

Green Practices Guideline for Construction Sector

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GREEN PRACTICES GUIDELINE FOR CONSTRUCTION SECTOR

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TABLE OF CONTENT

CHAPTER 1: INTRODUCTION

1.1 Background of Construction Industry	3
1.2 Reality of Construction Industry	5
1.3 Policy, Blueprint, Master Plan and Acts	7
1.4 Purpose of Green Guidelines for Construction Sector	8
1.5 Challenges in Implementing Green Construction	8
1.6 Scope and Application	10
1.7 Role and Responsibility Key Stakeholders	11
1.8 Case Study: Malaysia Energy Commission Headquarters (Diamond Building)	12
1.9 Case Study: S11 House, Petaling Jaya, Selangor, Malaysia.	15

CHAPTER 2: DEFINITION

2.1 Definition of Construction Sector	21
2.2 Definition of Green Construction	21
2.3 Categories of Companies	22

CHAPTER 3: GUIDING PRINCIPLES TOWARDS GREEN CONSTRUCTION

3.1 Malaysia Zero Net Carbon Vision	25
3.2 Enabling Sustainable City	26
3.3 Urban Sustainable Transportation	27
3.4 Basic Principles of Green Public Building	28
3.5 Basic Principles of Future Green House Design	29
3.6 Malaysia Green Rating Tools	30
3.7 Circular Economy Principles in the Construction Value Chain	31

CHAPTER 4: GREEN CONSTRUCTION PRACTICES & INDICATORS

4.1 Introduction	35
4.2 Key Enablers for Green Constructions	36
4.3 5 Steps for Green Constructions Practices Guideline	37
4.4 Directive Framework for Achieving Green Recognition	38
4.5 Involvement of Key Stakeholders in Green Construction	39
4.6 Green Construction Indicators	40
4.6.1 Construction Management	41
4.6.1.1 General Outlook	41
4.6.1.2 Goal Setting	41

CHAPTER 4: GREEN CONSTRUCTION PRACTICES & INDICATORS

4.6.1.3 Safety and Health Management	42
4.6.1.4 Construction Environmental Management and Activity Pollution Control	43
4.6.1.5 Construction Authorities	43
4.6.1.6 Green Rating Tools	44
4.6.1.7 Incentive / Tax Scheme	46
4.6.1.8 Land Management Plan	47
4.6.1.9 Social Impact Assessment	49
4.6.1.10 Facilities Management (FM)	50
4.6.2 Construction Innovation	53
4.6.2.1 General Outlook	53
4.6.2.2 Goal Setting	53
4.6.2.3 Innovation in Green Technology for Construction	54
4.6.3 Construction Materials & Resources	57
4.6.3.1 General Outlook	57
4.6.3.2 Goal Setting	57
4.6.3.3 Construction Materials / Resources	58
4.6.4 Waste in Construction	60
4.6.4.1 General Outlook	60
4.6.4.2 Goal Setting	60
4.6.4.3 Demolition Waste	61
4.6.4.4 Hazardous Waste	62
4.6.4.5 Construction Waste	63
4.6.4.6 Wastewater	63
4.6.5 Water Consumption in Construction	66
4.6.5.1 General Outlook	66
4.6.5.2 Goal Setting	66
4.6.5.3 Water Efficiency	67
4.6.6 Energy Consumption in Construction	70
4.6.6.1 General Outlook	70
4.6.6.2 Goal Setting	70
4.6.6.3 Energy Efficiency	71
4.6.7 Air Quality in Construction	75
4.6.7.1 General Outlook	75
4.6.7.2 Goal Setting	75

CHAPTER 4: GREEN CONSTRUCTION PRACTICES & INDICATORS

4.6.7.3 Ambient Air Quality	76
4.6.7.4 Indoor Air Quality	77
4.6.8 Noise Pollution Control	79
4.6.8.1 General Outlook	79
4.6.8.2 Goal Setting	79
4.6.8.3 Noise Limit and Control	80
4.6.9 Biodiversity	82
4.6.9.1 General Outlook	82
4.6.9.2 Goal Setting	82
4.6.9.3 Conservation and Preservation of Biodiversity	83
4.7 Implementation and Action Plan	85
4.8 Preparation and Target Setting	85
4.9 Monitoring and Evaluation	89
4.10 Framework of Green Construction Practices	90
4.11 Roadmap towards Green Recognition & Certification	94
4.12 Way forward Malaysia for Green Construction Sector	
4.13 Conclusion	95
References	R1

FOREWORD

The development of green practice guidelines is a continuation of the implementation of the MyHIAU 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.

ABBREVIATION

ACEM	Association of Consulting Engineers Malaysia
AGC	Attorney General Chambers of Malaysia
BAS	Building Automation System
CIDB	Construction Industry Development Board
CITP	Certified Information Technology Professional
CIPAA	Construction Industry Payment & Adjudication Act 2012
COP26	26 th United Nations Climate Change Conference
DASN	<i>Dasar Alam Sekitar Negara</i>
DOSH	Department of Occupational, Safety & Health
DOE	Department of Environment
DID	Department of Irrigation and Drainage
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPU	Economic Planning Unit
FGD	Focus Group Discussion
FM	Facilities Management
GBI	Green Building Index
GTFS	Green Technology Funding Scheme
IEA	International Energy Agency
IAQ	Indoor Air Quality
JKR	<i>Jabatan Kerja Raya</i>
JPSPN	<i>Jabatan Pengurusan Sisa Pepejal Negara</i>
KASA	<i>Kementerian Alam Sekitar dan Air</i>
LEED	Leadership in Energy and Environmental Design
MGTC	Malaysia Green Technology Corporation
MOSTI	Ministry of Science, Technology and Innovation
PAM	<i>Pertubuhan Arkitek Malaysia</i>
PV	Photovoltaic
SMEs	Small Medium Enterprises
SDG	Sustainable Development Goals
SOP	Standard Operating Procedure
SHASSIC	Safety and Health Assessment System in Construction
SCORE	<i>Program Penilaian Keupayaan dan Kemampuan Kontraktor</i>
TC9	Technical Committee 9
UNFCC	United Nations Framework Convention on Climate Change

TERMINOLOGIES

Green Construction Practices

Environmentally responsible and resource-efficient structures and methods are used throughout the life cycle of development, encompassing buildings from siting to design, construction, operation, maintenance, renovation, and deconstruction.

(United States Environmental Protection Agency, n.d)

Green Building Codes

Go beyond baseline code requirements, serve as a testing ground for future standards, and give jurisdictions another tool for managing building and development in a less disruptive, more appropriate manner.

(Building with Chemistry Organisation, n.d)

Green Guidelines

Practical suggestions/ideas are offered to aid in the greening of company functions.

(BRE Group, 2019)

Construction Industry

Industry-related to construction works, including design, manufacturing, technology, material and workmanship and services for purposes of construction.

(*Lembaga Pembangunan Industri Pembinaan Malaysia Act 1994*)

Civil Engineering

Managing, designing, constructing, and maintaining the built and natural environments, while operating within the carrying capacity of local ecosystems and the planet, employing technologies and practices that give services to society.

(*Lembaga Pembangunan Industri Pembinaan Malaysia Act 1994*)

Green Building

A building that, by its design, construction, or operation, reduces or eliminates negative impacts on the climate and natural environment while also having the potential to create positive ones.

(Green Building Council, n.d)

Green Technology

Set of technologies that assist mankind in extracting food, feed, fibre, fuel, and fertilizer from the environment using renewable and non-renewable energies while maintaining ecosystem resilience, supporting the environment in maintaining nutrient cycles, pollination, carbon sequestration, climate regulation, waste decomposition and detoxification, purification.

(National Green Technology Policy Malaysia, 2021)

Green Economy/ Growth

One in which public and private investments reduce carbon emissions and pollution, improve energy and resource efficiency, and avoid the loss of biodiversity and ecosystem services, resulting in increased revenue and employment.

(United Nation Environmental Programme, n.d)



1

CHAPTER



INTRODUCTION

1.1 Background of Construction Industry



- 1 According to data from the Department of Statistics Malaysia, Malaysia population reached **32.7 million** in 2021 (Department of Statistic Malaysia,2021).



- 2 Since independence, Malaysia has generally registered continuous economic growth and this development has brought numerous benefits including improved social amenities.



- 3 As the **population increases**, the demand for housing, infrastructure and utility increases. Economic development in Malaysia has contributed to environmental degradation and uncontrolled development.

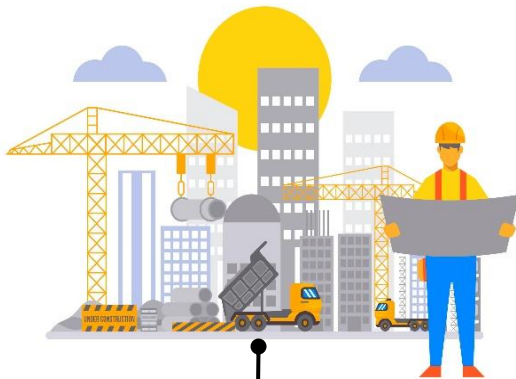


- 4 Nonetheless, the **conventional method** of construction is not efficient enough to cope with the increasing demand for development.

