

The circular economy is a concept that emphasizes the return of resources to environmental and economic systems through reuse and waste prevention, reducing material loss. It represents a systemic shift towards long-term resilience, focusing on durability, reuse, repair, recycling, and remanufacturing. The adoption of a circular economy approach in Malaysia presents significant opportunities to enhance resource efficiency, cost-effectiveness, waste reduction, address climate change, and promote sustainable economic growth, particularly in the mining and mineral sector.

Key aspects and initiatives related to the circular economy in Malaysia include:

01

Policy and Regulatory Framework:

The Malaysian government recognizes the importance of transitioning towards a circular economy and has implemented policies and regulations to support this shift. The Twelfth Malaysia Plan (2021-2025) aims to transform the country's linear economy model into a sustainable circular economy model, mitigating environmental harm.

02

Waste Management and Recycling:

Efficient waste management and recycling systems are crucial components of a circular economy. Malaysia has made progress in waste management through initiatives such as the National Strategic Plan for Solid Waste Management. Programs promoting waste reduction, recycling, and proper disposal, including waste separation at source, have been implemented.

03

Product Design and Extended Producer Responsibility (EPR):

Encouraging sustainable product design and implementing extended producer responsibility schemes are essential for achieving a circular economy. Guidelines integrating eco-design principles into product development are being established to minimize the environmental footprint throughout the product lifecycle. The exploration of EPR policies for various products, such as e-waste, batteries, and packaging, ensures producers take responsibility for their products' entire lifecycle.

04

Sustainable Consumption and Production:

Promoting sustainable consumption and production patterns is a key focus area for advancing the circular economy in Malaysia. Efforts are underway to raise consumer awareness about the environmental impact of their choices and encourage the adoption of eco-friendly and durable products. Additionally, initiatives support resource-efficient manufacturing processes, eco-labeling schemes, and green procurement in industries.

05

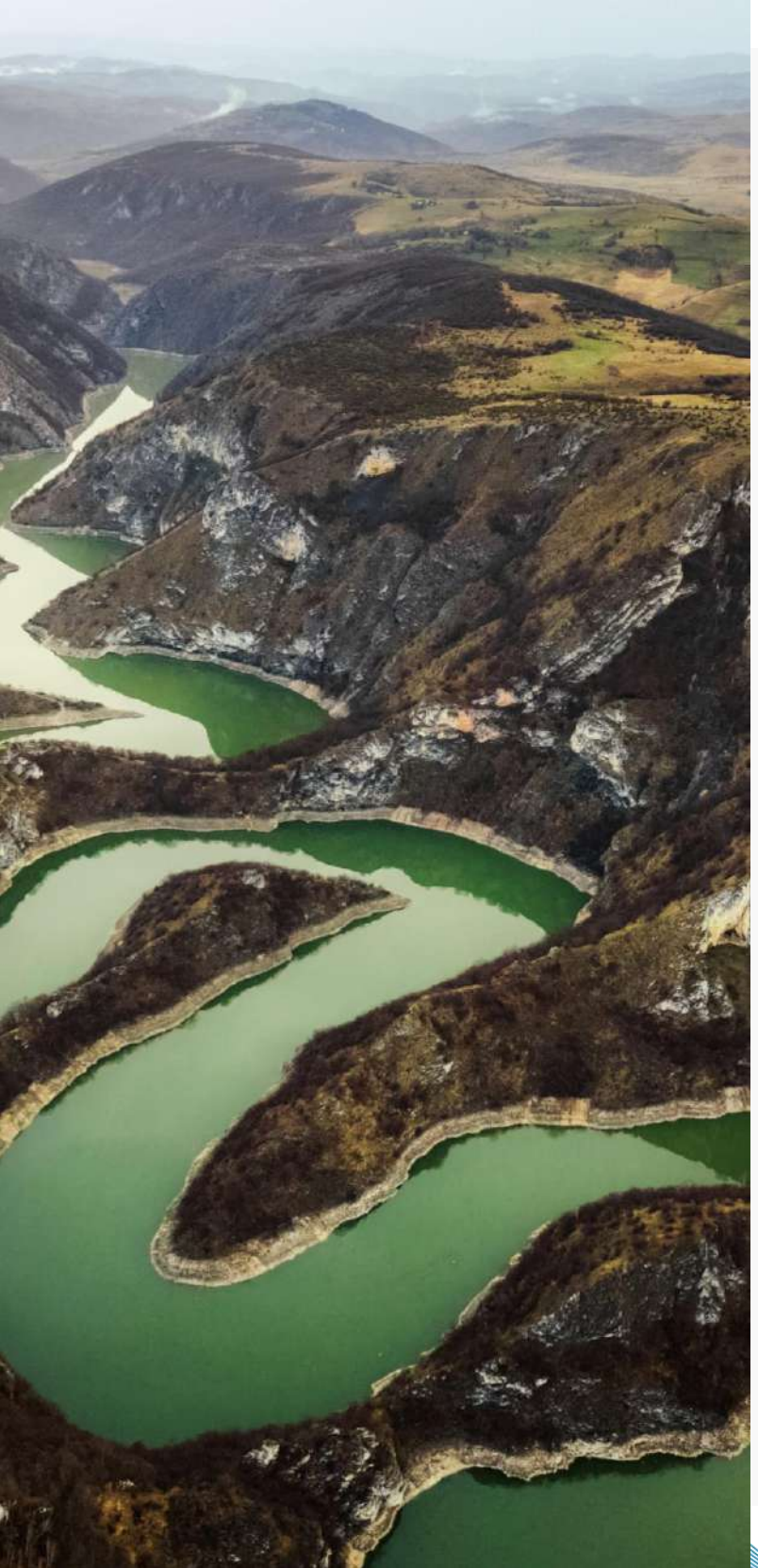
Innovation and Technology:

Innovation and the adoption of advanced technologies play a crucial role in facilitating the transition to a circular economy. Malaysia actively encourages research and development in waste-to-energy conversion, recycling technologies, and sustainable materials. The government, through agencies like the Malaysian Green Technology and Climate Change Centre (MGTC), provides support and funding for innovative projects contributing to a circular economy.

06

Collaboration and Stakeholder Engagement:

The successful implementation of a circular economy requires collaboration among various stakeholders, including government agencies, businesses, academia, and civil society. Malaysia fosters partnerships and engages stakeholders through platforms such as the Malaysia Circular Economy Conference (MyCEC) and the Malaysia Productivity Corporation (MPC). These collaborations aim to share knowledge, best practices, and resources to drive the circular economy agenda forward in the mining and mineral sector and beyond.



1.3.3 Impacts of ESG Towards the Industry

ESG, which stands for Environmental, Social, and Governance criteria, measures the ethical and sustainability impacts of investments in companies and businesses. In the mining and minerals sector in Malaysia, the consideration of ESG factors is crucial for long-term sustainability and success.

The Ministry of Finance has outlined strategies to empower and enable Small and Medium Enterprises (SMEs) in adopting ESG practices. This includes implementing Principles for Good Governance for Government-Linked Investment Companies (GLICs) and introducing specific financing measures such as Bank Negara's RM1 billion Low Carbon Transition Facility, RM100 million matching grant for NGOs and social enterprises, and RM80 million allocation to Kasih Suri under EPF and SOCSO. The establishment of the Malaysia Sustainable Development Goals Trust Fund (MySDG Fund) further supports ESG efforts.

The manufacturing industry faces the interconnected challenges of pollution avoidance, resource efficiency improvement, significant reduction in greenhouse gas emissions, and transformation of industrial structures to mitigate environmental impacts. Compliance with ESG principles has become increasingly important for the industry's long-term survival, as it aligns with the expectations of trading partners, capital markets, and financial institutions.
At COP26, developed countries pledged USD 100 billion annually to support climate efforts in developing countries, in line with the goals of the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC) until 2025. This climate finance includes local, national, and transnational funding for mitigation and adaptation actions, aligning with existing ESG frameworks that businesses can adopt.

Globally, a significant number of investors are placing greater emphasis on ESG frameworks within companies. Energy efficiency, waste management, greenhouse gas emissions, water consumption, and the use of biodegradable materials are central concerns for global finance. These aspects are covered by the three focal factors of ESG, measuring the sustainability and ethical impact of investments.

Businesses that neglect to address ESG components may face risks in their operations, increased financing costs, and fluctuating share price performance. To address environmental protection, climate change, and sustainable development, mining and minerals businesses should consider adopting green technologies in their operations and management.
By embracing ESG principles, the mining and minerals sector in Malaysia can enhance its environmental performance, social responsibility, and governance practices, ensuring long-term viability in an increasingly sustainable-focused global landscape.

1.3.4 Sustainable Development Goals

The United Nations Sustainable Development Goals (SDGs) were adopted in 2015 as a universal call to action to end poverty, protect the planet, and ensure peace and prosperity for all by 2030. These goals build upon the success of the Millennium Development Goals (MDGs), which were implemented from 2000 and significantly lifted almost one billion people out of extreme poverty, combated hunger, eliminated global consumption of ozone-depleting substances, and initiated reforestation efforts, among other achievements. The SDGs encompass the three pillars of sustainability: social, economic, and environmental elements. They provide a comprehensive framework for addressing global challenges and achieving sustainable development. Each goal is accompanied by specific targets and indicators to measure progress between 2020 and 2030. In Malaysia, the mining and minerals industry plays a significant role in contributing to the achievement of the SDGs. Manufacturers and businesses in this sector that embrace green practices actively support SDG 12.6, which encourages companies to adopt sustainable practices and integrate sustainability information into their reporting cycle.

By implementing sustainable practices, the mining and minerals industry can have a positive impact on multiple SDGs. For example:

Affordable and Clean Energy

The industry can contribute to the generation of clean and renewable energy, reducing reliance on fossil fuels.

Industry, Innovation, and Infrastructure

By adopting innovative technologies and sustainable mining practices, the industry can promote responsible and efficient resource extraction and contribute to sustainable infrastructure development.

Climate Action

The industry can mitigate its carbon footprint by implementing strategies to reduce greenhouse gas emissions and promote sustainable land use practices.

Life on Land

Through responsible mining practices, the industry can protect biodiversity, conserve ecosystems, and promote land restoration.

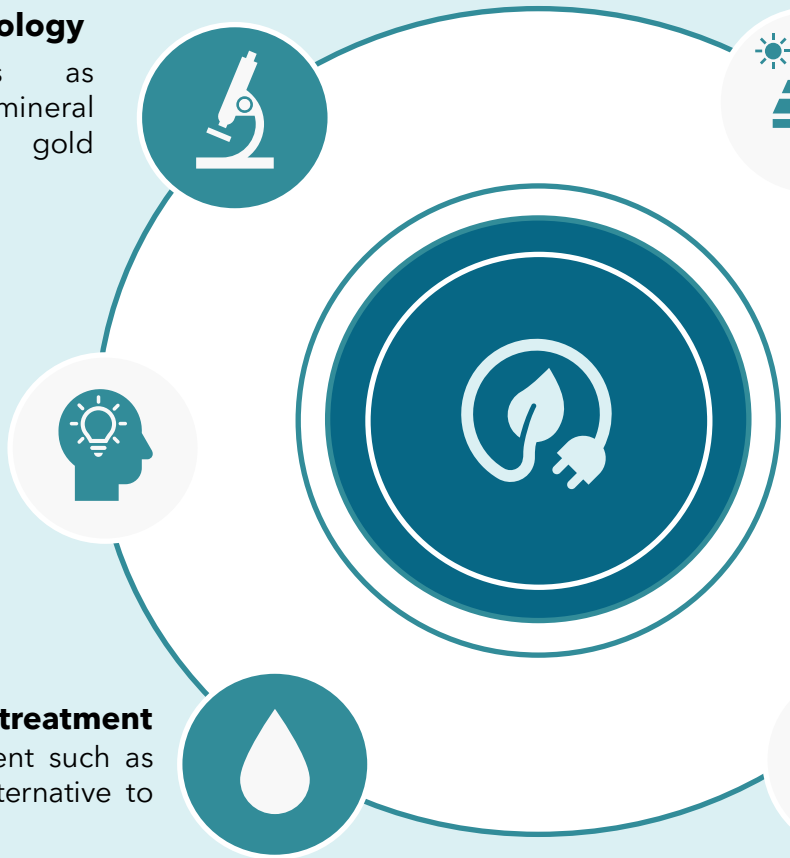
Partnerships for the Goals

Collaboration between the mining and minerals industry, government bodies, and civil society can foster partnerships and initiatives to drive sustainable development efforts.

1.4 The need for Green Practices

1.4.1 What are Green Practices (GP)?

Green Practices are any target or initiative set out by industries that is in line with target outlined in Green Technology Master Plan (GTMP). Examples of green practices in mining sector are:



Biotechnology

Green biotechnologies as alternatives for mineral processing for example gold extraction using microbes.

Green Technologies

Installation of technologies such as solar panel and mini hydro as source of renewable energy.

Polymeric material

Use of polymeric material to suppress dust from mining activities.

Zero discharge

Practice zero discharge for resources such as water within mining sites.

Usage of passive water treatment

Use passive water treatment such as constructed wetland as alternative to treat effluent.

Utilization of tailing materials

Utilization of tailing materials for other commercial uses for example brick-making.

1.4.2 Green Practices in the Mining Sector

The mining and minerals sector in Malaysia holds immense potential to contribute to enhanced livelihoods while supporting the global sustainability agenda. Environmental considerations and impacts have long been driving forces behind advancements in this industry.

In the context of green practices, the mining and minerals sector can embrace various initiatives tailored to specific sub-sectors, including metallic mining, non-metallic minerals, industrial minerals, and energy minerals/mineral fuels. Some examples of green practices in these sub-sectors are, industrial minerals, metallic mining, energy minerals/mineral fuels, non-metallic minerals.

By incorporating these green practices, the mining and minerals sector in Malaysia can enhance resource efficiency, mitigate environmental impacts, and align with sustainable development goals. It also positions the sector for long-term growth, improved competitiveness, and access to global markets with growing demand for environmentally responsible products.

Furthermore, the integration of green practices aligns with government policies, guidelines, and regulations related to climate action, decarbonization of industries, and green technology. This demonstrates the sector's commitment to environmental stewardship, compliance with sustainable development objectives, and facilitates the achievement of goals outlined in the Green Technology Master Plan. The adoption of green practices in the mining and minerals sector contributes to the economic and environmental viability of the industry while supporting broader national and global efforts towards sustainability and responsible resource management.

Industrial Minerals

Embracing circular economy principles by promoting the reuse and recycling of industrial mineral by-products. This can involve the development of innovative applications for waste materials and the establishment of closed-loop production systems to minimize waste generation

Metallic Mining

Implementation of cleaner production technologies and processes to minimize resource consumption, waste generation, and emissions. This can involve the adoption of energy-efficient equipment, optimization of extraction and processing techniques, and the implementation of rigorous pollution control measures.

Energy Minerals/ Mineral Fuels

Encouraging the adoption of cleaner and more sustainable energy sources, such as renewable energy technologies, to power mining operations. This can contribute to the reduction of greenhouse gas emissions associated with energy consumption in the sector.

Non-Metallic Minerals

Adoption of sustainable resource management practices, including responsible extraction and processing methods. This can involve measures to minimize environmental impacts, conserve water resources, and rehabilitate mined areas to support ecosystem restoration.

1.4.3 Existing National Policies & Guidelines

The mining and minerals sector in Malaysia operates within a framework of national policies and guidelines that promote sustainable development and ensure environmental protection. These policies and guidelines provide a regulatory foundation for responsible mining practices. Here are some key policies and guidelines relevant to the sector:

01

National Policy on the Environment

This policy aims to achieve continuous economic, social, and cultural progress while enhancing the quality of life for Malaysians through environmentally sound and sustainable development. It provides the overarching framework for environmental management and sets the direction for sustainable practices in the mining and minerals sector.

02

Environmental Quality Act 1974

This act is crucial for pollution prevention, abatement, and control, as well as the enhancement of environmental quality. It establishes regulations and standards for managing environmental impacts, including those related to mining activities, and ensures compliance with environmental requirements.

03

Water Services Industry Act 2006 (Act 655):

This act focuses on the water supply and sewerage services sector, establishing a licensing and regulatory framework. It aims to promote the national policy objectives for water supply services and sewerage services, including efficient and sustainable water use in mining operations.

04

Good Manufacturing Practice (GMP):

GMP is a prerequisite for manufacturing licenses and product registrations in various industries, including pharmaceuticals, traditional medicines, cosmetics, food, and veterinary products. Compliance with GMP ensures that manufacturers produce safe, efficacious, and quality products. This includes adherence to environmental and safety standards during manufacturing processes.

05

International Standard Organization (ISO) Standards

Standards: ISO develops international standards applicable across industries. Several ISO standards are relevant to manufacturers, including those in the mining and minerals sector. Examples include ISO 14001 for Environmental Management System, ISO 45001 for Occupational Safety and Health, and ISO 50001 for Energy Management System. These standards provide guidelines for environmental stewardship, occupational health and safety, and efficient energy management.

06

Malaysian Standard: MS1525:2019

This standard, developed by the Department of Standards, Malaysia, focuses on energy efficiency and the use of renewable energy in non-residential buildings. It provides a code of practice for reducing overall energy consumption and minimizing reliance on non-renewable energy sources. It covers passive and active measures that building owners can adopt, ensuring a safe, healthy, and comfortable environment for occupants.

1.4.4 Benefits of Green Practices

Green practices in the mining and minerals sector in Malaysia offer numerous benefits that contribute to improved efficiency, reduced resource consumption, and enhanced sustainability. By adopting these practices, the industry can achieve the following advantages:

Increased Efficiency and Resource Conservation

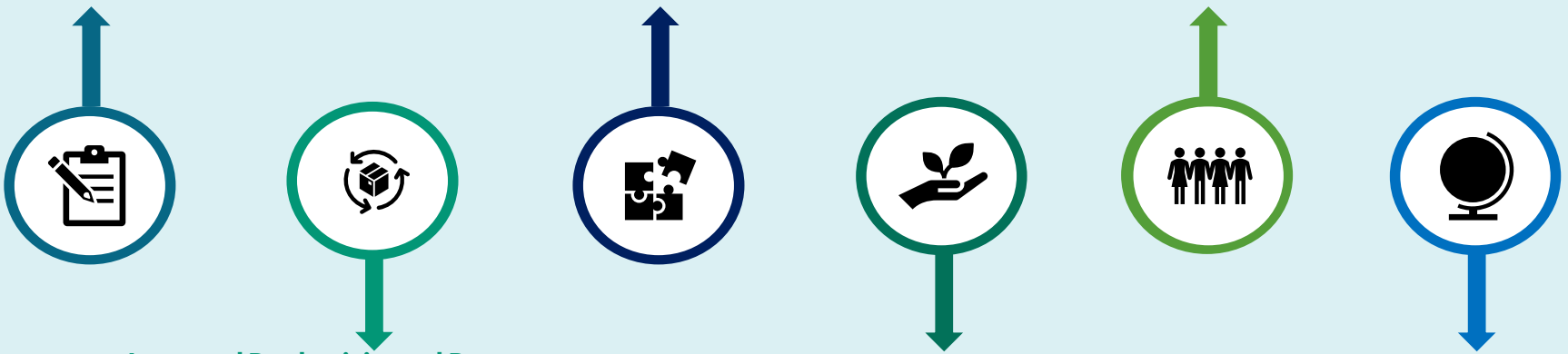
Green practices result in improved efficiency, reducing the consumption of materials, energy, and water. Through optimized processes and technologies, the industry can minimize waste generation and achieve a lower intensity of toxic or hazardous materials. Examples include implementing advanced extraction techniques, adopting energy-efficient equipment, and optimizing water usage, leading to cost savings and reduced environmental impact.

Support for Green Innovations

Embracing green practices fosters an environment conducive to innovation in technology and processes. The mining and minerals sector can drive the development and adoption of sustainable technologies, such as eco-friendly extraction methods and renewable energy integration. These innovations not only contribute to the industry's sustainability goals but also position companies at the forefront of technological advancements.

Enhanced Human Resource Utilization

Green practices in the industry promote better utilization of human resources. By investing in employee training and education on sustainable practices, companies can develop a skilled workforce capable of driving efficiency, implementing environmental safeguards, and adapting to evolving sustainability requirements. This improves productivity, job satisfaction, and retention rates.



Increased Productivity and Revenue

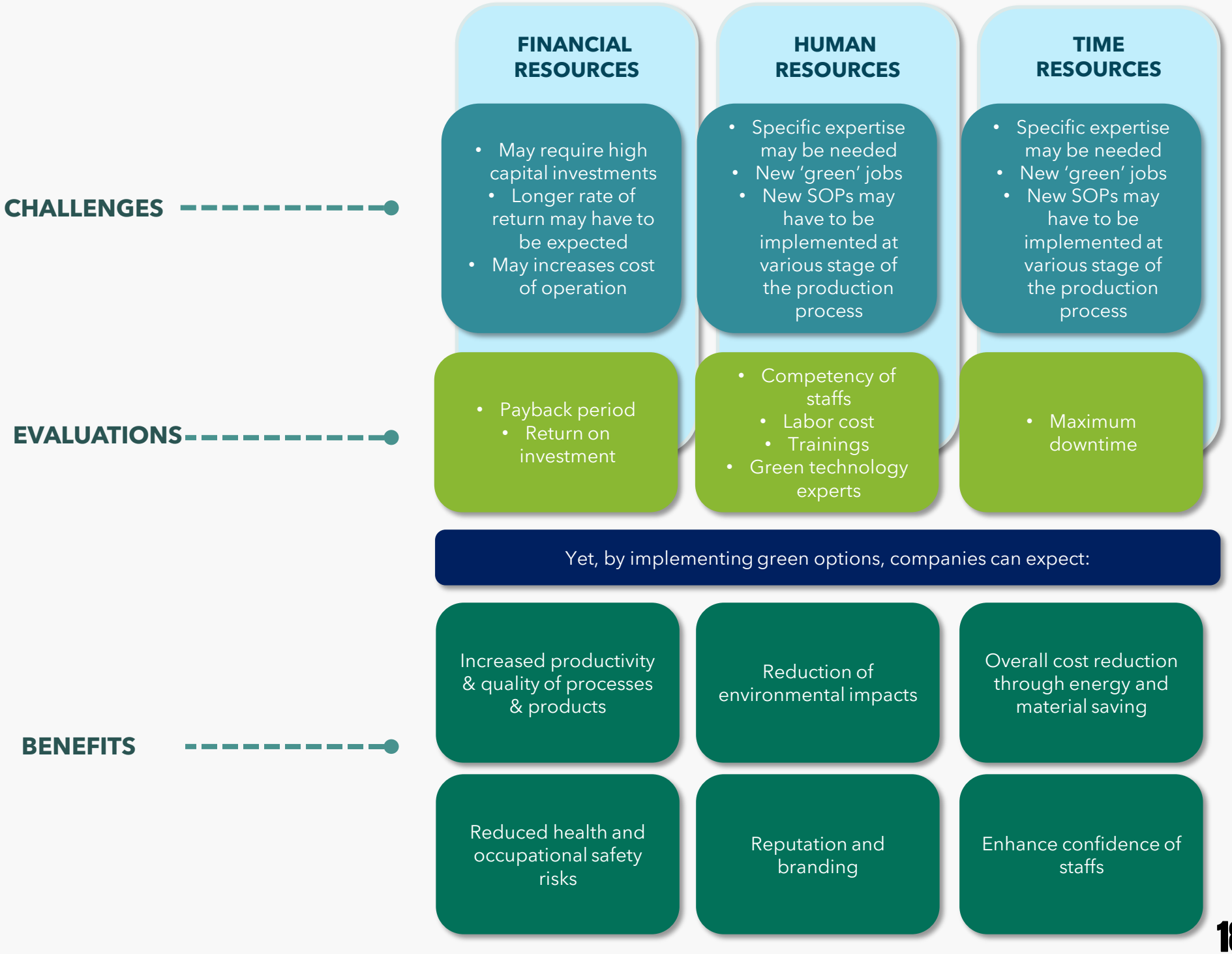
Adopting green practices often leads to increased industrial productivity and revenue. Streamlining processes, reducing waste, and optimizing resource utilization can improve overall operational efficiency. Moreover, incorporating sustainable practices enhances the company's reputation, attracting environmentally conscious customers and investors, and potentially expanding market opportunities.

