KEMENTERIAN
ALAM SEKITAR DAN AIR
Ministry of Environment and Water

MGTC

GREEN PRACTICES GUIDELINE FOR MANUFACTURING SECTOR

TABLE OF CONTENT

CORPORATE INFORMATION

PROJECT TEAM (MGTC)

TS. Shamsul Bahar Mohd Nor
Kamaradzaman Mohd Bakri
Abd Malik Atan
Azlina Hashim
Muhammad Faiz Abdul Rahman
Nur Amalina Hasanudin
Khairul Ikhwan Jamaludin

TECHNICAL EXPERT (UPM)

Dr Irina Harun (lead)
AP Dr Faradiella Mohd Kusin
Dr Zakiah Ponrahono
Dr Mohd Yusoff Ishak

PROJECT SUPPORT & FACILITATION

Afiqah Aiman Abdul Gaffar
Pubeshwaran Yuvarajan
Nur Shazreena Mat Shukri
Siti Afiqah Mohammad Sabri
Syazwani Sahrir
Fatiah Abdul Aziz

ACKNOWLEDGEMENTS

The team wishes to express our appreciation to all stakeholders who have provided feedback and comments to the draft versions of this document.

Dato' Jana Santhiran a/l Muniayan (KASA)
Hidayu Hashim (EPU)
Abd Aziz Chik (JAS)
Mohd Nazri Ramli (JAS)
Yusni Md Yusop (MIDA)
Hanis Ilyana Md Isa (MIDA)
Edison Choong Wan Sern (MATRADE)
Mohd Faizal Mohd Alwi (SIRIM Qas International)
Abd Rahim Wasik (SIRIM Qas International)
Ts. Raja Shazrin Shah (Galaxy Tech Solution (KL) Sdn Bhd)

FOREWORD

The development of green practice guidelines is a continuation of the implementation of the MyHIJAU Program under the Ministry of Environment and Water (KASA) and the Malaysian Green Technology and Climate Change Corporation (MGTC) which is a coordinating agency and secretariat for the program. This program has been approved by the National Council for Green Technology and Climate Change (MTHPI) which was held on 23 October 2012. This is one of the Government's initiatives in the development of Green Technology in Malaysia. It is in line with the implementation of the National Green Technology Policy as well as the direction of Sustainable Consumption & Production (SCP) to encourage local manufacturers, producers and suppliers, especially to companies and Small and Medium Enterprises (SMEs). In addition, it will also focus on the Government's initiatives and direction in the development of the country's SMEs.

The development of Green Practice Guidelines is to provide guidance to the green industry in implementing green practices at the preliminary stage, during and after construction is implemented. These guidelines also have an implementation direction to ensure that these Guidelines will continue to be referred to and used by all parties, especially industry players to help achieve the government's goal of implementing green development in Malaysia. This green practice can help the industrial sector to have the potential to venture into the field of green technology, especially in the production of green products and services, as well as increase the encouragement of producers, manufacturers and suppliers to apply green technology in the premises, production process and operation.
These Guidelines are more towards the requirements that need to be put into practice so that industries, companies and organizations have green practice guidelines that can be referred to as well as help companies achieve the government's goal of using green practices in line with SDG 12.6, which is to encourage the industry to use sustainable practices and integrate information sustainability into the reporting cycle.

Referring to the twelfth Malaysia plan under the eighth main focus which is to accelerate green growth, where this green practice development program is able to play a very important role in being a catalyst to ensure that these green practices are more practical and applicable to all parties in the green industry whether directly or indirectly for local companies and businesses to gain exposure to this green industry practice guide.

Therefore, increasing productivity and long-term profits through environmental, social and governance (ESG) elements should be applied in decision-making by ensuring that companies focus on reducing the negative impact on the environment. Although Malaysia only contributes 0.7 percent to greenhouse gas emissions, the Government will continue to fulfil its commitment to reduce GHG emission intensity up to 45 percent to GDP in 2030, based on emission intensity in 2005, in line with the aspiration to become a low carbon country. It is hoped that this goal can be achieved by focusing on the industry to understand the importance of green practices in business by applying knowledge about the benefits and applications of green technology as well as the implementation strategy of the green practice monitoring mechanism in business management to obtain the recognition of the green industry.

LIST OF ABBREVIATIONS

3R	Reduce, Reuse, and Recycle
CCS	Carbon Capture and Storage
CH_4	Methane
CO_2	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
GERD	Gross Domestic Expenditure on Research and Development
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
MITI	Ministry of International Trade and Industry
MSIC	Malaysia Standard Industrial Classification
MT	Metric Tonne

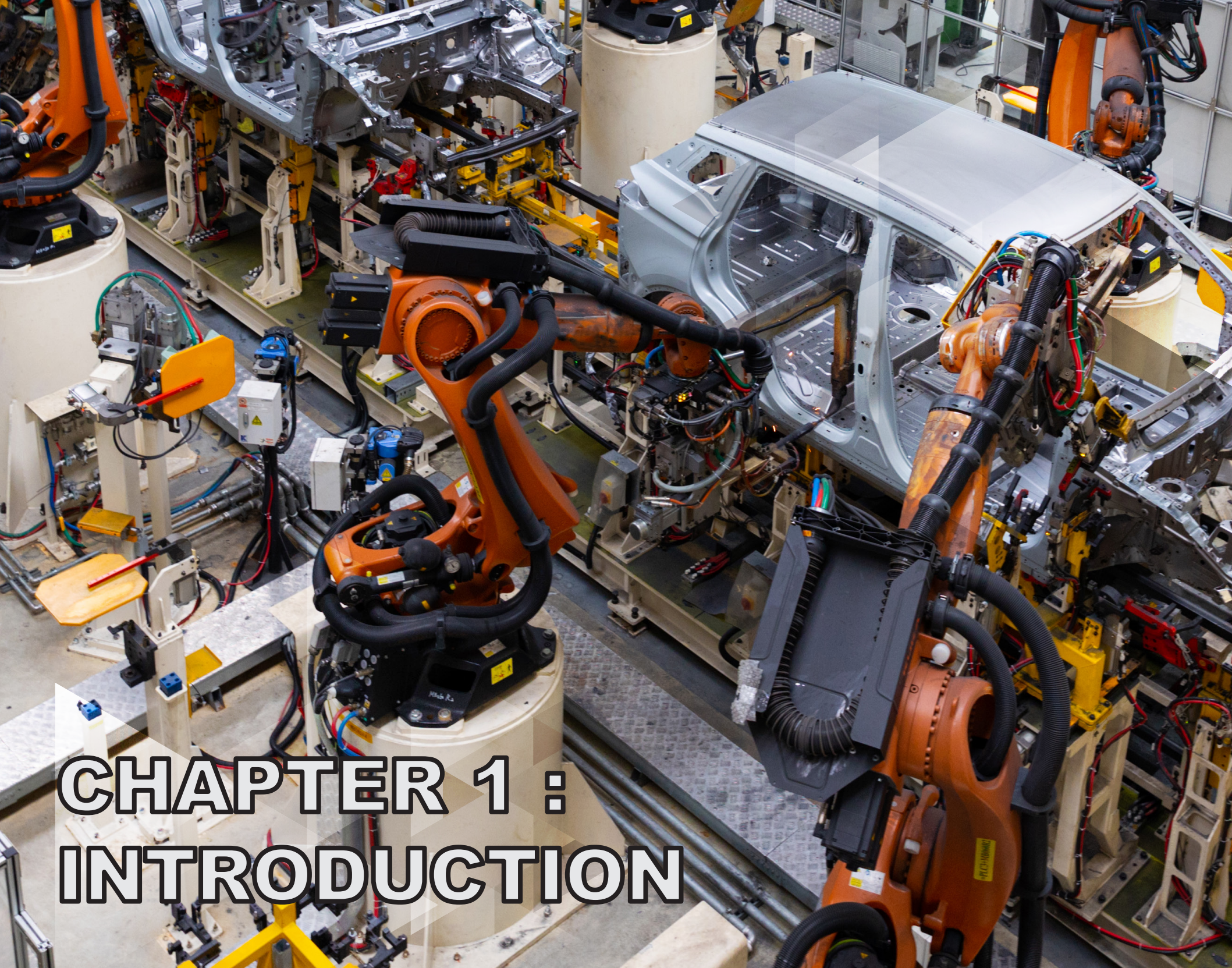
LIST OF ABBREVIATIONS

MW	Megawatt
MWh	Megawatt-hour
MyCREST	Malaysian Carbon Reduction & Environmental Sustainability Tools
MyOrganic	Malaysia Organic
MySDG Fund	Malaysia Sustainable Development Goals Trust Fund
N_2O	Nitrous Oxide
NEA	National Energy Awards
NEEAP	National Energy Efficiency Action Plan
NF_3	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
SF_6	Sulfur Hexafluoride
SME	Small and Medium Enterprises
SO_2	Sulfur Dioxide
SOP	Standard Operating Practice
SPAN	Suruhanjaya Perkhidmatan Air Negara
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
WEPLS	Water Efficient Product Labelling Scheme

LIST OF TERMINOLOGIES

These are the terminologies used within this Guideline:

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 hierarchy	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.



CHAPTER 1 : INTRODUCTION

HIGHLIGHTS OF THE MANUFACTURING INDUSTRY

The manufacturing sector plays a significant role in the nation's economic growth, creating job opportunities, producing more affordable goods in larger capacities, and improving livelihoods.

According to data from the Department of Statistics Malaysia, the manufacturing sector contributes 23.6% of Malaysia's GDP in 2020 (Dept. of Statistic Malaysia, 2021).

As of June 2021, manufacturing sales amounted to **RM124.4 billion**, an increase of 6.5 per cent.

The manufacturing sector employs **2,215,420 employees** amounting to **RM7360.3 million** of total salaries and wages (Dept. of Statistic Malaysia, 2021).

In 2020, the manufacturing sector along with the services and primary sectors attracted a total of **RM164 billion** worth of approved investments, 39.1% of which came from foreign investments.

This is expected to create **114,673 new jobs** across **4,599 projects** (Malaysian Investment Development Authority, 2020).

INDUSTRY AND THE ENVIRONMENT

While development brings prosperity to the people and the country, the economic, technological, and social advances have also altered the way people interact with their environment significantly.

The manufacturing industry has traditionally transformed primary outputs from multiple sources into new and innovative products

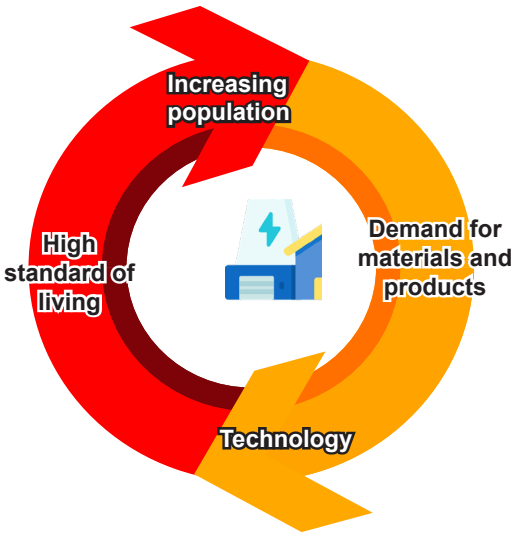
As the standard of living increases and population thrives, the demand for more materials and products have also increased.

To cope with the times and market demands, the industry has evolved into highly complex structures which converts various primary and intermediate goods into final products.

More natural resources such as metals, minerals, fossil fuels and water had to be utilized at higher energy intensities to produce the required volume of products

Naturally, this also increases the amount of waste and emissions that must be discharged into the environment, along with the subsequent depletion of natural resources.

How about the environmental impact?



NATURAL RESOURCES

Raw meterials, minerals, water, energy,land resources

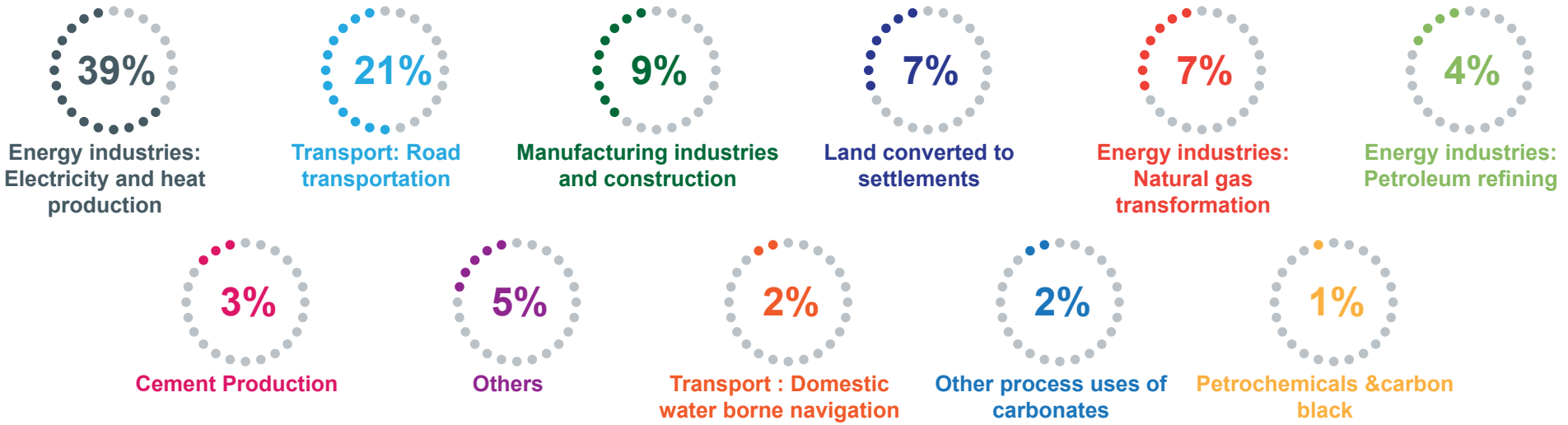
WASTE AND EMISSIONS

Solid waste, effluents, greenhouse gases, carbon emission

CLIMATE CHANGE: WHERE ARE WE?

Climate change is one of the most daunting challenges of the 21st century. At its core is the fact that economic development should not compromise the environment, and the greenhouse gases (GHGs) emissions must be controlled to alleviate and slow down the impacts of climate change for the benefit of current and future generations.

Malaysia currently contributes **0.7% to global GHGs emissions** (12th Malaysia Plan). Among the major sources of emissions, the manufacturing and construction industries were **the third largest contributor** (Malaysia BUR3 UNFCCC Report, 2020).



Malaysia aspires to be a low-carbon nation by 2050 through an unconditional commitment to **reduce GHG emissions** (against Gross Domestic Product: GDP) **of 45% by 2030** compared to 2005 level.

This aspiration is in line with the commitment of the Malaysian government towards climate action and green technology.

This also presents an opportunity for manufacturers and businesses through:

- New economic instruments to support the industry in decarbonization of their operations
- Strengthen their ESG portfolio and sustainability reporting

Initiatives such as the Green Techonology Master Plan, Green Technology Financing Scheme, Low Carbon Cities Framework and Government Green Procurement

New economic instruments such as carbon pricing and carbon tax will be introduced and imposed as part of strategies to achieve low-carbon development

National Energy Policy to be launched with Acts related to energy efficiency and conservation to supervise energy consumption by high-intensity users in the industrial and commercial sectors

Circular economic model will be implemented under the 12th Malaysia Plan to reduce pollution, waste generation and dependence on natural resources

SUSTAINABLE DEVELOPMENT GOALS

What is Sustainable Development Goals?

The UN SDGs was adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all people may enjoy peace and prosperity.

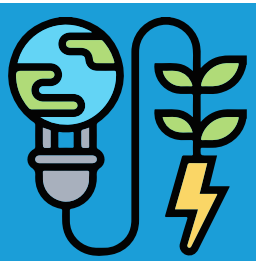
It is a continuation of the eight Millennium Development Goals (MDGs) which began in 2000 which had successfully lift nearly one billion people out of extreme poverty, combat hunger, eliminating global consumption of ozone-depleting substances, planting trees to offset the lost of forests and many other initiatives

The three pillars of sustainability, social, economic and environment elements are present in the SDGs, which were also made more actionable by introducing specific targets for each goal, along with indicators that are being used to measure progress of each target, some meant to be achieved between 2020 and 2030.