5



The **construction sector** is considered one of the main sources of environmental pollution in the world. It contributes to global warming as around half of all non-renewable resources consumed by humankind are used in construction, making it one of the least sustainable industries in the world (World Green Building Council, 2019).



6 The construction of buildings are responsible for almost **40% of global energy-related carbon emissions** and **50% of all extracted materials** (UNFCCC COP26, 2021).



7 The building and construction sector's demand on natural resources accelerates **climate change**, and **inefficient, unhealthy buildings negatively impact human health and wellbeing**.

8

Stated from 2021
United Nations
Climate Change
Conference, COP26

By 2050



Over **800 million** people living in more than **570** cities will be vulnerable to **sea-level rise and coastal flooding** (World Green Building Council, 2021).

1.6 billion urban dwellers will be regularly exposed to **extreme high temperatures** (World Green Building Council, 2021).



9 By 2060, the world's building stock will double and almost 70% of the global population is projected to live in urban areas (World Green Building Council, 2021).



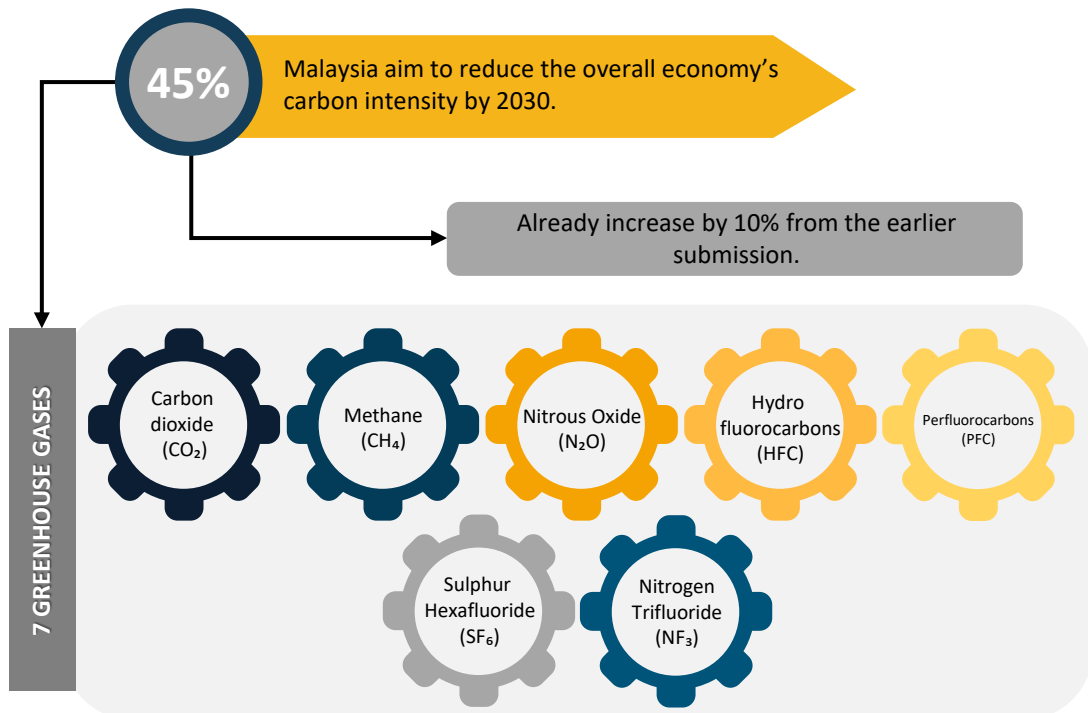
10 Nonetheless, when compared to standard technologies, **Green Technology** can help a great way to manage its carbon footprint, waste, conserve water, and use less energy.

1.2 Reality of Green Construction Industry

Sustainability is no longer just a buzzword. It is a fact that should be reflected in all aspects of the society's policy, operations and management. The construction industry is at the forefront of global and national efforts to achieve sustainable development due to the total energy, resource consumption, and carbon emissions. However, the majority of construction buildings in Malaysia and the rest of the world still implement traditional methods that are not always sustainable. Although the green construction has been demonstrated to have a major environmental impact and has been employed in the Malaysian construction for over ten years, only a few green concepts can be found in construction industries. The challenges that company experience may be the reason for the construction industry's slow acceptance of green principles.

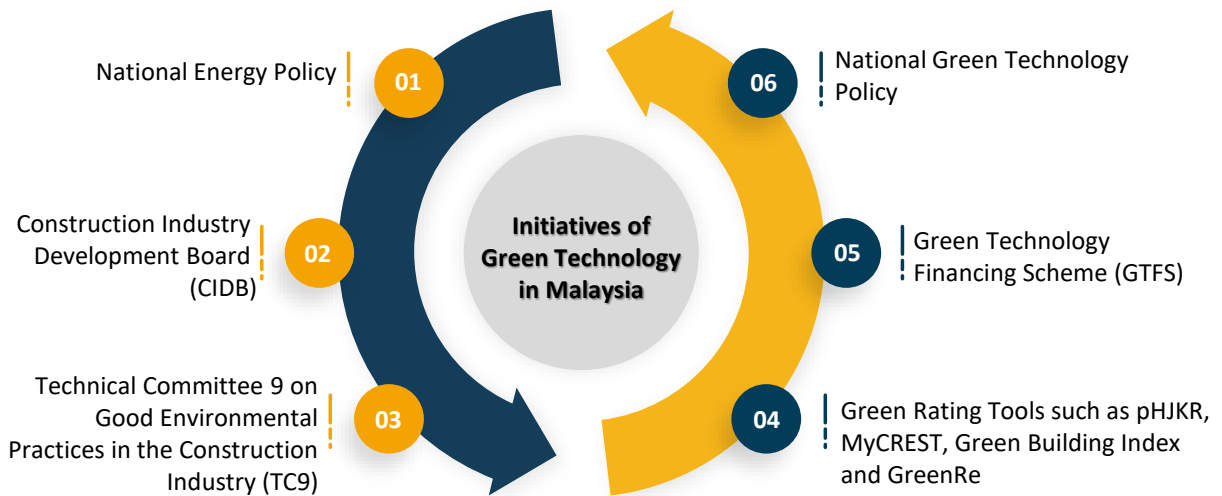


Besides that, the construction industry contributes to the prospect of the climate crisis by generating carbon dioxide (CO₂) through the development, usage of fossil fuels and material resources. According to the 2018 Global Status Report issued by the International Energy Agency (IEA), the construction industry continues to account 36% of global final energy usage and 39% of carbon-related energy use in 2017. In fact, during COP26 Malaysia has set an aim of achieving net-zero Green House Gas emissions by 2050.



Source: (Malaysian Dutch Business Council, 2021)

Additionally, the government is investing more resources, particularly in educating and attracting companies to continue to invest in the development of green construction industries in Malaysia. For example, green technology in the construction industry. This technology is one of the applications in conserving and preserving the natural resources during pre-construction, during construction and post-construction.



To summarise, in Malaysia, the management of green construction ideas are viewed as a vital component in achieving the goal of sustainability. The Construction Industry Transformation Programme (CITP) 2016:2020, for example, was announced by Malaysia's principal regulating agency for the construction industry, that consist of four key thrusts:



Positive developments in the industry have occurred as a result of this five-year programme, with significant gains in productivity among the thrusts. These efforts should be undertaken regularly to guarantee that all government initiatives supplied to companies are used to the best of their abilities in order to achieve good practices green construction industry in Malaysia. However, any issues or impediments faced by construction companies, particularly those out there, must be addressed immediately so that the initiatives supplied can be exploited to their full potential by the company.



1.3 Policy, Blueprint, Master Plan and Acts

Acts related to Construction sector

Environmental Quality Act 1974

1

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

Malaysian Construction Industry Development Board Act 1994 (Act 520)

2

Main focus encompasses three main areas:

- Enhancing construction quality through registration of construction personnel as well as skills and competency certification.
- Ensuring quality of building materials and compliance with standards.
- Contractors and site managers' responsibility to ensure the safety of buildings during or after the construction work.

Lembaga Industri Pembinaan Malaysia (Compounding of Offences) Regulations 2015

3

Offences committed under the provisions of the Malaysian Construction Industry Development Board Act 1994 (Act 520).

Construction Industry Payment & Adjudication Act (CIPAA) (Act 7)

4

It is Act to enable regular and timely payment, to create a mechanism for quick dispute settlement through adjudication, to offer remedies for payment recovery in the construction business, and to provide for related and incidental matters in the construction industry.

Street, Drainage and Building Act 1974 (Act 133)

5

On all provisions and regulations relating to roads, drainage, and buildings under the Local Authority's jurisdiction in Peninsular Malaysia.

Town and Country Planning Act (Act 172)

6

Established national, state, and local planning authorities and covers development plans, planning control (such as land and building use, permission, and appeal against a planning authority's decision), the appeal board, tree preservation orders, purchase notices, and other ancillaries/miscellaneous provisions.

Solid Waste And Public Cleansing Management Act 2007 (Act 672)

7

The Act 672 gives the executive power to the federal government to take the responsibility for solid waste management and public cleansing. The controlled solid waste includes commercial solid waste, construction solid waste, household solid waste, industrial solid waste, institutional solid waste, imported solid waste, public solid waste and time to time solid waste.