Support for ESG Aspirations and Sustainability Reporting

Green practices align with Environmental, Social, and Governance (ESG) aspirations and sustainability reporting. By integrating the specific indicators outlined in green practice guidelines, businesses can review, manage, and plan for more sustainable business decisions. This ensures alignment with ESG goals, enhances transparency, and promotes responsible corporate citizenship.

Adaptation to Global Initiatives

The global trend of green consumerism, carbon trading, and carbon taxes requires closer scrutiny of greener and sustainable practices in the industry. Initiatives related to carbon emissions reduction and environmental impact mitigation are gaining traction worldwide. By proactively adopting green practices, the mining and minerals sector in Malaysia can position itself for compliance with evolving regulations and tap into emerging opportunities related to green markets and carbon-neutral supply chains.


FINANCIAL RESOURCES
HUMAN RESOURCES
TIME RESOURCES
CHALLENGES
• May require high capital investments
• Longer rate of return may have to be expected
• May increases cost of operation
• Specific expertise may be needed
• New 'green' jobs
• New SOPs may have to be implemented at various stage of the production process
• Specific expertise may be needed
• New 'green' jobs
• New SOPs may have to be implemented at various stage of the production process
EVALUATIONS
• Payback period
• Return on investment
• Competency of staffs
• Labor cost
• Trainings
• Green technology experts
• Maximum downtime
Yet, by implementing green options, companies can expect:
BENEFITS
Increased productivity & quality of processes & products
Reduction of environmental impacts
Overall cost reduction through energy and material saving
Reduced health and occupational safety risks
Reputation and branding
Enhance confidence of staffs

1.5 Outcome from Green Practices

In order to determined level of GP implemented in an organisation, the initiatives related to GP shall be assessed according to the method described in Chapter 2 in the guideline and results from the assessment shall be translated into the following Star-Rating System:

1-Star	• Comply to all regulatory requirements • Demonstrate leadership in developing systematic environmental reporting practical		60% - 70%
2-Star	• Exhibit characteristics of being resource efficient • Demonstrating positive impacts from green practices • Incorporate and implement continuous quality improvement initiatives throughout business operations		71% - 80%
3-Star	• Demonstrate integration of governance framework related to sustainability and circular economy • Demonstrate capacity in contributing towards achieving national decarbonization targets • Demonstrate leadership in developing, expanding and applying new tech related to green practices		81% - 100%

CHAPTER 2
ASSESSMENT

2.1 About the Assessment of Green Practices

Green practices in the mining and minerals industry in Malaysia aim to foster innovation, minimize resource usage, eliminate or minimize toxic substances, reduce waste generation, and achieve net-zero greenhouse gas emissions throughout the entire product life cycle. While facing certain constraints, the industry recognizes the importance of embracing sustainable practices to ensure long-term viability and environmental stewardship.

This guideline has been specifically developed considering the unique capacities, operations, and environmental impacts of diverse sectors within the mining and minerals industry. It provides a framework for implementing green practices that are applicable and beneficial across various mining and minerals operations in Malaysia. The goals of green practices in the mining and minerals industry include:

01

Resource Conservation

The industry aims to conserve valuable resources such as raw materials, water, and energy. By optimizing resource usage and adopting efficient technologies and processes, mining and minerals companies can minimize their ecological footprint and reduce resource depletion.

02

Reduction of Toxic and Hazardous Materials

Green practices focus on minimizing the use of toxic and hazardous materials in mining operations. By adopting alternative materials or implementing safer technologies, the industry can significantly reduce the quantity and toxicity of emissions and waste generated during mining processes.

03

Greenhouse Gas Emission Reduction

The mining and minerals industry aims to reduce its greenhouse gas emissions. By implementing cleaner and more energy-efficient technologies, optimizing energy consumption, and exploring renewable energy options, the industry can contribute to mitigating climate change impacts.

The guideline provides general recommendations that can be applied across different sectors within the mining and minerals industry. It emphasizes the importance of businesses adopting and implementing green practices in Malaysia. These recommendations enable companies to develop action plans and implementation strategies tailored to their specific capabilities, operations, and long-term sustainability goals.

By following the outlined steps, mining and minerals companies can develop comprehensive action plans for integrating green practices into their existing and future operations.

The approach takes into account the industry's current capabilities and strategies, ensuring a practical and achievable transition towards sustainability and responsible resource management.

Overall, embracing green practices in the mining and minerals industry in Malaysia is crucial for conserving resources, minimizing environmental impacts, reducing greenhouse gas emissions, and promoting the industry's long-term viability in alignment with global sustainability goals.

2.2 Guideline Implementation

To successfully integrate green practices into existing operations and processes, businesses in the mining industry are recommended to follow the following three steps:

01
Assessment

02
Set target for Improvement

03
Implement Green Practice

A. Understand the Assessment Requirements

Familiarize yourself with the assessment criteria outlined in the Green Practices Data Collection Form (Appendix 2) for the six indicators described in Section 2.3. Refer to the Indicator Instrument Factsheet (Appendix 3) for detailed information on each indicator, including goals, targets, terminologies, data sources, and collection methods.

B. Prepare Relevant Documents

Prepare Relevant Documents: Gather the necessary documents and records as evidence of green practices implementation. These may include utility bills, purchasing records, contract documents, and other relevant information specified in the Indicator Instrument Factsheet and Green Practices Data Collection Form.

C. Conduct Assessment

Conduct Assessment: Evaluate green practices according to the criteria established for each sub-indicator. Present the relevant documents as proof of implementation during the assessment process. Scores will be assigned based on the criteria, and the overall mark for each indicator will be calculated by multiplying the sum of sub-indicator scores with their assigned weightage. The weightage reflects the applicability and importance of the indicator to the mining sector. The total score will be translated into a Star Rating system described in Section 1.5.

2.2 Guideline Implementation

To successfully integrate green practices into existing operations and processes, businesses in the mining industry are recommended to follow the following three steps:

01
Assessment

02
Set target for Improvement

03
Implement Green Practice

A. Define Clear Objectives

Based on the assessment conducted in Stage 1, establish clear objectives that describe the desired outcomes of implementing green practices in the mining industry. These objectives may include reducing greenhouse gas emissions, increasing market share for sustainable products, and more. Identify areas of improvement required to achieve the objectives based on the assessment results.

B. Set Realistic and Attainable Targets

Align targets for each sub-indicator with the goals and targets outlined in the Indicator Instrument Factsheet and the scoring criteria in the Green Practices Data Collection Form. Assign deadlines or timelines to each target to ensure progress can be measured effectively.

2.2 Guideline Implementation

To successfully integrate green practices into existing operations and processes, businesses in the mining industry are recommended to follow the following three steps:

01
Assessment

02
Set target for Improvement

03
Implement Green Practice

A. Formulate an Action Plan

Develop a detailed action plan that outlines the necessary steps and timelines for implementing green practices in the mining industry. Refer to the examples provided in Section 2.3 for guidance. Break down the goals into smaller, manageable tasks and assign responsibilities to individuals or teams. Include milestones and performance indicators to track progress effectively. Allocate resources, such as budgets and personnel, to support the implementation efforts.

B. Engage Employees

Foster employee engagement at all levels to drive successful implementation. Raise awareness about the importance of sustainability and provide training and education on green practices. Encourage employees to contribute ideas and suggestions for improving sustainability efforts. Recognize and reward environmentally conscious behaviors and achievements to cultivate a culture of sustainability within the mining industry.

C. Collaborate with Suppliers and Partners

Engage with suppliers and partners to promote sustainable practices throughout the mining supply chain. Encourage them to adopt environmentally friendly practices and prioritize suppliers with strong sustainability credentials. Collaborate on initiatives such as joint recycling programs or sharing best practices to collectively reduce the environmental footprint of the mining industry.

D. Measure, Evaluate, and Improve:

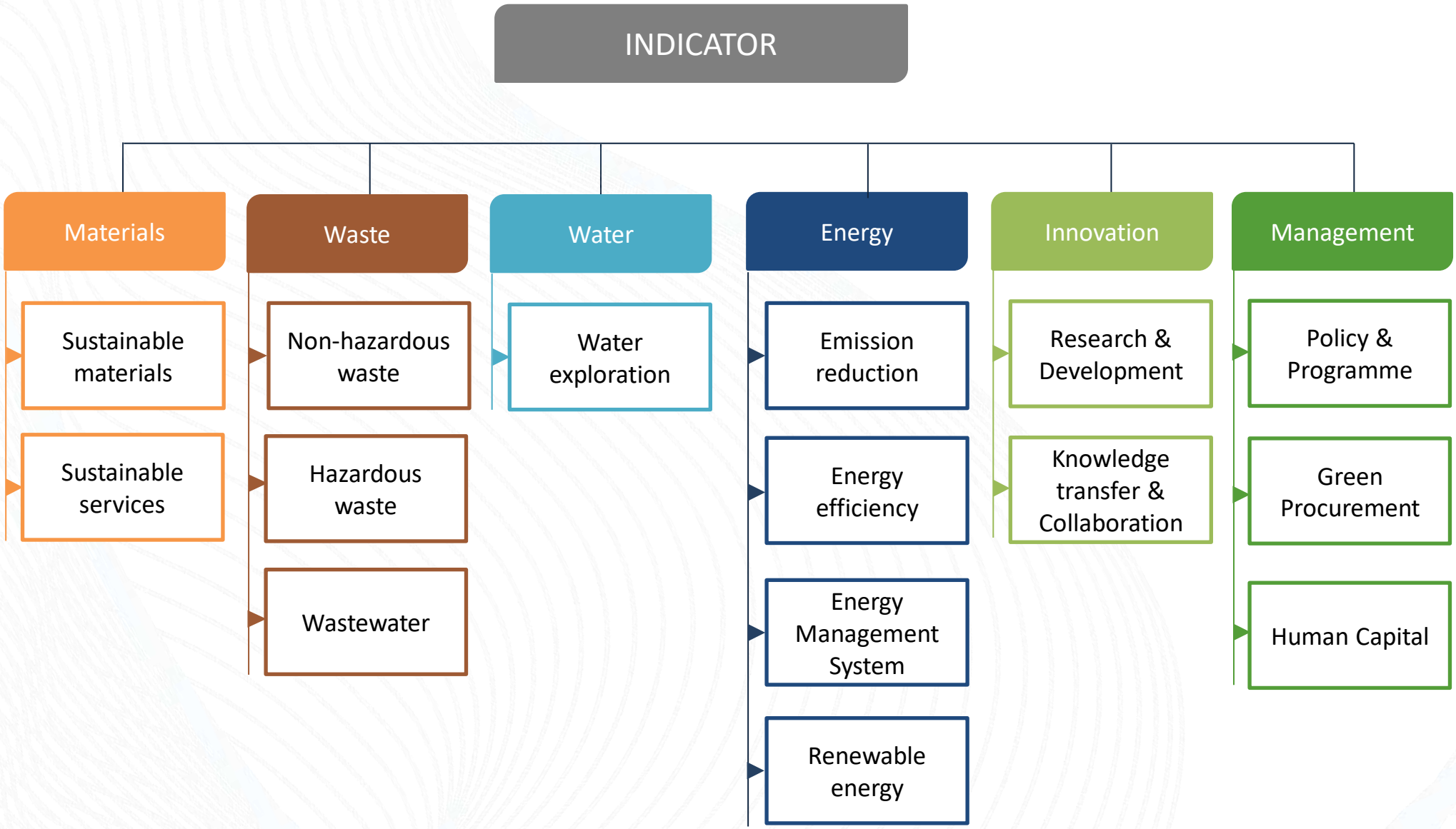
Measure, Evaluate, and Improve: Establish a system for measuring and evaluating the effectiveness of green practices in the mining industry. Monitor key performance indicators (KPIs) to track progress towards sustainability goals. Regularly review and analyze data to identify areas for improvement. Use this information to refine strategies and adjust implementation plans as needed, ensuring continuous improvement in the industry's green practices.

2.3 Indicators

Indicators are crucial for evaluating and comparing the performance of industries in adopting green practices. These indicators provide a standardized framework for assessing the environmental sustainability efforts across various sectors. In order to ensure a comprehensive and meaningful evaluation, a set of six indicators and sixteen sub-indicators have been identified based on three key requirements: applicability, measurability, and representativeness.
The selected indicators and sub-indicators were carefully chosen to capture the key aspects of green practices and their impact on sustainability. Applicability ensures that the indicators are relevant and applicable to a wide range of industries, allowing for consistent evaluation across different sectors. Measurability ensures that the indicators can be quantified or assessed using objective criteria, enabling meaningful comparisons between industries. Representativeness ensures that the indicators encompass a comprehensive set of factors that reflect the overall performance of green practices.

By utilizing these indicators, stakeholders can effectively gauge the extent to which industries are implementing green practices and contributing to sustainable development. The indicators provide a structured approach to measure and monitor progress in key areas such as resource conservation, emissions reduction, waste management, and sustainable operations.

These indicators serve as a valuable tool for decision-making, enabling industries to identify areas for improvement, set targets, and track their performance over time. Furthermore, they facilitate benchmarking exercises, allowing industries to compare their performance against sector peers and best practices.
The use of indicators promotes transparency and accountability, enabling stakeholders to assess the environmental performance of industries and make informed choices. It also provides an opportunity for recognition and incentives, as industries that demonstrate strong performance in adopting green practices can be acknowledged and rewarded for their efforts.


INDICATOR
Materials
Sustainable materials
Sustainable services
Waste
Non-hazardous waste
Hazardous waste
Wastewater
Water
Water exploration
Energy
Emission reduction
Energy efficiency
Energy Management System
Renewable energy
Innovation
Research & Development
Knowledge transfer & Collaboration
Management
Policy & Programme
Green Procurement
Human Capital

2.3.1 Materials

The Material Indicator for Green Practices focuses on the responsible and sustainable management of materials utilized across industries. Industries use various types of materials in their processes, with some relying exclusively on virgin materials while others incorporate recycled materials. The efficient consumption of materials is essential for the long-term survival and success of industries, as it directly impacts resource availability and overall material efficiency. The Material Indicator within the Green Practices framework encompasses two sub-indicators: Sustainable Materials and Sustainable Services.

Sustainable Materials: This sub-indicator assesses the demonstration of purchasing and utilization practices related to sustainable materials within industries. It requires industries to showcase a clear direction and vision towards sustainable material utilization, along with the implementation of self-regulation measures that align with sustainability goals. Additionally, recognition or certification from reputable third-party entities or certification bodies further validates the commitment to sustainable material practices.

Sustainable Services: This sub-indicator evaluates the purchase and utilization of sustainable services within industry operations. It encourages industries to demonstrate a specific direction and vision regarding the use of sustainable services. The implementation of self-regulation measures that align with sustainability goals should be evident, and recognition or certification from reputable third-party entities or certification bodies can further validate the adherence to sustainable service practices.

By addressing the Material Indicator and its sub-indicators, industries can enhance their material management practices, promoting the use of sustainable materials and services. This not only supports environmental conservation and resource preservation but also aligns with industry-wide sustainability goals. It demonstrates a commitment to responsible material utilization and contributes to the long-term viability and success of industries across diverse sectors. The scope for Material in Mining sector includes two (2) sub-indicators; Sustainable Materials and Sustainable services.

SUSTAINABLE MATERIALS

SUSTAINABLE SERVICES

2.3.1 Materials

Sub Indicators	Requirement	Objective Evidence for Assessment	Green Practices
Sustainable Materials	Demonstration on purchase or use of sustainable materials	• Company sustainability report • Businesses sustainability policies • Sustainability monitoring activity • Certification or recognition of sustainable material	Adopt best practices for handling, storing, and disposing of chemicals, ensuring compliance with relevant regulations and promoting the use of environmentally friendly alternatives.
Sustainable Services	Demonstration on purchase or use of sustainable services	• Company sustainability report • Businesses sustainability policies • Sustainability monitoring activity • Certification or recognition of sustainable services	Engage suppliers and contractors to adhere to environmental and social responsibility criteria, promoting sustainable practices throughout the supply chain.

2.3.2 Waste

Waste refers to any material that is discarded or released by the generator or holder, posing various environmental risks based on its chemical composition and physical state. In green practices, the focus is on prevention or reduction of waste at its source, employing strategies and approaches distinct from end-of-pipe treatment. The definition of industrial waste, as stated in Section 2 of the Environmental Quality Act 1974 (Act 127) and Regulations, encompasses matter prescribed as scheduled wastes or any solid, semi-solid, liquid, gas, or vapor emitted, discharged, or deposited in the environment in quantities, compositions, or manners that cause pollution.
Implementing an effective waste management plan necessitates strategic measures that encompass all stages of waste management. Businesses should conduct a thorough analysis of the current collection, handling, treatment, and disposal processes to identify existing or potential issues. Based on this assessment, specific goals and action plans can be developed and implemented, with regular monitoring and review to ensure progress.

The waste management plan should also prioritize the enhancement of stakeholders' knowledge through the effective dissemination of technical information and research findings concerning the environmental impacts of the waste generated. By promoting awareness and understanding, stakeholders can actively participate in waste reduction and proper waste management practices.
To guide waste management efforts, the following goals and targets have been established:

By 2025, achieve a 40% recycling rate of solid waste from total non-hazardous waste generated.

By 2025, completely eliminate waste disposal in landfills.

By 2030, achieve 100% recycling of sludge.

By 2030, recycle 33% of treated effluent.

By 2030, achieve a 50% recycling rate of hazardous waste from the total hazardous waste generated.

By 2030, establish 180 biogas capture facilities

These goals provide clear targets for waste reduction, recycling, and resource recovery, contributing to the overall objective of sustainable waste management. By striving to meet these targets, businesses can significantly reduce their environmental impact, conserve resources, and promote a circular economy approach in the handling of waste.
The scope for Waste in Mining sector includes three (3) sub-indicators; Wastewater, Non-hazardous and Hazardous Waste.

2.3.2 Waste

Sub Indicators	Requirement	Objective Evidence for Assessment	Green Practices
Wastewater	• Targeted percentage of water recycling achieved by the businesses • Targeted percentage of wastewater sludge recovery achieved by the businesses	Records on monitoring effluent discharge flow, recycling flow, and sludge recovered	• Implement advanced wastewater treatment technologies to ensure proper treatment and disposal of mining-related wastewater, minimizing its impact on the environment and local water sources. • Develop systems and processes to recycle and reuse treated wastewater within mining operations, reducing freshwater usage and minimizing overall water footprint.
Non-hazardous waste	• Targeted percentage of non-hazardous waste recycled achieved by the businesses • Number of biogas capture facility within the businesses	• Records on monitoring non-hazardous waste generated and recycled in the businesses • Number of biogas facility	Explore opportunities for reusing or repurposing mining waste or by-products to minimize environmental impact and promote circular economy principles.
Hazardous waste	Targeted percentage of hazardous waste recycled achieved by the businesses	• Records on monitoring hazardous waste generated and recycled in the businesses	Develop comprehensive waste management plans to reduce waste generation, promote recycling initiatives, and minimize the disposal of hazardous materials.

2.3.2 Water

Water scarcity and quality issues are prevalent despite water covering over two-thirds of the Earth's surface and being renewable on a global scale. Local shortages and degradation of water bodies occur frequently, posing significant challenges. With increasing demand, the withdrawal of water for industrial processes without returning it to the same water source in its original quantity and quality can lead to severe depletion of rivers, lakes, and groundwater tables.

Certain industrial processes and products necessitate the use of water, which may vary in quality requirements. While water may not be directly consumed in the production process, it is often indirectly utilized for cooling, heating, or washing purposes. Enhancing the rate of recirculation and minimizing evaporation can substantially reduce the overall water consumption, lessening the reliance on municipal water supplies, groundwater sources, or surface waters. It is recommended that facilities accurately measure and monitor the amount of water being recycled or recirculated within their operations.

By prioritizing water conservation measures, industries can mitigate the impact on local water resources and contribute to sustainable water management. Implementing efficient water usage practices, such as optimizing recirculation systems, reducing water losses, and implementing technologies that minimize water requirements, can help decrease water consumption and preserve water resources. Additionally, adopting water management strategies that prioritize water reuse and recycling can further contribute to sustainable water practices.

Considering the finite nature of freshwater resources, industries play a crucial role in promoting responsible water stewardship. By implementing measures to reduce water demand, enhance recycling and recirculation, and monitor water usage, industries can contribute to the conservation and sustainable management of this vital resource, ensuring its availability for future generations.
The scope for Water in Mining sector includes one (1) sub-indicators; Water Exploration.

Sub Indicators	Requirement	Objective Evidence for Assessment	Green Practices
Water Exploration	Targeted percentage of alternative water used by the businesses	Records on monitoring city water and alternative water use	Prioritize responsible water sourcing practices, considering the local hydrological conditions, water scarcity, and the needs of surrounding communities to minimize the impact on water resources.

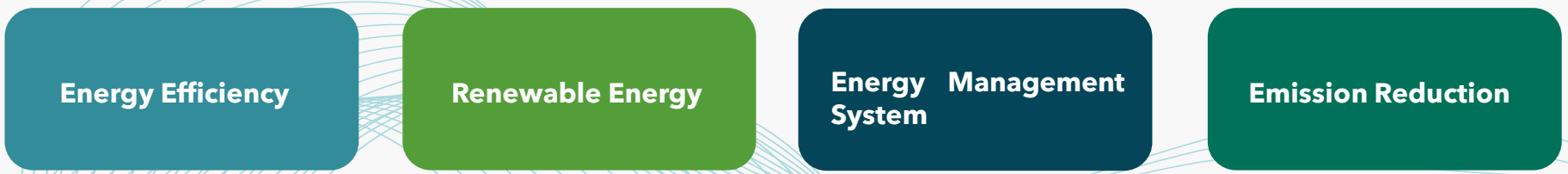
2.3.4 Energy

Energy consumption plays a pivotal role in achieving decarbonization and driving green practices in industries. Globally, electricity and power generation continue to be major contributors to greenhouse gas (GHG) emissions. Therefore, focusing on energy efficiency and transitioning to low-carbon energy sources is crucial for sustainable development. The adoption of electrification is gaining momentum in numerous decarbonization efforts. By shifting from traditional fossil fuel-powered systems to electric alternatives, industries can significantly reduce their carbon footprint. Electric vehicles (EVs), for instance, offer a greener transportation solution compared to internal combustion engine (ICE) vehicles. Furthermore, integrating renewable energy sources such as solar, wind, hydro, and geothermal power into electricity generation is essential for reducing reliance on fossil fuels and achieving a cleaner energy mix.