Manufacturers and businesses that adopt green practices are supporting the SDGs, particularly SDG 12.6 which is **to encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle.**

CLIMATE ACTION: MEASURES AND INITIATIVES BY THE MALAYSIAN GOVERNMENT

The issues of climate change and the environment are vital to the survival of our nation. The Government of Malaysia, through its various ministries, departments and agencies, has taken various measures and initiatives to address these issues, efforts of which can be categorized into three major themes; **energy, waste** and **forestry.**



ENERGY

RENEWABLE ENERGY (RE)

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

Emission avoidance: 460.52 Gg CO_2 eq

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

Emission avoidance: 6,535.99 Gg CO_2 eq

NATIONAL ENERGY EFFICIENCY ACTION PLAN (NEEAP)

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

- 5 star rated appliances
- Minimum Energy Performance Standard (MEPS)
- Co-generation
- Energy audits and energy management in buildings and industries
- Energy efficiant building Design

Emission avoidance: 458.02 Gg CO_2 eq

ENERGY EFFICIENT VEHICLES (EEVs)

Malaysia aims to become a regional hub for energy efficient vehicles (EEVs) through strategic invectments and 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 2014

Emission avoidance: 90.65 Gg CO_2 eq

GREEN BUILDING RATING SCHEME

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

Existing standard:
- Malaysia Carbon Reduction & Environmental Sustainability Tools (MyCREST)
- Green Performance Assessment System (PASS)

Green certification:
- Green Building Index (GBI)
- GreenRE

Emission avoidance: 143.47 Gg CO_2 eq

URBAN RAILED-PUBLIC TRANSPORT

The implementation of public trasport 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 CO_2 eq

NATURAL GAS VEHICLES (NGVs)

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

- Lower retail prices
- Incentives
- Road tax reduction
- Import duty and sale tax exemption

Emission avoidance: 114.77 Gg CO_2 eq

BIODIESEL

Biodiesel has received great attention as an alternative fuel, considering its abundant resources and environmental benefit. Related policies and Acts:

- The National Biofuel Policy
- Malaysian Biofuel
- Industry Act

Emission avoidance: 1,127.34 Gg CO_2 eq

OIL & GAS OPERATIONS

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

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

- Zero continuous flaring and venting in all operations for fugutive emissions
- Continuous improvement and plant efficiancy in natural gas transformation
- Enhance improvement in plant efficianct of oil refining industries

CLIMATE ACTION: MEASURES AND INITIATIVES BY THE MALAYSIAN GOVERNMENT

WASTE

WASTE PAPER RECYCLING

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

Impact:Increase 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:
3937.76 Gg CO_2 eq

BIOGAS RECOVERY FROM PALM OIL MILL EFFLUENT (POME)

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

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

Related Project:
Entry Point Project - Developing Biogas Facilities Palm Oil Mills
Related Program:
Economic Transformation Programme 2010

Emission avoidance:
2377.84 Gg CO_2 eq

FORESTRY

AGRICULTURE

Malaysian Organix Scheme (SOM) or Malaysia Organic (MyOrganic) is a certification that recognizes farm that practice good agricultural practices and organix fartming based on Malaysian Standard MS 1529:2015

Impact:
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 in Permanent Reserved Forest (PRF) is capped at 85 m3/ha for the period of tenth & elevent Malaysia Plan.
Related Certification:
Malaysia Criteria and Indicators for Forest Management Certification 2001

Emission avoidance:
20,307.50 Gg CO_2 eq

CONSERVATION OF BIODIVERSITY AND ECOSYSTEM SERVICES

Relevant initiative :
Malaysia Protected Area (PA) Network
Target:
Increase Protected Area to at least 20% by 2025.
Impact:
Protected Area increased from 2.757 to 3.171 million ha between 2014 and 2016

FOREST ENRICHMENT PROGRAMMES

- Aims:
- Improve degraded forests sequestration capacity
- Enhance connectivity between forests through two distinct initiatives
- Examples:
- Central Forest Spine (CPS) Programme in Peninsular Malaysia
- Heart of Borneo (HoB) Programme in Sabah and Sarawak

The carbon emission avoidance has been one of the central elements that link these efforts, and as manufacturers who are facing an increasingly carbon-conscious world, implementing green practices in current processes and operations are the next logical step in ensuring the survival and performance of the company.

IMPACTS OF ESG TOWARDS THE INDUSTRY

The manufacturing industry must address the interrelated challenges of avoiding pollution, improving resource efficiency, achieving major reductions in the emission of greenhouse gases (GHGs), and altering industrial structures to mitigate negative impacts towards the environment.

This is also supported by the emerging trend among trading partners, capital markets and financial institutions, where compliance with the principles of ESG (environment, social, and governance) has become increasingly imposed and must be seriously considered by the industry to ensure long-term survival of the manufacturing sector.

"ESG presents an intriguing opportunity to businesses and manufacturers"

WHAT IS ESG?

ESG refers to **Environmental, Social and Governance** criteria that measures the ethical and sustainability impacts of an investment in a company or business.

The Ministry of Finance had outlined some strategies to empower and enable SMEs towards ESG including:

1. Principles for Good Governance to be implemented by the Government-Linked Investment Companies (GLICs)
2. Through Budget 2022, specific financing measures were introduced including 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
3. Establishment of the Malaysia Sustainable Development Goals Trust Fund (MySDG Fund)

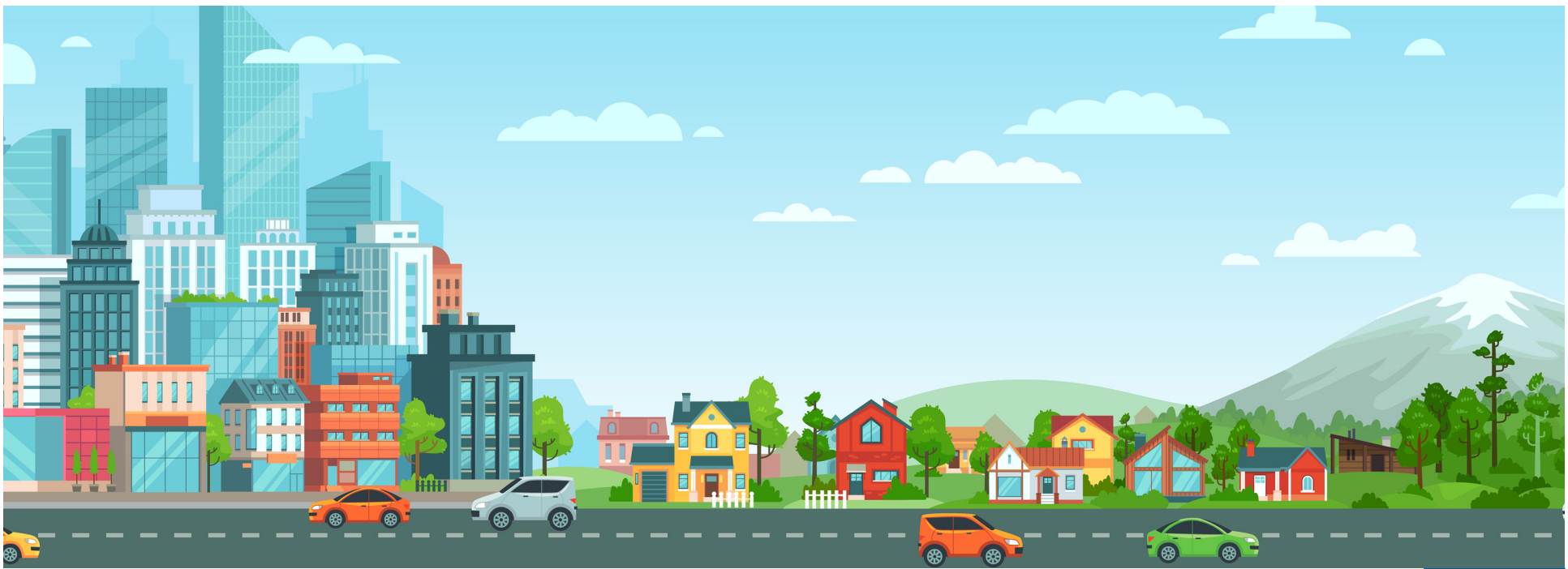
IMPACTS OF ESG TOWARDS THE INDUSTRY

At COP26, USD100 billion annually is pledged by developed countries to developing countries to support climate efforts that meets the goals of the **Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC)** up to 2025. This climate finance includes local, national, and transnational financing that support mitigation and adaptation actions which aligns with **existing ESG frameworks** that businesses can adopt and practice.

Within and beyond Malaysia, significant number of investors are placing more emphasis on the implementation of ESG framework within a company. Concerns about **energy efficiency, waste management, greenhouse gas emissions, water consumption or biodegradable** material are now central to global finance which are covered by the three focal factors of ESG that measures the sustainability and ethical impact of an investment.

Businesses that chose **not to address ESG** components may face risks in their business operations, **financing costs** and fluctuating share price performance.

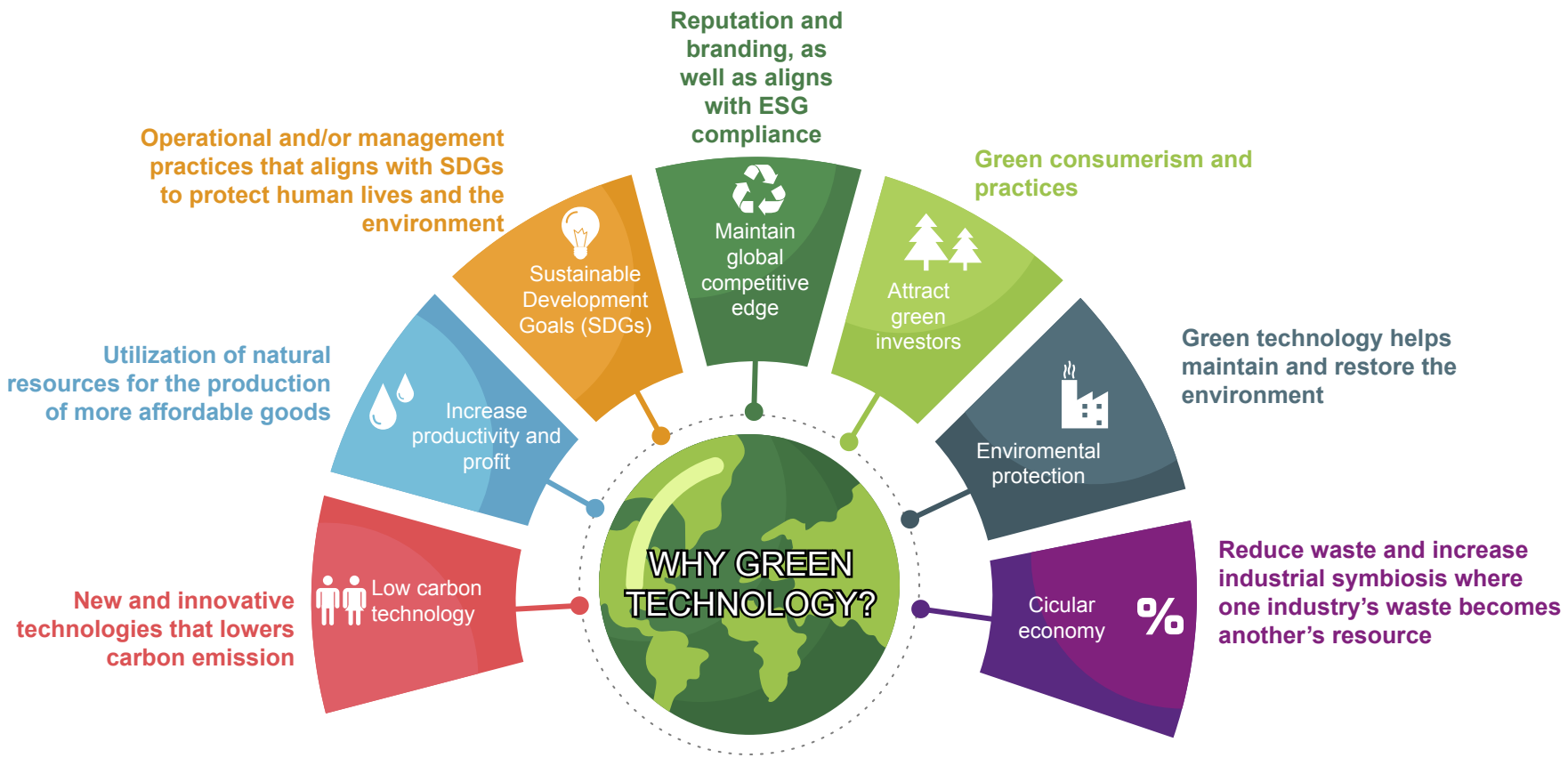
To address the issues of environmental protection, climate change and sustainable development, manufacturers should consider the **adoption of green technology** in their operations and management.



WHY MANUFACTURERS AND BUSINESSES SHOULD CONSIDER "GREEN PRACTICES"

"Green Practices" can be defined as the practice of creating structures and using processes that are **environmentally responsible** and **resource-efficient** throughout the lifecycle of a development.

The implementation of Green Practices in existing operations and processes has direct and indirect benefits to the industries and manufacturers. Other than environmental protection, the adoption of green practices **increases long-term productivity** and **profit.** Some of the **ESG elements** may also be achieved through these improvements, ensuring long-term survival of the company and cementing its good reputation



EXAMPLE SUCCESS STORY: IMPLEMENTATION OF GREEN PRACTICES IN THE INDUSTRY

There are many ways of implementing green technology within the operations, resources, or processes of an industry. The decision to go **'green'** may come from requirement to reduce carbon footprint, utilization of green resources, compliance with regulations, or contribution to society and the environment, but it is a decision that may well lead to **increased revenues, global recognition, improved performance of operations and higher productivity.**

FGV Holdings is a major palm plantation company that owns **28 biogas power plants** and had developed a commercial-scale palm-based natural gas plant in Malaysia. It supports the Malaysian sustainable agenda through initiatives in green energy and resources.

FGV PALM INDUSTRIES SDN BHD

Core business
Manufacturer of vegetable oils, cake and meal

Achievement
Won the National Energy Award (NEA) three years consecutively (2018-2020) the Renewable (Cogeneration) Category

Approach
Utilizing waste-to-energy technologies from the palm waste. Empty fruit bunches (EFB) were used to produce steam and electricity at FGVPI's Sahabat Biomass Cogeneration Plant in Lahad Datu, Sabah.

Added Value
The complex generated 7.2 megawatts (MW) of electricity, equivalent to powering up 4,000 houses. The rural mini grid was supported throught this initiative, enabling more than 1,500 homes to enjoy clean renewable electricity with lower cost of energy generation Around 16 metric tonnes (MT) of steam per hour was also generated for the refinery operations.

Revenue
This activity generated approximately RM12 million per year for the company.

Benefits
Increased revenue, energy savings and reduced carbon footprint

nea
NATIONAL ENERGY AWARDS

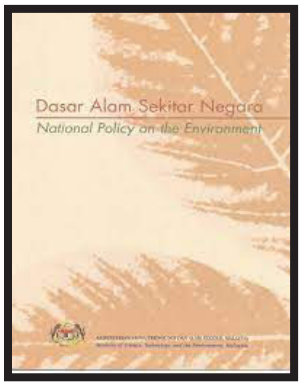
1	2	3
28816 MWh energy generated in 2018 and 2019	177035 MT CO2 saved in 2018 and 2019	76829 GJ energy sold from biogas and IPP Sahabat

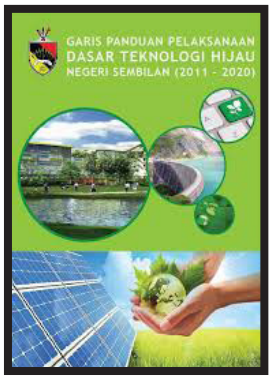
REALITY OF GREEN PRACTICES IN THE INDUSTRY

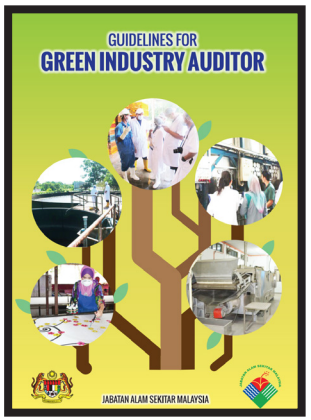
The manufacturing industry is uniquely positioned to improve livelihoods and at the same time contribute towards the **global sustainability agenda**. After all, the environmental aspects and impacts of products, activities and services have always been the driving factors of the advances in the manufacturing sector.

New paradigms involving **cleaner production, lean manufacturing** and **circular economy** can be found within the precepts of green manufacturing. Hence, embedding **green practices** in the manufacturing sector is a strategic move towards maintaining the economic and environmental viability of the industry.

The move to adapt green practices in existing processes and operation of the manufacturing industry is also aligned to many government policies, guidelines and regulations that are related to climate action, decarbonization of the industry and green technology.







EXISTING NATIONAL POLICIES, GUIDELINES AND STANDARDS

1 National Policy on the Environment (Dasar Alam Sekitar Negara)

Aims for continuous economic, social, and cultural progress and enhancement of the quality of life of Malaysians, through environmentally sound and sustainable development.

2 Environmental Quality Act 1974

Related to the prevention, abatement, control of pollution and enhancement of the environment quality.

Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977	Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978	Environmental Quality (Prescribed Premises) (Scheduled Waste Treatment and Disposal Facilities) Order 1989
Environmental Quality (Control of Emission from Diesel Engines) Regulations 1996	Environmental Quality (Control of Emission from Petrol Engines) Regulations 1996	Environmental Quality (Scheduled Waste) Regulations 2005
Environmental Quality (Industrial Effluent) Regulations 2009	Environmental Quality (Sewage) Regulations 2009	Environmental Quality (Clean Air) Regulations 2014

3 Water Services Industry Act 2006 (Act 655)

Aims at establishing a licensing and regulatory framework for regulatory intervention to promote the national policy objectives for the water supply services and sewerage services.

4 Good Manufacturing Practice (GMP)

A prerequisite for the application of a specific manufacturing license as well as product registration or cosmetic notification.

Must be followed by manufacturers of registered pharmaceutical and traditional products, as well as cosmetics to ensure that the products manufactured are safe, efficacious and of quality.	Available for medicinal products, traditional medicines and health supplements, cosmetics, food, and veterinary premises.

EXISTING NATIONAL POLICIES, GUIDELINES AND STANDARDS

5 The International Standard Organization (ISO)t

ISO develops 19,500 international standards applicable across various industries. The common ISO Standards which are relevant for manufacturers includes:

- ISO 14001: Environmental Management System
- ISO 45001: Occupational Safety and Health
- ISO 50001: Energy Management System

ISO 14001 helps organizations minimize the environment impacts of their operations. It specifies requirements for establishing an environmental policy, determining environmental aspects and impacts of products, activities and services, planning environmental objectives and measurable targets, implementation and operation of programs to meet objectives and targets, checking and corrective action.