Solid Waste And Public Cleansing Management Corporation Act 2007 (Act 673)

8

Act 673 establish the Solid Waste and Public Cleansing Management Corporation with the authority to administer and enforce the solid waste and public cleansing management laws, and for other purposes.

National Land Code (Act 56)

9

The National Land Code is a Malaysian law which enacted to amend and consolidate the laws relating to land and land tenure. The main object of the Code is to ensure uniformity of law and policy with respect to land tenure, registration of titles relating to land, transfer of land, leases and charges in respect of land, easements and other rights and interests in land.

Policy and Action Plan related to Construction Sector

National Construction Policy 2030

1

To promote sustainable construction practices and ambitious new ideas interlinked with global initiatives for a more sustainable world.

National Policy on the Environment (DASN)

2

To ensure continuous economic, social and cultural progress and improve the quality of life of Malaysians through sustainable development.

Green Technology Master Plan Malaysia 2017 - 2030

3

Offers a framework that promotes the incorporation of green technology into Malaysia's planned initiatives while considering the four pillars outlined in the National Green Technology Policy (NGTP), namely energy, environment, economy, and social.

National Renewable Energy Policy & Action Plan

4

Provides long-term goals for which all stakeholders should aspire increasing the use of indigenous renewable energy resources to help ensure national electricity supply security and long-term socio-economic development.

National Policy on Climate Change

5

Serves as a framework for mobilising and guiding government agencies, industry, communities, and other stakeholders and major groups in addressing climate change challenges holistically.

National Circular Economy Council (Will Be Established)

6

Empower national circular economy, create a framework of action and embolden all parties as enablers of the national agenda.

National Low Carbon Cities Master Plan (NLCCM)

7

Aims to transform Malaysian cities into low-carbon environments while propelling Malaysia's low-carbon growth to the next level.

1.4 Purpose of Green Industry Guideline for Construction Sector

Green construction is basically based on the development and responsible management of a healthy built environment based on ecological and resource efficiency principles. To achieve green construction, stakeholders in the construction industry must take a comprehensive approach to all operations along the construction value chain. In fact, most stakeholders expect the green construction industry guideline to resolve multiple issues in the future, including the complex application process, clarification on the indicators involved, incentives provided to stakeholders, and issues related to green certificates, as per workshop and survey participants.

- 01 To provide guides to the construction industries in implementing green practices within the operations for pre, during and post-construction stages.
- 02 To provide strategic directions on green practices implementation within Malaysia's construction industry with measurable performance.

1.5 Challenges in Implementing Green Construction

With increased environmental and climate change concerns, there has been an emphasis on how new structures are commissioned and developed, significantly in relation to the users of energy, water, waste and resource efficiency. However, there are some obstacles to the adoption of green construction. Figure below shows the barriers to the adoption of green construction.

High Capital Cost

Green construction require high cost for operations and maintenance that are not willing to spend by the construction industry.

Lack of Public Awareness

Most of the people are still not aware and have knowledge of the benefits of green construction and sustainable living, making them disinterested in the idea.



Complexity Construction Process

The complexity of some green construction such as requiring technological high performance and unskilled labour may be more difficult to practice than conventional construction.

Expensive Materials and Technology

Most appropriate environmentally friendly product for a particular purpose are not available locally, thereby making materials selection extremely complex.



1.6 Scope and Application

Scope of application of the Guidelines may be used in new and existing project planning, which may not necessarily require an Environmental Impact Assessment (EIA). The guidelines are suitable for all projects and other applications that want to implement green construction practices in their organizations. The implementation of green construction practices enables the demands of development to be met with a sustainable approach. After all, the industry needs to balance economic growth, social expansion, and environmental protection. The Green Construction Guideline covers the principles of implementing Green Construction Practices and describes the implementation procedures. The Green Construction Practices Guideline is applicable in the three main stages of construction at any construction works.

The Main Stages of the Construction in Construction Projects



Pre-Constructions

Planning, design and commissioning.

Key Players

- Architects;
- Developers;
- Technical consultants;
- Urban planners; or
- Government authorities (global, national, regional & local).



Construction & Buildings

Get ready to start construction, completing activities and handling plan, establishing safety programs, and more.

Key Players

- Contractors;
- Sub-contractors;
- Site managers;
- Civil engineers;
- Environmental officers;
- Architects; or
- General construction worker; etc.



Post Constructions

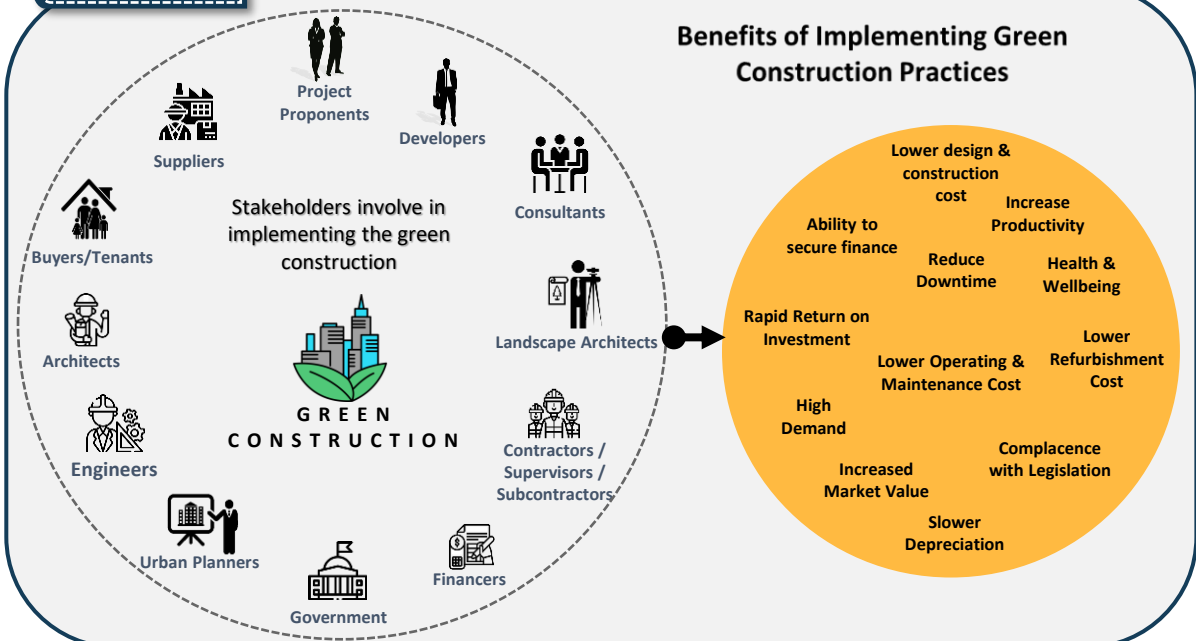
Maintenance, renovation, deconstruction, demolition, waste processing and disposal.

Key Players

- Buyers / Tenants;
- Private business; or
- Public facilities users.

Did you Know!

Benefits of Implementing Green Construction Practices





1.7 Roles and Responsibilities of Key Stakeholders

Roles and Responsibilities of the Stakeholders in Implementing Green Construction Practices

The following are the roles and responsibilities of stakeholders in practice green constructions:

01

Project Proponents

An individual or organization that has overall control and responsibility for the development of green and sustainable projects.

02

Consultants

Assist clients to make sound preparations for developing green and sustainable projects and ensure that contractors complete the project on cost.

03

Architects

Plans, designs and oversees the construction of green buildings.

04

Landscape Architects

The practice of landscape architecture includes or site analysis, site inventory, site planning, land planning, planting design, grading, stormwater management, sustainable design, construction specification, and ensuring that all plans meet the current building codes and local and federal ordinances.

05

Manufacturers & Suppliers

Manufactures and supply certificates and ecolabelling construction materials.

06

Buyers / Tenants

Purchases or rent a green building that gives positive impacts to the environment, social and economic.

07

Developers

Invests in developing or redeveloping the green and sustainable property.

08

Contractors/ Subcontractors/ Supervisors

Engages in green construction management. These consist planning, developing and coordinating of activities of a successful building construction project.

09

Financiers

Financial assistance such as bank loans will ensure the implementation of more green development which is costly to develop green building.

10

Government

Adopted regulations and policies which offer incentives as a part of promoting green building.

11

Engineers

Deals with the design, construction, and maintenance of the physical and naturally built environment, including public works such as roads, bridges, canals, dams, airports, sewage systems, pipelines, structural components of buildings, and railways.

12

Urban Planners

Review **site plans submitted by developers**. Urban and regional planners develop land use plans and programs that help create communities, accommodate population growth and revitalize physical facilities in towns, cities, counties, and metropolitan areas.

1.8 CASE STUDY

MALAYSIA ENERGY COMMISSION HEADQUARTERS (DIAMOND BUILDING)



Photo by Lin Ho. Courtesy of Putra Perdana Development Sdn. Bhd.