In Malaysia, the planned National Energy Policy includes ambitious targets to increase the generation of renewable energy from sources like solar, biomass, and biogas. This renewable energy capacity expansion aligns with the nation's commitment to reducing carbon intensity and achieving sustainable energy practices. To drive decarbonization and achieve long-term environmental sustainability, industries must prioritize energy-saving measures and the adoption of energy-efficient technologies. This includes optimizing manufacturing processes, implementing smart energy management systems, and investing in energy-efficient equipment. Additionally, exploring innovative solutions like energy recovery systems, waste heat utilization, and energy conservation initiatives can contribute to significant energy savings and emissions reduction.

By setting clear goals and targets, such as those outlined in the Nationally Determined Contribution (NDC), industries can actively contribute to the national and global efforts of reducing carbon intensity. Meeting the NDC target of carbon intensity reduction by a certain percentage compared to a baseline year demonstrates the commitment to sustainable practices and aligns with the broader goals of the Paris Agreement. Energy plays a critical role in decarbonization and achieving green practices in industries. By embracing electrification, adopting renewable energy sources, and implementing energy-saving measures, industries can drive the transition to a low-carbon economy, reduce GHG emissions, and contribute to a sustainable and resilient future.

The scope for Energy in Mining sector includes four (4) sub-indicators; Energy Efficiency, Renewable Energy, Energy Management System and Emission Reduction.



2.3.4 Energy

Sub Indicators	Requirement	Objective Evidence for Assessment	Green Practices
Energy Efficiency	Targeted percentage of electricity and fuel consumption reduction achieved by the businesses	• Meter energy usage readings • Bills of quantities for fuels • COA for fuels	Optimize energy consumption by using energy-efficient equipment, implementing energy management systems, and adopting energy-saving technologies.
Renewable Energy	Targeted percentage of renewable energy used by the businesses	• Meter energy usage readings • Bills of quantities for fuels • COA for fuels	Incorporate renewable energy sources such as solar, wind, or hydroelectric power to reduce reliance on fossil fuels and decrease greenhouse gas emissions.
Energy Management System	Demonstration of an Energy Management System setup within the businesses	Records supporting the setup, operation, and performance achieved by the Energy Management System	• Implement energy management systems to monitor and optimize energy consumption across mining operations, reducing energy waste and carbon emissions. • Renewable Energy Integration: Integrate renewable energy sources, such as solar or wind power, into mining operations to reduce reliance on fossil fuels and lower greenhouse gas emissions.
Emission Reduction	Targeted percentage of emissions reduction achieved by the businesses	GHG Inventory reports	Develop strategies to reduce greenhouse gas emissions through the use of cleaner technologies, carbon offset programs, and emissions monitoring

2.3.5 Innovation

Innovation plays a crucial role in driving green practices within the industry as businesses strive to adapt their business processes and activities to meet the demands of a competitive global market. By prioritizing innovation, businesses can develop marketable, viable, and effective products that align with sustainability objectives. One of the key indicators of innovation in green practices is research and development (R&D) efforts focused on green technology. Manufacturers invest in R&D to explore and develop innovative solutions that improve environmental performance and reduce the ecological footprint of their operations. This includes advancements in energy-efficient processes, waste reduction techniques, sustainable materials, and eco-friendly manufacturing methods.

Additionally, innovation in green practices encompasses the product development phase, which involves incorporating green product design principles. Manufacturers aim to create products that have minimal environmental impact throughout their lifecycle, from sourcing and production to use and disposal. This involves considering factors such as energy efficiency, recyclability, reduced resource consumption, and the use of environmentally friendly materials.

Setting goals and targets for innovation in green practices can drive businesses progress. Establishing robust research and development processes, output, and policies enables businesses to streamline their innovation efforts and focus on sustainable solutions. Increasing investment and incentives to support innovation in green practices further promotes the commercialization of environmentally friendly products. This can involve securing intellectual property rights, receiving awards and recognition, and fostering a culture of innovation within the businesses.

Strategic partnerships, collaborations, joint ventures, and knowledge transfer programs are also vital for fostering innovation in green practices. By collaborating with other businesses, sharing knowledge and expertise, and leveraging collective resources, manufacturers can accelerate the development and implementation of sustainable solutions. These partnerships can lead to the commercialization of innovative green products, technologies, and practices.

In conclusion, innovation is a critical measure of green practices in the industry. By prioritizing research and development efforts, incorporating green product design principles, and establishing strategic partnerships, manufacturers can drive the adoption of sustainable solutions, reduce their environmental impact, and contribute to a greener and more sustainable future.
The scope for Innovation in Mining sector includes two (2) sub-indicators; Knowledge Transfer and Collaboration and Research and Development (R&D).

Knowledge Transfer And Collaboration

Research And Development

2.3.5 Innovation

Sub Indicators	Requirement	Objective Evidence for Assessment	Green Practices
Knowledge Transfer and Collaboration	Demonstration of knowledge transfer and strategic collaboration occurring in the businesses	Records and documentations such as MOUs, MOAs, IPs, etc.	• Foster collaboration within the mining industry by sharing best practices, experiences, and knowledge to drive sustainable practices collectively. • Engage with local communities, governments, NGOs, and academic institutions to exchange knowledge, share information, and collaborate on sustainable mining initiatives
Research and Development	Demonstration of R&D activities occurring in the businesses	Records and documentations such as businesses chart, procedures, blueprints, proposals, etc.	• Invest in research and development to identify and implement innovative technologies and processes that improve the efficiency and sustainability of mining operations, such as advanced extraction techniques or waste management solutions. • Conduct research to develop and promote sustainable mining practices that minimize environmental impacts, reduce resource consumption, and improve overall operational efficiency

2.3.6 Management

Management plays a crucial role in driving and implementing green practices within the industry. The administration of an businesses, company, or business is responsible for creating forward-thinking policies and strategies that support the development of a more sustainable form of business. By embracing environmentally responsible practices, businesses can minimize the negative impacts of their manufacturing processes on the environment and contribute to a greener future. Going beyond compliance with legal requirements, being environmentally responsible means investing in human capital and adopting management practices that actively contribute to the industry's green initiatives. This involves fostering a culture of sustainability within the businesses, where all stakeholders, including employees and customers, are engaged in reducing environmental impacts. Effective management practices focus on integrating sustainable principles into decision-making processes, resource allocation, and operational strategies.

The global shift towards a green economy, driven by ESG frameworks and investment systems, is transforming the landscape of job creation, skills development, and job quality. Businesses that prioritize green practices and demonstrate commitment to environmental sustainability are better positioned to thrive in this evolving economic landscape. By proactively adopting green manufacturing principles, businesses can align their initiatives with the goal of achieving a greener future. Businesses have the flexibility to choose and prioritize their initiatives within the realm of green manufacturing based on their level of readiness and business objectives. This includes focusing on green energy solutions, developing green products, and implementing green processes. By incorporating renewable energy sources, reducing carbon emissions, and optimizing resource usage, businesses can enhance their environmental performance while improving operational efficiency.

The government has developed various initiatives to support and propel the adoption of green practices in the industry. Programs such as the MyHijau SME & Entrepreneur Development Program, Energy Audit Grant for the industrial sector, Energy Management Gold Standard (EMGS), Enhanced Time of Use tariff (EToU), and ISO14001 certification provide valuable resources and incentives for businesses to embrace sustainability. These initiatives encourage businesses to actively engage in green practices, implement energy-saving measures, adopt environmentally friendly technologies, and strive for continuous improvement in their environmental performance.

In conclusion, effective management practices are essential for driving green practices within the industry. By adopting forward-thinking policies, fostering a culture of sustainability, and embracing green initiatives, businesses can minimize their environmental footprint, meet the demands of a changing economic landscape, and contribute to a more sustainable future.
The scope for Management in Mining sector includes three (3) sub-indicators; Green Procurement, Policy and Programme and Human Capital.
.

Green Procurement

Policy and Program

Human Capital

2.3.6 Management

Sub Indicators	Requirement	Objective Evidence for Assessment	Green Practices
Green Procurement	Demonstration of green procurement practices occurring in the businesses	Records and documentations such as policies and standards, agreements, purchase records, etc.	Favour suppliers and contractors that adhere to sustainable practices, environmentally friendly materials, and low-impact technologies.
Policy and Program	Demonstration of policies and programs practices occurring in the businesses that support Green Practices	Records and documentations such as MOUs, MOAs, IPs, etc.	• Ensure responsible sourcing of minerals by adhering to internationally recognized standards and certifications that promote ethical and sustainable practices. • Establish comprehensive monitoring programs to track environmental impacts, regularly assess and report on performance, and proactively address any issues that arise. • Prioritize worker health and safety by providing proper training, implementing safety protocols, and regularly assessing and managing occupational risks.
Human Capital	Demonstration of a human capital development program in the businesses that support Green Practices	Records and documentations such as policies and standards, records of training, etc.	Invest in training programs to enhance employee knowledge and skills in environmental management, sustainability practices, and responsible mining techniques

CHAPTER 3
IMPLEMENTATION

3.1 Indicator Alignment

In this section, a framework is introduced to help industries in recognizing the various certificates, recognitions and benefits that exists within Malaysia. Using this framework, mining sector can refer to the specific guidelines and best practices that support the application of green practices in the industry. Mining sector can also refer to the indicators that align with the various existing initiatives.

Existing Initiatives	Agency/ Institutions	Description	Criteria for Assessment	Green Practices indicator	Benefits	Reference (Scan for link)
Green Investment Tax Allowance (GTA)	MIDA	Incentive for companies that undertake Green Technology projects involving capital investments	Renewable Energy (RE); Energy Efficient (EE); Green Building; Green Data Centre; Integrated Waste Management		Tax allowance	
Green Income Tax Exemptions (GITE)	MIDA	Incentive for companies that carry out services which support the implementation and operation of Green Technology projects.	Renewable Energy (RE); Energy Efficient (EE); Green Building; Green Data Centre; Green Certification and Verification; Green Township; Electrical Vehicle		Tax exemptions	
MyHIJAU Mark	MGTC	A government initiative to promote the sourcing and purchasing of green products and services in Malaysia	Existing Green Label Certification, or Performance Standard Compliance report from an independent certification body that meets the minimum standards recognized by MGTC		Eligibility for Government Green Procurement (GGP), Green Private Purchasing (GPP), and may be eligible for GITA or GITE	
Eco-labelling Scheme	SIRIM	This labelling gives eco-friendly products a competitive advantage over similar products	Compliance with products standards or specifications and the criteria, as well as relevant provisions in the Environmental Quality Act		Boost acceptance of products in international 'green markets' that favour green products with price premium	
Anugerah Industri Hijau	DOE	An initiative by the DOE to provide special recognition and encouragement to SMEs for the efforts of implementing green industry practices	Green activities and initiatives on water usage, electricity, fuel, raw materials, packaging materials, waste production, product lost, raw materials lost and wastewater production		Improved reputation and branding	

Existing Initiatives	Agency/ Institutions	Description	Criteria for Assessment	Green Practices indicator	Benefits	Reference (Scan for link)
National Energy Awards	MGTC	A platform to provide recognition and rewards to Malaysia's industry leaders in the growing green technology related products, services and energy services sectors for adopting and implementing sustainable energy practices	Renewable Energy (RE); Energy Efficient (EE);		International recognition and eligible to represent Malaysia at the annual ASEAN Energy Awards, Southeast Asia's highest energy awards	
Prime Minister's Hibiscus Awards	ENSEARCH, FMM & MICCI with recognition from KASA	Provide an opportunity for public recognition of businesses and industry's environmental commitment, management and performance	Leadership; Priority and commitment; Managing environmental issues; Training and communication; Legal and other compliance; Environmental emergencies; Employee participation; Supply chain; Environmental social programme; Environmental accounting; Eco-designs; Carbon footprint		National recognition with a Plague and Certificate of Participation, and eligibility to include award's logo for promotional activities	
National Green Technology Policy (NGTP)	KASA *previously developed under KeTTHA	This policy recognises green technology as a driver to accelerate the national economy and promote sustainable development	Energy sector; Building sector; Water and waste management sector; Transportation sector		Reduction in the rate of GHG emission	
Low Carbon Cities Framework (LCCP)	KASA	Provide framework to achieve sustainable development that will help in reducing carbon emissions by measuring the impact of development decisions in terms of carbon emissions and abatement	Urban Environment; Urban Transport; Urban Infrastructure, Building		Reduction performance will be awarded an environmental performance rating.	

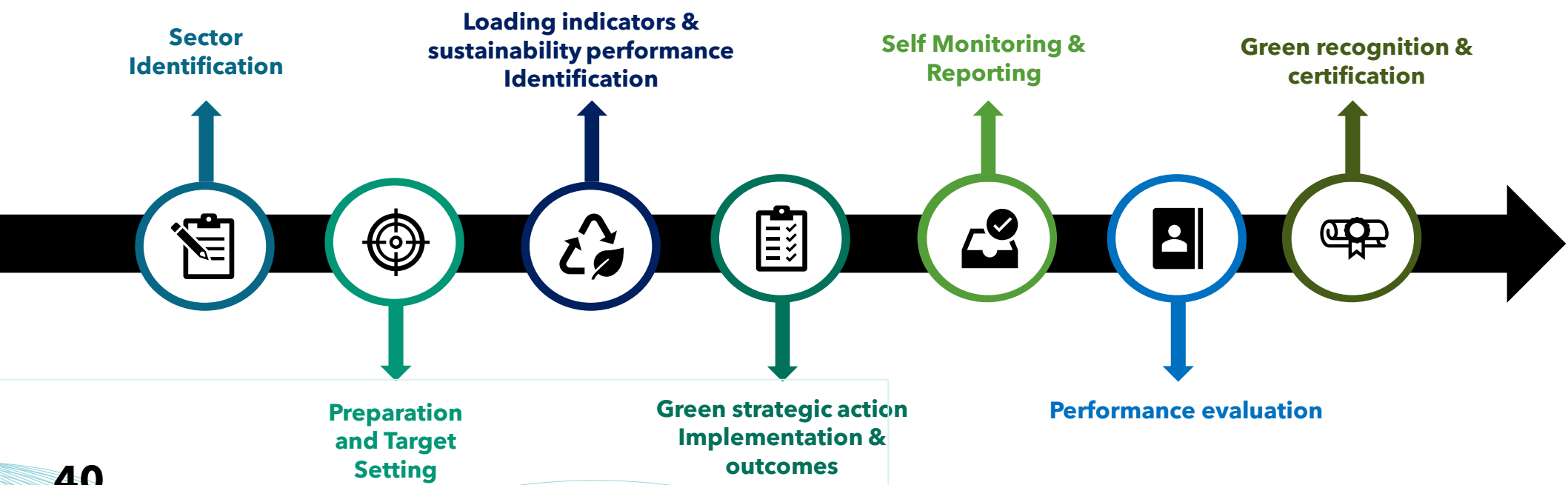
Existing Initiatives	Agency/ Institutions	Description	Criteria for Assessment	Green Practices indicator	Benefits	Reference (Scan for link)
Feed-in-Tariff	SEDA	Mechanism under the Renewable Energy Policy to catalyse generation of Renewable Energy (RE) up to 30 MW in size,	Biogas; biomass; small hydropower; solar photovoltaic		Reduce CO2 emissions and secure domestic energy supply, and guarantee investment security for renewable energy investors.	
Green Electricity Tariff (GET)	KeTSA	Encourage the use and purchase on green electricity from large scale solar and hydroelectric plants along with supporting the nation aspiration in reducing the net-zero GHG emission by 2020	Residential customer (100kWh per block); Non-residential customer (100kWh per block)		Subscribes able to receive Malaysia Renewable Energy Certificate (MREC) based on international REC standards and exempted from ICPT charge	
Malaysia Electricity Supply Industry Trust Account (MESITA)	KeTSA	Funding for programs or projects that support the development of national power industry including renewable energy R&D, human resource and energy efficiency	Electricity supply		Funding for programs and projects	
Energy Management Gold Statement (EMGS)	MGTC	Certification system delivered under the ASEAN Energy Management Scheme (AEMAS) based on excellence in energy management	Energy management		Recognized as a leader in energy management	

3.2 Towards Green Recognition

This guideline presents recommendations and proposed actions for the industry to implement green practices in their daily operations. It is driven by the vision of establishing a Green Certificate that recognizes and rewards sustainable practices within the industry. To support the industry in implementing green practices, a comprehensive Green Certificate Roadmap has been developed. This roadmap serves as a strategic guide, assisting industry players in adopting and implementing sustainable practices within their operations. It provides a structured approach to ensure that the industry is equipped with the necessary knowledge and resources to effectively integrate green practices.

The long-term goal is to enable industry players who have successfully implemented green and best practices to apply for the Green Certificate. This certification would serve as a formal recognition of their commitment to sustainability and environmental stewardship. As part of the proposed roadmap, industry players meeting the eligibility criteria for the Green Certificate may also benefit from proposed financing incentives and support.

By establishing the Green Certificate and associated benefits, the industry is encouraged to prioritize and embrace sustainable practices. This initiative not only acknowledges the efforts of the industry in adopting green practices but also serves as a catalyst for knowledge sharing and collaboration across the sector. Ultimately, the Green Certificate aims to drive widespread adoption of sustainable practices, promote environmental protection, and contribute to the overall sustainability goals of the mining and minerals industry in Malaysia.



3.3 Way Forward

To remain competitive and contribute to environmental protection in the mining sector, businesses must proactively adopt green practices and integrate ESG factors into their operations. This includes adopting circular business models, embracing ESG disclosure, transitioning to renewable energy sources, implementing decarbonization efforts, and exploring green financing and investment opportunities.

The integration of green practices within the mining sector is essential for fulfilling environmental responsibilities and aligning with the broader ESG framework. Investors increasingly consider ESG factors when making decisions, recognizing the value of sustainable and responsible mining practices. Regulatory requirements emphasize the importance of ESG disclosure for companies in the mining industry.

By incorporating ESG disclosure, mining companies can communicate their environmental initiatives, such as implementing energy-efficient operations, implementing waste reduction measures, utilizing renewable energy sources in mining activities, and undertaking efforts to mitigate climate change. Effective ESG disclosure enhances a company's reputation, attracts socially conscious investors, ensures regulatory compliance, and contributes to long-term value creation.

In evaluating the long-term sustainability and resilience of mining businesses, it is crucial to consider ESG factors alongside financial performance. This holistic approach enables companies to assess their environmental impact, social responsibility, and governance practices, ensuring alignment with sustainable development goals, investor expectations, and regulatory requirements.

Embracing ESG factors and integrating green practices in the mining sector not only positions businesses as responsible environmental stewards but also provides a competitive edge in the market. By proactively addressing environmental challenges, adopting sustainable mining practices, and incorporating ESG considerations, mining companies can secure their long-term viability, attract investment, comply with regulations, and contribute positively to the transition towards a sustainable and resilient economy.

REFERENCES

Academy Sciences of Malaysia. (2014). Blueprint for The Establishment of Rare Earth-Based Industries in Malaysia: A

Strategic New Source for Economic Growth - Summary for Policy Makers.

Ali, A. (2009). Implications of Trade Liberalisation to Malaysia's Mining Industry. Bulletin of the Geological Society of Malaysia, 55, 1-6.

Anon. (2016). Blueprints for a Greener Footprint: Sustainable Development at a Landscape Scale. World Economic Forum.

Anon. (2017). Sustainable Minerals Development: Best Practices in ASEAN, ASEAN Secretariat, Jakarta, November 2017.

Anon. (2018). Future Smart Mining. The Blueprint for the Future of Our Business. Anglo American Sustainable MiningnPlan.

Asia-Pacific Economic Cooperation. (2009). Sustainable Development Initiatives in the Malaysian Mineral Industry. APEC Conference on Sustainable Development of Mining Sector in APEC.

Athsani, R. A. A. (2016). Legal Framework of Mining Industry in Malaysia. Asian-Mena Counsel.

EU. (2010). Green Mines: Investing in Our Common Future. European Union.

OECD. (2019). Mining and Green Growth in the EECCA Region - Pre-publication version.

Guidelines for Green Industry Auditor. (2014). Department of Environment Malaysia, Ministry of Natural Resources and Environment.

Green Technology Master Plan Malaysia 2017-2030. (2017). Ministry of Energy, Green Technology and Water, Malaysia.

Hindalco Industries Limited. (2021). Sustainable Mining Charter. An Approach to Sustainable Mining.

Jiskani, I. M., Cai, Q., Zhou, W., Shah, S. A. A. (2021). Green and Climate-smart Mining: A Framework to Analyze Open-pit Mines for Cleaner Mineral Production. Resources Policy, 71, 102007.

Malaysian Minerals Year Book 2019. (2019). Department of Mineral and Geoscience Malaysia, Ministry of Natural Resources and Environment, Malaysia.

Malaysia Third Biennial Update Report to the UNFCCC. (2020). Ministry of Water and Environment. Putrajaya, Malaysia.

Malaysia Productivity Corporation. (2010). Sustainable Development Initiatives in Malaysia.

Ministry of Energy, Green Technology and Water, Malaysia. (2008). National Renewable Energy Policy & Action Plan.

Ministry of Energy and Natural Resources, Malaysia. (2021). Kerangka Pelan Transformasi Industri Mineral Negara 2021-2030.

Ministry of Natural Resources and Environment, Malaysia. (2009). National Mineral Policy 2: Towards Sustainable Mining.

Ministry of Natural Resources and Environment, Malaysia. (2017). Annual Report. Department of Mineral and Geoscience Malaysia.

NRC. (2018). Green Mining Innovation. Natural Resources Canada, Government of Canada.

Nurmi, P. A. (2017). Green mining – A Holistic Concept for Sustainable and Acceptable Mineral Production. Ann. Geophys. 60.

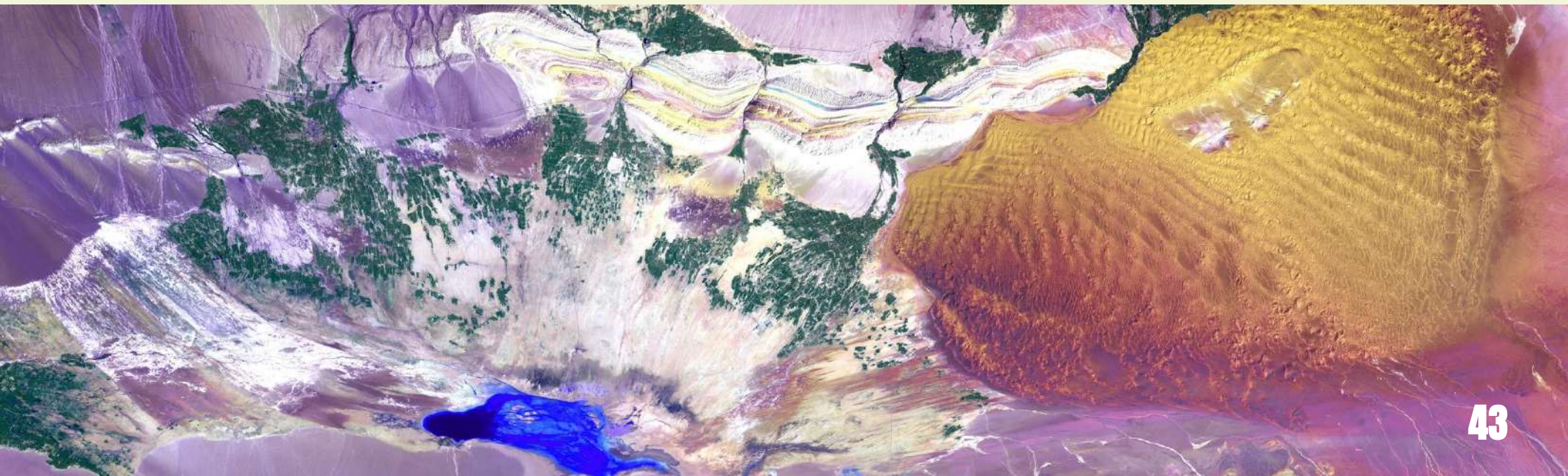
Olsson, O., Skanberg, K., and Larsen, R. K. (2019). The Swedish Mining Sector in Sustainable Futures. SEI report, Stockholm Environment Institute, May 2019.