ISO 45001 designed to replace OHSAS 18001 and improve levels of workplace safety and productivity. OHSAS 18001 focuses on controlling hazards and take a reactive approach, but ISO 45001 proactively evaluate and remedy hazards before any accidents or injuries occur.

ISO 50001 outlines the practices to achieve energy efficiency to meet environmental and carbon targets as part of improved energy performance. It also helps to measure and monitor energy use, identifying strategies to improve energy efficiency and allowing manufacturers to demonstrate environmental credentials.

6 Malaysian Standard: MS1525:2019

Standard developed by the Department of Standards, Malaysia and is a code of practice pertaining to energy efficiency and the use of renewable energy in non-residential buildings.

The code distinguishes between passive measures and active measures that can be adopted by building owners.

Passive measures consist of recommendations relating to architectural and passive design strategies for the building sector.

Active measures correspond to lighting, power and distribution, air conditioning and mechanical ventilation and energy management systems.

Helps reduce overall energy consumption and minimize the use of non-RE sources, maintaining a safe, healthy and comfortable environment for building occupants.

PURPOSE OF THE GREEN PRACTICES GUIDELINE FOR THE MANUFACTURING SECTOR

The development of the Green Practices Guideline was approved by the Ministry of Environment and Water in 2021 through the Twelfth Malaysia Plan (RMKe-12) under SDG 12.6 which is to encourage companies to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

This government initiative supports the country's development of green technology policies towards the direction of sustainable development for industries and organizations in Malaysia.

The **initial** implementation of this Guideline focuses on fostering **exposure, perception, knowledge** and **capacity building** of green resources, processes and technologies (culminating into the term known as **green practices**) of the industry.

MANDATE

Ministry of Environment and Water approval through the Twelfth Malaysia Plan (RMKe-12) in 2021.

GREEN POLICY

Support green technology policies towards sustainable development for industries and organizations in Malaysia

PURPOSE

Provide guide and recommendations to the manufacturing industries in implementing green practices.

APPROACH

Optimize consumption of natural resources, energy, and water while reducing toxic waste and emissions.

It is envisioned that the application of green practices in the industry will lead to **cleaner, more efficient** and **more environmentally friendly** operations, processes, and premises of the Malaysian industry.

OPTIMIZE

1

Consumption of natural resources including raw materials, water, energy and land use

2

CIRCULARITY

Increase circularity of materials, energy and water through reduce, reuse and recycle approaches

REDUCE

3

Reduce the emission of toxic or hazardous waste

4

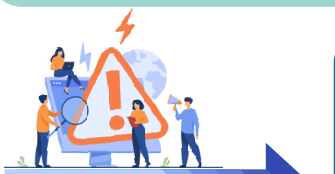
IMPLEMENT

Utilizing innovative green technologies to improve processes and operations

BENEFITS OF GREEN PRACTICES TOWARDS THE MANUFACTURING SECTOR

The major benefits of applying the options suggested by this guideline include increased efficiency and reduced consumption of materials, energy, and water. In essence it will produce less waste with a lower intensity of toxic or hazardous materials, as well as supporting green innovations of the technology. It should also lead to better human resource utilization for the industry.

Green practices may also increase industrial productivity and revenue, while inculcating a green working culture that is beneficial not only to the economy but also to the environment.



CHALLENGES

FINANCIAL RESOURCES	HUMAN RESOURCES	TIME RESOURCES
May require high capital investment Longer rate of return may have to be expected May increase cost of operation	Specific expertise may be needed New 'green' jobs New SOP may have to be implemented at various stages of the production process	Additional time may be required to implement options that involves equipment, structure or systems modification

EVALUATION

Payback period Return on investment	Competency of staffs Labor cost Trainings Green technology experts	Maximum downtime

BENEFITS

Yet, implementing green options, companies can expect:

Increased productivity and quality of process and products	Reduction of environmental impacts	Overall cost reduction through energy and materials saving
Reduced health and occupational safety risks	Reputation and branding	Enhance confidence of staffs

Through green practices in general, and based on the specific indicators outlined in this Guideline, manufacturers may review, manage and plan for more sustainable business decisions that supports their ESG aspirations and sustainability reporting.

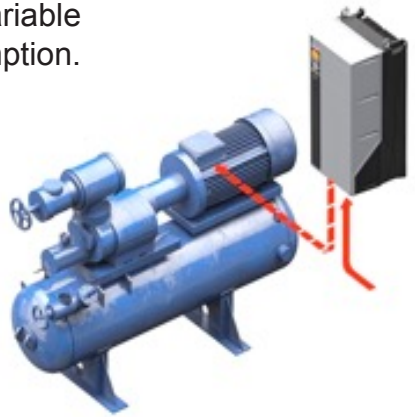
Furthermore, the global trend of green consumerism, carbon trading and carbon tax necessitates a closer look into greener and sustainable practices of the industry, as these initiatives are also in the initiation stage in Malaysia.

CASE STUDY: HOW INDUSTRY MAY BENEFIT FROM IMPLEMENTING GREEN PRACTICES

Direct benefits to manufacturers include cost saving that comes from reduced overall utilities consumption including electricity and water. These are some of the general examples:

1 Electricity saving through optimization of consumption

- Electric motors are widely used in the industry. Using variable frequency drive (VFD) or variable speed drive (VSD), the current flow can be controlled which optimizes energy consumption. Theoretically, up to 10-15% electricity can be saved from the use of the VFD or VSD.



Estimate:

Cost of operating a non-VSD motor = RM7,200/month
Price of new machine = RM30,000

With an average of 12.5% electricity saving,

Cost saved = RM10,800/year
Return of investment = 2.8 year

2 Water saving through recycle, reuse and reduce strategies

- Assuming one of the largest commercial premise consumption of water is around 500,000 m3/month, with just 15% reduction through strategies such as reduce, reuse and recycling of used water,

Estimate:

Average water bill = RM958,716/month

With an average of 15% reduction,

Consumption reduction = 425,000 m3/month
Cost saved = RM191,743/month

3 Electricity saving by utilizing daylight

- Assuming the electricity consumption of Company A is 138,244 kWh/month, corresponding to electricity bill of RM80,604.20/ month.

Estimate:

Setting up of transparent roof panels to utilize natural light in building, around 30% electricity saving is targeted which amounts to,

Consumption reduction = 41,473.2 kWh/month
Cost saved = RM24,222.83/month

OPERATIONAL DEFINITION OF GREEN PRACTICES

DEFINITION OF GREEN PRACTICES

By definition, green practices refers to the industrial development and production conducted without jeopardizing the environment or public health.

This concept is embodied by the definitions of “green industry”, “greening of industry” and also “cleaner production” which were defined by the United Nations Industrial Development Organization (UNIDO).

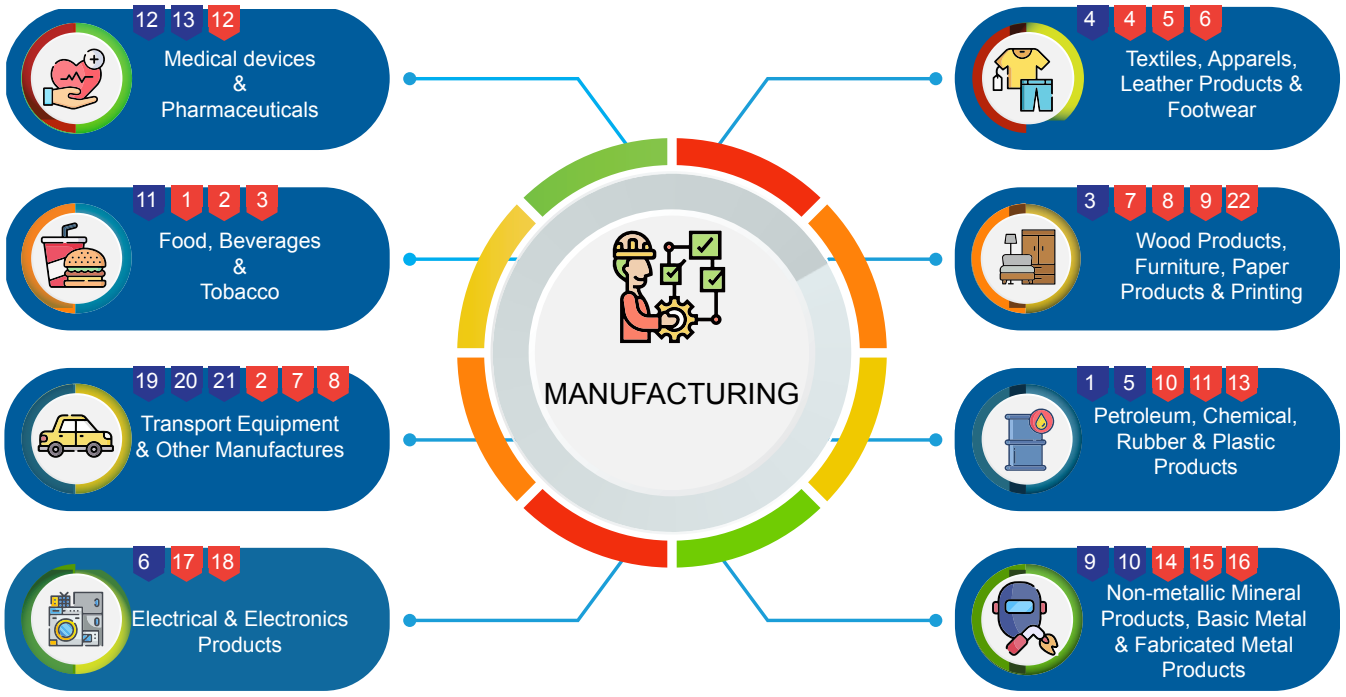
Green Industry	Industrial production and development does not come at the expense of the health of natural systems or lead to adverse human health outcomes
Greening of Industry	A method to attain sustainable economic growth and promote sustainable economies. It includes policymaking, improved industrial production processes and resource-efficient productivity
Cleaner Production	The continuous application of preventive environmental strategies to processes, products and services, to increase efficiency and reduce risks to humans and the environment. It addresses: 1. Production Efficiency: optimization of the productive use of natural resources (materials, energy and water); 2. Environmental management: minimization of impacts on environment and nature through reduction of wastes and emissions; and 3. Human Development: minimization of risks to people and communities and support for their development.

Manufacturers that adopt green practices integrate approaches that consider the environment, climate, social and economy within its operations.

SCOPE AND APPLICATION

The Green Practices Guideline for the Manufacturing Sector encompasses the following scope:

1. A general guide for all existing and new manufacturers;
2. The manufacturing sector includes, but are not limited to, 13 industries within the scope of the MinXistry of International Trade and Industry (MITI);
3. Include general guidance on identifying key action plans and implementation strategies for green practices.
4. The manufacturing sector includes all industries under Section C classified in the Malaysia Standard Industrial Classification (MSIC) 2008 Ver. 1.0, in accordance to the International Standard Industrial Classification of All Economic Activities (ISIC), Revision 4;
5. Include a list of green practices indicators that manufacturers can select, prioritize, implement, measure and monitor their performance;



The numbers 1-13 indicate the 13 industries within the scope of the Ministry of International Trade and Industry (MITI);

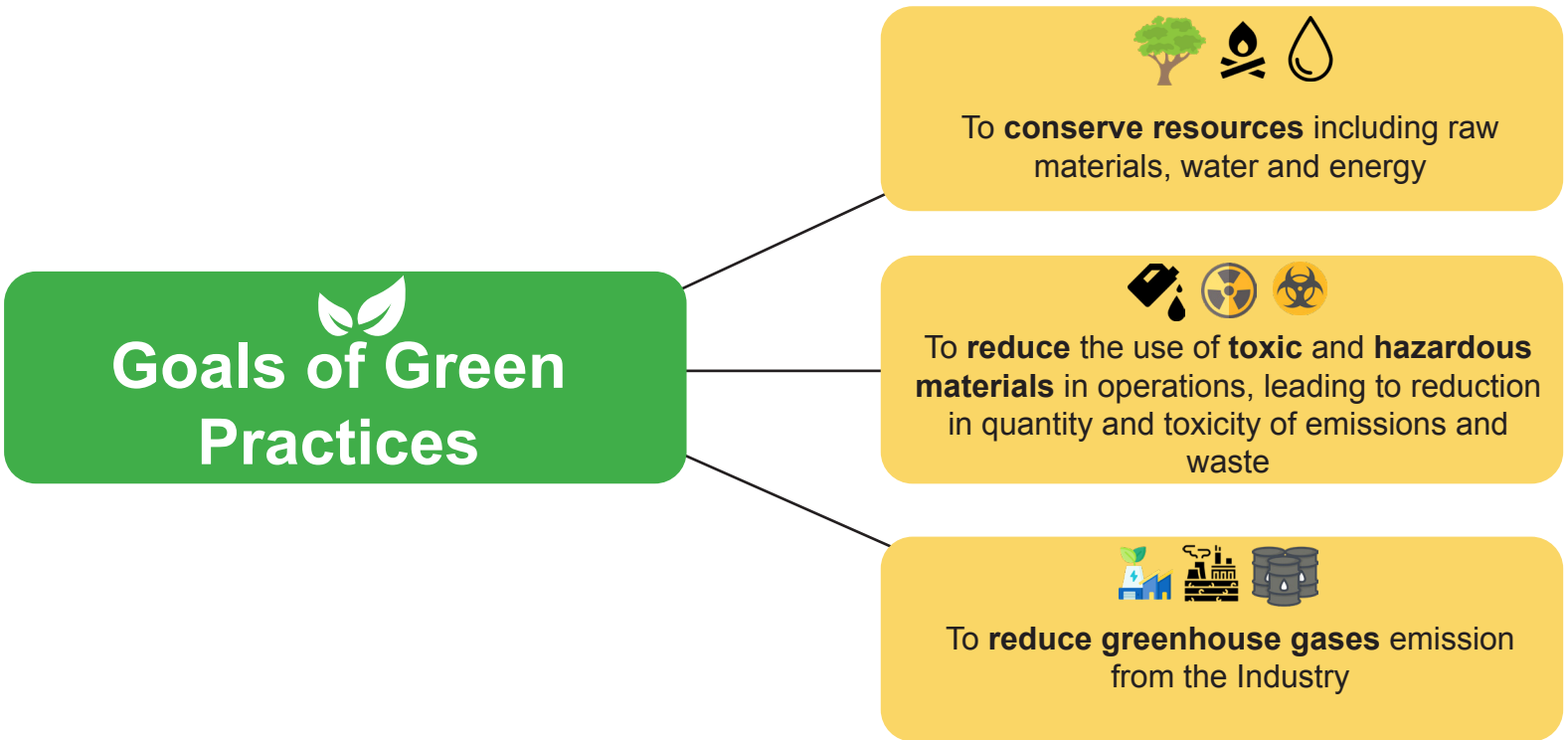
The numbers 1-22 indicate the 22 industries under Section C of the Malaysia Standard Industrial Classification (MSIC) 2008 Ver. 1.0

GREEN PRACTICES GUIDELINE FOR MANUFACTURING SECTOR

INTRODUCTION

Although not without its own constraints, green practices generally aim to create and distribute innovative products and services, use minimal resources, contain reduced or no toxic substances, produce reduced or zero waste, and create net-zero greenhouse gases across the entire life cycle of products and services.

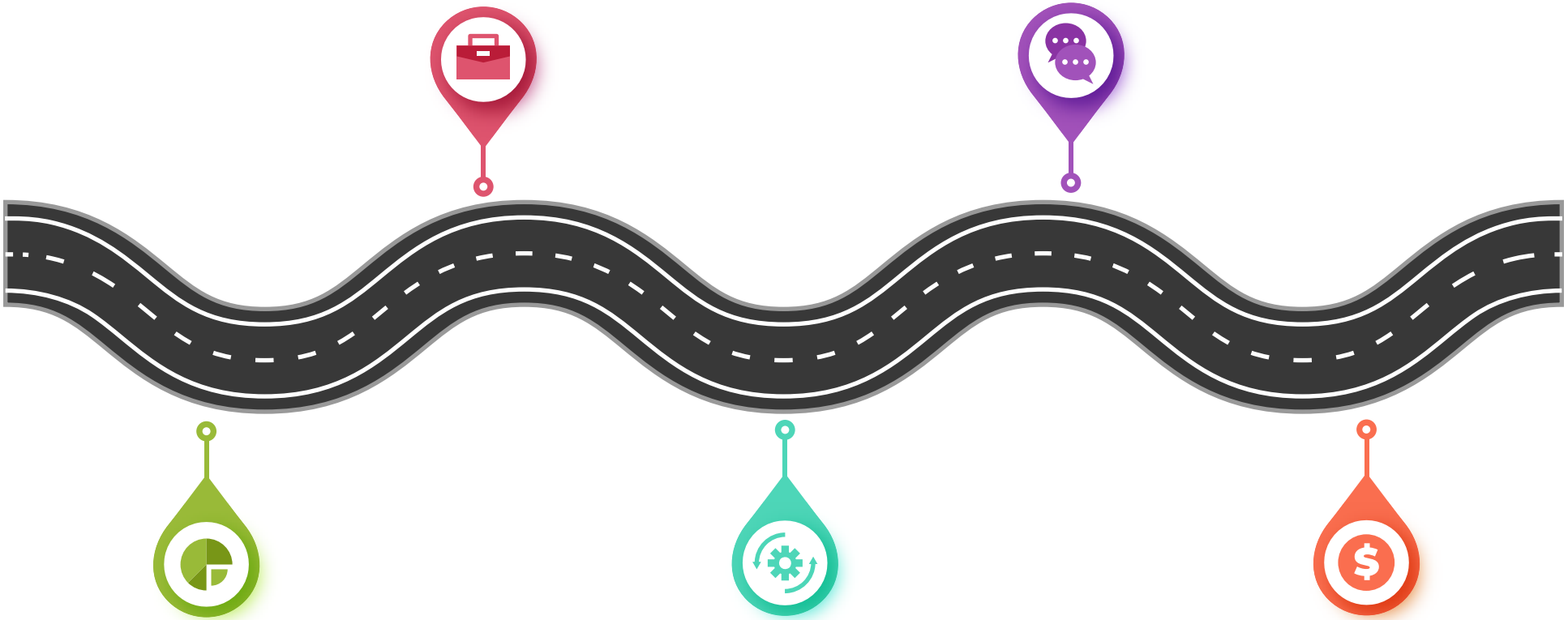
This guideline had been designed by considering the various capacities, operations and environmental impacts of the diverse industries within the manufacturing sector.