Location: Putrajaya, Malaysia (15 miles south of Kuala Lumpur)

Owner: Energy Commission of Malaysia

Principle Use: Office

Employees / Occupants: 400

Occupancy: 100%

Gross Square Footage: 158,075

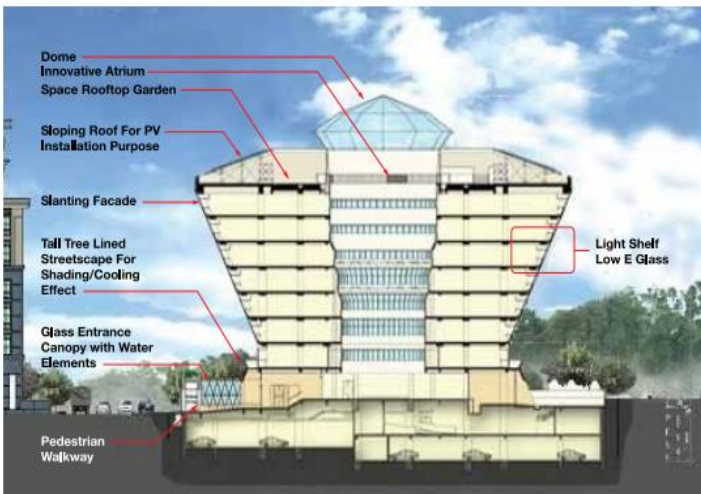
Conditioned Space: 123,450

Distinctions/Awards: ASEAN Energy Award, 2012; ASHRAE Technology Award 2013 (Second Place, Category I); Green Mark Platinum, 2010 (Singapore); and Green Building Index (GBI) Platinum, 2010 (Malaysia).

Total Cost: USD\$21.5 million

Cost Per Square Foot: \$136

Substantial Completion/Occupancy: June 28, 2010



Diamond Building Design Station

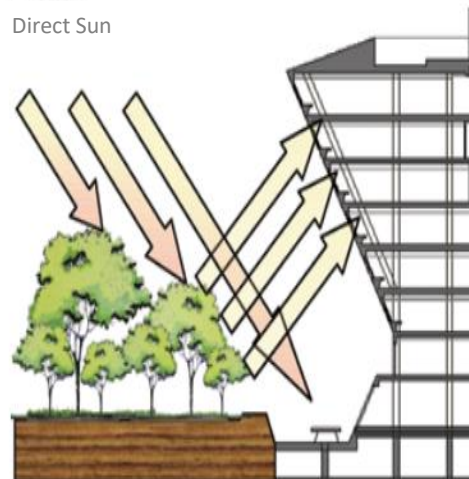
Source: (Malaysia Green Building Council, 2021)

Design Features

From the dome over its roof to its sunken garden and car park, every space within the Diamond Building is designed with functionality using state-of-the-art technology to optimise energy and water efficiency and indoor and outdoor environmental quality.

Facade

The building geometry with the 25-degree inclining facade was sculpted following the solar path. The north and south facades enjoy full self-shading, particularly from the hottest mid-day hours whilst the east and west facades are protected from direct penetration of sunlight, reducing solar impact by 41%. With the tilted e-glazing glass, direct sunlight is diffused; reflected off the landscape to provide glare-free day-lighting for the building whilst promoting heat minimisation.



Sunlight is diffused and reflected off the landscape, reducing heat gain into the building.

Source: Malaysia Green Building Council, 2021

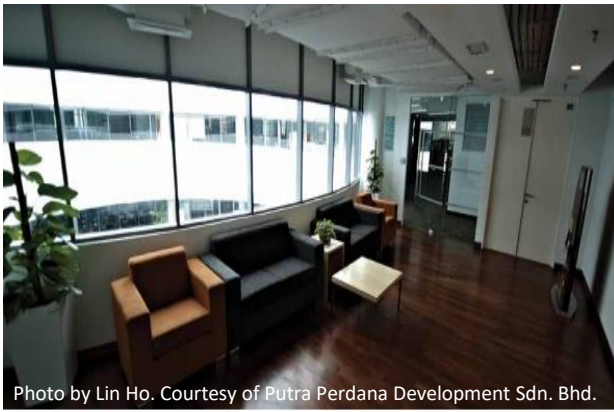


Photo by Lin Ho. Courtesy of Putra Perdana Development Sdn. Bhd.

The Diamond Building is designed to obtain at least 50% of its daylighting needs from natural lighting.

Energy Efficiency

This is made possible with the adaptation of green technologies into the design and build of the Diamond Building which ensures that natural resources are preserved and utilised in a sustainable manner while renewable energy is harnessed effectively as an alternative power source that fuels not only the building itself but the entire eco-system that resides within it.

Sunken Garden Area

01

The sunken garden located at the basement serves as a void space which provides natural ventilation to the parking area at the basement level.

Advanced Air Filtration (Electrostatic Precipitator)

02

This air cleaner ensures good indoor air quality (IAQ), especially during the time open burning in Indonesia causes haze.

Photovoltaics

03

The building is installed with thin film telluride module type photovoltaic (PV) panels, with a total installed capacity of 71.4 kWp, fed indirectly to the national grid. This total capacity produced is estimated to cover approximately 10% of the building's energy needs. In general, the expected electricity generated is 102,000 kWh per year which is equivalent to RM40,000 cost savings annually or an avoidance of 63,000 kg annual carbon dioxide (CO₂) emission.

Energy-Efficient Electric Lights

04

General office lighting is ceiling suspended with electronic ballasts and T5 tubes of 104 lumen/W efficacy. Compact fluorescent downlights are used in the common areas and T5 light fittings are used in the garage.

Insulated Concrete Roof

05

To reduce heat absorption in the building, the rooftop area is insulated using boards with a thickness of 100mm. The concrete roof is tightly insulated both horizontally and vertically.

Daylight Responsive Lighting Control

06

To maximize daylighting, the artificial lighting system is daylight responsive. Two light sensors are installed on each façade with one additional sensor on the first floor to measure the atrium light level. A building automation system (BAS) centrally controls electric lights in the daylight zones via light sensors. All worktables have individual task lights, providing flexibility and comfort of individual light control.

Skylight

07

At the lounge area outside the small theatre on level seven is a skylight that takes in mostly diffuse light from the southern part of the sky. The skylight brings sufficient light to illuminate the lounge area, eliminating the need for electric lights during the day.

Water Efficiency

The Diamond Building incorporates effective management of water resources through the following systems:

● **RAINWATER HARVESTING**

Using rainwater for toilet flushing and irrigation has reduced annual potable water consumption by 35% compared to potable water otherwise used for industry standard water fittings and irrigation as defined by the Green Building Index. Rainwater is collected from the 7,530 ft² (700 m²) catchment area dome and stored in four 2,600 gallons (10,000 L) rooftop tanks.

● **EFFICIENT WATER FITTINGS**

These reduce potable water use by more than 67% compared to conventional plumbing fittings. These included dual flush toilet system, waterless urinals and water taps with aerators for economical water flow.

● **GREY WATER RECYCLING**

Wastewater (grey water) from toilet washbasins and floor traps are collected and discharged to irrigate the mini wetland area. The greywater irrigates the plants within the wetland via a subsoil soaker hose.



Photo by Lin Ho. Courtesy of Putra Perdana Development Sdn Bhd.

Rainwater downpipe

✓ The building's eco-friendly measures cost USD\$1 million, representing about 6% of the total construction cost. Savings of almost USD\$333,000 annually in operating costs from energy efficiency (USD\$317,000) and solar power generation (USD\$15,000) result in an estimated payback of 3.5 years despite Malaysia's subsidized utility tariff rates.



Scan here

Reference Document:
Diamond Building Brochure

1.9 CASE STUDY

S11 HOUSE, PETALING JAYA, SELANGOR, MALAYSIA.



Source: Cheah, J. 2015

Design of the front of the house S11

S11 House is Malaysia's first Green Building Index Platinum rated house that won the Tropical Building Category of the ASEAN Energy Awards in 2013. It is in Petaling Jaya, Selangor and it is designed by Ar. Dr. Tan Lake Mun. It is a green tropical house which is conceptualized along the lines of a tree. A lot of sustainable design strategies and passive designs are used in order to maintain the thermal comfort of the building such as the stack ventilation, cross ventilation, overhang roof, building orientation and building material.



Source: Cheah, J. 2015

Front elevation drawing of S11 House

Salvaged materials used in S11 house

Much of the demolished old house materials from the 1960s house were reused for the constructions of the S11 house.

Old crushed concrete

01

Crushed concrete was reused for backfilling aggregate in the S11 house. Concrete is inherently difficult to dispose because it is heavy and hard to transport. Reusing these materials also lessens the load on our landfills. Another added benefit of using these materials is the reduction of CO₂ emissions associated with concrete production. Using old concrete to produce aggregate takes less energy than mining virgin aggregate and it helps to conserve virgin aggregate supplies.

Old clay brick

02

The architect cleaned and reused old clay bricks for feature walls. In the S11 house, natural fair-faced red clay bricks baked in a kiln are used as main feature walls in the home interior because brick is high thermal mass material. Brick absorbs and stores heat, and then slowly releases it. Brick remains warm or cool long after the heat or air-conditioning has shut off, so it reduces heating, cooling loads and energy consumption.

Recycled timber

03

Timber is a valuable resource that is repairable, renewable and can be diverted from landfill. For the construction of the S11 house, roofing timbers were used for formwork strutting and propping. The recycled timbers are all Forest Stewardship Council (FSC) certified while old recycled "chengal" were reused for the ground floor decking timbers.