CASE STUDY: In-Situ Leaching Mining Method

Introduction:
In-Situ Leaching (ISL) mining, also often referred to as Solution Mining or In-Situ Recovery Mining is a third alternative mining technique, quite different to conventional open-pit or underground mining and milling operations. The ISL process can be applied to the extraction of uranium, copper, silver, gold, nickel and many other minerals such as Rare Earth (RE). The premise of ISL is to exploit the local geology of some orebodies that may be in somewhat porous material by injecting a leaching agent called "lixiviant" dissolving the ore in solution, which can then be relatively easy to recover. For an ore deposit to be amenable to ISL it must occur within permeable materials and be confined above and below by low permeability materials such as clays or shales. Given these general criteria, chemical leaching solutions are injected into the ore deposit "In-Situ" and dissolves the mineral of interest. These mineral-laden solutions, also termed as pregnant solution are then extracted back to the surface for further processing. In this way, instead of the ore being excavated, crushed and chemically treated in a large surface processing plant, the process chemicals are injected to the targeted mineral concentrated layers directly. As such, the ISL technique generally has lower production costs than conventional mines.

Principle of ISL Mining:
There are 4 principle advantages of ISL in comparison to conventional open-pit mining methods; that are (1) No overburden removal and thus no vegetation clearing is required, (2) No conventional mineral processing involving crushing and milling of the ore on the surface is necessary, which is a great advantage as it minimizes the burden of dealing with tailings, (3) One is able to extract lower grade ore than is possible with other techniques; and (4) there is minimal surface disturbance with the least environmental impact. The ISL mining method has many advantages as well as inherent problems with the greatest disadvantage of ISL is a risk of potentially contaminating ground water.

A large number of lixiviant materials are used that broadly fall under two categories: acids and carbonate reactants. Commonly used reactants include sulfuric acid and ammonium bicarbonate. Sulfuric acid offers high leach performance at a relatively low cost but produces residues which degrades performance. The choice of lixiviant often depends on the amount of calcium in the ore. If calcium content is significant, alkaline leaching is typically used; otherwise, acid leaching is used, which typically yields higher recovery rates at a lower cost. One advantage of alkaline leaching is that undesired impurities are less likely to be dissolved in solution; however, this can also be a disadvantage as orebody must be directly exposed to the solution in order to permit extraction.



ISL Mining of Ion-Adsorption Clay Rare Earth Deposit:

ISL mining is becoming the more prevalent approach to Ion-Adsorption Clay (IAC) Rare Earth (RE) deposit mining in comparison to traditional open-pit mining techniques. The ISL technique involves the drilling and operation of an extensive series of injection and recovery holes, injecting and extracting the chemical solutions continuously. IAC RE deposits suitable for ISL are in permeable clay that are confined by adjacent impermeable structures, which facilitates the chemical solution injection and recovery. A lixiviant is injected into the orebody above the water table via boreholes for the purpose of dissolving the RE ion in solution, thereby mobilizing it.

In IAC RE deposit, the general extraction process involves injecting a leaching agent into the orebody above the water table, extracting RE bearing IAC in solution, recovering the RE bearing solution, referred to as "pregnant solution" to the surface by designated piping, tunnel, drain and pool collection system. Ammonium sulphate is typically used as lixiviant where the chemical process facilitates for the RE ions to be extracted. One advantage of ammonium sulphate is that certain undesired impurities are less likely to be dissolved in solution. The Methodology of ISL mining for the IAC RE deposit is shown in Figure 1.

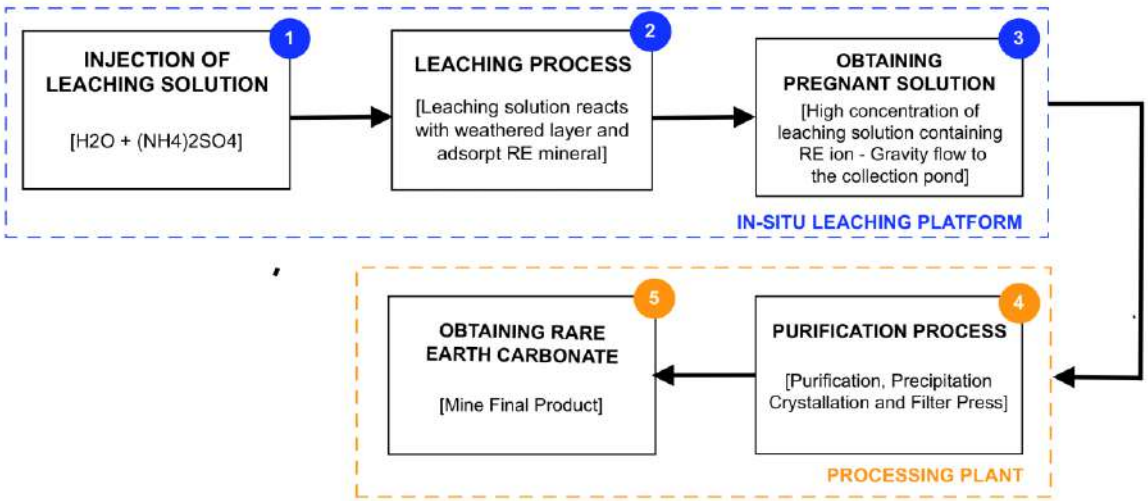


Figure 1: The Methodology of ISL Mining for the IAC RE Deposit

Techniques for ISL have evolved to the point where it is a controllable, safe, and environmentally benign method of mining, which can operate under strict environmental controls and which often has cost advantages. In the mining of IAC RE deposit, the mine normally consists of injection holes fields, which are progressively established over the orebody as the targeted mineral is depleted from sections of the orebody after leaching. Injection hole field design is on a grid with pregnant solution collection facility located at the foothill alternating extraction and injection wells, each of identical design and typical of normal exploration boreholes. In the mining of IAC RE deposit, the

spacing between 200 mm diameter injection holes is about 2 m with each extraction zone having a central leaching distribution tank complete with piping reticulation system. Return water system concept is used in the ISL mining scheme where no water discharge is permissible. The supernatant is returned to the liquid preparation tank to prepare for the next round of leaching solution. It needs to be noted that for the IAC RE deposit, the ISL mining would only be possible for deposit located above ground water table so as to protect the ground water from contamination and also to avoid dilution of the leaching solution. Thus, the geomorphology of the deposit is one of the determining factor in ensuring the success of the ISL mining of IAC RE deposit.

A series of monitoring wells are situated around each mineralized zone to detect any movement of leaching solution outside the mining area. The injection holes are not cased as the injection of the leaching solution does not involve high pressure injection where the solution only flow to and from the ore zone and do not affect any underlying water table. The leaching solution pass through the ore to oxidize and dissolve the RE minerals in situ.

Source: MCRE (2023)

Figure 2: An illustration of a Typical ISL Mining of IAC RE Deposit in Perak

In the mining of IAC RE deposit, the production life of an individual ISL well pattern is usually less than 1 year, typically 6 to 10 months. Most of the RE is recovered during the first 6 months of the operation of those injection holes. The most successful operations have achieved a total overall recovery of about 70% of the RE from the ore. Over time, production flows decrease as clay and silt become trapped in the permeable sediments. After ISL mining is completed, the quality of the remaining ground water must be restored to a baseline standard determined before the start of the operation so that any prior uses may be resumed.

History of ISL Uranium Mining

Historically, ISL was first tried on an experimental basis for uranium mining in Wyoming during the early 1960s. The first commercial mine began operating in 1974. About a dozen projects are licensed to operate in the United States (in Wyoming, Nebraska, and Texas), and most of the operating mines were less than 10 years old in the early 21st century. Most are small, but they supply some 85% of the U.S. uranium production. About 16% of world uranium production is by ISL including all Kazakhstan and Uzbekistan output. ISL can also be applied to other minerals such as copper and gold. In recent years, the ISL method has been widely used in the mining of IAC RE deposit in Southern China.

Way Forward

The concept of ISL mining method is a departure from the conventional mining where land clearing of vast mining area is a requirement. In contrast, ISL mining does not require overburden stripping and creation of mining pools to cater for the tailing storage facility, thus mining activity may take place hand in hand with other land use at the same area. Sensitive area such as forest reserve may be preserved while mining activity being carried out, extracting the site specific natural resource of mineral deposit in the area. The concept should pave the way for the review of current policy of not allowing mining in sensitive area. An illustration of a typical ISL mining of IAC RE deposit in Perak is as shown in Figure 2.

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CASE STUDY: Watershed Management in Mongolia

Description:
Mongolia has recognized the importance of green practices in its environmental legislation and watershed management planning. The country has established key laws and regulations to protect the environment and promote sustainable water management. These measures aim to balance economic development with environmental conservation and address the challenges posed by water scarcity and competing water demands.

Efforts and Findings:
In implementing the Integrated Watershed Management Plan (IWMP), Mongolia has made significant progress in adopting green practices. The IWMP-MoMo project focused on the Kharaa watershed and provided valuable insights into sustainable watershed management strategies. The project emphasized the need for sustainable urban water management, including groundwater modeling, infrastructure improvements, and wastewater treatment enhancements. It also highlighted the importance of standardized monitoring data, participatory monitoring, and free and open-source geodata management. Additionally, the project emphasized the significance of water education programs and the establishment of clear roles, responsibilities, and funding mechanisms for effective implementation.

Conclusions:
Mongolia's commitment to green practices in watershed management has yielded positive outcomes. The country has demonstrated the importance of considering the specific characteristics of each watershed and implementing tailored solutions. Through the development of monitoring networks, modeling techniques, and online data portals, Mongolia has improved its understanding of water resources and enhanced decision-making processes. However, challenges related to water scarcity, technical capacity, and data availability persist and require continuous attention. The experience gained in Mongolia underscores the ongoing need for capacity building, stakeholder engagement, and the continuous evaluation and improvement of green practices in watershed management.
Overall, Mongolia's efforts in embracing green practices in watershed management serve as a valuable example for other regions. By prioritizing sustainability, Mongolia is striving to achieve a balance between economic growth and environmental protection, ultimately contributing to the long-term well-being of its ecosystems and communities.

APPENDIX

GLOSSARY

Assessor

An individual or a group of people being assigned to conduct a green practices assessment to measure level green practices performance of an organisation.

Circular economy

A circular economy is an economic system in which resources are used, reused, and recycled in a closed loop, rather than being extracted, used, and then discarded as waste. It is based on the principles of reducing, reusing and recycling, and it is designed to minimize waste and pollution while conserving natural resources.

Environmental, Social and Governance

Set of criteria that measures the ethical and sustainability impacts of an investment in a company or business.

Green Practices Guideline

A document that provides guide for the industry in implementing green practices within their operations.

Green Practices

Environmentally friendly actions, which promote environment protection and sustainable development.

Greenhouse Gas

Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrochlorofluorocarbons (HCFCs), ozone (O_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). See *carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbon, ozone, hydrofluorocarbon, perfluorocarbon, sulfur hexafluoride*.

Indicator

A metrics concerning energy, water, waste, material, innovation and management that measures level of green practices of an organisation.

Instrument

A tool comprises of data collection form, instrument factsheet and rubric that is used by assessor to evaluate level of green practices in an organisation.

Rubric

A set of sustainable criteria for assessing level of green practices in an organisation.

Sustainable Development Goals

A universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity

ACRONYMS

3R	Reduce, reuse, recycle
CO_2	Carbon dioxide
COP26	The 2021 United Nations Climate Change Conference
CQI	Continuous Quality Improvement
DSTIN	Dasar Teknologi dan Inovasi Negara
ESG	Environmental, Social and Governance
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GHG	Green House Gas
GP	Green Practice
GT	Green Technology
GTMP	Green Technology Master Plan
IPCC	The Intergovernmental Panel on Climate Change
LCA	Life Cycle Analysis
LCC	Life Cycle Costing
MGTC	Malaysian Green Technology and Climate Change Corporation
NDC	Nationally Determined Contribution
SDG	Sustainable Development Goals
SME	Small Medium Enterprise
SOP	Standard Operating Procedure
SPAN	Suruhanjaya Perkhidmatan Air Negara
TE	Technical Expert
UN	United Nation
UNFCC	The United Nations Framework Convention on Climate Change

DATA COLLECTION TEMPLATE

GENERAL INFORMATION			
AUDIT INFORMATION			
No.	**ITEMS**		**DESCRIPTION**
1	Objective	:	
2	Scope	:	
3	Auditor's Name	:	

INFORMATION OF PREMISE

No.	**ITEMS**		**DESCRIPTION**
1	Name of Premise	:	
2	Address	:	
3	Total No. of Employee	:	
4	Operation Hours	:	
5	Type of Sector	:	
6	Year of Operation	:	
7	History of DOE Enforcement Involvement	:	

INDICATOR MATRIX			
INDICATOR -SUB INDICATOR		**WEIGHTAGE BY SUB-INDICATOR**	**WEIGHTAGE BY INDICATOR**
Materials	Sustainable materials	50	**10**
	Sustainable services	50	
Waste	Wastewater	40	**20**
	Non-Hazardous	40	
	Hazardous waste	20	
Water	Water Exploration	100	**20**
Energy	Emission Reduction	30	**30**
	Energy Efficiency	30	
	Energy Management System	10	
	Renewable Energy	30	
Innovation	Research and Development	50	**10**
	Knowledge transfer & Collaboration	50	
Management	Policy & Programme	30	**10**
	Green Procurement	40	
	Human Capital	30	
TOTAL			**100**

EVALUATION INDICATOR MATRIX

INDICATOR	SUB INDICATOR	WEIGHTAGE BY SUB-INDICATOR	MARK BY SUB-INDICATOR (A)	INPUT MARKS HERE	WEIGHTAGE BY INDICATOR (B)	MARK BY INDICATOR ∑(A)*(B)/100
Materials	Sustainable materials	50	x / 4 * 50	x	10	
	Sustainable services	50	x / 4 * 50	x		
Waste	Wastewater	40	x / 4 * 40	x	20	
	Non-Hazardous	40	x / 4 * 40	x		
	Hazardous waste	20	x / 4 * 20	x		
Water	Water Exploration	50	x / 4 * 50	x	20	
Energy	Emission Reduction	30	x / 4 * 30	x	30	
	Energy Efficiency	30	x / 4 * 30	x		
	Energy Management System	10	x / 4 * 10	x		
	Renewable Energy	30	x / 4 * 30	x		
Innovation	Research and Development	50	x / 4 * 50	x	10	
	Knowledge transfer & Collaboration	50	x / 4 * 50	x		
Management	Policy & Programme	30	x / 4 * 30	x	10	
	Green Procurement	40	x / 4 * 40	x		
	Human Capital	30	x / 4 * 30	x		
				TOTAL	**100**	
				STAR RATING (***Please tick based on the star rating assessment criteria)***	**1-Star**	
					2-Star	
					3-Star	

STAR RATINGS (ASSESSMENT CRITERIA)

1 Star

- Comply to all regulatory requirements
- Demonstrate leadership in developing systematic environmental reporting practical

2 Star

- Exhibit characteristics of being resource efficient
- Demonstrating positive impacts from green practices
- Incorporate and implement continuous quality improvement initiatives throughout business operations

3 Star

- Demonstrate integration of governance framework related to sustainability and circular economy
- Demonstrate capacity in contributing towards achieving national decarbonization targets
- Demonstrates leadership in developing, expanding and applying new tech related to green practices

Marks	Star Rating
0	No Star
60	1 Star
71	2 Star
81	3 Star
100.1	Invalid

DATA COLLECTION FORM

MATERIAL INDICATOR

INDICATOR: Material

Indicator: Sustainable Materials

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Demonstration on purchase/utilisation of sustainable materials utilisation with specific direction/vision;with self-regulation implementation (evidence of correlation on sustainability goals); and received recognition/certification from third party/ies/certificate body	Company Sustainability Report: A report published by a company or businesses about environmental, social, and governance (ESG) impacts containing specific policy statements or guidelines or instructions for green material application as well as the practice of self-regulation on the application (through monitoring) to show the correlation with the sustainability goal and to provide evidence of related certificate or proof of recognition.	
	3	Demonstration on purchase/utilisation of sustainable materials utilisation with specific direction/vision;with self-regulation implementation (evidence of correlation on sustainability goals)	Company Sustainability Report: A report published by a company or businesses about environmental, social, and governance (ESG) impacts containing specific policy statements or guidelines or instructions for green material application as well as the practice of self-regulation on the application (through monitoring) to show the correlation with the sustainability goal.	
	2	Demonstration on purchase/utilisation of sustainable materials utilisation with specific direction/vision	Company Sustainability Report: A report published by a company or businesses about environmental, social, and governance (ESG) impacts containing specific policy statements or guidelines or instructions for green material application.	
	1	Demonstration on purchase/utilisation of sustainable materials utilisation	Company Sustainability Report: A report published by a company or businesses about environmental, social and governance (ESG) impacts.	
	0	None	No initiative at all	

INDICATOR: Material

Sub-Indicator: Sustainable Services

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Demonstration on purchase/utilisation of sustainable services utilisation with specific direction/vision;with self-regulation implementation (evidence of correlation on sustainability goals); and received recognition/certification from third party/ies/certificate body	Company Sustainability Report: A report published by a company or businesses about environmental, social, and governance (ESG) impacts containing specific policy statements or guidelines or instructions for green services application as well as the practice of self-regulation on the application (through monitoring) to show the correlation with the sustainability goal and to provide evidence of related certificate or proof of recognition.	
	3	Demonstration on purchase/utilisation of sustainable services utilisation with specific direction/vision;with self-regulation implementation (evidence of correlation on sustainability goals)	Company Sustainability Report: A report published by a company or businesses about environmental, social, and governance (ESG) impacts containing specific policy statements or guidelines or instructions for green services application as well as the practice of self-regulation on the application (through monitoring) to show the correlation with the sustainability goal.	
	2	Demonstration on purchase/utilisation of sustainable services utilisation with specific direction/vision	Company Sustainability Report: A report published by a company or businesses about environmental, social, and governance (ESG) impacts containing specific policy statements or guidelines or instructions for green services application.	
	1	Demonstration on purchase/utilisation of sustainable services utilisation	Company Sustainability Report: A report published by a company or businesses about environmental, social and governance (ESG) impacts.	
	0	None	No initiative at all	

WASTE INDICATOR

INDICATOR: Waste				
Sub-Indicator: Wastewater				
A. Treated Effluent				
Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Wastewater recovery initiative/technology available (e.g., IETS, biogas capture facility and etc.); implemented; WITH monitoring in place; ≥ 33% treated effluent recycle; WITH continuous quality improvement (CQI); WITH certification/ recognition/ validation	*Validation/ certification/ recognition*: Refers to document issued by third party that confirms performance and achievement in meeting certain standard or *criteria*.	
	3	Wastewater recovery initiative/ technology available (e.g., IETS, biogas capture facility and etc.); implemented WITH monitoring in place; WITH achievement of Treated Effluent Recycle ≥ 33%	*Monitoring records*: Refers to documents/ records used as evidence and primary data for the purpose of calculating the intended goals and targets. Examples of records that can be referred to are record of waste generated, recycled, reused, repurposed, disposed. Example of continuous quality improvement (CQI) evidence including positive outcome to cost saving; OR profit generation; OR reduce environmental impact.	
	2	Wastewater recovery initiative/ technology available (e.g., IETS, biogas capture facility and etc.); WITH monitoring in place	*Relevant contract agreements:* Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the businesses with the intention to manage hazardous waste in a sustainable manner.	
	1	Wastewater recovery initiative/ technology available (e.g., IETS, biogas capture facility and etc.)	*Purchasing records and documents:* Documents that serve as evidence of the businesses acquiring services or/ and products/ system.	
	0	NO initiative of wastewater recovery	*Installation records*: Documents that serve as evidence for installation of technologies in the businesses.	

B. Sludge Recovery

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Sludge recovery initiative/ technology available; implemented; WITH monitoring in place; WITH continuous quality improvement (CQI); WITH achievement of 100% sludge recovery; WITH certification/ recognition/ validation	*Validation/ certification/ recognition*: Refers to document issued by third party that confirms performance and achievement in meeting certain standard or *criteria*.	
	3	Sludge recovery initiative/ technology available; implemented; WITH monitoring in place; WITHOUT continuous quality improvement (CQI); WITH achievement of 100% sludge recovery	*Monitoring records*: Refers to documents/ records used as evidence and primary data for the purpose of calculating the intended goals and targets. Examples of records that can be referred to are record of waste generated, recycled, reused, repurposed, disposed. Example of continuous quality improvement (CQI) evidence including positive outcome to cost saving; OR profit generation; OR reduce environmental impact.	
	2	Sludge recovery initiative/ technology available; implemented; WITH monitoring in place	*Relevant contract agreements:* Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the businesses with the intention to manage hazardous waste in a sustainable manner.	
	1	Sludge recovery initiative/ technology available, but NOT implemented	*Purchasing records and documents:* Documents that serve as evidence of the businesses acquiring services or/ and products/ system.	
	0	NO initiative of sludge recovery	*Installation/ maintainence records*: Documents that serve as evidence for installation of technologies in the businesses.	

INDICATOR: Waste

Sub-Indicator: Non-hazardous

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Initiative/technology available (e.g., biogas capture facility and etc.); implemented; WITH monitoring in place; WITH ≥ 40% recycle rate; WITH certification/ recognition/ validation	*Validation/ certification/ recognition*: Refers to document issued by third party that confirms performance and achievement in meeting certain standard or *criteria*.	
	3	Initiative/ technology available (e.g., biogas capture facility and etc.); implemented; WITH monitoring in place; WITH recycle rate ≥ 40 %	*Monitoring records*: Refers to documents/ records used as evidence and primary data for the purpose of calculating the intended goals and targets. Examples of records that can be referred to are record of waste generated, recycled, reused, repurposed, disposed. Example of continuous quality improvement (CQI) evidence including positive outcome to cost saving; OR profit generation; OR reduce environmental impact.	
	2	Initiative/ technology available (e.g., biogas capture facility and etc.); implemented; WITH monitoring in place;	*Relevant contract agreements:* Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the businesses with the intention to manage hazardous waste in a sustainable manner.	
	1	Initiative/ technology available (e.g., biogas capture facility and etc.)	*Purchasing records and documents:* Documents that serve as evidence of the businesses acquiring services or/ and products/ system.	
	0	NO initiative of waste diversion to disposal	*Installation/ maintainance records*: Documents that serve as evidence for installation of technologies in the businesses.	

INDICATOR: Waste

Sub-Indicator: Hazardous Waste

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Initiative/technology available; implemented; WITH monitoring in place; ≥ WITH 50% recycle rate; and WITH validation/ certification/ recognition	*Validation/ certification/ recognition*: Refers to document issued by third party that confirms performance and achievement in meeting certain standard or *criteria*.	
	3	Initiative/ technology available; implemented; WITH monitoring in place; WITH ≥ 50% recycle rate	*Monitoring records*: Refers to documents/ records used as evidence and primary data for the purpose of calculating the intended goals and targets. Examples of records that can be referred to are record of waste generated, recycled, reused, repurposed, disposed. Example of continuous quality improvement (CQI) evidence including positive outcome to cost saving; OR profit generation; OR reduce environmental impact.	
	2	Initiative/ technology available; implemented; WITH monitoring in place;	*Relevant contract agreements:* Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the businesses with the intention to manage hazardous waste in a sustainable manner.	
	1	Initiative/ technology available	*Purchasing records and documents:* Documents that serve as evidence of the businesses acquiring services or/ and products/ system.	
	0	NO initiative of waste diversion to disposal	*Installation/ maintainance records*: Documents that serve as evidence for installation and maintenance of technologies in the businesses. Other initiatives including minimizing the feed to avoid over generation of hazardous waste.	