General recommendations are made to enable applicability across various industries, while maintaining a general goal of focusing on the implementation of green practices by manufacturers in Malaysia.

The steps outlined can be applied to develop action and implementation plans in implementing green practices in existing and future operations, based on current capabilities and strategies.

The 5 steps below are recommended for manufacturers intending to integrate green practices into their existing operations and processes:



2

DETERMINE INDICATORS

Six indicators with 18-sub indicators are outlined which can be used by manufacturers to determine the relevant options.

4

ASSESS PERFORMANCE

The measured elements will be assessed, taking note of specific areas for improvement.

1

SET OBJECTIVES

Green objectives chosen based on ambitions and expectations of the company and consumers.

3

MEASURE INPUTS, OPERATIONS & PRODUCTS

Based on selected indicators, manufacturers can measure the specific elements according to identified methodology.

5

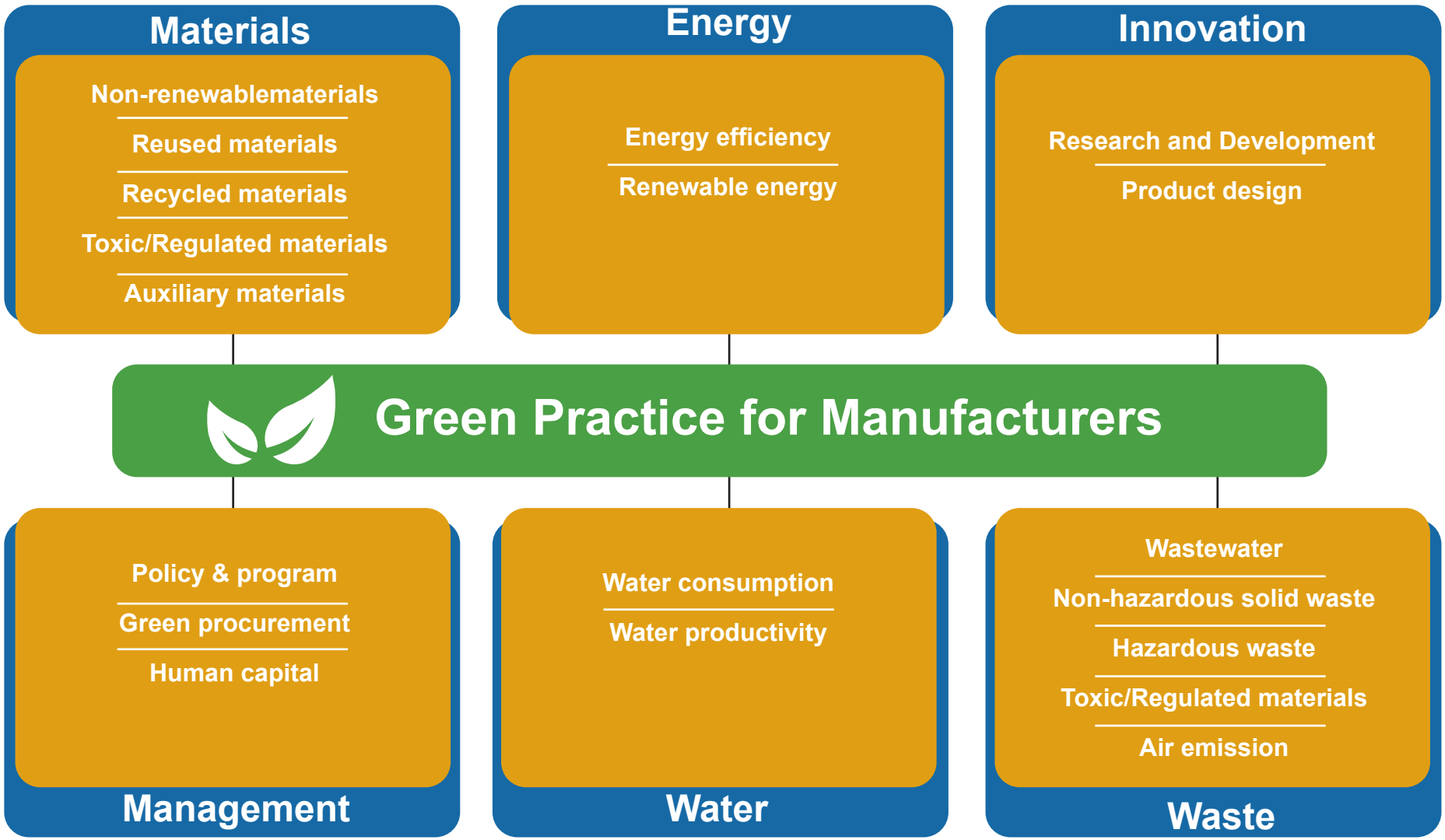
DEVELOP ACTION PLANS & IMPLEMENTATION STRATEGY

Based on findings, specific action plans & implementation strategies will be developed including approach, responsibilities & timeline.

Further details can be found in the **Guideline Implementation** section, starting from page 63.

GENERAL INDICATORS

As green practices approach is adopted by many entities through a variety of means, it is important to ascertain the performance of the manufacturers based on specific set of indicators which enable an inclusive comparison. **Six indicators** were identified based on three requirements: **applicability, measurability**, and **representative**.



GENERAL INDICATORS

Through these indicators:

Manufacturers can identify problems, set targets, measure performance, understand outcomes, and choose the best practices to improve their performance.

In this guideline:

The list of impacts and recommendations is by no means exhaustive; there are various impacts and associated recommendations that are appropriate within the scope of the indicators hence these recommendations are included as examples to provide an overview of how green approaches can be implemented within the many operations and processes in the industry.

MATERIALS

Manufacturers use various types of materials in their processes. Some manufacturers require the use of virgin materials exclusively, while others may utilize recycled materials. Long-term survival of manufacturers depends on the efficient consumption of materials. This is linked with the availability of natural resources and achieving high material efficiency is highly recommended.

Main aspects of material efficiency

- Generate less waste per product regardless of end-of-life scenarios
- Reduce the amount of material used for manufacturing through process improvement or in-house recycling or reusing
- Achieve better waste segregation and management to move up the waste hierarchy steps: Disposal, recycling, reuse, minimization and prevention

This leads to:

01. Prevention and reduction in extraction and consumption of virgin raw materials
02. Cost and energy savings in fabrication
03. Transformation of the waste management process, leading to more efficient transportation and disposal of waste
04. Reduction of industrial waste volumes
05. Increased recycling and reusing in waste management
06. Reduced energy demands, carbon emissions & overall environmental impact

GOALS AND AIMS

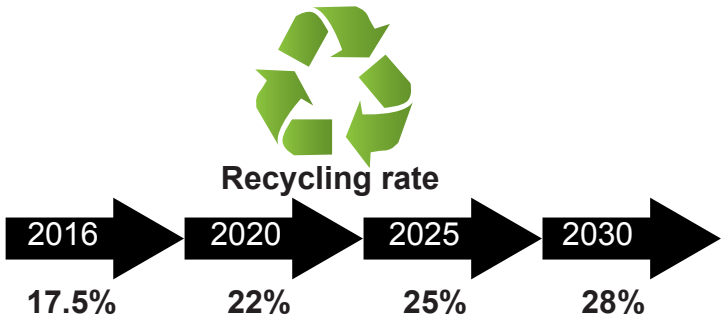
To focus on reducing the amount of natural resources required to produce finished goods through a cleaner and more material- and energy-efficient manufacturing processes, leading to overall reduction of waste and emissions.

- 12.2: By 2030, achieve the sustainable management and efficient use of natural resources
- 12.4: By 2020, achieve the environmentally sound management of chemical and all wastes throughout their life cycle.
- 12.5: By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

ALIGNMENT WITH GREEN TECHNOLOGY MASTER PLAN TARGETS

The efforts towards increasing material resource efficiency as outlined in this Guideline are aligned with the GTMP targets as highlighted below:



RMKe-12 targets a recycling rate of 40% in Malaysia by 2025. While in the EU, the target for recycling of municipal waste is 65% while for packaging waste is 75% by 2030.

SCOPE

The scope for materials (MAT) includes five (5) sub-indicators, **Non-renewable Materials (MAT1), Reused Materials (MAT2), Recycled Materials (MAT3), Toxic or Regulated Materials (MAT4)** and **Auxiliary Materials (MAT5).**

Sub-indicator	Definition	Impacts	Green Practices
Non-renewable Materials (MAT1)	Non renewable materials are finite resources and are declining in reserves as they are extracted from the environment to be used in the human economy.	• Security of material supply is threatened as non-renewable materials are finite in nature. • The extraction, processing and transportation of non-renewable materials increase the overall environmental impact as these activities consumes energy and generate wastes that are dis-charged into the air, water, and land.	• Incorporate the use of materials which are renewable, recyclable and/or recycled into existing processes. • Extending the lifetime of product through product design may reduce requirement for non-renewable materials. Reducing the use of materials that require high energy consumption. • Design products that uses lower amount of virgin materials.

Sub-indicator	Definition	Impacts	Green Practices
Reused Materials (MAT2)	Materials that are reused in its original form without undergoing reprocessing in the form of repurposed either for a similar or different function.	• Reduction of waste as materials are taken out of the waste stream. • Reducing the overall energy consumption during product manufacturing. • Reducing the environmental impacts by creating less pollution. • Savings for the manufacturers through reducing the cost of purchases and disposal.	• Incorporate product design to improve lifetime of products to allow the materials to be reused extensively. • Incorporate circular economy and design into existing operations by considering the reuse value of materials within the networks of manufacturers, suppliers, and consumers.
Recycled Materials (MAT3)	Used materials that are reprocessed into new materials which can then be used in new products.	• Savings for the manufacturers as the amount of non-renewable materials are reduced in the manufacturing process, further reducing the total amount of waste. • Reducing the overall energy consumption during product manufacturing as it is more energy efficient to recycle a material than to manufacture it from virgin materials. • Savings through reducing the cost of purchase and disposal.	• Increase incorporation of recycled materials into products. • Design products to increase recyclability of products and parts. • Use only recyclable materials in products. • Recycle residues and waste from production processes, within the manufacturing plant or outside it. • Increase recyclability in term of dismantling and recovery of recyclable materials from products at end of life.

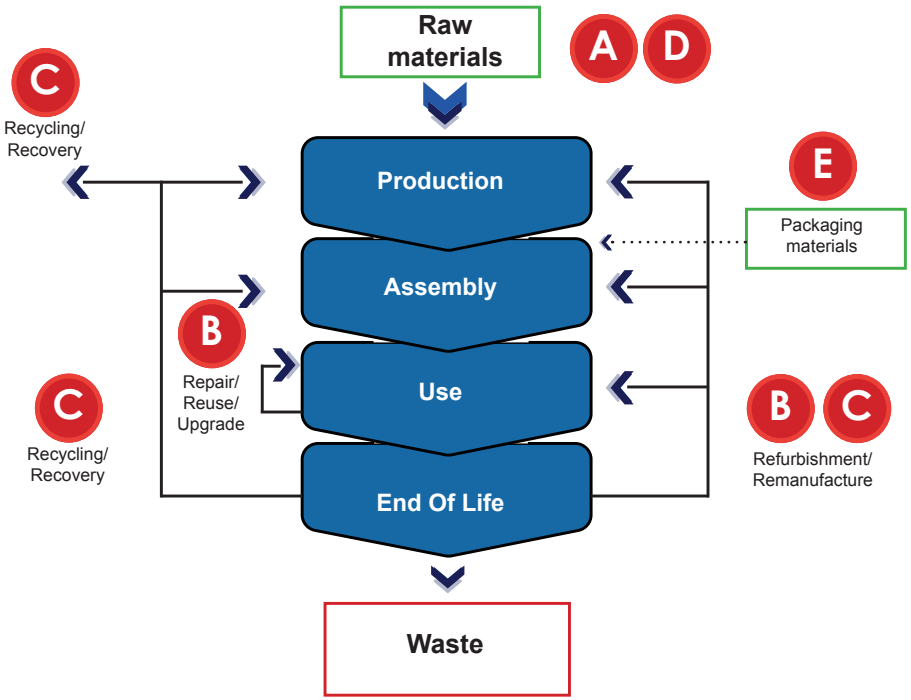
Sub-indicator	Definition	Impacts	Green Practices
Toxic or Regulated Materials (MAT4)	Materials that are classified as hazardous and/or toxic.	• Generation of toxic and/or hazardous by-products and waste. • Hazardous waste management incur more cost to the manufacturers. • Harmful emissions produced during production process. • Toxic material and waste threatens the health and safety of workers and the public.	• Avoid the use of harmful chemicals in products and use only when essential. • Incorporating use of materials that are safe and sustainable by design and throughout their cycle. • Finding an alternative to currently used toxic or hazardous materials without jeopardizing the quality of products.
Auxiliary Materials (MAT5)	Materials that are used for production or maintenance needs and are not incorporated directly into the production output. Auxiliary materials may be added to the basic materials to extend the specific properties to the finished products, or used to service equipment and premises, used for supply and marketing or as administrative materials.	• Spent auxiliary materials may require special management for handling disposal. • Consumed auxiliary materials contribute to fugitive emission of GHG with high global warming potential.	• Avoid or minimize the use of hazardous or toxic materials in cleaning or other non-production operations. • Minimize the use of periodical consumables such as batteries, cartridges and containers, and liquid materials used for maintenance such as coolants or lubricants. • Switch to eco-friendly materials. • Incorporate 3R in offices and premises.

IMPLEMENTATION POTENTIALS

The figure below lists the potential areas for improvements in material efficiency that manufacturers may adopt in their practices:

TARGET

Efficient consumption of materials



A Reduce	B Increase	C Increase	D Reduce	E Reduce
Non-renewable materials	**Reused materials**	**Recycled materials**	**Toxic/ regulated materials**	**Auxiliary materials**
Reduce the consumption of virgin materials for example by extending the lifetime of product through product design	Reusing materials such as waste and/ or consumables within the premise e.g., customized spill kits used on-site	Implement policies, strategies, and programs that support 3R implementation within and beyond the manufacturing premises	Wherever possible, substitute hazardous and/or regulated chemicals with materials that has lower environmental impacts throughout product or service life cycle	Wherever possible eliminate, minimize, or reduce use of auxiliary materials such as packaging. If not possible, consider using recycled materials or recyclable materials

WASTE AND EMISSIONS

Waste is anything that the generator or holder has no further and is discarded or released to the environment. Waste poses different environmental risks based on its chemical composition and physical state. In green practices, the strategies and approaches are different from end-of-pipe treatment as it focuses on prevention or reduction of waste at source.

The general meaning of industrial waste is stated in Section 2 of the Environmental Quality Act 1974 (Act 127) and Regulations which states, **"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."**

Implementing an effective waste management plan requires strategic measures. It must be structured and consider all the stages:

Manufacturers must analyze the current collection, handling, treatment, and disposal stages and identify current or potential problems. Subsequently, specific goals and action plans can be designed and implemented with regular monitoring and reviewing. The waste management plan should also consider enhancing the knowledge of key stakeholders through effective dissemination of technical information and research on the environmental impacts of the waste produced.

GOALS AND AIMS

To focus on reducing the generation of waste and emissions generated from manufacturing operations by developing an effective waste management plan.