Recycled stonework

04

The architect collects leftovers from granite manufacturers and project rejects. These leftovers typically would go to the landfill, but the architect is able to salvage them by using essentially a large-scale cutter that stamps the stone into the shape of pavers, floor tiles and backsplash material. All these materials are used for bathrooms, driveway and ground floor living areas.

Concrete

05

Concrete is resource-efficient, and the ingredients require slight processing. The amount of CO₂ produced during manufacturing and the net impact of using concrete as a building material is relatively small. In the S11 house, concrete is widely used as pavement and exterior cladding, it helps to reduce the urban heat island effect thus minimizing the energy required to cool the building. Therefore, less energy is needed to achieve thermal comfort for the user artificially.

Space Planning

Successful space planning can reduce waste and avoid unnecessary renovation or destruction in the future. Moreover, it can increase energy performance and comfort by placing spaces near or away from the sun, heat, breezes and views. Space planning also provide important economic and environmental value. For example, to reduce the need on artificial lighting and cooling.



Source: Cheah, J. 2015

FRONT ELEVATION

Openings and windows facing north.

The swimming pool and koi pond are located at two extreme north-south ends and provide evaporative cooling for the house. Evaporative cooling acts as a heat sink and helps to passively cool buildings, reducing the energy needed for air conditioning. Wind and buoyancy caused by air temperature differences generate air pressure differences throughout occupied spaces. Moreover, most of the internal partition walls were removed to promote cross-ventilation and to create unobstructed space between the living room, the koi pond and the pool. S11 house is designed to enhance these natural air flows and take advantage of them rather than work against them. In general, thermal comfort has been achieved in S11 house ARC 2213/2234 Asian Architecture.

The S11 house has a clear north-south orientation for all its openings and windows. Instead, adjustable windows and openings are used to promote controllable cross ventilation. The double volume family room is positioned on the first floor with the 7-meter-high full sliding glass walls, facilitating maximum cross ventilation whilst also opening the entire internal living space into the outdoor deck. It allows the naturally happening airflow patterns around and, in a building, to lead outdoor air into the space, thus leaving a cross-ventilation effect.



S11 house ground floor plan.

Source: Cheah, J. 2015

Maximizing daylight by space planning

The S11 house was planned in a way to maximize daylighting but not at the expense of creating unpleasant working conditions in space. This is particularly essential in the S11 house because the south side of the building will create a lot of natural light, so the architect controls the direct-beam sunlight by using internal and external shading devices, horizontal and vertical louvres. For good daylighting, the S11 house oriented on an east-west axis that maximizes north and south exposure. This green tropical house was planned for the site and conceptualized along the lines of tree which help to filter and distribute the light. The design intention is to provide the occupants with a brighter space while cooking and having breakfast. However, a cooler place with less heat gain is formed while having dinner in the evening.



Source: Cheah, J. 2015

Vegetation helps to filter and distribute the light.



Source: Cheah, J. 2015

Internal lightings in S11 house.



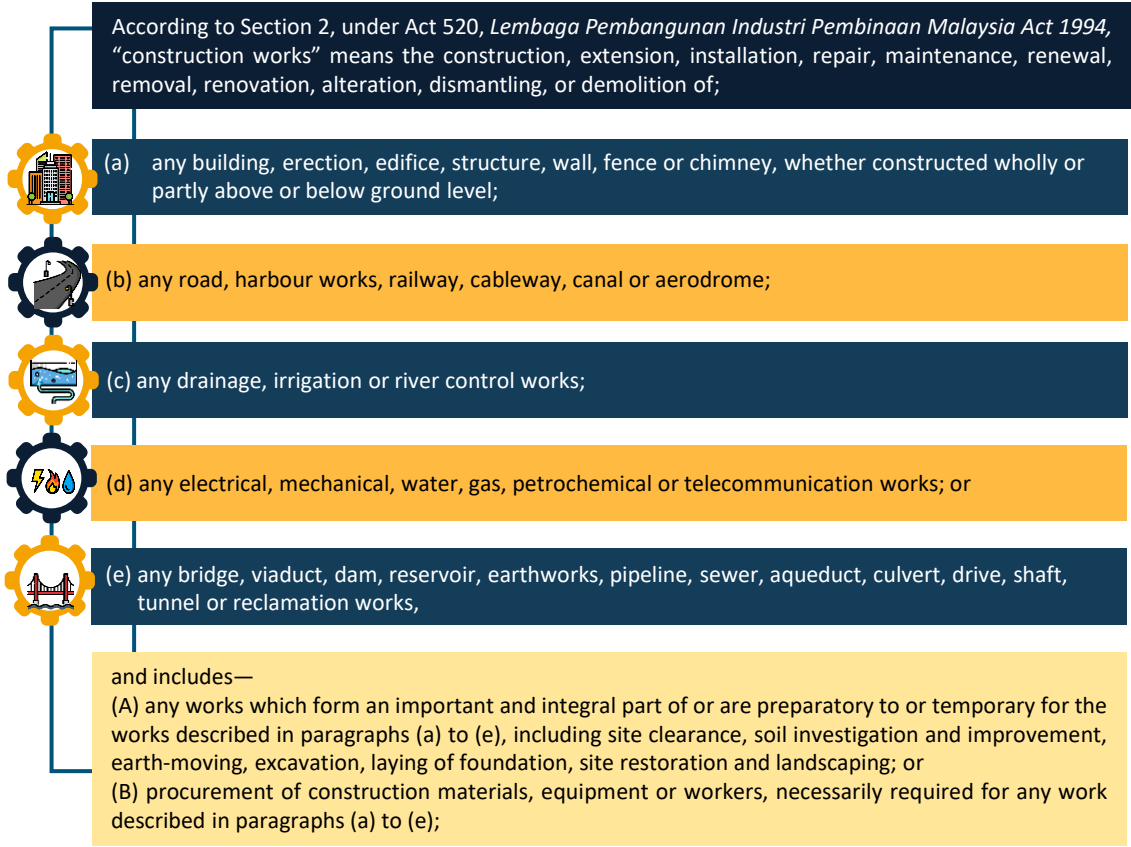
2

CHAPTER

DEFINITION

2.1 Definition of Construction Sectors

Construction Sectors




2.2 Definition of Green Construction

The adoption of sustainable and green construction has become an important subject in Malaysia and has been duly highlighted under the Malaysian Construction Industry Master Plan (2006-2015). The public's awareness and interest in how buildings affect the environment, worker productivity, and public health is growing in Malaysia. As a result, the public and private sectors are beginning to demand buildings that reduce energy consumption, increase resource efficiency, and improve indoor air quality. Developers, owners, operators, insurers, and the public are beginning to recognise and embrace the advantages of green construction. The definition of green construction in this Guideline is as follows:

DEFINITION

The industry related to construction works, including design, manufacturing, technology, material and workmanship and services for purposes of construction based on environmental principles and resource efficiency prior pre-construction, during construction and post construction.
(Adapted from U.S. Green Building Council, LEED, 1994)



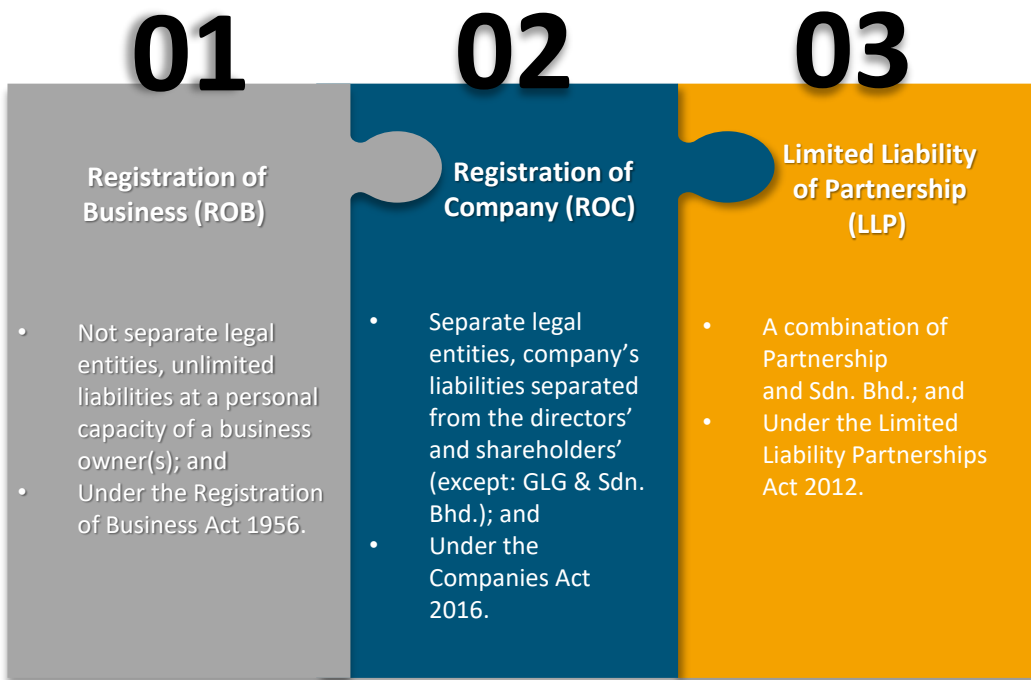
To eliminate or reduce the negative environmental effects on the design, construction and operation phase.

Green buildings use less energy and natural resources, which helps to reduce the amount of waste and pollution we create.