WATER CONSERVATION INDICATOR

INDICATOR: Water **Sub-Indicator: Water Exploration**				
Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	30% alternative water used	Metered water usage readings (i.e., m^3), utility bills (i.e., m^3) or any other documents recording the water consumption for the businesses.	
	3	20% alternative water used	Meter alternative water consumption readings (i.e., m^3), utility bills (i.e., m^3), or any other documents recording the alternative water consumption for the businesses. In the event that consumption data for the alternative water is not available, alternative water production readings can be used.	
	2	10% alternative water used		
	1	5% alternative water used		
	0	NO alternative water used		

ENERGY INDICATOR

INDICATOR: Energy

Sub-Indicator: Emission Reduction

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	45% emission reduction achieved	*GHG Inventory reports prepared in accordance to nationally or internationally recognised standards*	
	3	35% emission reduction achieved		
	2	25% emission reduction achieved		
	1	15% emission reduction achieved		
	0	No emission reduction achieved		

INDICATOR: Energy

Sub-Indicator: Energy Efficiency

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	8% of energy savings	*Energy consumption: Meter energy usage readings (i.e., kWh, kJ, MMBTU), utility bills (i.e. kWh, kJ, MMBTU), or any other documents recording the energy consumption for the organisation.*	
	3	6% of energy savings		
	2	4% of energy savings	*Fuel consumption:* Bills of quantities for fuels (i.e., litres of fuel, kg of fuel, cu.ft of gases), or any other documents recording the fuel consumption for the organisation.	
	1	2% of energy savings	*Certificates of analysis (COA):* COA for fuels shall be referred to determine calorific values of fuels used (if applicable).	
	0	No energy savings		

INDICATOR: Energy

Sub-Indicator: Energy management

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	External certification received for energy management system	*Organisation energy policies:* Organisation policies or guidelines specific to energy or main policy documents which specifically address energy efficiency plan and target.	
	3	Energy saving measure implemented; WITH systematic reporting and monitoring system; WITH energy policies in place	*Organisation mission and vision statements:* Organisation mission and vision statements specific to energy or main policy documents which specifically address energy efficiency.	
	2	Energy saving measure implemented; WITH systematic reporting and monitoring system; WITHOUT energy policies in place	*Energy management activity:* Records and documentation related to energy management activity that include the energy management committee and energy audit.	
	1	Energy saving measure implemented; WITHOUT systematic reporting and monitoring system; WITHOUT energy policies in place	*Data related to energy management activity:* Records and documentation of energy consumption, renewable energy, energy saving and performance within the organisation.	
	0	No energy management system	Reports, reviews by third parties, or certifications received by the businesses based on locally or internationally recognised standards.	

INDICATOR: Energy

Sub-Indicator: Renewable energy

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	40% of Renewable Energy used	*Energy consumption:* Meter energy usage readings (i.e., kWh, kJ, MMBTU), utility bills (i.e. kWh, kJ, MMBTU), or any other documents recording the energy consumption for the organisation.	
	3	30% of Renewable Energy used	*Renewable energy consumption:* Meter renewable energy production readings (i.e., kWh, kJ), utility bills (i.e., kWh, kJ, MMBTU), or any other documents recording the renewable energy consumption for the organisation.	
	2	20% of Renewable Energy used	*Fuel consumption:* Bills of quantities for fuels (i.e. litres of fuel, kg of fuel, cu.ft of gases), or any other documents recording the fuel consumption for the organisation.	
	1	10% of Renewable Energy used	*Certificates of analysis (COA):* COA for fuels shall be referred to determine calorific values of fuels used (if applicable).	
	0	No Renewable Energy used	*Energy consumption:* Meter energy usage readings (i.e., kWh, kJ, MMBTU), utility bills (i.e. kWh, kJ, MMBTU), or any other documents recording the energy consumption for the organisation.	

INNOVATION INDICATOR

INDICATOR: INNOVATION **Indicator: Research and Development (R&D)**				
Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Visible Return on Value based on R&D process/ initiative/ output managed by innovation unit/department / personnel, resulting in commercialization/ intellectual property filling/ registration and award	***Proof of in-house R&D Process:***	
	3	Established in house R&D process to Green Practice/ Sustaible Innitiative with proven investment managed by Innovation unit/ department/ personnel	*Businesses Structure:* Refers to systems which outlines how innovation activities are formalized through functions within an R&D unit within the boundaries of the organisations under evaluation, OR	
	2	Established inhouse R&D process to Green Practice/ Sustaible Innitiative managed by Innovation unit/ department / personnel	*Appointment letter or Minute Meeting indicating specific person-in-charge of an R&D project related to Green Practice, OR*	
	1	Established inhouse R&D process relating to Green Practice/ Sustainable Innitiative	*Project Charter:* A document that describes an innovation project in its entirety. (Overview, an outline of scope, an approximate schedule, a budget estimate, anticipated risks, and key stakeholders	
	0	None	***Proof of R&D Investment***	
			Grant Proposal: A document proposing a research project requesting for sponsorship of that research, OR	
			Grant Award Document: A written agreement between the organisation and a grantee as the official notification of grant approval with evidence for contractual grant reporting, OR	
			Investment records: Financial documents/records used as evidence for internal and external investment of technology or system which enables innovation process/ research/ practice/ development in the organisation	

INDICATOR: INNOVATION

Indicator: Research and Development (R&D)

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
			Proof of R&D Outcome	
			Intellectual Property (IP): Provisional IP application document/ E-Filling document/ published detailed of invention on intellectual protection within copyright, trademark, patents, geographical indications, plant varieties, industrial designs and semiconductor integrated circuit layout designs, OR	
			Recognition/ Award/ Certification: Refers to the state or quality innovation product/ process/ service that are recognized or acknowledged by certified bodies, OR	
			Proof of Return on Value *Economic Value:* Project completion report or Financial accounting report outlining investment, revenue and net profit based on commercialization/ marketing attribution success of innovative green products/ services, OR	
			Proof of Return on Value *Social Value*: Project completion report with evidence of applied/ implemented/ reviewed innovation practices which leads to pre-set goals that are measurable improvements on existing practices of identified community.	
			Proof of Return on Value *Project completion report with evidence of improvement on productivity/ practice/ System and resource and material-efficiency leading to improved air and water quality/ fewer waste/ more renewable energy sources and other sustainable conditions*	

INDICATOR: INNOVATION

Indicator: Knowledge Transfer and Collaboration

Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	Strategic partnership/ Collaborative project with signed MOU+MOA and visible Return on Value		
	3	Strategic partnership/ Collaborative projects with signed MOU+MOA	***Proof of R&D Outcome***	
	2	Strategic partnership/ Collaborative projects with signed MOU	*Intellectual Property (IP):* Documents related to intellectual protection such as copyrights, trademarks, trade secret, industrial design, utility innovation or patent, OR	
	1	Strategic partnership/Collaborative projects with NDA/LOI	*Proof of Return on Value* *Economic Value:* Project completion report or Financial accounting report outlining investment, revenue and net profit based on commercialization/ marketing attribution success of innovative green products/ services, OR	
	0	None	*Proof of Return on Value* *Social Value*: Project completion report with evidence of applied/ implemented/ reviewed innovation practices which leads to pre-set goals that are measurable improvements on existing practices of identified community.	

MANAGEMENT INDICATOR

INDICATOR: MANAGEMENT **Sub-Indicator: Policy and Programme**				
Score Please tick (/)	Point	Score Criteria	Data Sources / Evidence	Attachment Reference
	4	A present of policy related to sustainability, participate in any sustainability program, produce a report related to sustainability program, and receive recognition at national and international level.	*Policy or standards:* Refers to a written policy and/ or international/ national standards used/ implemented within the boundaries of the businesses.	
	3	A present of policy related to sustainability, participate in any sustainability program, produce report related to the sustainability program and receive recognition or certification.	*Monitoring record*s: Refers to documents/ records used as evidence and primary data for the purpose of achieving the intended goals.	
	2	A present of policy related to sustainability, participate in any sustainability program, and produce a report related to the sustainability program.	*Contract agreements:* Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the businesses with the intention to manage hazardous waste in a sustainable manner.	
	1	A present of policy related to sustainability and participate in any sustainability program.		
	0	NONE of the above		

INDICATOR: MANAGEMENT

Sub-indicator: Green Procurement

Score Please tick (/)	Point	Score criteria	Data Sources / Evidence	Attachment Reference
	4	A present of policy and practice of green procurement, record of purchases as evidence including eco-label certified services or/and products/system.	Policy or standards: Refers to a written policy and/or international/national standards used/implemented within the boundaries/organisations.	
	3	A present of policy and practice of green procurement and record of purchases as evidence.	Monitoring records: Refers to documents/records used as evidence and primary data for the purpose to achieve the intended goals.	
	2	A present of policy and practice of green procurement.	Contract agreements: Documents referred to as evidence for indicating mutual obligations between the parties.	
	1	A present of green procurement policy.	Purchasing records and documents: Documents that are serve as evidence of the businesses acquiring services or/and products/system.	
	0	None		

INDICATOR: MANAGEMENT

Sub-indicator: Human Capital

Score Please tick (/)	Point	Score criteria	Data Sources / Evidence	Attachment Reference
	4	A present of human capital policy development to establish lifelong learning culture.	Policy or standards: Refers to a written policy and/or international/national standards used/implemented within the boundaries/organisations.	
	3	Key performance indicator documented related to human capital development.	Monitoring records: Refers to documents/records used as evidence and primary data for the purpose to achieve the intended goals.	
	2	Mission and vision of the businesses related to human capital development.	Contract agreements: Documents referred to as evidence for indicating mutual obligations between the parties.	
	1	Minutes of meetings related to human capital development.	Purchasing records and documents: Documents that are serve as evidence of the organisation acquiring services or/and products/system.	
	0	None		

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: MATERIAL

SUB-INDICATOR: SUSTAINABLE MATERIALS

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: Encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns

a) Goal 12.4: Responsible management of chemical and waste
b) Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (target at Sustainable reporting in companies).

1.2. INDICATOR

Material

1.3. SUB-INDICATOR

Sustainable Materials

1.4. LAST UPDATE

3 January 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Services
- Fisheries (Aquaculture)
- Manufacturing
- Livestock
- Mining
- Forest operation
- Construction
- Agriculture & Plantation

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITION

Organisation: The entity undergoing the evaluation.

Baseline year: A reference point in time against which measure of consumption and/or in the future are measured.

Sustainable material: Sustainable materials are materials that are produced and used in a way that minimises environmental impact and reduces the depletion of natural resources. These materials are often produced using renewable resources, are non-toxic, and are biodegradable or recyclable, for example, clay, rock, sand, bamboo, or materials with eco-label.

Circular economy: A circular economy is an economic system in which resources are used, reused, and recycled in a closed loop, rather than being extracted, used, and then discarded as waste. It is based on the principles of reducing, reusing and recycling, and it is designed to minimize waste and pollution while conserving natural resources.

Life Cycle Assessment: Life Cycle Assessment (LCA) is a methodology used to evaluate the environmental impact of a product or service over its entire life cycle. This includes the extraction of raw materials, production, transportation, use, and disposal or recycling of the product.

ESG: ESG stands for Environmental, Social and Governance. It is a set of criteria used to evaluate the sustainability and societal impact of an investment in an organisation.

Certification: Certification is the provision by an independent body or an authorised agency of written assurance that the product, service, or system in question meets specific requirements.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

2.2. CONCEPT

Not applicable.

2.3. UNIT OF MEASURE

Not applicable.

3. METHODOLOGY

3.1. DATA SOURCES

Company sustainability report: A report published by a company or businesses about environmental, social and governance (ESG) impacts.

Organisation sustainability policies: Organisation policies or guidelines specific to sustainability addressed in the company sustainability report.

Sustainability monitoring activity: Self-regulation implementation to show correlation with sustainability goals.

Certification or recognition of sustainable material: Certifications attained by the organisation (including from third parties) related to sustainable material.

3.2. DATA COLLECTION METHOD

Reference and citation to sections, parts, and/or entire documents as evidence. Documents cited shall specifically address the following aspects:

1. Evidence of company sustainability report
2. Evidence of policy for the application of green material.
3. Evidence of self-regulation implementation relating to sustainability goals
4. Evidence of certification or recognition from other parties including third parties

3.3. COMPUTATION

Not applicable

3.4. ASSUMPTIONS AND UNCERTAINTIES

Not applicable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

There are no limitations to this indicator.

4.2. VALIDATION

1. GRI Standards
2. SASB Standards

4.3. QUALITY MANAGEMENT

ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework

ISO/CD 59004 Circular Economy – Terminology, Principles and Guidance for Implementation

5. REFERENCES

1. National Energy Efficiency Action Plan 2016-2025
2. Malaysia Renewable Energy Roadmap (MyRER)
3. Malaysia National Energy Policy (NEP) 2022-2040
4. The Sustainable Development Goals (SDGs)

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: MATERIAL

SUB-INDICATOR: SUSTAINABLE SERVICES

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: Encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

Sustainable Development Goal 12*: Ensure sustainable consumption and production patterns*

a) Goal 12.1: Implement the 10-year sustainable consumption and production framework
b) Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (target at Sustainable reporting in companies).
c) Goal 12.8: Promote universal understanding of sustainable lifestyles

1.2. INDICATOR

Material

1.3. SUB-INDICATOR

Sustainable Services

1.4. LAST UPDATE

18 January 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Services
- Fisheries (Aquaculture)
- Manufacturing
- Livestock
- Mining
- Forest operation
- Construction
- Agriculture & Plantation

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITION

Organisation: The entity undergoing the evaluation.

Baseline year: A reference point in time against which measure of consumption and/or in the future are measured.

Sustainable services: Sustainable service is a service that fulfils customer needs and can be perpetuated for a long period of time without negatively influencing the natural and social environments. For example, certification or recognition like ISO 14000 or MyHijau, strategy/planning, technical support, testing, and verification.

Sustainable framework: A written document describing a framework for action to enhance international cooperation and accelerate the shift towards sustainable consumption and production (SCP) patterns in both developed and developing countries.

Life cycle thinking: Refers to increasing the sustainable management of resources and achieving resource efficiency along both production and consumption phases of the lifecycle, including resource extraction, the production of intermediate inputs, distribution, marketing, use, waste disposal and re-use of products and services.

Sustainable development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

2.2. CONCEPT

Not applicable.

2.3. UNIT OF MEASURE

Not applicable.

3. METHODOLOGY

3.1. DATA SOURCES

Company sustainability report: A report published by a company or businesses about environmental, social and governance (ESG) impacts.

Organisation sustainability policies: Organisation policies or guidelines specific to sustainability addressed in the company sustainability report.

Sustainability monitoring activity: Self-regulation implementation to show correlation with sustainability goals.

Certification or recognition of sustainable material: Certifications attained by the organisation (including from third parties) related to sustainable services.

3.2. DATA COLLECTION METHOD

Reference and citation to sections, parts, and/or entire documents as evidence. Documents cited shall specifically address the following aspects:

1. Evidence of company sustainability report
2. Evidence of policy for the application of green services.
3. Evidence of self-regulation implementation relating to sustainability goals
4. Evidence of certification or recognition from other parties including third parties

3.3. COMPUTATION

Not Applicable

3.4. ASSUMPTIONS AND UNCERTAINTIES

Not applicable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

There are no limitations to this indicator.

4.2. VALIDATION

1. GRI Standards
2. SASB Standards
3. House Rule

4.3. QUALITY MANAGEMENT

ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework

ISO/CD 59004 Circular Economy – Terminology, Principles and Guidance for Implementation

5. REFERENCES

1. National Energy Efficiency Action Plan 2016-2025
2. Malaysia Renewable Energy Roadmap (MyRER)
3. Malaysia National Energy Policy (NEP) 2022-2040
4. The Sustainable Development Goals (SDGs)

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: WASTE

SUB INDICATOR: WASTEWATER

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

1. Goal 1: 100% sludge to be recycled by 2030.
2. Goal 2: 33% of treated effluent to be recycled by 2030.

These goals are aligned with the GTMP 2017-2030 emphasising on the wastewater treatment recycling targets. It has been outlined that by 2030, 100% of sludge shall be recycled and 33% of treated effluent shall be recycled. These goals also map to SDG #12 - Sustainable consumption and production, specifically addressing target #12.3 - Substantially reduce waste generation through prevention, reduction, recycling, and reuse by 2030.

1.2. INDICATOR

Waste

1.3. SUB-INDICATOR

Wastewater

1.4. LAST UPDATE

9 May 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Fisheries (Aquaculture)
- Manufacturing
- Livestock
- Mining

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITION

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Boundary: A defined border that accounts and limits the key business activities and processes which forms a basis of the study or analysis within the reporting period.

Functional Unit: A specific/selected amount of feed or product or service defined as a basis of calculation, such as mass (weight), volume, and units.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

Wastewater: Effluent generated after the use of any water related resources in a variety of applications or processes.

Sludge recovery: It is the process of extracting useful components from sludge. Dewatering, thickening, and digesting are just a few of the processes that can be used to recover the sludge and make them ready for repurposed process.

2.2. CONCEPT

Not applicable.

2.3. UNIT OF MEASURE

1. Percentage (%) of recycling of water from the wastewater processing unit within the organisation.
2. Percentage (%) of sludge recovery from the wastewater processing unit within the organisation.

3. METHODOLOGY

3.1. DATA SOURCES

Validation/certification/recognition: Refers to documents issued by third parties that confirms performance and achievement in meeting certain standards or criteria.

Monitoring records: Refers to documents/records used as evidence and primary data for the purpose of calculating the intended goals and targets. Examples of records that can be referred to are record of wastes generated, recycled, reused, repurposed, disposed.

Relevant contract agreements: Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the organisation with the intention to manage hazardous waste in a sustainable manner.

Purchasing records and documents: Documents that serve as evidence of the organisation acquiring services or/and products/system.

Installation records: Documents that serve as evidence for installation of technologies in the organisation.

Maintenance records: Documents that serve as evidence of maintenance activity of the wastewater processing unit.

3.2. DATA COLLECTION METHOD

Observations: Observations are made during the site visit to understand the actual case scenario of the green initiative implementation within the boundaries of the organisation.

Interviews: Interviews with respondent carried out to acquire insight of the processes/activities involved within the boundaries of the organisation.

Questionnaires/surveys: A set of questions designed for respondent to acquire insight of the processes/activities involved within the boundaries of the organisation.

Documents reviews: Documents reviewed during the site visit to support the observation.

Evidence:

1. Initiative proposal: Business or project planning with budget allocation.
2. Evidence of initiatives-
   Purchasing record, or installation record; presence of initiative/unit /facility/equipment/system being validated.
3. Monitoring record – look for current record and check for frequency monitoring.
4. Data availability at selected baseline year:
   a. Data on:
      i. Amount of discharge from the stream leaving the treatment unit to water bodies;
      ii. Amount of discharge from the stream leaving the treatment facility that is utilized elsewhere in the businesses;
      iii. Amount of wastewater generated from the process unit.

   At least any two data listed above must be available to allow calculation on treated recycled effluent.

   b. Data on amount of sludge leaving the treatment unit and amount of sludge sent for disposal.
5. Evidence of recycling by third parties e.g., receipt/invoice/financial report etc.
6. Validation of recycling by third parties e.g., contract/validation report/audit report.

7. Evidence of continuous quality improvement (CQI) exercise such as minute of meeting/CQI report. Example of CQI is performance of the selected contractor.
8. Evidence of recognition by third party such as validation or certification or award.

3.3. COMPUTATION

Percentage (%) of recycled water=

[(Amount of recycled water) / (Total amount of wastewater generated)] ×100

Where:

Amount of recycle of water = Amount of discharge from the stream leaving the treatment facility that is utilized elsewhere in the businesses within the baseline year.

Total amount of wastewater generated = Amount of wastewater discharge from the stream leaving the process unit within the baseline year.

Note: In the case of stream meter is not available the secondary data in the form of size (volume) of the following storage may be used: pond, tank, dam etc.

Percentage (%) of sludge recovery=[((A-B))/((A))]×100

Where:

A = Amount of sludge produced from the wastewater treatment facility and leaving the wastewater treatment unit.

B = Amount of sludge produced from the wastewater treatment facility and sent for disposal.

3.4. ASSUMPTIONS AND UNCERTAINTIES

Instrument applicability is limited to the activities within the defined boundary.

Secondary data will be used in the event of primary data is unavailable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

Not applicable.

4.2. VALIDATION

Not applicable.

4.3. QUALITY MANAGEMENT

National Water Quality Standard.

5. REFERENCES

1. Green Technology Master Plan (GTMP) 2017 – 2030.
2. Sustainable Development Goals (SDG) 2030.

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: WASTE

SUB INDICATOR: NON-HAZARDOUS

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

1. Goal 1: 40% recycling rate of solid waste from total non-hazardous waste generated by 2025.
2. Goal 2: 100% avoidance of waste to landfills by 2025.
3. Goal 3: 180 unit of biogas capture facility by 2030.

These goals are aligned with the world convention COP 26 by the UNFCC emphasising on the solid wastes recycling target, landfill avoidance, and reduction of carbon intensity (against GDP) in 2030 compared to 2005 level. It has been outlined that by 2030, 40% of the solid wastes generated shall be recycled, 100% avoidance of waste to the landfill, and there shall be 180 unit of biogas capture facility. These goals also map to SDG #12 - Sustainable consumption and production, specifically addressing target #12.3 - Substantially reduce waste generation through prevention, reduction, recycling, and reuse by 2030.

1.2. INDICATOR

Waste

1.3. SUB INDICATOR

Non-hazardous waste

1.4. LAST UPDATE

11 April 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Services
- Fisheries (Aquaculture)
- Manufacturing
- Livestock
- Mining
- Forest operation
- Construction
- Agriculture & Plantation

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Biogas Capture Facility: A facility that capture biogas released as a result of waste degradation.

Boundary: A defined border that accounts and limits the key business activities and processes which forms a basis of the study or analysis within the reporting period.

Functional Unit: A specific/selected amount of feed or product or service defined as a basis of calculation, such as mass (weight), volume, and units.

Non-Hazardous Wastes: Any form of materials that are discarded from a process/activity, and in this document, specifically refers to solid form of waste materials.

Non-hazardous waste loss: Any leakage/spills along the waste stream before or after treatment process.

Recycling: Process in converting waste materials into new materials or objects.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

2.2. CONCEPTS

Not applicable.

2.3. UNIT OF MEASURE

1. Percentage (%) of recycling of non-hazardous waste within the organisation.
2. Number of biogas capture facility

3. METHODOLOGY

3.1. DATA SOURCES

Validation/certification/recognition: Refers to documents issued by third party that confirms performance and achievement in meeting certain standard or criteria.

Monitoring records: Refers to documents/records used as evidence and primary data for the purpose of calculating the intended goals and targets. Examples of records that can be referred to are record of wastes generated, recycled, reused, repurposed, disposed. Example of CQI evidence including positive outcome to cost saving; OR profit generation; OR reduce environmental impact.