ALIGNMENT WITH GREEN TECHNOLOGY MASTER PLAN TARGETS

The efforts to achieve more efficient waste management in this Guideline are aligned with the GTMP targets as highlighted below:

WASTE-TO-ENERGY

Increasing number of Waste-to-Energy thermal plant

2020	2025	2030
1	-	3

WASTEWATER TREATMENT

towards ----------> 2030

100% sludges to be recycled
33% treated effluent to be recycled

RESOURCE RECOVERY

Increasing number of palm oil mills with biogas capture facilities (beyond 500 in 2020)

Initiatives

- Emphasizing the efficient use of waste as a resource
- Resource recovery from other sources of organic waste
- Facilitating industry's growth in resource recovery through Extended Producer Responsibility (EPR) initiatives

SCOPE

The scope for waste (WST) includes four (4) sub-indicators, **Wastewater (WST1), Non-hazardous Solid Waste (WST2), Hazardous Waste (WST3),** and **Air Emission (WST4).**

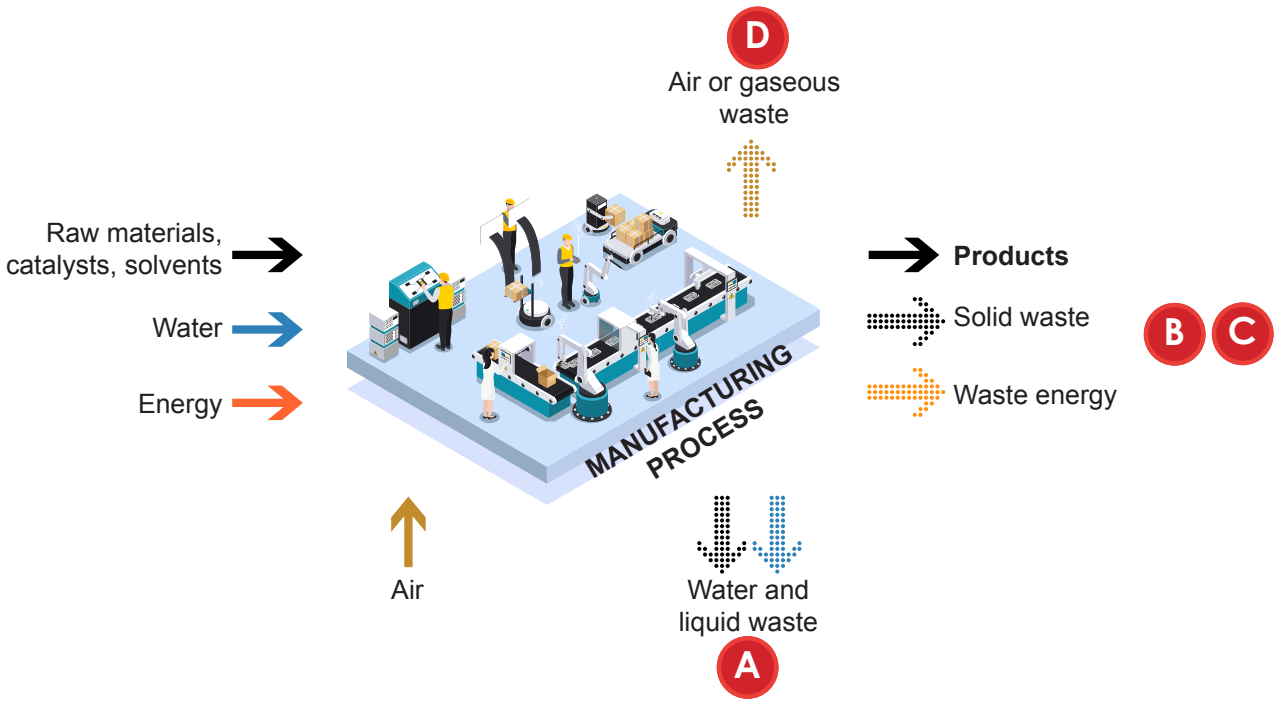
Sub-indicator	Definition	Impacts	Green Practices
Wastewater (WST1)	Effluent generated from any industrial processes	• Untreated wastewater can damage the environment. • The components of the wastewater will determine the appropriate treatment methods. Some methods may require higher cost for treatment. • Release of untreated waste can cause detrimental impact to the environment and can be subjected to legal enforcement	• Incorporate sustainability considerations into existing treatment processes. • Consider treatment methods that have lower environmental impacts for example GHG emissions. • Consider substituting hazardous materials within the manufacturing process to reduce cost of treating wastewater.
Non-hazardous Solid Waste (WST2)	Any waste that is not listed as Scheduled Waste (according to EQA 1974) including domestic and industrial waste.	• Solid waste will eventually end up in landfills and cause many environmental problems.	• Increase the use of recycled/ recyclable materials within products and auxiliary materials. • Implement the 3R (reduce, reuse, and recycle) concept among the workforce. • Reduce the use of auxiliary materials.

Sub-indicator	Definition	Impacts	Green Practices
Hazardous Waste (WST3)	Waste that meets the characteristics of a hazardous waste and exhibit any one or more of the following characteristics ignitability, corrosivity, reactivity or toxicity. In Malaysia, hazardous wastes are regulated under Environmental Quality (Scheduled wastes) Regulations 2005.	• Hazardous waste require special handling and treatment. • Hazardous waste handling and treatment is costly, but is necessary due to its toxic nature.	• Choose materials that are less hazardous when feasible. • Ensure the hazardous waste is managed according to EQA1974 regulations.
Air Emission (WST4)	Gases and particles which are put into the air or emitted by various sources. Air emissions also include greenhouse gases (GHGs) that covers seven gases including carbon dioxide (CO_2), methane (CH_4), nitrous oxide ($N2_O$), hydro-fluorocarbons (HFCs), perfluoro-carbons (PFCs), sulfur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).	• Environmental or human health issue e.g. sulphur dioxide (SO2) from industrial processes and the burning of fossil fuels contributes to acid rain, while ozone and fine particulate matter lead to the formation of smog, aggravating respiratory and cardiac conditions. • GHG emissions lead to exacerbation of climate change and its impacts.	• Minimise the generation of gaseous emissions including greenhouse gases, through process optimization and substituting green chemicals. • Choose processes that produce less emissions during the production. • Choose raw materials that produces less emissions in its lifetime. • Consider carbon capture and storage technology in existing process to reduce carbon footprint of products. • Venture into innovative technologies that utilizes existing emissions to produce higher valued products such as production of concrete from emissions.

IMPLEMENTATION POTENTIALS

TARGET

Efficient waste management for environmental protection



A Reduce	B Reduce	C Reduce	D Reduce
Wastewater	**Non-hazardous solid waste**	**Hazardous waste**	**Air emission**
Improve wastewater treatment systems or utilize water recycling for activities that does not require high quality water.	Enhance the 3R (reduce, reuse, and recycle) concept among staffs and workers.	Choose materials that are less hazardous when feasible.	Monitor and manage carbon footprint of products or utilize efficient gaseous waste treatment strategies.

WATER

Although water covers over two-thirds of the earth's surface and is renewable on a global scale, local shortages and quality problems occur frequently. As demand increases, if the water withdrawn for industrial processes is not returned to the same water body in its original quantity and quality, significant depletion of rivers and lakes as well as a decrease in groundwater tables are expected.

It has been estimated that **demand for freshwater will surpass current water supply by 40% by 2030 .**

- National Adaptation Plan, 2020

There are certain processes and products that require the use of water of varying quality. Although water is may not be consumed directly in the production process, it is often used indirectly for cooling, heating, or washing. Increasing the rate or recirculation and avoiding evaporation will reduce the amount required to be utilized from municipal water, groundwater, or surface waters. it is advisable for facilities to measure how much water is being recycled or recirculated.

GOALS AND AIMS

To focus on reducing raw water consumption through water recirculation or recycling.

6.3: By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4: By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate

6.6: By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lake

ALIGNMENT WITH GREEN TECHNOLOGY MASTER PLAN TARGETS

The efforts to achieve more efficient waste management in this Guideline are aligned with the GTMP targets as highlighted below :

WATER MANAGEMENT	2025	2030
Integrated river basin management	10% (freshwater abstraction rate)	15% (freshwater abstraction rate)
Water treatment and distribution technology	25% (NRW)	20% (NRW)

*Non-revenue water (NRW): Water that is lost before it reaches the customer

OTHER INITIATIVES

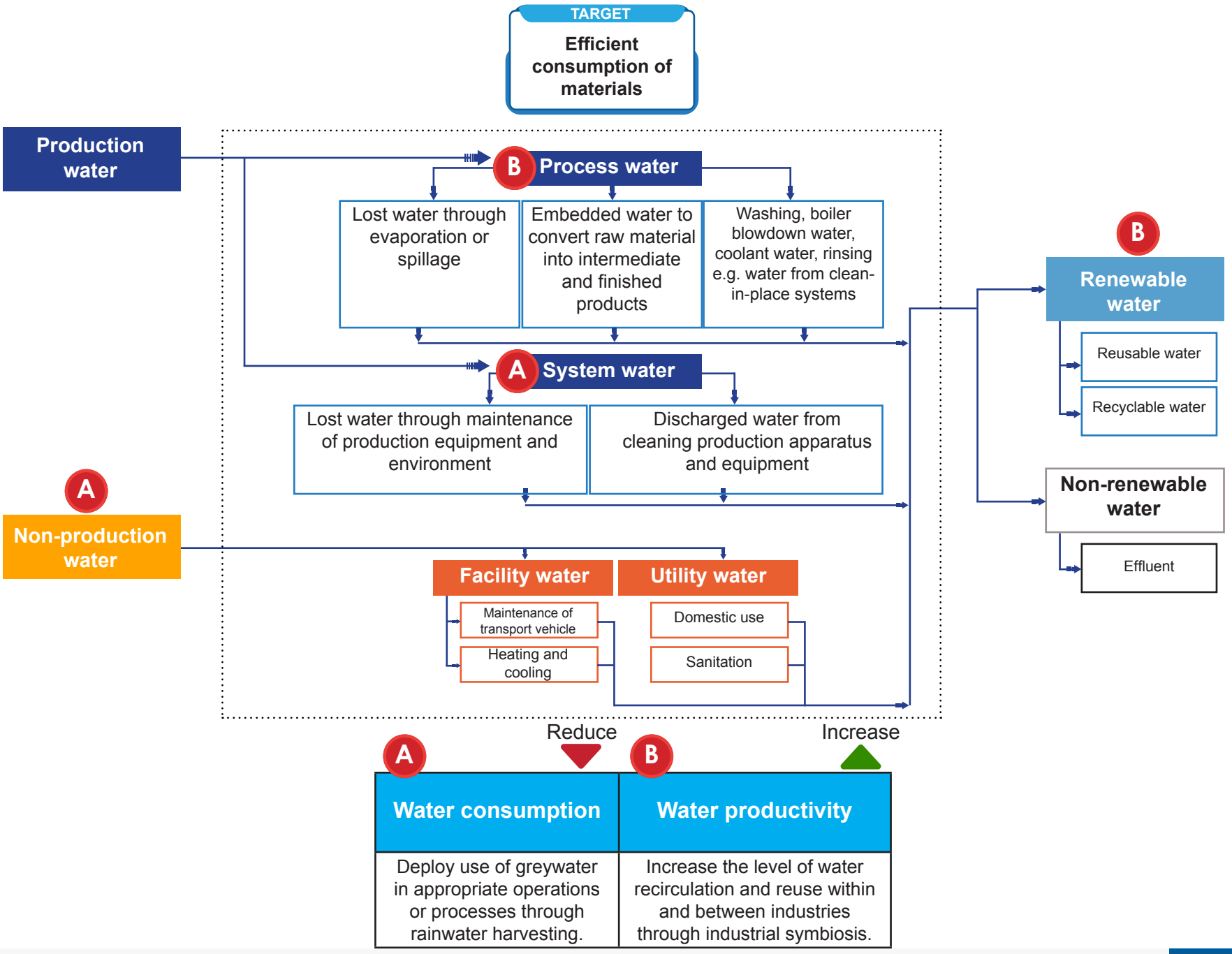
- Water Efficient Product Labelling Scheme (WEPLS) to be mandatory by 2019. WEPLS is initiated by SPAN which aims to register and label water efficient products.
- 60% of towns in Malaysia installed with Rainwater Harvesting Systems.
- National NRW Reduction Program where grant incentive is provided by the Government to promote effective and consistent NRW reduction based on targets set by SPAN.

SCOPE

The scope for water (WTR) includes two (2) sub-indicators, **Water Consumption (WTR1)** and **Water Productivity (WTR2)**.

Sub-indicator	Definition	Impacts	Green Practices
Water Consumption (WTR1)	The amount of water consumed within the facility.	• Increase production cost • Increase generation of wastewater.	• Improve water usage efficiency. • Monitor and increase the usage of recycled or reused water.
Water Productivity (WTR2)	This sub-indicator links the water consumption with the product yield; hence the economic value of the industrial production can be measured based on the water withdrawn.	• A low level of water productivity indicates that water is of low value and may be used for low value purposes. • Water footprint increases with lower water productivity.	• Increase the level of water recirculation and reuse within and between industries through industrial symbiosis. • Improve process design based on targeted water productivity. • Adopt cleaner production processes that optimizes the use of water.

IMPLEMENTATION POTENTIALS



ENERGY

Global data have consistently indicated that energy consumption remains the largest contributor of greenhouse gases (GHGs) with a sectoral share of about two-thirds of total global emissions.

Within this broad sector, we can break contributions by sub-sectors like transport, buildings, industry-related energy consumption, agriculture, and several unallocated and fugitive emissions. Industry-related energy consumption make up about a quarter of the total sectoral emissions and this almost in entirety come from manufacturing. Majority of global population still rely on vehicles powered by fossil fuels. The adoption of electric vehicles (EVs) could significantly shift dependency internal combustion engines (ICE). This draws new attention to impacts from electricity generation.

Coal mined from the Earth → Coal-fired Power Plant → Electricity Transmission

Although electricity generation technologies is constantly improving along with the rapidly growing production volume, but in reality, majority of electricity generated still originates from fossil fuels. Renewable energy such as solar, wind, hydro, geothermal, and other renewable sources is gaining global traction but still remains as an alternative in many instances. The urgent need to shift dependency of energy from fossil fuels to renewables remains prevalent, as is energy transition.

Through the planned National Energy Policy, the generation of renewable energy from solar, biomass and biogas are aimed to increase up to 31% of capacity in 2025. This will be achieved through several planned Acts related to energy efficiency and conservation to supervise energy consumption by high-intensity consumers in the industrial and commercial sectors.

Therefore, actions must be taken at the facilities to ensure that the intensity of energy consumption will decrease sufficiently so that even with increased production, the total energy consumption remains stable or decreases, leading to sustainable environmental protection and reduced overall energy costs.

GOALS AND AIMS

To focus on reducing overall energy efficiency and the adoption of renewable energy in manufacturing processes, facilities, operations, and management.

7.3: By 2030, double the global rate of improvement in energy efficiency

ALIGNMENT WITH GREEN TECHNOLOGY MASTER PLAN TARGETS

The efforts to achieve more efficient energy management in this Guideline are aligned with the GTMP targets as highlighted below:

WATER MANAGEMENT		
	2025	2035
Renewable Energy	**31%** RE mix (installed capacity)	**40%** RE mix (installed capacity)
Peninsular Malaysia solar penetration	**24%**	**30%**

OTHER INITIATIVES

- Electricity generation diversity: Maintaining Herfindahl-Hirschman Index (HHI) below 0.5
- Reducing carbon emission from power plants: Imposition of clean coal technology requirement for new coal-fired plant
- Reinvigorating co-generation policy
- National Energy Efficiency Action Plan (NEEAP)

Promotion of 5-star rated appliances • **Refrigerator** • **Air conditioner**	**Promotion of 5-star rating and labels**
Minimum Energy Performance Standards (MEPS) • **EE lighting campaign** • **High efficiency motors**	**Promotion through awareness programs, enforcement of MEPS and labelling**
Energy audits and energy management in buildings and industries • **Large and medium commercial buildings** • **Large and medium industries** • **Large Government facilities** • **Medium-sized commercial buildings**	**Matching grants: free energy audit will be provided to large and medium sized commercial buildings, industries, large Government facilities; provided that the business owner is willing to invest an amount of energy saving measures equal to the cost of the energy audit**
Co-generation • **Co-gen in industries and commercial buildings**	**To promote co-gen in industries and commercial buildings**