2.3 Categories of Companies

A category of companies can apply this Guideline during construction to ensure that sustainability concepts are followed. Nevertheless, the impacts towards the demand of development consequently enforced the implementation of green construction to meet sustainable development. The Guideline also applicable to small and medium enterprises (SMEs) in construction sectors who face financial difficulties', labour shortages, and a lack of technological adoption in implementing green construction.





3

CHAPTER

GUIDING PRINCIPLES
TOWARDS GREEN
CONSTRUCTION

3.1 MALAYSIA ZERO-NET CARBON VISION 2050

carbon-neutrality

45 percent reduction in emissions intensity of GDP by 2030



Guiding Principles

A net-zero carbon building is highly energy efficient with all remaining energy from on-site and/or off-site renewable sources. The guiding principles to achieve net-zero carbon are:

● Measure and Disclose Carbon

Carbon is the ultimate metric to track, and buildings must achieve an annual operational net-zero carbon emissions balance based on metered data.

● Reduce Energy Demand

Prioritise energy efficiency to ensure that buildings are performing as efficiently as possible and not wasting energy.

● Generate Balance from Renewables

Supply remaining demand from renewable energy sources, preferably on-site followed by off-site, or from offsets.

● Improve Verification and Rigour

Over time, progress to include embodied carbon and other impact areas such as zero water and zero waste.

Adapted:
World Green Building Council, (2021)

General design strategies in achieving net zero carbon can be applied through:

7 DESIGN STRATEGIES

01 Reducing virgin materials demand.

02 Reducing fossil energy demand.

03 Repurposing existing buildings and materials.

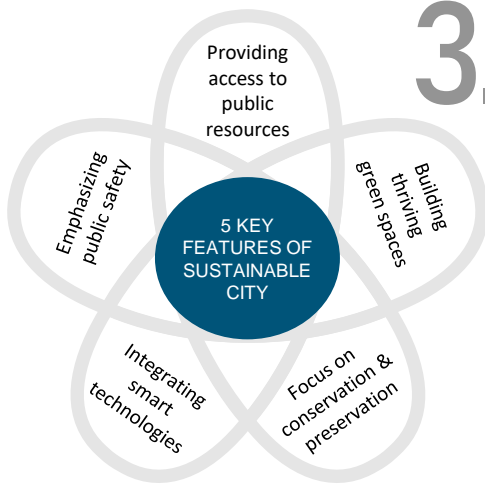
04 Reducing the need for material replacements during building life-cycle by choosing longer-lasting products.

05 Designing for adaptability, deconstruction and reuse: making your own materials and buildings repurposable.

06 Replacing fossil energy elsewhere.

07 Sequestering (biogenic) carbon.

3.2 ENABLING SUSTAINABLE CITY



Green practices in construction help cities adapt to the changing climate while also enhancing climate resilience and providing other critical benefits, including cleaner air and water. Cities are engines for development, and increasing urban populations provide connection and opportunity. But cities can also exacerbate some of the world’s most serious environmental and socio-economic challenges.

Source: Gibson, R. B., Hassan, S., Holtz, S., Tansey, J., & Whitelaw, G. (2005).

GUIDING PRINCIPLES FOR SUSTAINABLE URBAN DEVELOPMENT

Rethinking spatial planning

towards transit-orientated development based on development of high-density, mixed-use neighbourhoods, served by a high-quality public transport hub and good quality pedestrian and cycle infrastructure.

Rethinking infrastructure & utility design

towards low carbon decentralised energy and water systems.

Rethinking way materials flow

towards redesigning goods and services to be readily reused, reconditioned & recycled to reduce pollution whilst creating new economic opportunities.

Rethinking building design

towards more efficient in its use of energy, water, materials and land and is designed to adapt to demographic, technological and social change.



Redesign public parks

towards inclusive & more parks, rivers, boulevards and public squares to help address climate resilience, enhance quality of life, provide outdoor play space, improve air, water quality and mitigate against noise pollution.

Rethinking cities design

towards resilient economies by embracing change, supporting investment in universities, creating environments that promote innovation and engaging the private sector in supporting the communities in which they operate.

Reengaging communities

towards low carbon, high quality, lifestyles and encouraging people to actively engage in the governance, management and operation of cities, neighbourhoods and public institutions.

Repurposing governance structure

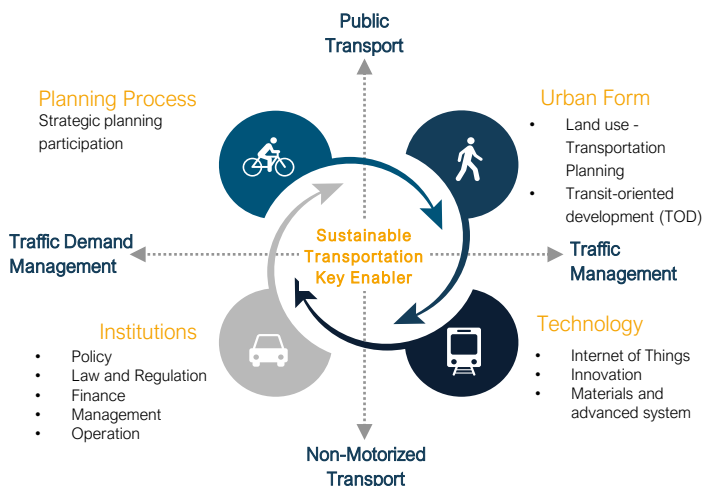
towards more transparent and able to engage communities in creating places that are healthy, vibrant, inclusive and resource efficient.

3.3 SUSTAINABLE URBAN TRANSPORTATION

Developing effective approaches of urban transportation to manage a variety of connected urban concerns are vital, including low-density sprawl, air pollution, and traffic congestion.

GUIDING PRINCIPLES

Transit-Oriented Development (TOD) is an effective approach of urban transportation development that promotes a compact, pedestrian-scaled, mixed-use development strategically positioned within a short walk of high-capacity transportation. TOD allows for residential, commercial, and recreational places to be built within walking distance of public transportation, such as a light rail line. This close proximity shortens commuting times and decreases production losses caused by traffic congestion. The goal of TOD is to make walking, biking, and taking public transportation more convenient, safe, and comfort in everyday life.



Source: Excerpted from Transportation Oriented Development Standard, 3rd Edition by the Institute for Transportation & Development Policy (2017).

WALK

Develop neighbourhoods that promote walking as an active transportation mode.

CYCLE

Prioritise non-motorised transport networks with safe spaces and facilities for cyclists, such as cycle lanes and parking.

CONNECT

Create dense networks of streets and paths.

TRANSIT

Locate development near high-capacity, reliable public transit.

MIX

Plan for mixed-income, uses and demographics.

DENSITY

Optimise density, including by absorbing urban growth with taller buildings.

COMPACT

Create areas or within-city regions with short transit commutes.

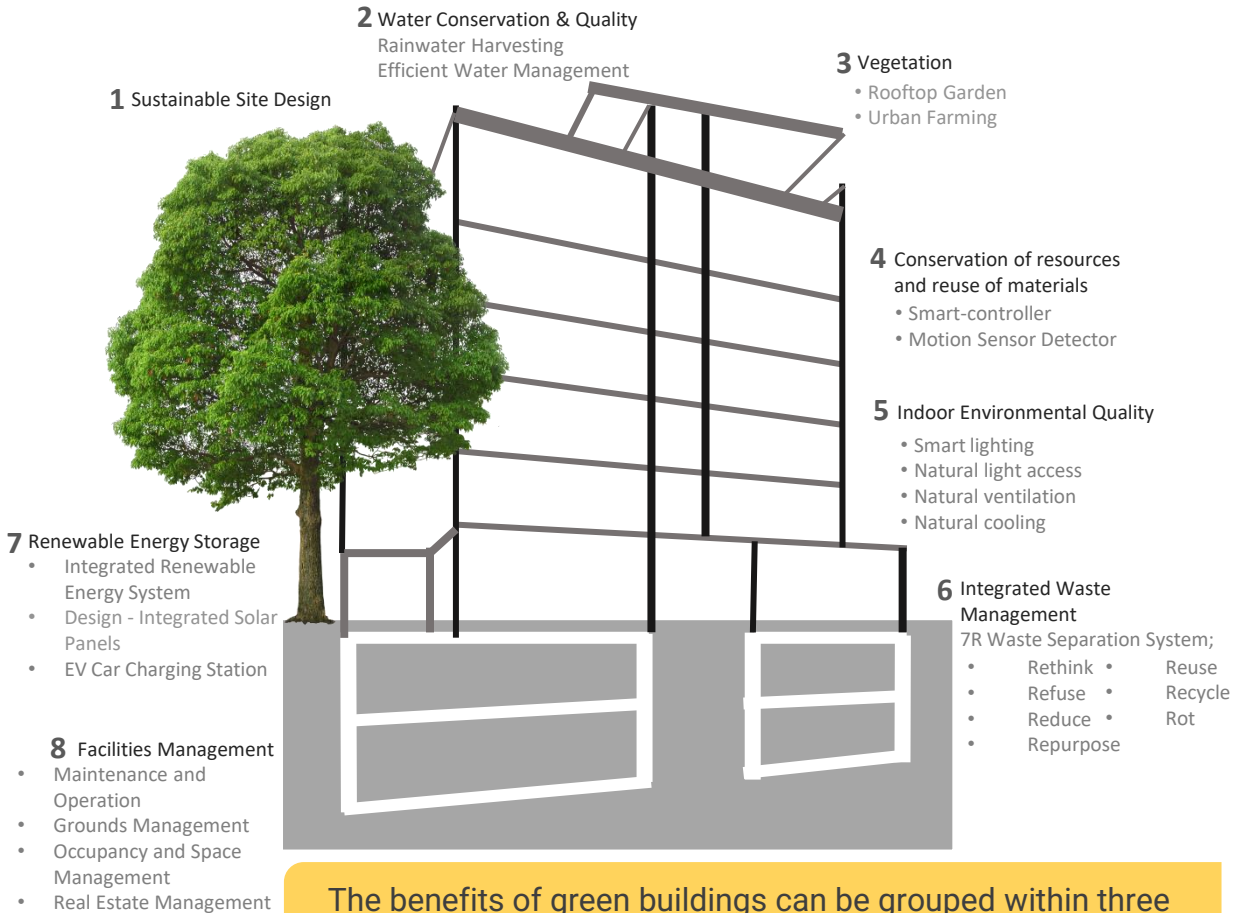
SHIFT

Increase mobility by regulating parking and road use.