Relevant contract agreements: Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the organisation with the intention to manage hazardous waste in a sustainable manner.

Purchasing records and documents: Documents that serve as evidence of the organisation acquiring services or/and products/system.

Installation/maintenance records: Documents that serve as evidence for installation and maintenance of technologies in the organisation.

3.2. DATA COLLECTION METHOD

Observations: Observations are made during the site visit to understand the actual case scenario of the green initiative implementation within the boundaries of the organisation.

Interviews: Interviews with respondent carried out to acquire insight of the processes/activities involved within the boundaries of the organisation.

Questionnaires/surveys: A set of questions designed for respondent to acquire insight of the processes/activities involved within the boundaries of the organisation.

Documents reviews: Documents reviewed during the site visit to support the observation.

Evidence:

1. Initiative proposal: Business or project planning with budget allocation.
2. Evidence of initiatives-
   Dedicated space/storage of non-hazardous waste; purchasing record, or installation record; transportation record (e.g., no trips/schedule to transport the waste to dedicated disposal/recycling premise) presence of initiative/unit /facility/equipment/system being validated.
3. Policy in place, documented (e.g., minutes of meeting/policy document/annual budget approval) and disseminated.
4. Monitoring record– look for current record and check for frequency monitoring.
5. Data availability at selected baseline year on the amount of non-hazardous waste recycled, amount of non-hazardous waste disposed, and amount of non-hazardous waste generated. At least any two data listed

must be available to allow calculation on non-hazardous waste recycle.

6. Evidence of recycling by third parties e.g., receipt/invoice/financial report etc.
7. Validation of recycling by third parties e.g., contract/validation report/audit report.
8. Evidence of continuous quality improvement (CQI) exercise such as minute of meeting/CQI report. Example of CQI is performance of the selected contractor.
9. Evidence of recognition by third party such as validation or certification or award.

3.3. COMPUTATION

Selecting a baseline year;

Percentage (%) of recycling non-hazardous waste = [Amount of recycling non-hazardous waste / Total amount of non-hazardous waste generated] × 100;

where:

Amount of recycling non-hazardous waste = Amount of non-hazardous waste generated – Amount of non-hazardous waste disposed.

Total amount of non-hazardous waste generated is the summation of all wastes generated from the process/activity within the boundary.

3.4. ASSUMPTIONS AND UNCERTAINTIES

Non-hazardous waste loss during the activities within the defined boundary is assumed to be negligible.

Secondary data will be used in the event of primary data is unavailable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

There are no limitations to this indicator.

4.2. VALIDATION

Not applicable.

4.3. QUALITY MANAGEMENT

ISO 14040:2006 Environmental management – Life cycle assessment – Principles and framework

5. REFERENCES

1. Green Technology Master Plan (GTMP) 2017 – 2030.
2. Sustainable Development Goals (SDG) 2030.

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: WASTE

SUB-INDICATOR: HAZARDOUS WASTE

1. INDICATOR INFORMATION

1.1 GOALS AND TARGETS

1. Goal 1: 50% recycling rate of hazardous waste from the total hazardous waste generated by 2030
2. Goal 2: 40% recycling rate of solid waste from total waste generated by 2025
3. Goal 3: 100% avoidance of waste to landfill/zero waste to landfill by 2025

These goals are aligned with the GTMP 2017-2030 prepared by the Ministry of Energy, Green Technology and Water Malaysia emphasising on the hazardous waste recycling targets. It has been outlined that by 2030, 50% of the hazardous wastes generated from the industrial/sectoral activities shall be recycled. On top of that, the selected goals also addressed the target set by the world convention COP 26 by the UNFCC emphasising on achieving 40% recycling rate and 100% avoidance/zero waste directed to the landfill by 2025. These goals are also mapped to SDG #12 - Sustainable consumption and production, specifically addressing target #12.3 - Substantially reduce waste generation through prevention, reduction, recycling, and reuse by 2030.

1.2. INDICATOR

Waste

1.3. SUB-INDICATOR

Hazardous waste

1.4. LAST UPDATE

8 May 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Services
- Manufacturing
- Livestock
- Mining
- Forest operation
- Construction
- Agriculture & Plantation

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Boundary: A defined border that accounts and limits the key business activities and processes which forms a basis of the study or analysis within the reporting period.

Functional Unit: A specific/selected amount of feed or product or service defined as a basis of calculation, such as mass (weight), volume, and units.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

Recycling: Process in converting waste materials into new materials or objects.

Scheduled Waste: Scheduled waste is any waste that has hazardous characteristics that have the potential to negatively impact the public and the environment. A total of 77 types of scheduled waste are listed under the First Schedule, Environmental Quality (Scheduled Waste) Regulations 2005, and the management of such waste shall be in accordance with the provisions under the above Regulations.[1]

Waste loss: Any leakage/spills along the waste stream before or after treatment process.

2.2. CONCEPT

Not applicable.

2.3. UNIT OF MEASURE

Percentage (%) of recycling of hazardous waste within the organisation.

3. METHODOLOGY

3.1 DATA SOURCES

Validation/certification/recognition: Refers to documents issued by third party that confirms performance and achievement in meeting certain standard or criteria.

Monitoring records: Refers to documents/records used as evidence and primary data for the purpose of calculating the intended goals and targets. Examples of records that can be referred to are record of wastes generated, recycled, reused, repurposed, disposed. Example of continuous quality improvement (CQI) evidence including positive outcome to cost saving; OR profit generation; OR reduce environmental impact.

Relevant contract agreements: Documents referred to as evidence for indicating mutual obligations between the parties. Examples are agreement made by the organisation with the intention to manage hazardous waste in a sustainable manner.

Purchasing records and documents: Documents that serve as evidence of the organisation acquiring services or/and products/system.

Installation/maintenance records: Documents that serve as evidence for installation and maintenance of technologies in the organisation. Other initiatives including minimising the feed to avoid over generation of hazardous waste.

3.2 DATA COLLECTION METHOD

Observations: Observations are made during the site visit to understand the actual case scenario of the green initiative implementation within the boundaries of the organisation.

Interviews: Interviews with respondent carried out to acquire insight of the processes/activities involved within the boundaries of the organisation.

Questionnaires/surveys: A set of questions designed for respondent to acquire insight of the processes/activities involved within the boundaries of the organisation.

Documents reviews: Documents reviewed during the site visit to support the observation.

Evidence:

1. Initiative proposal: Business or project planning with budget allocation.

[1] Source: Department of Environment

2. Evidence of initiatives-
    - Dedicated space/storage of schedule waste; valid licence from regulatory body (special management) permit; purchasing record, or installation record; maintenance record; transportation record (e.g., no trips/schedule to transport the waste to dedicated disposal/recycling premise) presence of initiative/unit /facility/equipment/system being validated.
    - Policy in place, documented (e.g., minutes of meeting/policy document/annual budget approval) and disseminated.
    - Monitoring record– look for current record and check for frequency of monitoring.
    - Data availability at selected baseline year on the amount of schedule waste recycle, amount of schedule waste disposed, and amount of schedule waste generated. At least any two data listed must be available to allow calculation on schedule waste recycle.
3. Evidence of recycling by third parties e.g., receipt/invoice/financial report etc.
4. Validation of recycling by third parties e.g., contract/validation report/audit report.
5. Evidence of continuous quality improvement (CQI) exercise such as minute of meeting/CQI report. Example of CQI is performance of the selected contractor.
6. Evidence of recognition by third party such as validation or certification or award.

3.3 COMPUTATION

$$\text{Percentage (\%) of hazardous waste recycled} = \frac{\text{Amount of hazardous waste recycled}}{\text{Amount of hazardous waste generated}} \text{ x } 100$$

where;

Amount of hazardous waste recycled = Amount of hazardous waste generated – Amount of hazardous waste disposed.

Total amount of hazardous waste generated is the summation of all hazardous waste generated from the process/activity within the boundary.

3.4. ASSUMPTIONS AND UNCERTAINTIES

- Instrument applicability is limited to the activities within the defined boundary.
- Secondary data will be used in the event of primary data is unavailable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1 COMMENT AND LIMITATION

There are no limitations to this indicator.

4.2 VALIDATION

Not applicable.

4.3 QUALITY MANAGEMENT

ISO 14040:2006 Environmental management — Life cycle assessment — Principles and framework

ISO/CD 59004 Circular Economy – Terminology, Principles and Guidance for Implementation

5. REFERENCES

1. Green Technology Master Plan (GTMP) 2017 – 2030.
2. Sustainable Development Goals (SDG) 2030.
3. "Malaysia - High-Level Segment Statement COP 26." *Unfccc.int*, 11 Nov. 2021, https://unfccc.int/documents/31082

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: WATER

SUB-INDICATOR: WATER EXPLORATION

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: To reduce dependency on potable water by exploring the consumption of other water resources such as rainwater and recycled water.

The goal of this instrument is mapped to the following global goals and National targets:

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns.

Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (target at Sustainable reporting in companies).

1.2. INDICATOR

Water

1.3. SUB-INDICATOR

Water Exploration

1.4. LAST UPDATE

16 March 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture
- Aquaculture
- Construction
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Organisation: The entity undergoing the evaluation.

Water: Refers to water that meets quality standards for various processes and applications within the industry.

Potable water: Refers to clean and safe drinking water that meets quality standards for various processes and applications within the industry – for the purpose of this Guideline, this also refers to water supplied as city water.

Water conservation: Refers to the practice of reducing water usage, improving efficiency, and implementing sustainable strategies to minimize the overall water footprint within processes.

Water efficiency: Refers to the optimization and reduction of water usage throughout industrial processes to minimize waste and improve resource conservation.

Water saving: A water consumption reduction measured against a baseline year.

Water consumption: An energy usage by the organisation and its sub-entities for its operations and activities.

Alternative water: Refers to water from alternative sources such as rainwater or reclamation processes.

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

2.2. UNIT OF MEASUREMENT

Percentage (%) of alternative water used with reference to the total water used within the organisation.

3. METHODOLOGY

3.1. DATA SOURCE

Water consumption: Metered water usage readings (i.e., m^3), utility bills (i.e., m^3), or any other documents recording the water consumption for the organisation.

Alternative water consumption: Meter alternative water consumption readings (i.e., m^3), utility bills (i.e., m^3), or any other documents recording the alternative water consumption for the organisation. In the event that consumption data for alternative water is not available, alternative water production readings can be used.

3.2. DATA COLLECTION METHOD

Water consumption:

- Meter usage reading showing a consumption of water over a period of time. Typically, meter reading is provided with a monthly time span. The total water consumed shall be computed by taking the total meter readings for individual months over the period of the reporting year. In the event that more than one water source is available, the sum of the meter readings shall be considered.
- Bills of quantities of water purchased shall be used to represent consumption of water over a period of time. The total water consumed shall be computed by taking the total quantities for the period of the reporting year. In the event that more than one water source is consumed, the sum of the quantities of water consumed shall be considered.
- Other forms of evidence acceptable include, purchase invoices, bill of lading, and other similar documents.
- Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for water purchased with the assumption that the water purchased is consumed within the reporting period.

Alternative water consumption:

- Meter usage reading showing a consumption of alternative water over a period of time. Typically, meter reading is provided with a monthly time span. The total alternative water consumed shall be computed by taking the total meter readings for individual months over the period of the reporting year. In the event that more than one alternative water source is available, the sum of the meter readings shall be considered.
- Bills of quantities of alternative water purchased shall be used to represent consumption of alternative water over a period of time. The total alternative water consumed shall be computed by taking the total quantities for the period of the reporting year. In the event that more than one

alternative water source is consumed, the sum of the quantities of alternative water consumed shall be considered.

- Other forms of evidence acceptable include, purchase invoices, bill of lading, and other similar documents.
- Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for alternative water purchased with the assumption that the water purchased is consumed within the reporting period.

Observations: Observations are made during the site visit to understand the actual case scenario of the green initiative implementation within the boundaries of the organisation.

Interviews: Interviews with respondent carried out to acquire insight of the processes/activities involved within the boundaries of the organisation.

Questionnaires/surveys: A set of questions designed for respondent to acquire insight of the processes/activities involved within the boundaries of the organisation.

Documents reviews: Documents reviewed during the site visit to support the observation.

3.3. COMPUTATION

The renewable energy percentage and renewable fuel percentage for the reporting period can be calculated using the following equations:

$$\text{Percentage (\%) of alternative consumption} = \frac{[\text{Alternative water consumption (i.e., } m^3)]}{[\text{Total water consumption (i.e., } m^3)]} \times 100\%$$

3.4. ASSUMPTIONS AND UNCERTAINTIES

Any and all averaging approach to consumption data shall be noted and wherever practicably possible the uncertainties shall be quantified.

Total water consumed for the reporting period shall be calculated based on the actual consumption of water for each month within the reporting period. In the event of data unavailability, average consumptions can be provided. Averaging approaches and assumptions made should be described in sufficient detail.

Total water consumed for the year of reporting shall be calculated based on the actual consumption of fuel for each month within the reporting period. Each source of water should be calculated separately.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

Not applicable.

4.2. VALIDATION

Measurement and Verification (M&V) report to verify savings endorsed by certified M & V professional.

4.3. QUALITY MANAGEMENT

Not applicable.

5. REFERENCES

1. ISO 46001:2019 Water efficiency management systems.
2. Green Technology Master Plan Malaysia 2017–2030.
3. The Sustainable Development Goals (SDGs).

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: ENERGY

SUB-INDICATOR: EMISSION REDUCTION

1. INDICATOR INFORMATION

1.1 GOALS AND TARGETS

Goal 1: Nationally Determined Contribution (NDC) of 45% carbon intensity reduction in 2030 compared to 2005 level.

The goal of this instrument is mapped to the following global goals and National targets:

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns

Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (target at Sustainable reporting in companies).

National Commitment at COP – Nationally Determined

Contribution (NDC) of 45% carbon intensity reduction in 2030 compared to 2005 level.

1.2 INDICATOR

Energy

1.3 SUB-INDICATOR

Emission Reduction

1.4 LAST UPDATE

3 January 2023

1.5 RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1 DEFINITIONS

Organisation: The entity undergoing the evaluation.

Energy: Energy resources, which refer to substances like fuels, petroleum products, heating and cooling, and electricity in general, because a significant portion of the energy contained in these resources can easily be extracted to serve a useful purpose.

Energy consumption: Energy usage by the organisation and its sub-entities for its operations and activities.

Energy savings: Energy consumption reduction measured against a baseline year.

Emission: Emission herein refers to greenhouse gas (GHG). GHG is a gas that absorbs and emits radiant energy within the thermal infrared range, causing the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. GHG emissions herein refers to all the GHGs and are collectively reported in carbon dioxide equivalent (CO_2e).

Baseline year: A reference point in time against which measure of consumption and/or in the future are measured.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

GHG inventory: A list of emission sources and the associated emissions quantified using standardized methods.

*Scope 1: D*irect greenhouse (GHG) emissions that occur from sources that are controlled or owned by an organisation (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles).

Scope 2: Indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling.

Scope 3: Indirect GHG emissions associated with activities from assets not owned or controlled by the reporting organisation.

2.2 CONCEPT

Not Applicable

2.3 UNIT OF MEASURE

Percentage (%) reduction in emissions by an organisation within its operations in percentage with reference to a selected baseline year.

3. METHODOLOGY

3.1 DATA SOURCES

GHG Inventory reports prepared in accordance to nationally or internationally recognised standards.

3.2 DATA COLLECTION METHOD

GHG Inventory:

1. The emissions for the reporting period shall be the total GHG emissions generated by the organisation for the reporting period in CO_2e.
2. The total GHG emissions generated shall consider the total of Scope 1 and Scope 2 emissions generated by the organisation for the reporting period.
3. If present, the Scope 3 emission shall be considered for computing the total emissions.
4. Reports generated by the "Sistem Pengurusan dan Pemantauan Industri Hijau" provided by Department of Environment Malaysia can serve as evidence to represent the total GHG emissions for the organisation for the reporting period.
5. Reports and certification by national or international standards such as the ISO 14064 can serve as evidence to represent the total GHG emissions for the organisation for the reporting period.

Observations: Observations are made during the site visit to understand the actual case scenario of the green initiative implementation within the boundaries of the organisation.

Interviews: Interviews with respondent carried out to acquire insight of the processes/activities involved within the boundaries of the organisation.

Questionnaires/surveys: A set of questions designed for respondent to acquire insight of the processes/activities involved within the boundaries of the organisation.

Documents reviews: Documents reviewed during the site visit to support the observation.

3.3 COMPUTATION

The emission reduction can be calculated using the following equation:

$$\text{Emission reduction} = \frac{[\text{Total emissions for the reporting period}(\text{kg } CO_2e) - \text{Total emissions for the baseline year}(\text{kg } CO_2e)]}{\text{Total emissions for the baseline year (kg } CO_2e)} \times 100\%$$

3.4 ASSUMPTIONS AND UNCERTAINTIES

The uncertainties reported within the organisation's GHG inventory shall be noted.

Any and all averaging approach to GHG data shall be noted and wherever practicably possible the uncertainties shall be quantified.

GHG emissions shall account for Scope 1 and Scope 2 emissions for the organisation.

Scope 3 emissions may be included in the calculation. If Scope 3 emissions are included, values of Scope 3 emissions shall be considered throughout all the expressions.

Any omissions shall be clearly noted with justifications.

Calculation methods to comply with GHG Protocol Standards or IPCC standards or ISO 14064 standards or any other internationally recognise standards.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1 COMMENT AND LIMITATION

There are no limitations to this indicator.

4.2 VALIDATION

The review or validation of information and GHG inventory by the organisation shall be noted.

4.3 QUALITY MANAGEMENT

Any certification obtained with regard to the organisation's carbon emissions and management shall be noted.

5. REFERENCES

1. National Energy Efficiency Action Plan 2016–2025.
2. Malaysia Renewable Energy Roadmap (MyRER).
3. Dasar Tenaga Negara (DTN) 2022–2040.
4. The Sustainable Development Goals (SDGs).

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: ENERGY

SUB-INDICATOR: ENERGY EFFICIENCY

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: Energy saving meeting the National energy savings target of 8% by 2025.

The goal of this instrument is mapped to the following global goals and National targets:

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns

Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (target at Sustainable reporting in companies).

National Energy Efficiency Action Plan 2016–2025:

1. 52,233 GWh of energy savings (8.0%)
2. 37,702 kt CO_2 equivalent reduction

1.2. INDICATOR

Energy

1.3. SUB-INDICATOR

Energy Efficiency

1.4. LAST UPDATE

3 January 2023

1.5 RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Fisheries (Aquaculture)
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Organisation: The entity undergoing the evaluation.

Energy: Energy resources, which refer to substances like fuels, petroleum products, heating and cooling, and electricity in general, because a significant portion of the energy contained in these resources can easily be extracted to serve a useful purpose.

Energy Consumption: An energy usage by the organisation and its sub-entities for its operations and activities.

Energy Saving: An energy consumption reduction measured against a baseline year.

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

Certified M & V Professional: A certified professional that qualifies to conduct measurement and verification activities according to guidelines or standards for reporting energy savings.

2.2 CONCEPT

Not applicable.

2.3 UNIT OF MEASURE

Percentage (%) of electricity and fuel consumption reduction measured against the baseline year.

3. METHODOLOGY

3.1. DATA SOURCES

Energy consumption: Meter energy usage readings (i.e., kWh, kJ, MMBTU), utility bills (i.e., kWh, kJ, MMBTU), or any other documents recording the energy consumption for the organisation.

Fuel consumption: Bills of quantities for fuels (i.e., litres of fuel, kg of fuel, cu. ft of gases), or any other documents recording the fuel consumption for the organisation.

Certificates of analysis (COA): COA for fuels shall be referred to determine calorific values of fuels used (if applicable).

3.2. DATA COLLECTION METHOD

Energy consumption:

1. Meter usage reading showing a consumption of energy over a period of time. Typically, meter reading is provided with a monthly time span. The total energy consumed shall be computed by taking the total meter readings for individual months over the period of the reporting year. In the event that more than one energy source is available, the sum of the meter readings shall be considered.
2. If there are more than one type of energy being consumed, a common energy unit shall be utilised. (e.g., MWh, MJ)
3. Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for energy purchased with the assumption that the energy purchased is consumed within the reporting period.

Fuel consumption:

1. Bills of quantities of fuel for fuels purchased shall be used to represent consumption of fuel over a period of time. The total fuel consumed shall be computed by taking the total quantities for the period of the reporting year. In the event that more than one fuel source is consumed, the sum of the quantities of fuel consumed shall be considered.
2. Other forms of evidence acceptable include, purchase invoices, bill of lading, and other similar documents.
3. If there are more than one type of fuel being consumed, a common energy unit shall be utilised. (e.g., MWh, MJ)
4. The energy unit of fuels shall be computed by multiplying the calorific value (e.g., J/kg, kJ/l) of the fuel with the quantity (e.g., kg, l). Refer to the Appendix for the list of common calorific value that can be used as reference. In the event of fuels not listed in the Appendix, the assessor shall request from the organisation for such information accompanied by respective reference document (e.g., certificates of analysis for fuel calorific value, literature reference).
5. Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for fuel purchased with the assumption that the energy purchased is consumed within the reporting period.

Observations: Observations are made during the site visit to understand the actual case scenario of the green initiative implementation within the boundaries of the organisation.

Interviews: Interviews with respondent carried out to acquire insight of the processes/activities involved within the boundaries of the organisation.

Questionnaires/surveys: A set of questions designed for respondent to acquire insight of the processes/activities involved within the boundaries of the organisation.

Documents reviews: Documents reviewed during the site visit to support the observation.

3.3 COMPUTATION

The energy and fuel saving for the reporting period can be calculated using the following equations:

$$\text{Percentage (\%) of energy saving} = \frac{\text{Total energy consumed for the year of reporting (units for energy)} - \text{Total energy consumed for the baseline year (unit for energy)}}{\text{Total energy consumed for the baseline year (unit for energy)}} \times 100\% \quad (1)$$

$$\text{Percentage (\%) of fuel saving} = \frac{\text{Total fuel consumed for the year of reporting (unit for fuel)} - \text{Total fuel consumed for the baseline year (unit for fuel)}}{\text{Total fuel consumed for the baseline year (unit for fuel)}} \times 100\% \quad (2)$$

NB: Negative (%) indicates there is savings, positive (%) indicates there is no savings

3.4 ASSUMPTIONS AND UNCERTAINTIES

Wherever fuel characteristic information is used for calculations, it shall be noted that the averaging of such characteristics (i.e., calorific value) contributes to uncertainties.

Any and all averaging approach to consumption data shall be noted and wherever practicably possible the uncertainties shall be quantified.

Total energy consumed for the reporting period shall be calculated based on the actual consumption of energy for each month within the reporting period. In the event of data unavailability, average consumptions can be provided. Averaging approaches and assumptions made should be described in sufficient detail.

Total fuel consumed for the year of reporting shall be calculated based on the actual consumption of fuel for each month within the reporting period. Each type of fuel should be calculated separately.

Suggested unit for fuel as follows:

- Liquid fuel (i.e., petrol, diesel, oil, etc.): litres of fuel
- Solid fuel (i.e., coal, woodchip, etc): kg of fuel
- Gaseous fuel (i.e., natural gas, LPG, etc.): MMBTU or cu. ft. of gases

If the organisation is reporting both energy and fuels, the energy units should be standardised in MWh or MJ and reported in combination.

4 OTHER METHODOLOGICAL CONSIDERATIONS

4.4 COMMENT AND LIMITATION

There are no limitations to this indicator.