Total savings in 10 years (GWh) = 49,943

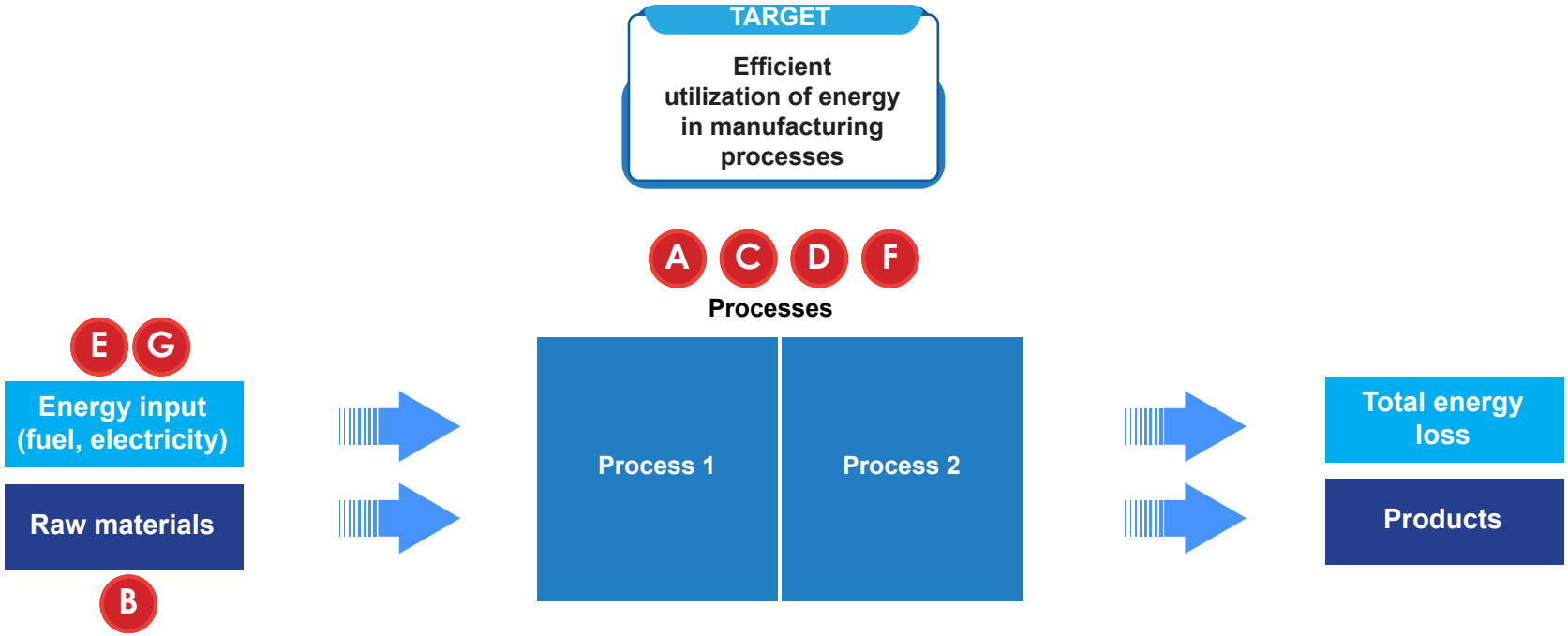
SCOPE

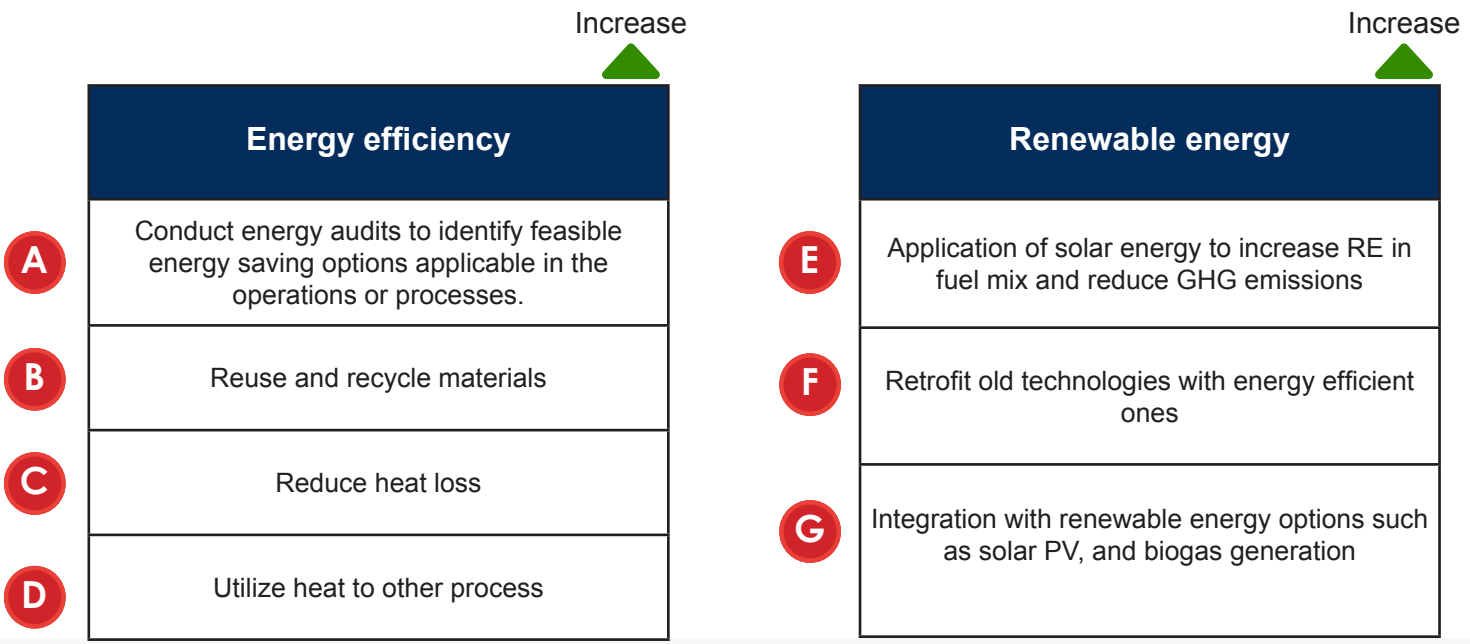
The scope for energy (ENR) includes two (2) sub-indicators, **Energy Efficiency (ENR1) and Renewable Energy (ENR2).**

Sub-indicator	Definition	Impacts	Green Practices
Energy Efficiency (ENR1)	Maintain the same of less amount of energy consumption to produce better outputs.	• Energy production depletes non-renewable energy resources and contributes to high greenhouse gases emissions due to current energy mix which includes significant percentage of polluting sources. • High energy consumption adds to the operation and overhead costs. • High energy consumption leads to high demand of electricity, causing the utility generates more electricity to cater for the demand. • Inefficient energy consumption hinders optimum renewable energy design. • Energy efficiency is the single most cost-effective productivity tool available within an energy portfolio enabling creation of products and services with the lowest energy cost.	• Minimize energy consumption during use phase by using the lowest energy consumption components, using the default power saving mode, and insulating the heating components. • Optimize energy flow in the production processes through heat optimization • Utilizing waste heat. • Reduce energy consumption and emissions from transportation and avoid methods of transportation that are harmful to the environment. • Implement automation of processes. • Utilization of new or existing technologies including heat integration, co-generation and renewable energy. • Conduct energy audits to identify feasible energy saving options applicable in the operations or processes.

Sub-indicator	Definition	Impacts	Green Practices
Renewable Energy (ENR2)	Energy from a source that is not depleted when used such as solar, wind or biomass, among others.	• Reduces the carbon footprint of the manufacturer and the products. • The production, transportation or use of non-renewable energy resources such as fossil fuels generates significant amount of greenhouse gases. • Reduces the negative environmental impacts of non-renewable energy. • With carbon tax mechanism, manufacturers are facing higher tax when using fossil-based energy as electricity or fuels. • Enables waste to be upgraded to energy resources, thus reducing dependence on the electricity grid, and saving energy costs. • Reduce the amount of waste that needs to be treated. • Increase the waste value.	• Utilization of renewable energy from process residues (waste materials, waste heat or solid waste), or from auxiliary facilities (solar, wind or equivalent). • Application of waste-to-energy technologies. • Facilitate circular economy through resource sharing and fuel optimization. • Utilization of new or existing technologies including heat integration, co-generation and waste utilization for energy.

IMPLEMENTATION POTENTIALS





INNOVATION

Manufacturers are driven to adapt their business processes and activities to develop marketable, viable, and effective products as global competition intensifies.

The innovation indicators include research and development efforts into green technology and its implementation directly in the manufacturing sector, as well as product development phases which incorporates green product design.

GOALS AND AIMS

To support, recognize and advocate green innovations and sustainable practices within the traditional manufacturing processes and operations. It supports the goals of Green Practices through efforts and financial commitments in research and development (R&D) and product design.

9.5: Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

9.7: Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities

ALIGNMENT WITH GREEN TECHNOLOGY MASTER PLAN TARGETS

The efforts towards implementation of innovation in the manufacturing operations as outlined in this Guideline are aligned with the GTMP especially as one of the five strategic thrusts of:

- Strengthening the institutional framework
- Provide a conducive environment for green technology development
- Intensify human capital development in green technology
- **Intensify green technology research and innovations,** and
- Promotion and public awareness

Through Research, Development and Commercialization efforts

Malaysia had developed the National Research and Development Priority Areas (NRPAs) which steers the common vision for Science, Technology and Innovation in Malaysia, measured through Gross Domestic Expenditure on R&D (GERD) amounted to RM10.6 billion in 2012 (36% from the public sector and 64% funded by the private sector). It is aimed that the country achieves a minimum of 2% GERD

SCOPE

The scope for innovation (INO) includes two (2) sub-indicators, **Research and Development (INO1) and Product Design (INO2).**

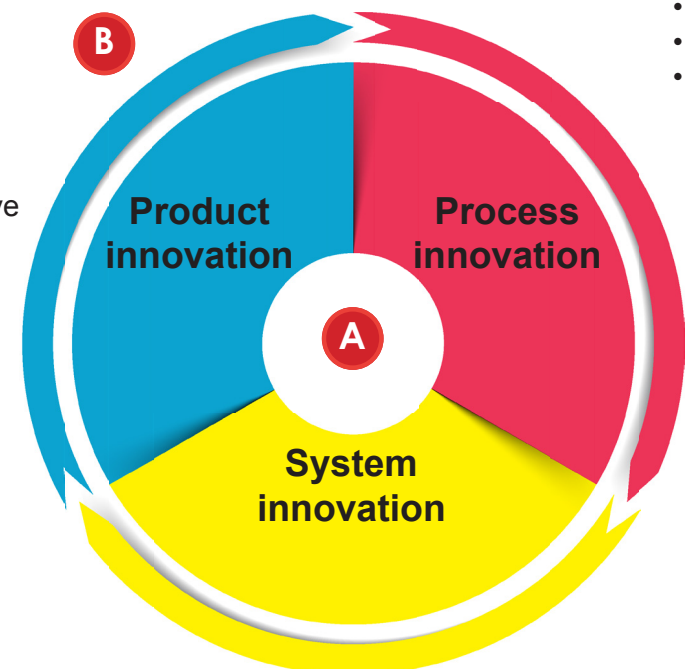
Sub-indicator	Definition	Impacts	Green Practices
Research and Development (INO1)	Activities or efforts that tackles specific issues to innovate products or services. R&D may require resources both in terms of financial and material, and time. R&D may also result in the production of scientific papers, intellectual properties, and new knowledge.	• R&D allows new and emerging technologies to be applied directly into processes, to further increase productivity, and improve products.	• Develop and implement policies related to allocation of resources towards R&D within the organization. • Making strategic investment in R&D and innovations that enable green technologies to be embedded into existing infrastructure, systems, and processes. • Collaborative efforts with academia to improve products and processes. • Knowledge transfer efforts with international bodies and industries.
Product Design (INO2)	The process of developing a specific product that addresses the specific needs of the market.	• Extending the lifetime of products will decrease the need for new products which subsequently will decrease materials and energy consumption for production.	• Optimize product lifetime by increasing reliability and durability. • Incorporates product design that stimulates sustainable behaviour. • Design for easier maintenance and repair (e.g., indicate opening instructions for cleaning and repair, allow wear location to be detected on parts which facilitate disassembly and replacement). • Design a modular product structure, enabling upgrade and prolonging products lifetime. • Designing future-proof products with long functional and aesthetic life span. • Design products to meet possible future needs of consumers.

IMPLEMENTATION POTENTIALS

TARGET

To inculcate the culture of innovation in the manufacturing sector

- Sustainable materials for products
- Advanced product design
- Effective product disassembly/ recove
- Modular and reconfigurable design



- Sustainable processes
- Advanced process technologies
- Integrated processes
- Improved process performance

- Sustainable systems
- Enterprise level system integration
- Supply chain integration

A — Increase

R&D

Optimization study to improve quality and/or longevity of product

B — Increase

Product design

Utilizing product design to incorporate sustainability thinking but maintaining the functionality of products

MANAGEMENT

The administration of an organization, company or business is crucial in creating the right forward-thinking policies that support the development of a more sustainable form of business. All stakeholders, including employees and customers benefit from taking measures to reduce the negative impacts of the manufacturing process towards the environment.

Being environmentally responsible entails more than just meeting legal requirements; it also means going beyond compliance and investing more in human capital and management practises that contribute to the industry's green initiatives.

The world is moving towards green economy particularly through ESG frameworks and investment systems which are changing the current scenario of job creation, skills evolution, and job quality.

GOALS AND AIMS

To focus on development and implementation of green policies, practices, and systems that stimulate the creation and availability of green jobs within the organization.

8 DECENT WORK AND ECONOMIC GROWTH

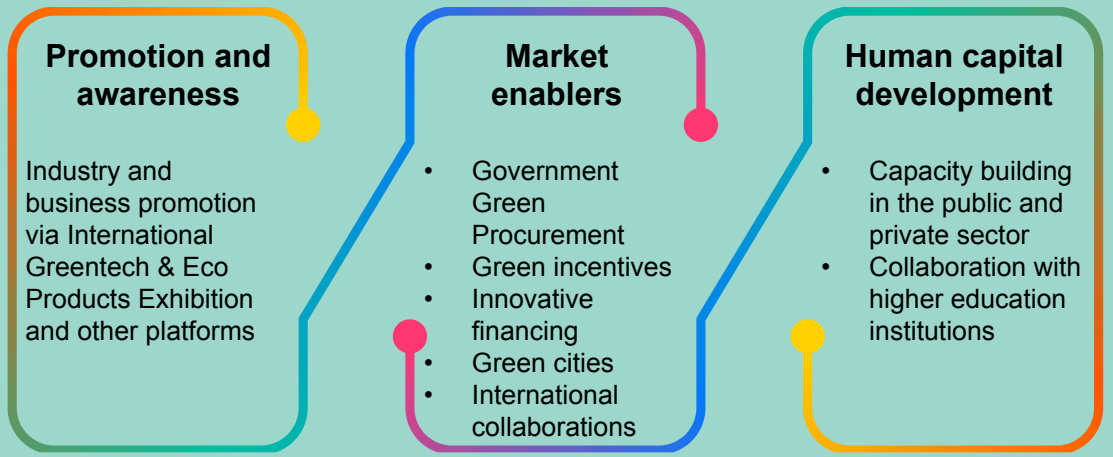
- 8.3: Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small- and medium-sized enterprises, including through access to financial services
- 8.6: By 2020, substantially reduce the proportion of youth not in employment, education or training
- 8.8: Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

- 12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities
- 12.10: Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products

ALIGNMENT WITH GREEN TECHNOLOGY MASTER PLAN TARGETS

The efforts towards management elements in the manufacturing operations in this Guideline are aligned with the GTMP targets as highlighted below:



Number of green manufacturers

2025	2030
10,200 (30%)	17,000 (50%)

Under the classification of green manufacturing, manufacturers can decide and prioritise their initiatives towards green energy, green products and green processes based on their level of business readiness.
Initiatives developed by the government to propel such choices include the MyHijau SME & Entrepreneur Development Program, Energy Audit Grant for industrial sector, Energy Management Gold Standard (EMGS), Enhanced Time of Use tariff (EToU) and ISO 14001 certification, among others.

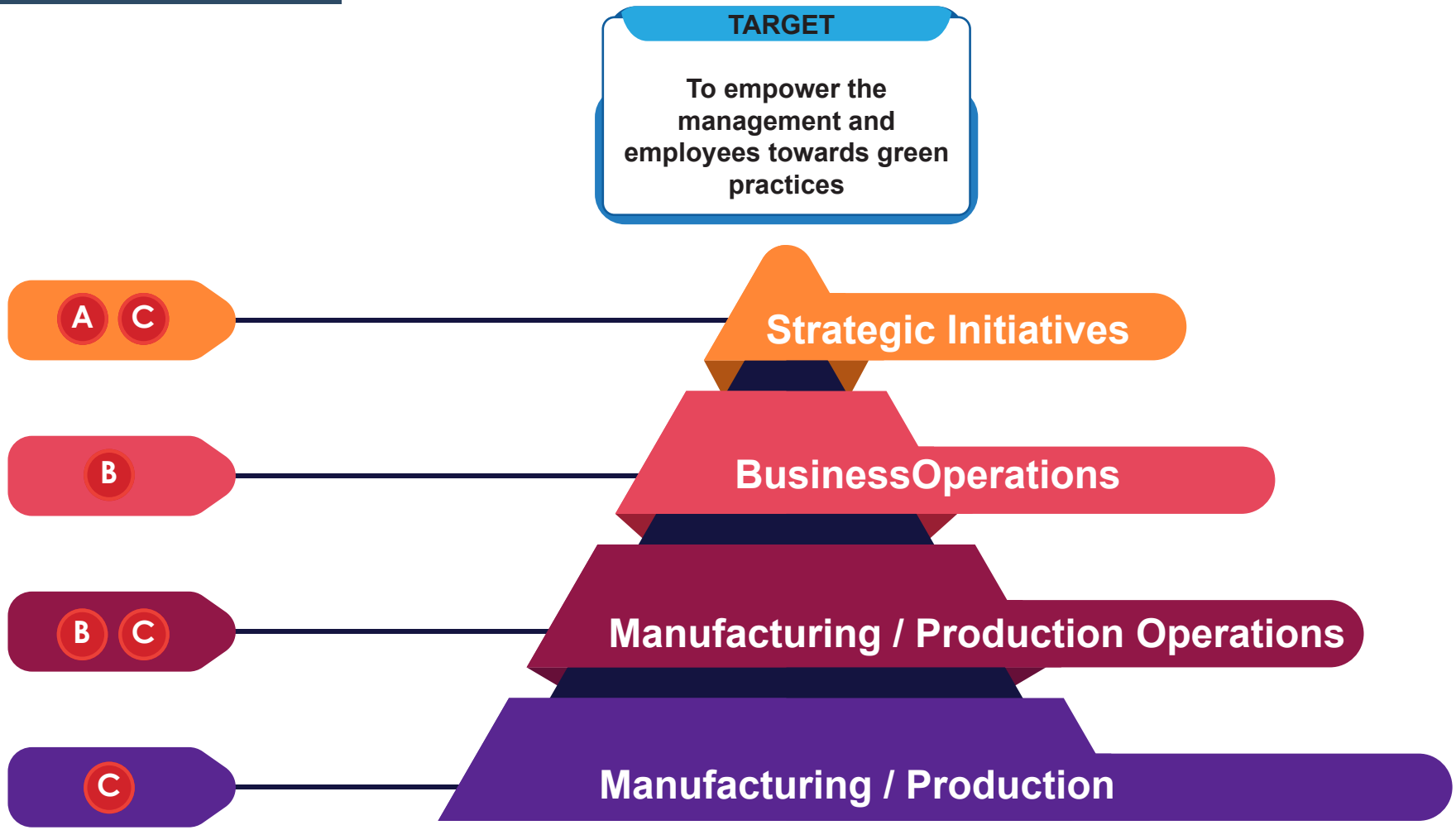
SCOPE

The scope for management (MGT) includes three (3) sub-indicators, **Policy and Program (MGT1), Green Procurement (MGT2) and Human Capital (MGT3).**