3.4 BASIC PRINCIPLES OF GREEN BUILDING

The balance between exploitation and protection of natural resources in the construction industry can be achieved through the application of eco-friendly building materials and construction processes based on the concepts of energy conservation and recycling.

Green practices of construction involves the use of materials and processes that are resource-efficient and environmentally responsible throughout the life cycle of a building within the inter-relationships and associated cost and performance trade-offs. Eight (8) basic principles of green public building that can be applied are:



The benefits of green buildings can be grouped within three categories: **environmental, economic and social.**

Source: Excerpted from Green Buildings Workbook: A Guide for IDB Practitioners, developed by Milena Breisinger, Manela Diez and Christoph Tagwerker (2013).

ENVIRONMENTAL

Green buildings have positive impacts on the environment (at the building or city scale) by generating energy or supporting biodiversity, eliminating negative environmental consequences by using less water, energy, or natural resources.

ECONOMIC

Green buildings offer several economic or financial benefits relevant to a range of different groups of people. These include cost savings on utility bills (through energy & water efficiency); lower construction costs & higher property value; increased occupancy rates or operating costs.

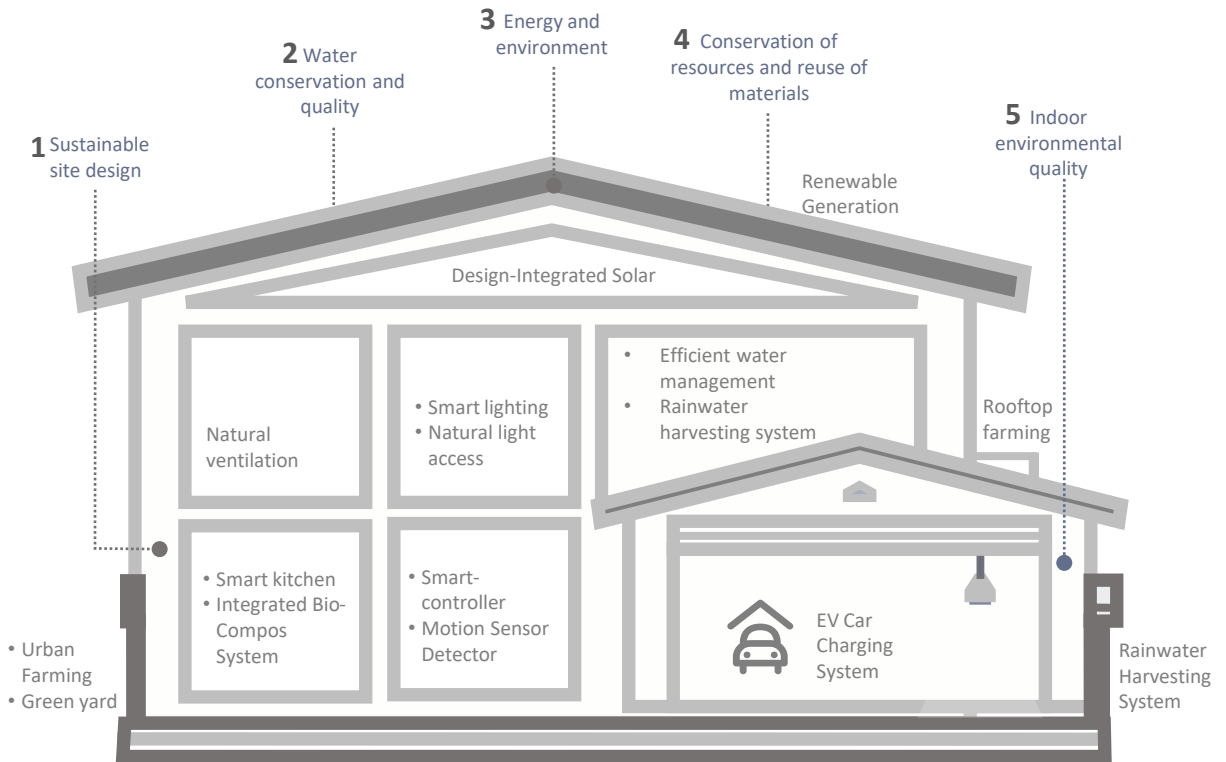
SOCIAL

Green buildings bring positive social impacts around the health and wellbeing of people who work in green offices or live in green homes.

3.5

5 BASIC PRINCIPLES OF FUTURE GREEN HOME DESIGN

Green investment in future house construction should be emphasized on principles of less water consumption, optimization of energy efficiency, conserving of natural resources, generating less waste and providing healthier spaces for occupants, as compared to a conventional building.



Source: Excerpted from the Beyond Green™ Guidelines for High-Performance Homes, 6th Edition by the Sustainable Buildings Industry Council (2016).



Towards Net-Zero Home

- Home Performance Improvement**
 Comfort, quality and design will increase the value.
- Costs Stabilize**
 Renewable energy, smart home system for feasible future cost operation and management.
- Resilient and Long-Term Return**
 Well-prepared for power outages and future limited resources.
- Reduce Carbon Footprint**
 Energy production, smart integrated-design and system, better living standard and quality.

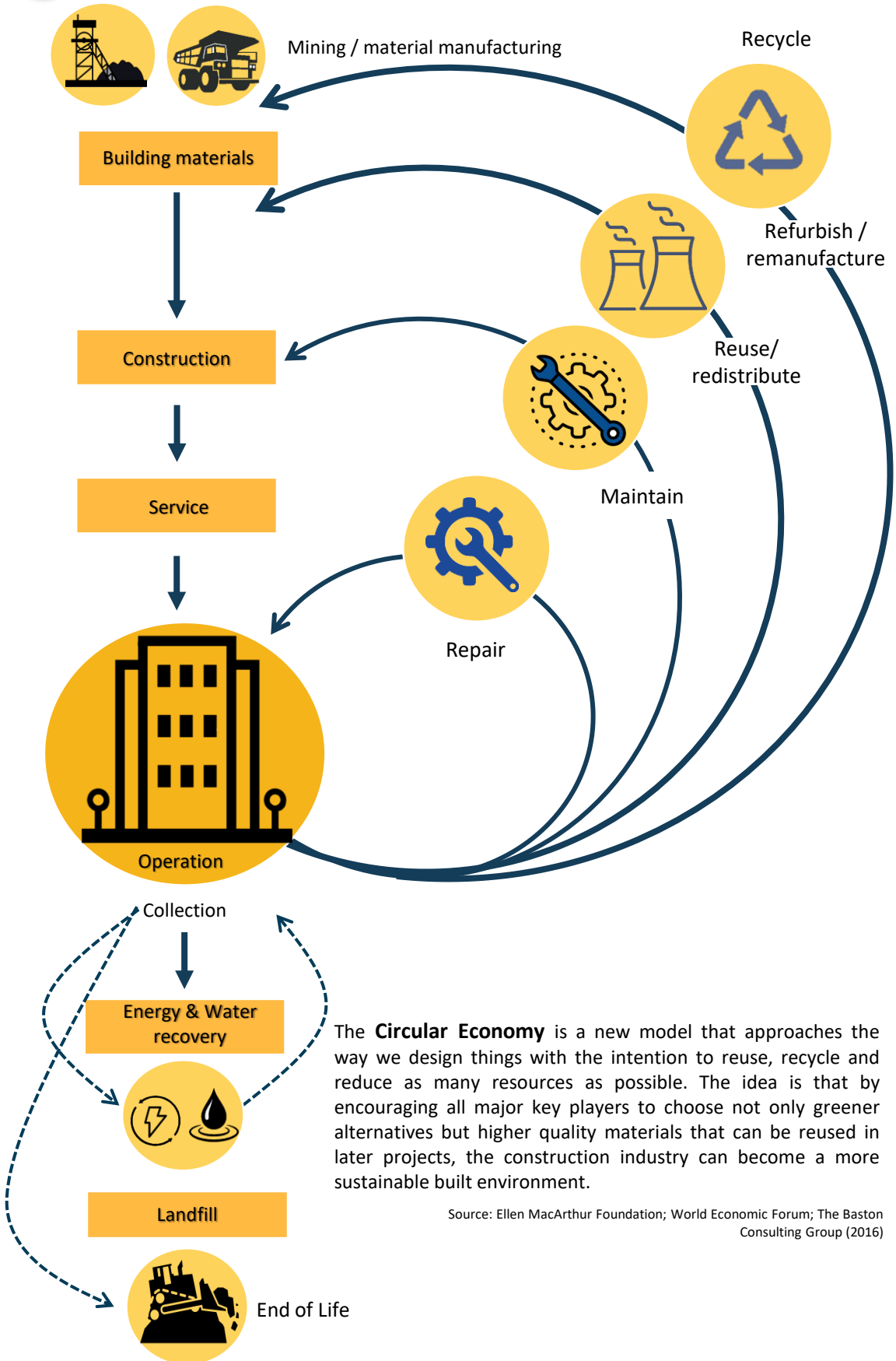
Investing in green technology is the most **efficient way** to achieve a variety of global goals, including combating climate change, building sustainable and vibrant communities, and boosting economic growth.