4.5 VALIDATION

Measurement and Verification (M&V) report to verify savings endorsed by certified M & V professional.

4.6 QUALITY MANAGEMENT

Not applicable.

5 REFERENCES AND DOCUMENTATION

1. National Energy Policy (2022–2040).
2. National Energy Efficiency Action Plan 2016–2025.
3. The Sustainable Development Goals (SDGs

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: ENERGY

SUB INDICATOR: ENERGY MANAGEMENT SYSTEM

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: Energy saving meeting the National energy savings target of 8% by 2025.

The goal of the Energy: Energy Efficiency instrument is mapped to the following global goals and National targets:

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns

Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (target at Sustainable reporting in companies).

National Energy Efficiency Action Plan 2016-2025

1. Target of 52,233 GWh of energy savings (8.0%)
2. Target of 37,702 kt CO_2 equivalent reduction

Malaysia Renewable Energy Roadmap (MyRER)

National aspiration of 31% renewable energy (RE) capacity by 2025 and 40% by 2035

Dasar Tenaga Negara (DTN) 2022-2040

National target set for RE at 18,431MW in 2040.

1.2. INDICATOR

Energy

1.3. SUB-INDICATOR

Energy Management Systems.

1.4. LAST UPDATE

3 January 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITION

Organisation: The entity undergoing the evaluation.

Energy: Energy resources, which refer to substances like fuels, petroleum products, heating and cooling, and electricity in general, because a significant portion of the energy contained in these resources can easily be extracted to serve a useful purpose.

Renewable energy: Energy resources that is collected from renewable resources that are naturally replenished on a

human timescale. It includes sources such as sunlight, wind, the movement of water, and geothermal heat.

Energy consumption: An energy usage by the organisation all it any sub-entities for its operations and activities.

Energy Management System: A set of policies and procedures integrated and put into practice to track, analyse, and plan for energy usage in an organisation.

Energy savings: An energy consumption reduction measured against a baseline year.

Baseline year: A reference point in time against which measure of consumption and/or in the future are measured.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

2.2. CONCEPT

Not applicable.

2.3. UNIT OF MEASURE

Not applicable.

3. METHODOLOGY

3.1. DATA SOURCES

Organisation energy policies: Organisation policies or guidelines specific to energy or main policy documents which specifically address energy efficiency plan and target.

Organisation mission and vision statements: Organisation mission and vision statements specific to energy or main policy documents which specifically address energy efficiency.

Energy management activity: Records and documentation related to energy management activity that include the energy management committee and energy audit.

Data related to energy management activity: Records and documentation of energy consumption, renewable energy, energy saving and performance.

Reports, reviews by third parties, or certifications received by the organisation based on locally or internationally recognised standards.

Company policies, mission, and vision statements for continuous improvement.

3.2. DATA COLLECTION METHOD

Organisation energy policies:

1. Policies or guidelines specific to energy or main policy documents which specifically address energy efficiency plan and target.
2. Statements within the policy describing energy management systems. Statements describing targets for energy reduction, energy efficiency efforts, and any statements describing efforts or targets in achieving energy efficiency, increasing renewable energy mix, increasing renewable fuel mix shall also be considered.

Organisation mission and vision statements:

1. Organisation mission or vision statements specific to energy or organisation aspiration documents which specifically address energy efficiency plan and target.
2. Statements within the mission or vision statements describing energy management systems can be used as evidence. Statements within mission or vision statements describing targets for energy reduction, energy efficiency efforts, and any statements describing efforts or targets in achieving energy efficiency, increasing renewable energy mix, increasing renewable fuel mix shall also be considered.
3. Organisation mission and vision statements specific to energy or main policy documents which specifically address energy efficiency.

Energy management activity:

1. Documents, records, logbooks, minutes of meetings, and any written documentation related to energy management activity. May include documents describing activities by the energy management committee and energy audit.
2. Any form of documentation, including media such as videos and pictures related to energy management activity may also be considered as evidence.

Data related to energy management activity:

1. Records and documentation of energy consumption, renewable energy, energy saving and performance within the organisation.
2. Documents, records, logbooks, minutes of meetings, and any written documentation of data related to energy management activity. May include documents recording data activities by the energy management committee and energy audit.

Organisation mission and vision statements: Organisation mission and vision statements specific to energy or main policy documents which specifically address energy efficiency.

Energy management activity: Records and documentation related to energy management activity that include the energy management committee and energy audit.

Data related to energy management activity: Records and documentation of energy consumption, renewable energy, energy saving and performance within the organisation.

Reports, reviews by third parties, or certifications received by the organisation based on recognised standards.

Company policies, mission, and vision statements for continuous improvement.

Reference and citation to sections, parts, and/or entire documents as evidence. Documents cited shall specifically address the following aspects:

1. Evidence of a policy for more efficient use of energy.
2. Evidence of fixed targets and objectives to meet the policy.
3. Evidence of the usage data to better understand and make decisions about energy use.
4. Evidence of the performance of the policy.
5. Evidence of a continuous improvement in energy management.

3.3. COMPUTATION

Not Applicable

3.4. ASSUMPTIONS AND UNCERTAINTIES

Not applicable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

There are no limitations to this indicator.

4.2. VALIDATION

1. ISO 50001:2018 Energy Management System.
2. AEMAS Energy Management Gold Standard.

4.3. QUALITY MANAGEMENT

Not applicable.

5. REFERENCES

1. National Energy Efficiency Action Plan 2016–2025
2. Malaysia Renewable Energy Roadmap (MyRER).
3. Dasar Tenaga Negara (DTN) 2022–2040.
4. The Sustainable Development Goals (SDGs)

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: ENERGY

SUB INDICATOR: RENEWABLE ENERGY

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: National target of 31% RE (renewable energy) capacity mix in 2025, and 40% by 2035.

The goal of this instrument is mapped to the following global goals and National targets:

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns.

Goal 12.6: Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (target at Sustainable reporting in companies).

National Energy Efficiency Action Plan 2016 – 2025:

1. 52,233 GWh of energy savings (8.0%)
2. 37,702 ktCO_2 equivalent reduction

Malaysia Renewable Energy Roadmap (MyRER)

National aspiration of 31% renewable energy (RE) capacity by 2025 and 40% by 2035.

Dasar Tenaga Negara (DTN) 2022 – 2040

National target set for RE at 18,431MW in 2040.

1.2. INDICATOR

Energy

1.3. SUB-INDICATOR

Renewable Energy

1.4. LAST UPDATE

13 May 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Organisation: The entity undergoing the evaluation.

Energy: Energy resources, which refer to substances like fuels, petroleum products, heating and cooling, and electricity in general, because a significant portion of the energy contained in these resources can easily be extracted to serve a useful purpose.

Renewable energy: Energy resources that is collected from renewable resources that are naturally replenished on a human timescale. It includes sources such as sunlight, wind, the movement of water, and geothermal heat.

Renewable fuel: Fuel resources that is produced from renewable resources. Examples include biofuels and Hydrogen fuel. This is in contrast to non-renewable fuels such as natural gas, LPG, petroleum, coal, and other fossil fuels and nuclear energy.

Energy consumption: An energy usage by the organisation and all its sub-entities for its operations and activities.

Energy savings: An energy consumption reduction measured against a baseline year.

Reporting period: The time span for which the instrument assesses the organisation. Unless required otherwise time span should be one year.

2.2. CONCEPT

Not applicable

2.3. UNIT OF MEASURE

Percentage (%) of renewable energy used with reference to the total energy used within the organisation.

Percentage (%) of renewable fuel used with reference to the total fuel used within the organisation.

3. METHODOLOGY

3.1. DATA SOURCES

Energy consumption: Meter energy usage readings (i.e., kWh, kJ, MMBTU), electricity bills (i.e., kWh, kJ, MMBTU), or any other documents recording the energy consumption for the organisation.

Renewable energy consumption: Meter renewable energy production readings (i.e., kWh, kJ), utility bills (i.e., kWh, kJ, MMBTU), or any other documents recording the renewable energy consumption for the organisation.

Fuel consumption: Bills of quantities for fuels (i.e., litres of fuel, kg of fuel, cu.ft of gases), or any other documents recording the fuel consumption for the organisation.

Certificates of analysis (COA): COA for fuels shall be referred to determine calorific values of fuels used (if applicable).

3.2. DATA COLLECTION METHOD

Energy consumption:

1. Meter usage reading showing a consumption of energy over a period of time. Typically, meter reading is provided with a monthly time span. The total energy consumed shall be computed by taking the total meter readings for individual months over the period of the reporting year. In the event that more than one energy source is available, the sum of the meter readings shall be considered.
2. If there are more than one type of energy being consumed, a common energy unit shall be utilised. (e.g., MWh, MJ)
3. Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for energy purchased with the assumption that the energy purchased is consumed within the reporting period.

Renewable Energy consumption:

1. Meter usage reading showing a generation of renewable energy over a period of time. Typically, meter reading is provided with a monthly time span. The total renewable energy generated shall be computed by taking the total meter readings for individual months over the period of the reporting year. In the event that more than one energy source is available, the sum of the meter readings shall be considered.
2. If there are more than one type of renewable energy being generated, a common energy unit shall be utilised. (e.g., MWh, MJ)

3. Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for energy purchased with the assumption that the energy purchased is consumed within the reporting period.

Fuel consumption:

1. Bills of quantities of fuel for fuels purchased shall be used to represent consumption of fuel over a period of time. The total fuel consumed shall be computed by taking the total quantities for the period of the reporting year. In the event that more than one fuel source is consumed, the sum of the quantities of fuel consumed shall be considered.
2. Other forms of evidence acceptable include, purchase invoices, bill of lading, and other similar documents.
3. If there are more than one type of fuel being consumed, a common energy unit shall be utilised. (e.g., MWh, MJ)
4. The energy unit of fuels shall be computed by multiplying the calorific value (e.g., J/kg, kJ/l) of the fuel with the quantity (e.g., kg, l). Refer to the Appendix for the list of common calorific value that can be used as reference. In the event of fuels not listed in the Appendix, the assessor shall request from the organisation for such information accompanied by respective reference document (e.g., certificates of analysis for fuel calorific value, literature reference).
5. Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for fuel purchased with the assumption that the energy purchased is consumed within the reporting period.

Fuel consumption coming from renewable sources:

1. Bills of quantities of fuel for fuels coming from renewable purchased shall be used to represent consumption of renewable fuel over a period of time. The total renewable fuel consumed shall be computed by taking the total quantities for the period of the reporting year. In the event that more than one renewable fuel source is consumed, the sum of the quantities of fuel consumed shall be considered.
2. Other forms of evidence acceptable include, purchase invoices, bill of lading, and other similar documents. Documents and records of renewable fuels consumed (e.g., biomass, biogas) can also serve as evidence.
3. If there are more than one type of renewable fuel being consumed, a common energy unit shall be utilised. (e.g., MWh, MJ)
4. The energy unit of renewable fuels shall be computed by multiplying the calorific value (e.g., J/kg, kJ/l) of the fuel with the quantity (e.g., kg, l). Refer to the Appendix for the list of common calorific value that be used as reference. In the event of fuels not listed in the Appendix, the assessor shall request from the organisation for such information accompanied by respective reference document (e.g., certificates of analysis for fuel calorific value, literature reference).
5. Other documents that can be used as evidence are purchase invoices received by utility providers or suppliers for fuel purchased with the assumption that the energy purchased is consumed within the reporting period.

Observations: Observations are made during the site visit to understand the actual case scenario of the green initiative implementation within the boundaries of the organisation.

Interviews: Interviews with respondent carried out to acquire insight of the processes/activities involved within the boundaries of the organisation.

Questionnaires/surveys: A set of questions designed for respondent to acquire insight of the processes/activities involved within the boundaries of the organisation.

Documents reviews: Documents reviewed during the site visit to support the observation.

3.3. COMPUTATION

The renewable energy percentage and renewable fuel percentage for the reporting period can be calculated using the following equations:

Percentage (%) of renewable energy consumption =

$$\frac{[\text{Energy consumption coming from RE sources (i.e., kWh, kJ, MMBTU)}]}{[\text{Total energy consumption (i.e., kWh, kJ, MMBTU)}]} \times 100\%$$

Percentage (%) of renewable fuel consumption =

$$\frac{[\text{Fuel consumption coming from renewable sources (unit for fuel)}]}{[\text{Total fuel consumption (unit for fuel)}]} \times 100\%$$

3.4. ASSUMPTIONS AND UNCERTAINTIES

Wherever fuel characteristic information is used for calculations, it shall be noted that the averaging of such characteristics (i.e., calorific value) contributes to uncertainties.

Any and all averaging approach to consumption data shall be noted and wherever practicably possible the uncertainties shall be quantified.

Total energy consumed for the reporting period shall be calculated based on the actual consumption of energy for each month within the reporting period. In the event of data unavailability, average consumptions can be provided. Averaging approaches and assumptions made should be described in sufficient detail.

Total fuel consumed for the year of reporting shall be calculated based on the actual consumption of fuel for each month within the reporting period. Each type of fuel should be calculated separately.

Suggested unit for fuel as follows:

Liquid fuel (i.e., petrol, diesel, oil, etc.) - litres of fuel

Solid fuel (i.e., coal, woodchip, etc) - kg of fuel

Gaseous fuel (i.e., natural gas, LPG, etc.) – MMBTU or cu.ft of gases

If the organisation is reporting both renewable electricity and renewable fuels, the energy units should be standardised in MWh or MJ and reported in combination.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

There are no limitations to this indicator.

4.2. VALIDATION

Renewable Energy Certificate (REC) issued by Tenaga Nasional Berhad (TNB) or GSPARX Sdn. Bhd. to validate total amount of renewable energy subscribed.

4.3. QUALITY MANAGEMENT

Not applicable.

5. REFERENCES

1. National Energy Efficiency Action Plan 2016 – 2025
2. Malaysia Renewable Energy Roadmap (MyRER)
3. Dasar Tenaga Negara (DTN) 2022 – 2040
4. The Sustainable Development Goals (SDGs)

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: INNOVATION

SUB-INDICATOR: KNOWLEDGE TRANSFER AND COLLABORATION

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: Establishment of strategic partnership/ collaboration/ JV/ knowledge transfer program for innovation in green practices and commercialisation initiatives.

Sustainable Development Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.

Sustainable Development Goal 9: Build resilient infrastructure, promote sustainable industrialization, and foster innovation

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns

Green Technology Master Plan (GTMP) 2017 – 2030
Strategic Thrust

ST2: Market Enablers

8.3.6 Introducing Roll-Out Plans Comprising Human Capital Development and Public - Private Collaboration to Green the Cities

8.3.7 International Collaborations

ST3: Human Capital Development

8.4.2 Greater Collaboration with Tertiary Institutions for Upskilling of Graduates

Dasar Sains, Teknologi, Inovasi Negara (DSTIN) 2021 – 2030

ST1: Advancing Scientific and Social Research Development and Commercialisation

1. Increase Gross Expenditure on R&D (GERD) to at least 2.0% of GDP by 2020
2. Enhance the performance of public and private Research, Development & Commercialization funding

1.2. INDICATOR

Innovation

1.3 SUB-INDICATOR

Knowledge transfer and collaboration

1.4 LAST UPDATE

13 May 2023

1.5 RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Knowledge transfer: Method of sharing information, abilities, ideas, discoveries, and skills across different areas/ community that encourages innovation and boost efficiency in the businesses system. The activity involves research, academic engagement for technology transfer or commercialization through the relationship between collaborative partners, with outcomes of successful knowledge or technology transfer and commercialization.

Strategic collaboration: Strategic actions or programs in innovation practice to achieve specific goals and objectives of mutual benefit to the parties involved, creating values for intended audience/clients/consumers/stakeholders.

2.2. CONCEPT

Not applicable

2.3. UNIT OF MEASURE

Not applicable

3. METHODOLOGY

3.1 DATA SOURCES

Contract agreements: Documents indicating mutual obligations between two or more parties such as Letter of Intent (*LOI)/ Non-Disclosure Agreement (NDA)/ Memorandum of Understanding (MOU)/ Memorandum of Agreement (MOA).*

Intellectual Property (IP): Documents related to intellectual protection such as copyrights, trademarks, trade secret, industrial design, utility innovation or patent.

Proof of Return on Value:

Economic Value: Financial accounting report indicating outlining investment, revenue and net profit based on commercialization/ marketing attribution success of innovative green products/ services.

Social Value: Project completion report with evidence of applied/ implemented/ reviewed innovation practices which leads to pre-set goals that are measurable improvements on existing practices of identified community.

Other related Value: Project report or document information improvement on productivity/ practice/ System and resource and material-efficiency leading to improved air and water quality/ fewer waste/ more renewable energy sources and other sustainable conditions.

3.2 DATA COLLECTION METHOD

Contract agreements

Evidence indicating a formal contract or agreement within collaborative parties:

1. Letter of Intent (*LOI)/ Non-Disclosure Agreement (NDA)/ Memorandum of Understanding (MOU)/ Memorandum of Agreement (MOA).*

Intellectual Property (IP)

1. Provisional IP application document or;
2. E-Filling document or;
3. Published detailed of invention or;
4. IP Award certificate/ letter or;
5. IP filing number

Organisation may present proof of Economic ROI and/or Social Value ROI

Proof of Return on Investment (ROI) or Return on Value (ROV):

Proof of Economic ROI

1. Financial accounting report of commercialized product/service solution resulting from innovation project. (e.g., commercial activities, transactions, order, invoice)

2. Proof of positive return on investment (ROI) is not necessary. However, businesses will only need to proof that commercialized product/ service is going to or actively being promoted to market.

Proof of Social Value ROI

1. Project completion report (clearly shows measurable pre-set goals to improve existing practices related to community engagement outlining innovation product/ service/ process applied/ implemented/ system/ management/ productivity reviewed on identified community).
2. In the event of an ongoing project, proof of actual goals is not yet necessary. However, proof plan or ongoing engagement with community must be present through official project documents.

Proof of Other ROV

1. Project completion report with evidence of improvement on productivity/ practice/ System and resource and material-efficiency leading to improved air and water quality/ fewer waste/ more renewable energy sources and other sustainable conditions.

3.3 COMPUTATION

Not applicable

3.4 ASSUMPTIONS AND UNCERTAINTIES

Not applicable

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1 COMMENT AND LIMITATION

Not applicable

4.2 VALIDATION

Not applicable

4.3 QUALITY MANAGEMENT

1. Malaysian Standards (MS) - Standards Malaysia
2. Local or International Product Certification – SIRIM
3. Good Design Mark – Malaysia Design Council
4. MyHIJAU Mark - MGTC

5. REFERENCES

1. Green Practice Guideline for Services Sector (Final Report Draft 2022)
2. Green Technology Master Plan Malaysia /GTMP (2017 – 2030)
3. Dasar Sains, Teknologi dan Inovasi Negara/ DSTIN (2021 – 2030)
4. Dasar Keusahawanan Negara /DKN (2030)
5. Sustainable Development Goals (SDG) 2030
6. Dasar Perubahan Iklim Negara

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: INNOVATION

SUB-INDICATOR: RESEARCH AND DEVELOPMENT (R&D)

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal 1: Establishment of Research & Development (R&D) process, output, and policy for organisation.

Goal 2: To increase investment or incentive received to support innovation in green practice to promote commercialization, Intellectual Property and award/recognition within the organisation.

Sustainable Development Goal 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.

Sustainable Development Goal 9: Build resilient infrastructure, promote sustainable industrialization, and foster innovation

Sustainable Development Goal 12: Ensure sustainable consumption and production patterns

Green Technology Master Plan (GTMP) 2017 – 2030

Strategic Thrust

ST4: Research & Development & Commercialization (R&D&C)

8.5.1 A key steppingstone towards an innovative Green Technology (GT) hub

8.5.1.1 R&D&C Projects

8.5.2 Encouraging more localised and demand driven R&D&C

ST2: Market Enablers

8.3.2 Funding GT project development

8.3.3 Exploring Alternative GT Financing Ecosystem

8.3.4 GT Incentives

Dasar Sains, Teknologi, Inovasi Negara (DSTIN) 2021 – 2030

ST1: Advancing Scientific and Social Research Development and Commercialisation

1. Enhance commercialisation and increase uptake of home-grown R&D innovative products through clear guidelines and standards compliance
2. Increase Gross Expenditure on R&D (GERD) to at least 2.0% of GDP by 2020

1.2. INDICATOR

Innovation

1.3 SUB-INDICATOR

Research and Development (R&D)

1.4 LAST UPDATE

13 May 2023

1.5 RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Research & Development (R&D): Activities that organisation undertakes to innovate and introduce new improvised products and services.

Commercialisation: The process of bringing new products and services to market.

Innovation: Innovation refers to activity that contribute to the creation of key products, services, or processes to reduce the harm, impact, and deterioration of the environment while optimising the use of natural resources.

Products: Product innovation involves creating new products or improved versions of existing products that increase their uses or impact in green solution/environment. It applies the concept of green to the entire process of product innovation by increasing resource utilization, efficiently promoting green production design, and positively promoting corporate financial performance.

Services: Green service innovation includes elements such as green invention, environmental service portfolio, environmental service delivery, and environmental service design. Distinct from other service innovations, green service innovation focuses on environmental social responsibility and customer experience.

Intellectual Property: Form of property that includes any tangible/intangible creations of human intellect, green practices, or green innovation initiatives. Namely patents, copyrights, industrial design, utility innovation, trademarks, and trade secrets.

Social innovations: New solutions (products/ services/ models/ markets/ processes) that simultaneously meet a social need and lead to new or improved capabilities and relationships and better use of assets and resources.

2.2 CONCEPT

Not applicable

2.3 UNIT OF MEASURE

Not applicable

3. DATA SOURCE AND DATA COLLECTION METHOD

3.1 DATA SOURCES

Innovation Management Procedure: Sets of policies, processes and procedures used by organisations to ensure fulfilment of tasks required to achieve operational objective for innovation (including financial success, safe operation, product quality, client relationships, legislative and regulatory conformance, and worker management).

Businesses Structure: Refers to systems which outlines how innovation activities are formalized through functions within an R&D unit and within the boundaries of the organisations under evaluation.

Product/ Design/ System/ Solution Blueprint/ Refers to related standard documents/record/proof of concept and pertaining innovation outcome.

Project Charter: A document that describes an innovation project in its entirety. (Overview, an outline of scope, an approximate schedule, a budget estimate, anticipated risks, and key stakeholders.

Grant Proposal: A document proposing a research project requesting for sponsorship of that research.

Grant Award Document: A written agreement between the organisation and a grantee as the official notification of grant approval with evidence for contractual grant reporting.

Investment Records: Financial documents/records used as evidence for internal and external investment of technology or system which enables innovation process/ research/ practice/ development in the organisation.

Intellectual Property (IP): Provisional IP application document/ E-Filling document/ published detailed of invention on intellectual protection within copyright, trademark, patents, geographical indications, plant varieties, industrial designs and semiconductor integrated circuit layout designs.

Recognition/ Award/ Certification: Refers to the state or quality innovation product/ process/ service that are recognized or acknowledged by certified bodies.

Proof of Return on Value:

Economic Value: Financial accounting report indicating outlining investment, revenue and net profit based on commercialization/ marketing attribution success of innovative green products/ services.

Social Value: Project completion report with evidence of applied/ implemented/ reviewed innovation practices which leads to pre-set goals that are measurable improvements on existing practices of identified community.

Other related Value: Improvement on productivity/ practice/ System and resource and material-efficiency leading to improved air and water quality/ fewer waste/ more renewable energy sources and other sustainable conditions.