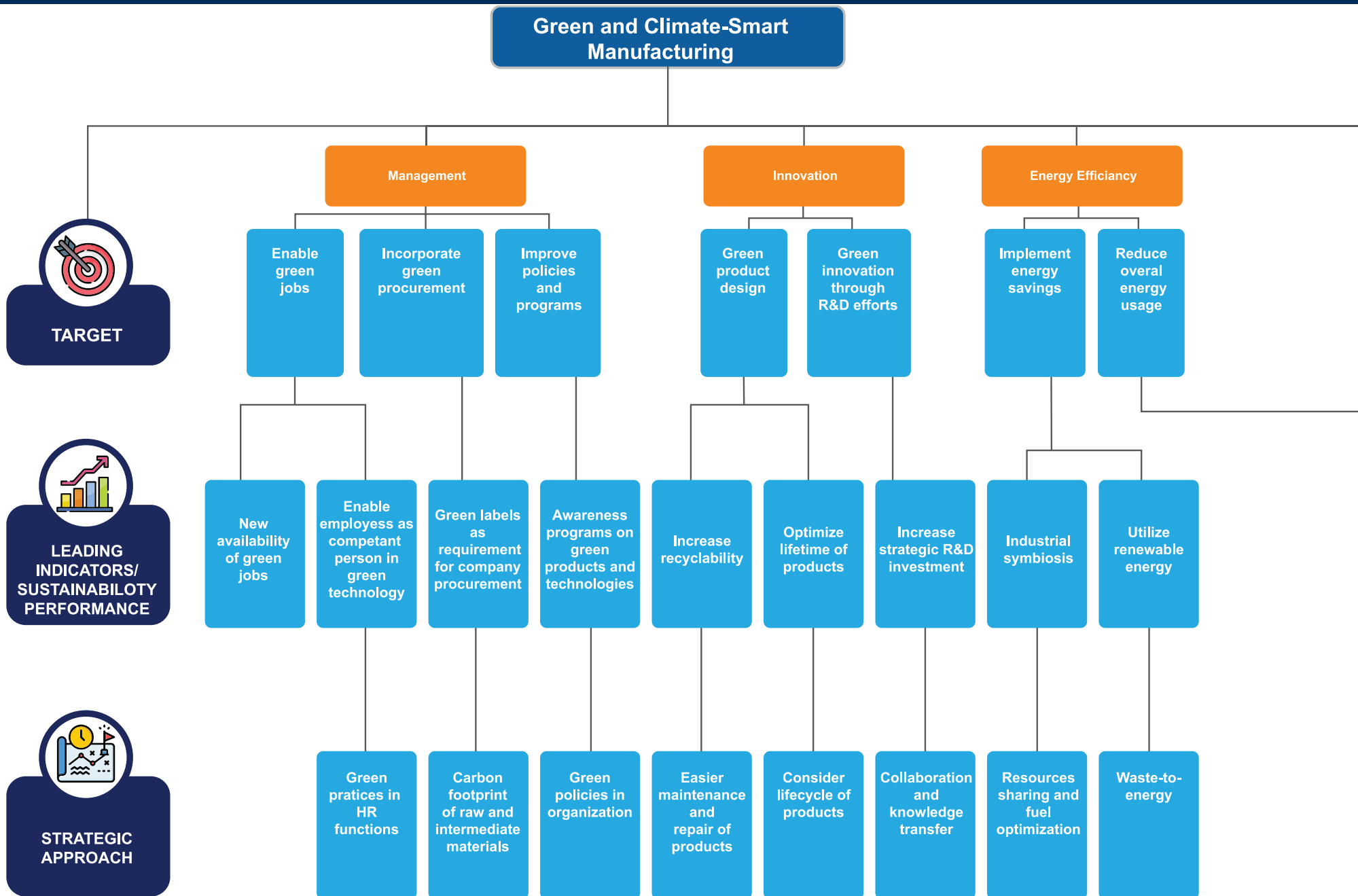
Sub-indicator	Definition	Impacts	Green Practices
Policy and Program (MGT1)	Conformance to industry standards in environmental management and compliance to safety regulations. In addition, additional initiatives such as developing green metrics within the organization or conducting in-house and external programs to support the green initiatives are also included.	• Ensuring the manufacturing process and operations safe and not detrimental to the environment. • Being partly eligible for various local and international sustainability awards.	• Promotion of recycling and reuse practices, along with other sustainable environmental management practices among employees of the organization or company. • Raise awareness of responsible and sustainable consumption through internal campaigns. • Develop green policies or operating standards that are applicable to all aspects of operations within the organization.

Sub-indicator	Definition	Impacts	Green Practices
Green Procurement (MGT2)	Procurement of materials, products, services and works that take into consideration the environmental criteria that minimizes the adverse impacts of human activities.	• Promote purchases that have low environmental impact and are more sustainable. • Increase resource and operational efficiency. • Eligibility to be recognized under the Government Green Procurement program.	• Purchase environmentally friendly products and service. • Include environmental requirements in specifications with contractors, suppliers, and service providers. • Establish a mechanism to determine level of greenhouse gas emissions generated by suppliers.
Human Capital (MGT3)	The creation and availability of green jobs and competent person at the managerial, technical and/or professional levels. It also includes capacity building and training for the existing workforce to enhance skills, capabilities, attitudes, and commitment in green and sustainable practices in the organization.	• Challenging to implement green technology in manufacturing processes and operations without availability of green workers and related competent person. • The trajectory of ESG indicates the growing significance of having green workers within the organization. • Current demand for green human capital.	• Open opportunities to the current workforce to become competent person for environmental management and green practices. • Implement policies, practices, and systems that stimulate the creation and availability of green jobs within the company. • Inculcate green practices in functions and management of human resource. • Development of career paths for competent person related to environment protection and climate action such as environmental auditor and that of similar roles.

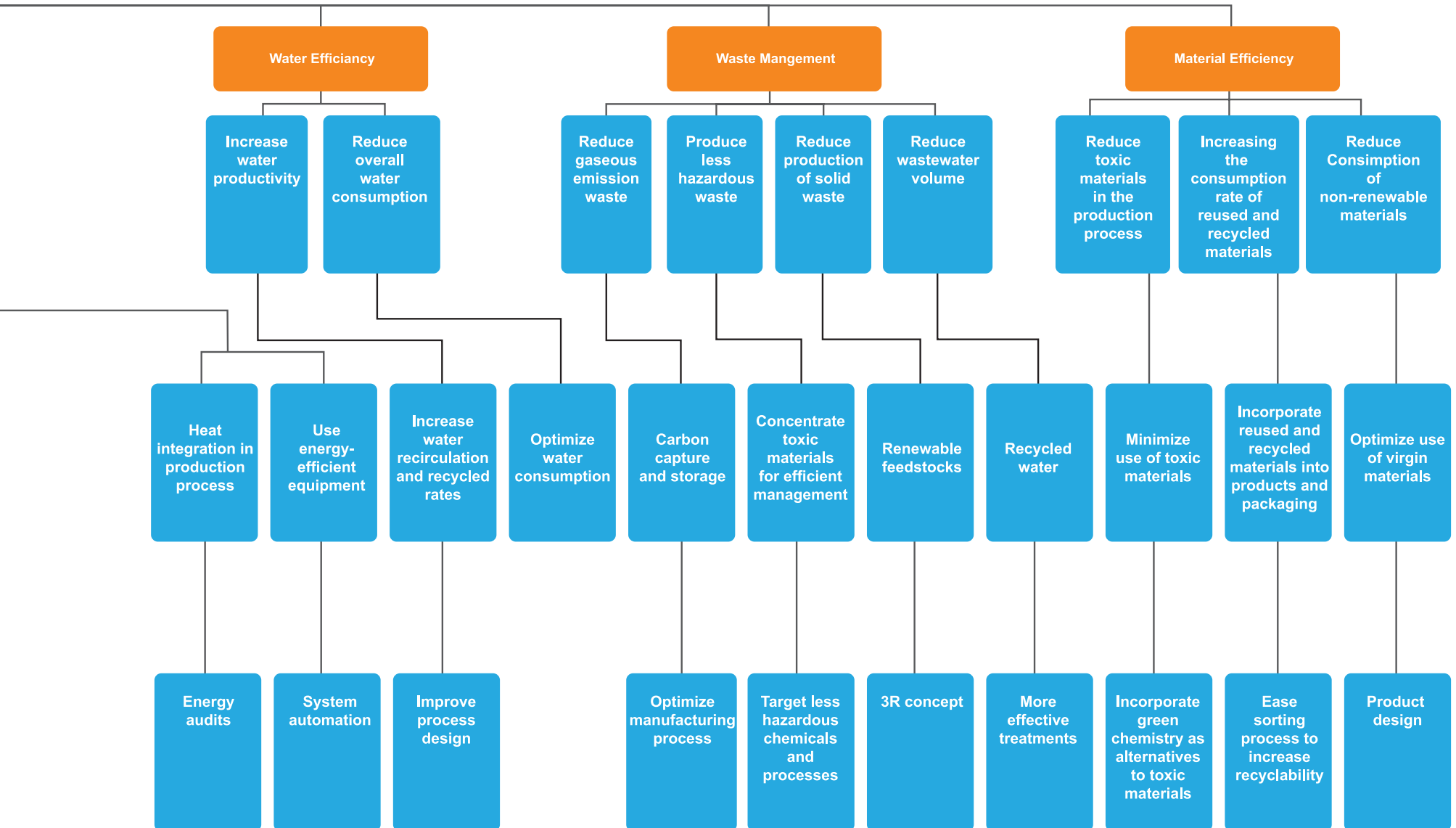
IMPLEMENTATION POTENTIALS



FRAMEWORK OF STRATEGIC APPROACH



FRAMEWORK OF STRATEGIC APPROACH



INDICATORS ALIGNMENT WITH EXISTING POLICIES, BENEFITS AND RECOGNITIONS

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, manufacturers can refer to the specific guidelines and best practices that support the application of green practices in the industry. Manufacturers 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 (GITA)	MIDA	Incentive for companies that undertake Green Technology projects involving capital investments.	Renewable Energy (RE); Energy Efficiency (EE); Green Building; Green Data Centre; Integrated Waste Management	WASTE ENERGY	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 Efficiency (EE); Green Building; Green Data Centre; Green Certification and Verification; Green Township; Electrical Vehicle	MANAGEMENT ENERGY	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	MATERIAL WASTE ENERGY	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 product standards or specifications and the relevant eco-labelling criteria, as well as relevant provisions in the Environmental Quality Act	MATERIAL WASTE ENERGY	Boost acceptance of products in international “green markets” that favour green products with a price premium	
Anugerah Industri Hijau	Dept. of Environment (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	MATERIAL WASTE WATER ENERGY MANAGEMENT	Improved reputation and branding	

INDICATORS ALIGNMENT WITH EXISTING POLICIES, BENEFITS AND RECOGNITIONS

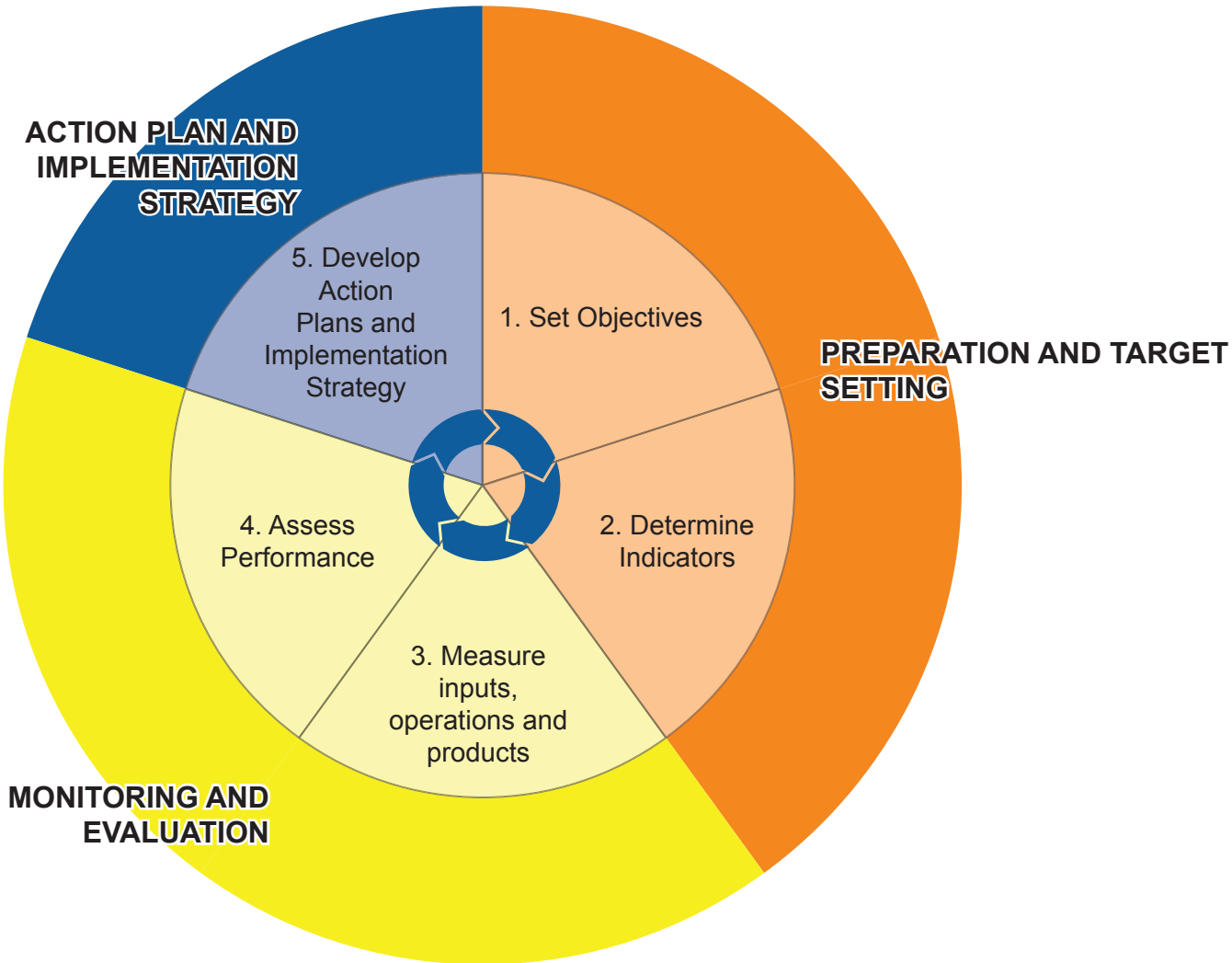
Existing Initiatives	Agency/ Institutions	Description	Criteria for Assessment	Green Practices Indicator	Benefits	Reference (Scan for link)
National Energy Awards	MGTC	A platform to provide recognition and rewards to Malaysia's industry leaders in the growing green technology related products, services and energy services sectors for adopting and implementing sustainable energy practices.	Energy Efficiency (EE), Renewable Energy (RE)	ENERGY INNOVATION	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 issue; Training and communication; Legal and other compliance; Environmental emergencies; Employee participation; Supply chain; Environmental social programme; Environmental accounting; Eco-design; Carbon footprint	WASTE INNOVATION MANAGEMENT	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	MATERIAL WASTE WATER ENERGY INNOVATION MANAGEMENT	Reduction in the rate of GHG emission	
Low Carbon Cities Framework (LCCF)	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	MATERIAL WATER ENERGY INNOVATION	Reduction performance will be awarded an environmental performance rating	
Feed-in Tariff (FiT)	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	ENERGY MANAGEMENT	Reduce CO2 emissions and secure domestic energy supply, and guarantee investment security for renewable energy investors	

INDICATORS ALIGNMENT WITH EXISTING POLICIES, BENEFITS AND RECOGNITIONS

Existing Initiatives	Agency/ Institutions	Description	Criteria for Assessment	Green Practices Indicator	Benefits	Reference (Scan for link)
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 2050.	Residential customer (100kWh per block); Non-residential customer (1000kWh per block)	ENERGY INNOVATION	Subscribers 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	ENERGY INNOVATION MANAGEMENT	Funding for programs and projects	
Energy Management Gold Standard (EMGS)	MGTC	Certification system delivered under the ASEAN Energy Management Scheme (AEMAS) based on excellence in energy management.	Energy management	ENERGY MANAGEMENT	Recognized as a leader in energy management	

GUIDELINE IMPLEMENTATION

As described in the Introduction (page 31), there are five steps outlined in these guidelines for manufacturers. These five steps can be divided further into three main stages, namely 'Preparation and Target Setting', 'Monitoring and Evaluation' and 'Action Plan and Implementation Strategy'.



STAGE 1: PREPARATION AND TARGET SETTING

Manufacturers must start by setting the objectives and targets based on a general understanding of all the positive and negative environmental impacts of the existing processes, operations, equipment, materials, waste, and facilities.

Set targets and objectives

- Based on specific need of the organization or premiss, determining the objectives provides the specific direction into which the audit process may help
- Eg: To identify and list specific energy issues faced by Factory A

Once the objectives are identified, the manufacturer should determine the indicators (using the 6 indicators and 18 sub-indicators listed before which are aligned with the previously selected targets and objectives.

Once specific indicators are selected, the data collection method and the expected outputs must be determined before proceeding to the next stage which involves the actual measurement of the indicators and performance assessment.

Determine data methodology

- Once the objectives were determined, the appropriate approach can be selected. Major requirements are the location selection (which determines the audit boundary), methods of data collection (on-site observation or documentation), required documents (process flow diagrams, site plan) and tools used (field sensors, checklist).

Determine the required outputs

- Based on the aim of the audit, required outputs should be listed.
- Eg: List of materials, sources and factors of material wastage and energy loss, risk type and sources

STAGE 2 : MONITORING & EVALUATION

The actual measurement and evaluation will be conducted based on the specific methodology previously determined.

Current standards and guidelines form the basis for benchmarks, where the measured data can be compared.

The performance and impact of each indicator will be evaluated, followed by listing the potential actions which could mitigate or enhance impacts of the specific indicator.

Specific recommendations as outlined in these guidelines can be used as a guide of potential interventions for each sub-indicator as its performance will be assessed.

STAGE 3 : ACTION PLAN & IMPLEMENTATION STRATEGY

In developing the action plan and implementation strategy, the specific action must be duly detailed to include the specific goals, division of tasks and responsibilities, timelines and resources.

Appropriate communication and motivation systems are also suggested to be established to ensure that the goals of the green manufacturing practices can be achieved in a timely and successful manner.

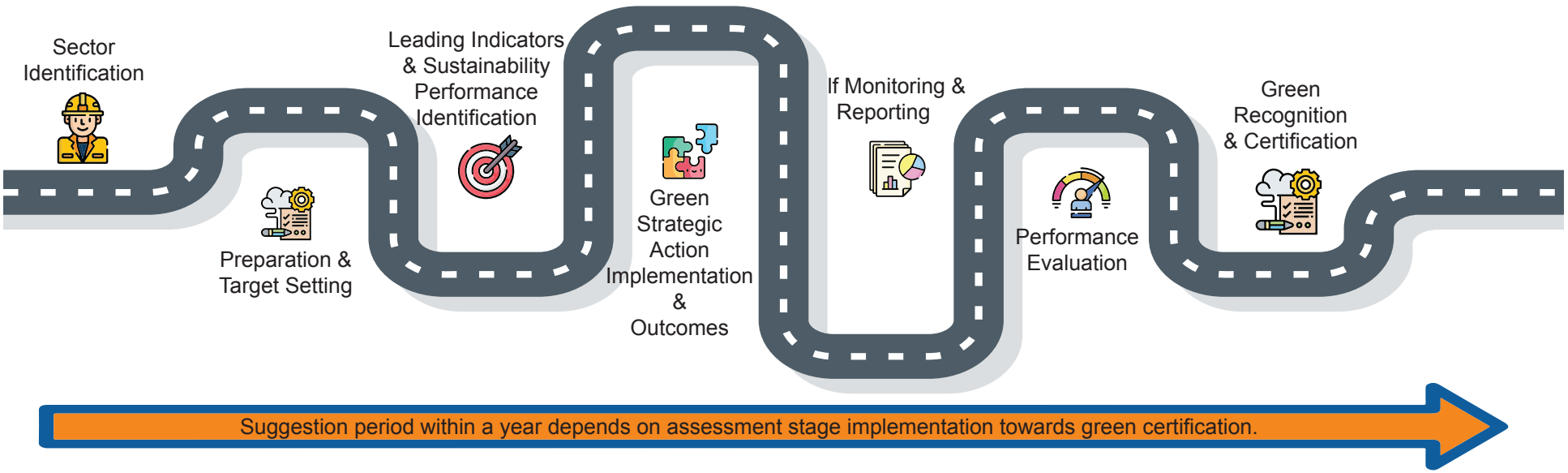
EXAMPLE

Indicator	Target Setting	Monitoring and Evaluation	Action Plan	Responsibility and Timeline
MATERIALS **Recycled materials**	Increase usage of recycled materials in specific products.	Monitor and record trend of recyclable material used.	Identify recycling companies to secure supply or materials.	Marketing Department to screen potential companies and create database by Oct 2022.
WASTE AND EMISSION **Air emission**	Carbon emission at minimal level.	Monitor air quality at emission source.	Implement CCS system.	Environmental Officer to monitor weekly and quarterly report.
ENERGY **Energy consumption**	Reduction of energy consumption in offices.	Monitor and record monthly electricity bills and consumption rates.	To implement new SOP for electrical appliances in the office.	HR Dept to develop SOP for air-conditioning and energy habits in company office by Sept 2022.
INNOVATION **R&D**	Increase R&D expenditure in green technology.	Evaluate current R&D expenditure and tangible benefits.	Identify strategic partners for new mixing system that is more energy-efficient.	Finance Dept to report current and past R&D spending. R&D Dept to identify strategic partners.

TOWARDS GREEN RECOGNITION AND CERTIFICATION

This guideline describe the recommendations and proposed actions that can be adopted by manufacturers to implement green practices in their daily operations. This is driven by the eventual development of a Green Certificate which recognizes green practices in the industry.

The Green Certificate Roadmap is proposed as shown below. This roadmap is developed to ensure that the industry is facilitated in implementing green practices within their operations.



In the long term, it is envisioned that manufacturers who have implemented green and best practices in the industry may apply for the Green Certificate, and being eligible for, as of now, proposed financing benefits and support. In the short term, manufacturers may refer to the table in pages 60-62 for potential benefits and recognitions that they are eligible for based on their current performance.

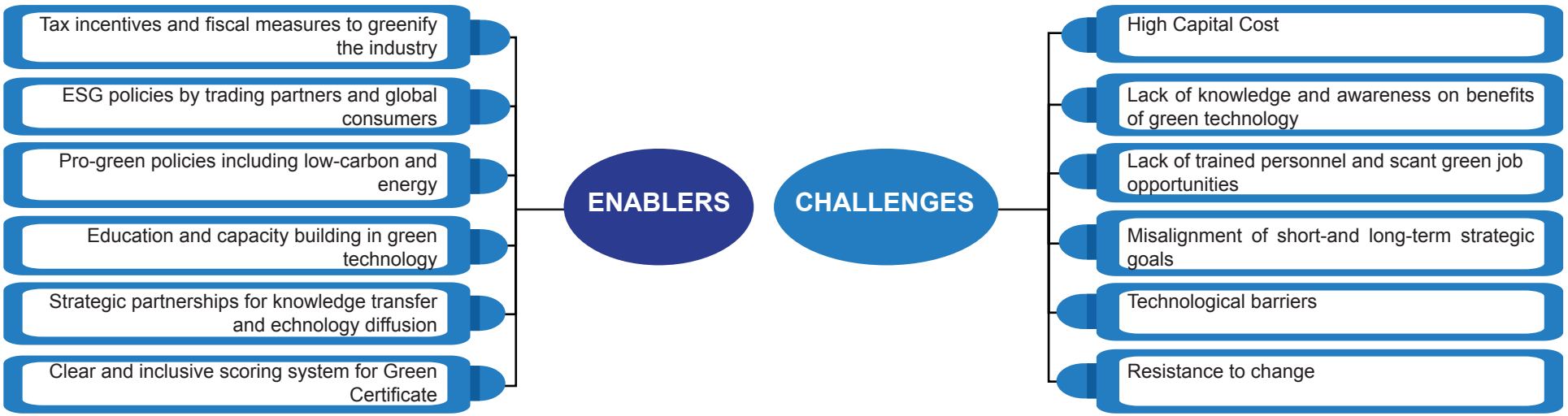
CHALLENGES IN IMPLEMENTATION OF GREEN PRACTICES GUIDELINE

Despite the benefits of implementing green practices in the industry, it is undeniable that there are some challenges that hinder immediate applicability of the Green Industry.

- The lack of awareness and knowledge about green technology leads to the perspective that green innovations are costly and require complete overhaul of businesses.

- Those motivated to spearhead the green initiatives face a lack of advisory support, absence of financial incentives and policy implementation, experienced verifiers and longer rates of return for their investments.
- Weak public pressure on green products or processes may also create barriers towards the adoption of green manufacturing, other than supply barriers and poor supplier commitment.

It is crucial that an enabling environment can be achieved where strategic partnerships are made among all stakeholders (industry, government, academia and the public) to develop the regulatory and institutional framework, the fiscal instruments of incentives and investment mechanisms, the capacity, and public advocacy in terms of the green market.



To ensure an enabling environment, three stages are identified, namely Development, Facilitation, and Implementation. Therefore, the development of this guideline falls under the first stage of Development and within the element: governance, and policy planning.

Development Stage

Sets the stage for any approaches that allows various entities to diagnose the current situation and plan a strategic framework. It is aimed at low-hanging fruits; such as education and capacity building at a systemic level and require long term commitment before the impacts can be seen. Manufacturers and industries can start by analysing their current performance and creating their own green strategies while relevant authorities assess local efficiencies and develop interventions based on capacity and available resources.

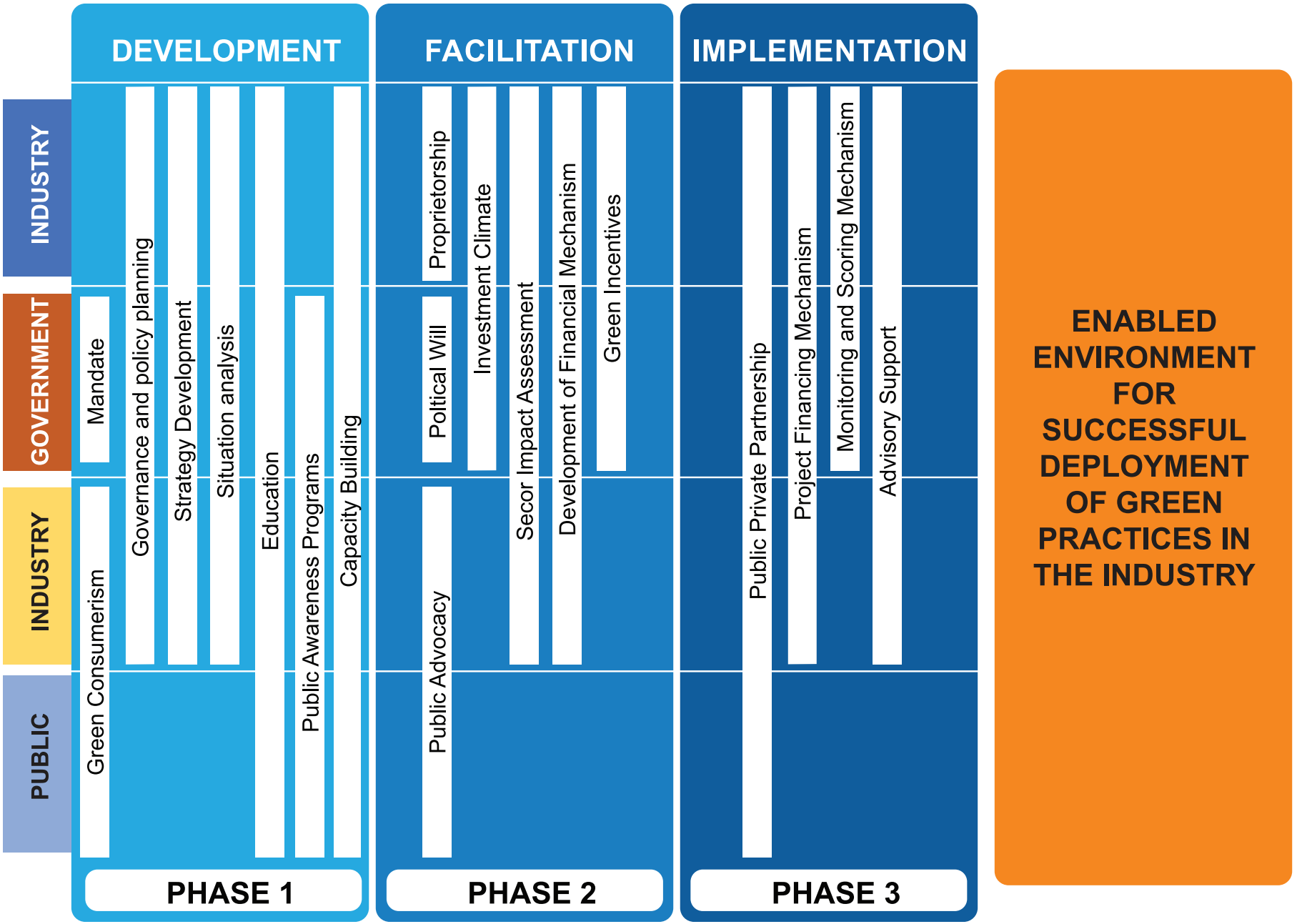
Facilitation Stage

Involves an assessment of actions taken during the initial stages and performance of all strategic partners. This provides a foundation in developing financial mechanisms to increase buy-ins from the industry, as well as communication strategies to facilitate adherence to new green regulatory framework. A clear cost-benefit analysis, both monetary and non-monetary, must be in place.

Implementation Stage

Describes the requirement for a clear advisory support system with full capacity to fund and implement the program. Another key item is the scoring mechanism for the Green Certificate which the industry must adhere to before they can be awarded. Only once all these capacities are in place, can the Green Certificate Scheme be implemented successfully.

CREATING AN ENABLING ENVIRONMENT



WAY FORWARD

Sustainability and Environmental, Social, and Governance (ESG) policy is especially important across all sectors. The concern about climate change, social justice, corporate responsibility are drivers for actions especially for manufacturers and businesses.

ESG is also good for business as companies with consistently high ESG performance tend to score higher total shareholder return than medium ESG performers.

Manufacturers who take the initiatives towards sustainability and ESG through this Guideline may expect cost savings and increase in profitability, along with increasing goodwill and reputation. Incorporating these initiatives as formal policies, as a conclusion, is a strategic business move and will empower your company to navigate into the next decade and beyond, of change in manufacturing.

REFERENCES

Altenburg, T. and Assmann, C. (2017) Green Industrial Policy: Concept, Policies, Country Experiences, German Development Institute. Geneva. Retrieved from: https://wedocs.unep.org/bitstream/handle/20.500.11822/22277/
Green_industrial_policy.pdf.

Department of Statistics Malaysia. (2021). Index of Industrial Production. Retrieved from: https://www.dosm.gov.my.

Economic Planning Unit. (2021). Twelfth Malaysia Plan 2021-2025. Retrieved from: https://rmke12.epu.gov.my/en.

Kerajaan Negeri Sembilan. (2011). Garis Panduan Pelaksanaan Dasar Teknologi Hijau Negeri Sembilan (2011-2020). Retrieved from: http://www.ns.gov.my/component/phocadownload/category/107-tahun-2011#.

Global Green Growth Institute. (2016). Green Growth Planning Guidelines. Retrieved from: https://www.greengrowthknowledge.org/guidance/green-growth-planning-guidelines.

Iskandar Regional Development Authority. (2014). Green Economy Guideline Manual. Retrieved from: https://iskandarmalaysia.com.my/green/resources.html.

Jabatan Alam Sekitar Malaysia. (2014). Guidelines for Green Industry Auditor. Retrieved from: https://enviro2.doe.gov.my/ekmc/digital-content/87723/.

Kementerian Tenaga, Teknologi Hijau dan Air (KeTTHA). (2008). National Renewable Energy Policy & Action Plan. Retrieved from: https://www.seda.gov.my/policies/national-renewable-energy-policy-and-action-plan-2009/.

Kementerian Tenaga, Teknologi Hijau dan Air (KeTTHA). (2017). Green Technology Master Plan Malaysia 2017-2030. ISBN 978-967-5893-09-4. Retrieved from: https://www.pmo.gov.my/wp-content/uploads/2019/07/Green-Technology-Master-Plan-Malaysia-2017-2030.pdf.

Kementerian Tenaga, Teknologi Hijau dan Air (KeTTHA). (2018). Garis Panduan Perolehan Hijau Kerajaan 3.0. Retrieved from: https://www.myhijau.my/green-procurement/.

Malaysian Investment Development Authority (MIDA). (2020). Malaysia Investment Performance Report. Retrieved from: https://www.mida.gov.my/report/.

Kementerian Alam Sekitar dan Air (KASA). (2002). Dasar Alam Sekitar Negara. Retrieved from: https://www.doe.gov.my/dasar-alam-sekitar-negara/.

Partnership for Action on Green Economy. (2017). Green Industrial Policy and Trade: A Tool-Box. Retrieved from: https://www.un-page.org/resources/green-industrial-policy-green-trade/green-industrial-policy-and-trade-tool-box.

Qureshi, M. I. et al. (2020) 'Classifications of sustainable manufacturing practices in ASEAN region: A systematic review and bibliometric analysis of the past decade of research', Sustainability (Switzerland), 12(21), pp. 1–19. doi: 10.3390/su12218950.

Raja Ghazilla, R. A. et al. (2015) 'Drivers and Barriers Analysis for Green Manufacturing Practices in Malaysian SMEs: A Preliminary Findings', Procedia CIRP. Elsevier, 26, pp. 658–663. doi: 10.1016/J.PROCIR.2015.02.085.

Sachidananda, M., Webb, D. P. and Rahimifard, S. (2016) 'A Concept of Water Usage Efficiency to Support Water Reduction in Manufacturing Industry', Sustainability 2016, Vol. 8, Page 1222. Multidisciplinary Digital Publishing Institute, 8(12), p. 1222. doi: 10.3390/SU8121222.

WWF. (2018). Cleaner Production Guide for the Textile Sector. Retrieved from: https://www.wwf.se/dokument/wwf-and-hm-cleaner-production-guide-for-the-textile-sector/.


JORDANO
AirArabia
Azerbaijan