3.2 DATA COLLECTION METHOD

The data to be collected should prove the existence of a Research and Development (R&D) unit/ dept/ personnel with proof of project document and R&D result that includes any one of the suggested types of evidence.

Proof of in-House R&D Process (any of the following):

Existence of R&D unit/dept/ personnel/ appointment

1. A unit or section or department that has a role on promoting innovation
   (e.g: R&D department, testing department, incubation unit) or;
2. Appointment letter or minute meeting indicating specific Person in Charge for a R&D project related to green practices.
3. Position or job title in charge in R&D, testing or innovation (e.g: Project manager, Research Supervisor,) or;
4. A project or an activity promoting innovation in management procedure within the reporting period. (e.g: new product development, Innovation Competition, Design improvement, product or service refinement) or;
5. In the event of unit or section specifically promoting innovation is not present, a specific team that work on innovation project can be considered as evidence of innovation management system in place.

Product/ Design/ System/ Solution Blueprint

1. Evidence illustrates the outcome from R&D, Commercialization, or Innovation (eg: Technical Drawing, System Drawing or chart, Layout, Product blueprint, Prototype, Model Making, Mock-ups, Proof of Concept Development).
2. A proof of service system (eg: System Flowchart, Apps, Software Development).

Project Charter: Project Plan and Proposal or Project Roadmap outlining the overview of project, scope, schedule, estimated budget.

Proof of Research & Development Investment (any of the following):

Grant Proposal:

1. Proof of submitted grant proposal outlining context, objectives, and methods leading to research and development project for innovation activities/ product/ services/ process. or;
2. Grant proposal draft that will be submitted within the year of reporting period. (With proof of call for submission poster/ email/ letter)

Grant Award Document:

1. Grant agreement for research and development project – active grant. (eg: Grant letter, Contract agreement, grant certificate, Proof of grant/ financial) or;
2. Grant payment (eg: Proof of grant/ financial record or transaction) or;
3. Grant Monitoring records (eg: Project progress report, financial statements)

Investment Records:

1. Financial documents/records used as evidence for internal and external investment of technology or system which enables innovation process/ research/ practice/ development in the organisation.
2. A written agreement between the organisations as the official notification of grant/ fund/ sum value invested with evidence for contractual investment reporting.

Internal/external investment of innovation-enabling technology or system:

1. Agreement, subscription, assignment, or other document evidencing in physical form an investment appointing the businesses as custodian.
2. Purchase or installation record of system or technology.

Proof of Research & Development Outcome/ Project Report (any of the following):

Proof of Return on Investment (ROI) or Return on Value (ROV):

Proof of Economic ROI

1. Financial accounting report of commercialized product/service solution as a result of innovation project. (e.g commercial activities, transactions, order, invoice)
2. Proof of positive return on investment (ROI) is not necessary, businesses will only need to proof that commercialized product/ service is going to or actively being promoted to market.

Proof of Social Value ROI

1. Project completion report (clearly shows measurable pre-set goals to improve existing practices related to community engagement outlining innovation product/ service/ process applied/ implemented/ system/ management/ productivity reviewed on identified community).
2. In the event of an ongoing project, proof of actual goals is not yet necessary. However, proof plan or ongoing engagement with community must be present through official project documents.

Proof of Other ROV: Project completion report with evidence of improvement on productivity/ practice/ System and resource and material-efficiency leading to improved air and water quality/ fewer waste/ more renewable energy sources and other sustainable conditions.

Intellectual Property (IP):

1. Provisional IP application document/ E-Filling document/ published detailed of invention on intellectual protection within copyright, trademark,

patents, geographical indications, plant varieties, industrial designs and semiconductor integrated circuit layout designs.
2. E-Filling document or;
3. Published detailed of invention or;
4. IP Award certificate/ letter or;
5. IP filling number.

Recognition/ Award/ Certification:

1. Recognition of achievement, label, standards or special acknowledgment on Innovative solution, product or services. (eg: MyHIJAU mark, Eco-label mark, MS mark, or significant recognition promoting innovation).
2. Certificate for Research & Development outcome from local or international agencies, association, government bodies and authorities (eg: Product Certification from SIRIM, Standards Malaysia, MGTC, MRM or MyIPO).
3. Proof of award received from R&D&C&I initiative, projects, programs, or venture. (eg: Local or International recognized award/ organizer/ provider).

3.3 COMPUTATION

Not applicable

3.4 ASSUMPTIONS AND UNCERTAINTIES

Not applicable

4 OTHER METHODOLOGICAL CONSIDERATIONS

4.1 COMMENT AND LIMITATION

Not applicable

4.2 VALIDATION

Not applicable

4.3 QUALITY MANAGEMENT

- Malaysian Standards (MS) – Standards Malaysia
- Local or International Product Certification – SIRIM
- Good Design Mark – Malaysia Design Council
- MyHIJAU Mark – MGTC

5. REFERENCES

1. Green Practice Guideline for Services Sector (Final Report Draft 2022)
2. Green Technology Master Plan Malaysia /GTMP (2017 – 2030)
3. Dasar Sains, Teknologi dan Inovasi Negara/ DSTIN (2021 – 2030)
4. Sustainable Development Goals (SDG) 2030
5. Dasar Keusahawanan Negara /DKN (2030)

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: MANAGEMENT

SUB-INDICATOR: GREEN PROCUREMENT

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal: Encourage companies to adopt sustainable practices and integrate sustainability information into their reporting cycle.

This goal is mapped to SDG #12 - Sustainable consumption and production, specifically addressing target #12.6 - Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (Sustainable target reporting in companies).

1.2. INDICATOR

Management

1.3. SUB-INDICATOR

Green Procurement

1.4. LAST UPDATE

13 May 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Boundary: A defined border that accounts for and limits the key business activities and processes which form the basis of the study or analysis.

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Reporting period: The period for which the instrument assesses the businesses. Unless required, otherwise period should be one year.

Management: Management from an businesses perspective refers to planning, organizing, and administering its resources and activities effectively to achieve specific objectives efficiently.

Green Procurement: The acquisition of environmentally friendly products and services, including setting environmental requirements in selecting suppliers, contractors, and contract agreements.

2.2. CONCEPTS

Not applicable.

2.3. UNIT OF MEASURE

Not applicable.

3. METHODOLOGY

3.1. DATA SOURCES

Policy or standards: Refers to a written policy and/or international/national standards used/implemented within the businesses 's boundaries.

Monitoring records: Refers to documents/records used as evidence and primary data to achieve the intended goals.

Contract agreements: Documents are evidence for indicating mutual obligations between the parties.

Purchasing records and documents: Documents indicate the businesses acquiring services or/and products/systems.

3.2. DATA COLLECTION METHOD

Policy or standards:

1. A green procurement written document that states services or/and products/systems.
2. A description of company guidelines related to services or/and products/systems.
3. Strategic action plan document of a company on green procurement commitments.
4. Green procurement policy document related to the businesses 's services or/and products/systems.

Monitoring Records:

1. A statement of green practices activities related to green procurement that are shared in minutes of meetings, mission & vision, website, social media, and others.
2. Recognition of certificate and award on green procurement activities in national and international businesses.

Contract agreements: A documented agreement on green procurement related to services or/and products/systems (LoI/MoU/MoA).

3.3. COMPUTATION

Not applicable

3.4. ASSUMPTION AND UNCERTAINTIES

Not applicable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

Not applicable.

4.2. VALIDATION

Any nationally and internationally recognized eco-label certification.

4.3. QUALITY MANAGEMENT

ISO 20400:2017 (Green Procurement)

5. REFERENCES AND DOCUMENTATION

1. Sustainable Development Goals (SDG) 2030.
2. ISO 20400:2017 Guideline

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: MANAGEMENT

SUB-INDICATOR: POLICY AND PROGRAMME

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal: Encourage small, medium, and large companies to adopt sustainable practices and reporting.

This goal is aligned with the Sustainable Development Goals (SDGs) created by the United Nations in its 2030 Agenda. Sustainable Development #12.6 focuses on small, medium, and large companies adopting sustainable practices by integrating sustainable information into their reporting cycle. This goal is crucial to ensure that the pattern of Consumption and Production should be sustainable as the key to sustaining the livelihoods of current and future generations.

1.2. INDICATOR

Management

1.3. SUB-INDICATOR

Policy and Programme

1.4. LAST UPDATE

13 May 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITIONS AND CONCEPTS

2.1. DEFINITIONS

Boundary: A defined border that accounts for and limits the key business activities and processes which form the basis of the study or analysis.

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Reporting period: The period for which the instrument assesses the businesses. Unless required, otherwise time span should be one year.

Management: Management from an businesses perspective refers to planning, organizing, and administering resources and activities effectively to achieve specific objectives efficiently.

Policy: Documented statement to achieve specific goals by the businesses.

Program: An activity that supports the achievement of the stated goal. The results of the project activities must have a direct, real, and measurable impact on achieving the intended purpose.

2.2. CONCEPT

Not applicable.

2.3. UNIT OF MEASURE

Not applicable.

3. METHODOLOGY

3.1. DATA SOURCES

Policy or standards: Refers to a written policy and/or international/national standards used/implemented within the businesses 's boundaries.

Monitoring records: Refers to documents/records used as evidence and primary data to achieve the intended goals.

Contract agreements: Documents are evidence for indicating mutual obligations between the parties

3.2. DATA COLLECTION METHOD

Policy or standards:

1. Policy or standards comply with local, national, and international legislation and regulations (e.g., Environmental Quality Act 1974).
2. Policy or standards of green practice by the businesses (e.g., ISO standards).
3. Developed guidelines or standard operating procedures of any green practice by the businesses (e.g., MyHIJAU Guidelines).
4. A planned roadmap and implemented strategy of new green practices (e.g., National Green Growth Roadmap).

Monitoring Records:

1. Reports of participation in any sustainability programs on the website, social media, posters, and minutes of meetings.
2. Recognition of certificate and award received on sustainability programs at national and international levels.

Contract agreements:

1. A written agreement of green practices commitment among employees and top management (e.g., Vision and missions of businesses).
2. A written agreement of green practices commitment with industries (e.g., MOU/MOA/LOI/LOA/NDA).
3. A written agreement of green practices commitment for corporate social responsibility (CSR) (e.g., Community).

3.3. COMPUTATION

Not applicable

3.4. ASSUMPTION AND UNCERTAINTIES

Not applicable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1. COMMENT AND LIMITATION

Not applicable.

4.2. VALIDATION

Not applicable.

4.3. QUALITY MANAGEMENT

ISO 9001:2015 (Quality Management Systems)
ISO 14001:2015 (Environmental Management System)
ISO 45001:2018 (OSHA)

5. REFERENCES

1. Sustainable Development Goals (SDG) 2030.
2. ISO 9001:2015 Guideline
3. ISO 14001:2015 Guideline
4. ISO 45001:2018 Guideline

INDICATOR INSTRUMENT FACTSHEET

INDICATOR: MANAGEMENT

SUB-INDICATOR: HUMAN CAPITAL

1. INDICATOR INFORMATION

1.1. GOALS AND TARGETS

Goal: Encourage companies to adopt sustainable practices and integrate sustainability information into their reporting cycle.

This goal is mapped to SDG #12 - Sustainable consumption and production, specifically addressing target #12.6 - Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle (Sustainable target reporting in companies).

1.2. INDICATOR

Management

1.3. SUB-INDICATOR

Human Capital

1.4. LAST UPDATE

13 May 2023

1.5. RELATED SECTORS

This indicator instrument applies to the following sectors:

- Agriculture & Plantation
- Aquaculture
- Construction
- Forest operation
- Livestock
- Manufacturing
- Mining
- Services

2. DEFINITION, CONCEPT, AND CLASSIFICATIONS

2.1. DEFINITIONS AND CONCEPTS

Boundary: A defined border that accounts for and limits the key business activities and processes which form the basis of the study or analysis.

Baseline year: A reference point in time against which a measure of consumption and/or production in the present and/or future are measured.

Reporting period: The period for which the instrument assesses the businesses. Unless required, otherwise period should be one year.

Human Capital: A productive wealth embodied in labour, skills, and knowledge that can be developed, recruited, trained, and managed to achieve businesses goals.

2.2. CONCEPT

Not applicable

2.3. UNIT OF MEASURE

Not applicable.

3. METHODOLOGY

3.1. DATA SOURCES

Policy or standards: Refers to a written policy and/or international/national standards used/implemented within the boundaries/ businesses.

Monitoring records: Refers to documents/records used as evidence and primary data to achieve the intended goals.

Contract agreements: Documents are evidence for indicating mutual obligations between the parties.

Purchasing records and documents: Documents indicate the businesses acquiring services or/or products/systems.

3.2. DATA COLLECTION METHOD

Policy or standard:

1. Human capital development document that stated key performance indicators related to green practices.
2. A strategic action plan on human capital development that the businesses undertakes to meet its green practices.
3. Policy on human capital development related to green practices applied in the businesses.

Monitoring Records:

1. Minutes of meetings related to human capital development.
2. A statement of documented human capital development that the businesses shares on its website, social media, and other media of communications.
3. Recognition of businesses human capital development activities (e.g., certificate, award at national and international levels).
4. *Contract agreements: A d*ocumented agreement indicating mutual obligations between the parties that is related to human capital development.

3.3 COMPUTATION

Not applicable

3.4 ASSUMPTIONS AND UNCERTAINTIES

Not applicable.

4. OTHER METHODOLOGICAL CONSIDERATIONS

4.1 COMMENT AND LIMITATION.

Not applicable.

4.2 VALIDATION

Not applicable.

4.3 QUALITY MANAGEMENT

ISO 30414:2018 (Human Resource Management)

5. REFERENCES AND DOCUMENTATION

1. Sustainable Development Goals (SDG) 2030.
2. ISO 30414:2018 Guide

QUESTIONNAIRE

1. Cost-benefit analysis: This involves comparing the costs of implementing the evaluation method with the potential benefits that it is expected to produce.
    (a) On a scale of 1-5, how expensive is it to implement this evaluation method? (1 = very inexpensive, 5 = very expensive)
    (b) On a scale of 1-5, how much of a benefit is this evaluation method expected to produce? (1 = no benefit, 5 = significant benefit)
    (c) On a scale of 1-5, how likely is it that the benefits of this evaluation method will outweigh the costs? (1 = not likely at all, 5 = extremely likely)
    (d) On a scale of 1-5, how confident are you that the costs of this evaluation method can be financed? (1 = not confident at all, 5 = extremely confident)
    (e) On a scale of 1-5, how well does this evaluation method compare to other evaluation methods in terms of cost-benefit ratio? (1 = much worse, 5 = much better)
    (f) On a scale of 1-5, how much of an impact does this evaluation method have in terms of unintended consequences? (1 = no impact, 5 = significant impact)
    (g) On a scale of 1-5, how much of an impact does this evaluation method have in terms of long-term costs or benefits? (1 = no impact, 5 = significant impact)
    (h) On a scale of 1-5, how much of an impact does this evaluation method have in terms of regulatory or legal considerations? (1 = no impact, 5 = significant impact)

2. Feasibility study: This is a comprehensive analysis of the potential risks, challenges and opportunities of the evaluation method, including the resources required and the potential impact on the stakeholders.
    (a) On a scale of 1-5, how easy is it to implement this evaluation method? (1 = very difficult, 5 = very easy)
    (b) On a scale of 1-5, how well does this evaluation method fit within the available resources and constraints? (1 = not well at all, 5 = extremely well)
    (c) On a scale of 1-5, how likely is it that this evaluation method will be successful given the available resources and constraints? (1 = not likely at all, 5 = extremely likely)
    (d) On a scale of 1-5, how much time is required to implement this evaluation method? (1 = very little time, 5 = a significant amount of time)
    (e) On a scale of 1-5, how well does this evaluation method perform during the pilot testing? (1 = not well at all, 5 = extremely well)
    (f) On a scale of 1-5, how well does this evaluation method perform in terms of logistics? (1 = not well at all, 5 = extremely well)
    (g) On a scale of 1-5, how well does this evaluation method perform in terms of data accessibility? (1 = not well at all, 5 = extremely well)
    (h) On a scale of 1-5, how well does this evaluation method perform in terms of expert review? (1 = not well at all, 5 = extremely well)

3. Time analysis: This involves analysing the amount of time required to implement the evaluation method, including the time required for data collection, analysis, and reporting.
    (a) On a scale of 1-5, how much time is required to set up this evaluation method? (1 = very little time, 5 = a significant amount of time)
    (b) On a scale of 1-5, how much time is required for data collection with this evaluation method? (1 = very little time, 5 = a significant amount of time)
    (c) On a scale of 1-5, how much time is required for data analysis with this evaluation method? (1 = very little time, 5 = a significant amount of time)
    (d) On a scale of 1-5, how much time is required for reporting with this evaluation method? (1 = very little time, 5 = a significant amount of time)
    (e) On a scale of 1-5, how often does the data need to be updated with this evaluation method? (1 = rarely, 5 = frequently)
    (f) On a scale of 1-5, how much of an impact does this evaluation method have on staff time? (1 = no impact, 5 = significant impact)
    (g) On a scale of 1-5, how much of an impact does this evaluation method have on the project timeline? (1 = no impact, 5 = significant impact)
    (h) 8. On a scale of 1-5, how well does this evaluation method fit within the overall project schedule? (1 = not well at all, 5 = extremely well)
    (i) On a scale of 1-5, how much flexibility is there to adjust the timing of data collection and analysis with this evaluation method? (1 = very little flexibility, 5 = a lot of flexibility)
    (j) On a scale of 1-5, how much time is required for training personnel to use this evaluation method? (1 = very little time, 5 = a significant amount of time)

4. Pilot testing: This involves testing a small-scale version of the evaluation method to identify any potential issues or challenges that need to be addressed before full implementation.
    (a) On a scale of 1-5, how well did this evaluation method perform during the pilot test? (1 = not well at all, 5 = extremely well)
    (b) On a scale of 1-5, how well did the evaluation method meet the needs of the test participants? (1 = not well at all, 5 = extremely well)
    (c) On a scale of 1-5, how well did the evaluation method achieve the desired outcomes? (1 = not well at all, 5 = extremely well)
    (d) On a scale of 1-5, how much feedback did test participants provide about the evaluation method? (1 = very little feedback, 5 = a lot of feedback)
    (e) On a scale of 1-5, how well did the evaluation method perform compared to other similar methods tested? (1 = not well at all, 5 = extremely well)
    (f) On a scale of 1-5, how feasible is it to implement this evaluation method on a larger scale? (1 = not feasible at all, 5 = extremely feasible)
    (g) On a scale of 1-5, how much of an impact did the evaluation method have on the pilot test participants? (1 = no impact, 5 = significant impact)
    (h) On a scale of 1-5, how well did the evaluation method perform in terms of data accuracy? (1 = not well at all, 5 = extremely well)
    (i) On a scale of 1-5, how well did the evaluation method perform in terms of data reliability? (1 = not well at all, 5 = extremely well)

(j) On a scale of 1-5, how well did the evaluation method perform in terms of data validity? (1 = not well at all, 5 = extremely well)

5. Expert review: This involves consulting with experts in the field to gain their perspective on the feasibility of the evaluation method, including any potential challenges and opportunities.
    (a) On a scale of 1-5, how well does this evaluation method align with current industry standards and best practices? (1 = not well at all, 5 = extremely well)
    (b) On a scale of 1-5, how well does this evaluation method address the research question or problem it is intended to solve? (1 = not well at all, 5 = extremely well)
    (c) On a scale of 1-5, how well does this evaluation method utilize appropriate methods and techniques? (1 = not well at all, 5 = extremely well)
    (d) On a scale of 1-5, how well does this evaluation method account for potential sources of bias? (1 = not well at all, 5 = extremely well)
    (e) On a scale of 1-5, how well does this evaluation method account for potential confounding variables? (1 = not well at all, 5 = extremely well)
    (f) On a scale of 1-5, how well does this evaluation method account for potential ethical concerns? (1 = not well at all, 5 = extremely well)
    (g) On a scale of 1-5, how well does this evaluation method account for potential limitations? (1 = not well at all, 5 = extremely well)
    (h) On a scale of 1-5, how well does this evaluation method account for potential uncertainties? (1 = not well at all, 5 = extremely well)
    (i) On a scale of 1-5, how well does this evaluation method account for potential generalizability? (1 , not well at all, 5 = extremely well)
    (j) On a scale of 1-5, how well does this evaluation method perform in terms of data quality? (1 = not well at all, 5 = extremely well)

6. Stakeholder analysis: This involves identifying and assessing the perspectives and needs of the stakeholders affected by the evaluation method, to understand the feasibility of the method in relation to their needs and concerns.
    (a) On a scale of 1-5, how important are the stakeholders in the success of this evaluation method? (1 = not important at all, 5 = extremely important)
    (b) On a scale of 1-5, how satisfied are stakeholders with this evaluation method? (1 = not satisfied at all, 5 = extremely satisfied)
    (c) On a scale of 1-5, how well does this evaluation method meet the needs of the stakeholders? (1 = not well at all, 5 = extremely well)
    (d) On a scale of 1-5, how much input did stakeholders have in the development of this evaluation method? (1 = no input, 5 = significant input)
    (e) On a scale of 1-5, how well does this evaluation method align with the goals and objectives of the stakeholders? (1 = not well at all, 5 = extremely well)
    (f) On a scale of 1-5, how well does this evaluation method account for potential stakeholder conflicts? (1 = not well at all, 5 = extremely well)
    (g) On a scale of 1-5, how well does this evaluation method account for potential stakeholder resistance? (1 = not well at all, 5 = extremely well)

(h) On a scale of 1-5, how well does this evaluation method account for potential stakeholder power imbalances? (1 = not well at all, 5 = extremely well)
(i) On a scale of 1-5, how well does this evaluation method consider the perspectives of diverse stakeholders? (1 = not well at all, 5 = extremely well)
(j) On a scale of 1-5, how well does this evaluation method involve stakeholders in the implementation and monitoring process? (1 = not well at all, 5 = extremely well)

7. Logistics: This involves assessing the logistical aspects of the evaluation method, including the availability of necessary equipment, personnel, and facilities required to implement the evaluation method.
   (a) On a scale of 1-5, how well does this evaluation method fit within the existing infrastructure and resources? (1 = not well at all, 5 = extremely well)
   (b) On a scale of 1-5, how much additional infrastructure and resources are required for this evaluation method? (1 = no additional resources, 5 = significant additional resources)
   (c) On a scale of 1-5, how well does this evaluation method account for potential logistical challenges? (1 = not well at all, 5 = extremely well)
   (d) On a scale of 1-5, how well does this evaluation method account for potential geographical challenges? (1 = not well at all, 5 = extremely well)
   (e) On a scale of 1-5, how well does this evaluation method account for potential seasonal challenges? (1 = not well at all, 5 = extremely well)
   (f) On a scale of 1-5, how well does this evaluation method account for potential security challenges? (1 = not well at all, 5 = extremely well)
   (g) On a scale of 1-5, how well does this evaluation method account for potential scalability? (1 = not well at all, 5 = extremely well)
   (h) On a scale of 1-5, how well does this evaluation method account for potential sustainability? (1 = not well at all, 5 = extremely well)
   (i) On a scale of 1-5, how well does this evaluation method account for potential adaptability? (1 = not well at all, 5 = extremely well)
   (j) On a scale of 1-5, how well does this evaluation method account for potential data privacy? (1 = not well at all, 5 = extremely well)

Link to Google form: https://docs.google.com/forms/d/e/1FAIpQLSenOOok7nloLCSrkRLYF5CW0yX3_u5k_Jup7UM-1Vec9w5Zrw/viewform?usp=sf_link