3.6 MALAYSIA GREEN RATING TOOLS



Malaysia's industry recognised **Green Rating Tool** for buildings to promote sustainability in the built environment and raise awareness among Developers, Architects, Engineers, Planners, Designers, Contractors and the Public about environmental issues and our responsibility to the future generation.

3.7 Circular Economy Principles in the Construction Value Chain



The **Circular Economy** is a new model that approaches the way we design things with the intention to reuse, recycle and reduce as many resources as possible. The idea is that by encouraging all major key players to choose not only greener alternatives but higher quality materials that can be reused in later projects, the construction industry can become a more sustainable built environment.

Source: Ellen MacArthur Foundation; World Economic Forum; The Baston Consulting Group (2016)



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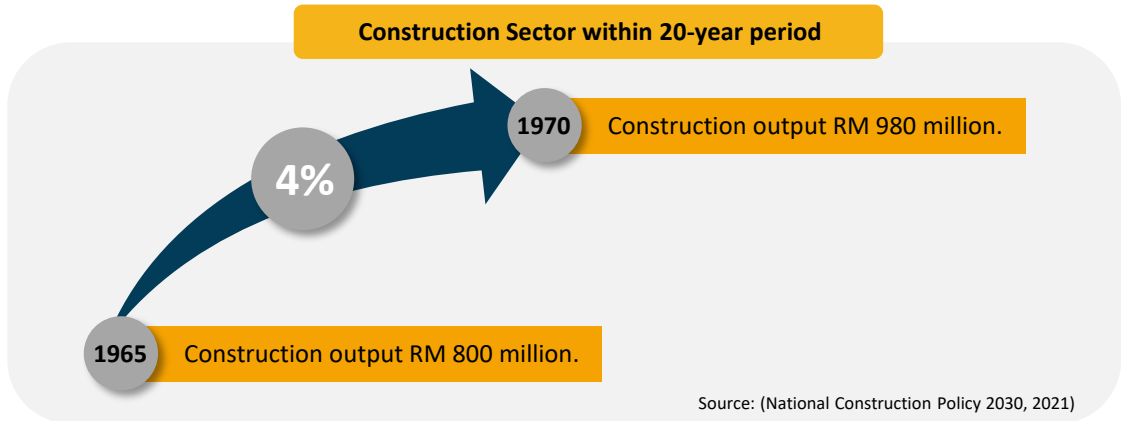
CHAPTER

GREEN
CONSTRUCTION
PRACTICES &
INDICATORS



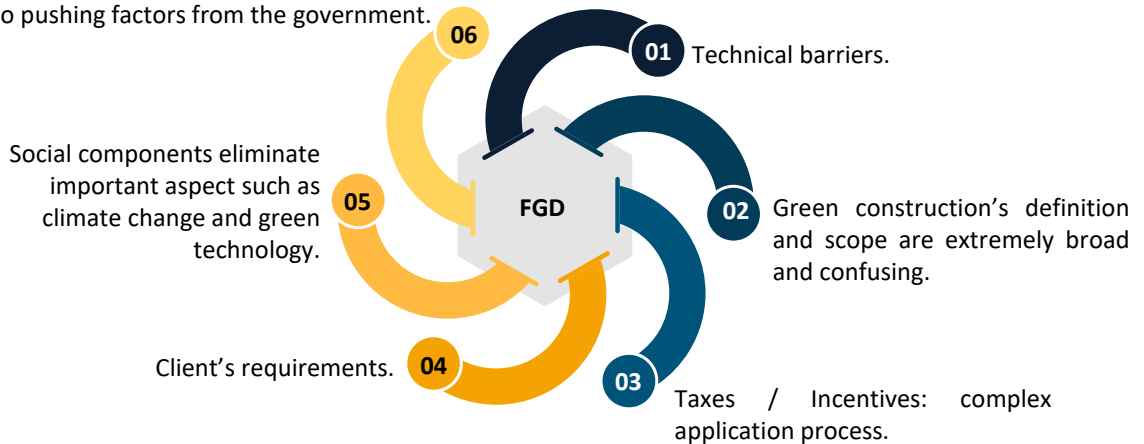
4.1 Introduction

Malaysia's construction business has risen tremendously, with a direct impact on the national economy and national growth as a whole. Commonly, the green construction movement in developing countries like Malaysia tends to focus on the relationship between construction, human development and environmental elements. The construction sector is confronted with significant hurdles in terms of green construction.

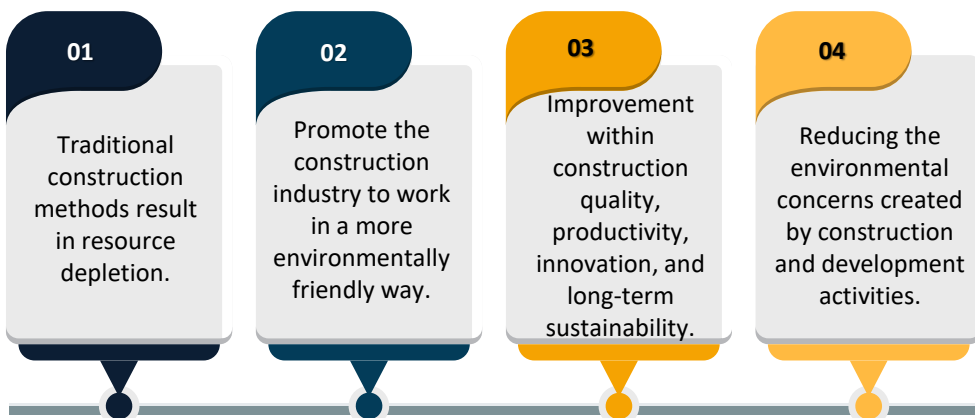


Stakeholders on the subject during Focus Group Discussion (FGD) have defined the challenges for adopting green construction in Malaysia, and some of the issues raised include:

No pushing factors from the government.



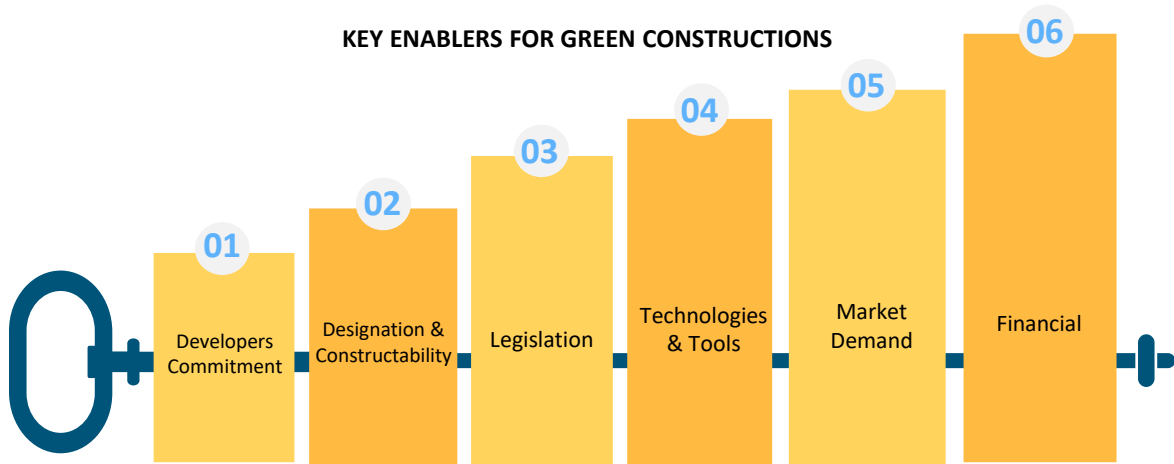
Based on the issues that arise in green construction, the government has reached a turning point in order to ensure the comprehensive development can be done in this sector. There are several major reasons why a specific standard for green construction should be developed, including the following:





4.2 Key Enablers for Green Construction

The construction sector is distinguished by a complex supply chain and a diverse set of entities with competing or conflicting interests. To make green construction work, all stakeholders must work together closely because all design, construction, and user behaviour domains must be highly compatible. All stakeholders must understand and guarantee that their activities and decisions contribute as little as possible to the overall environmental load. In building a sustainable industry, diverse stakeholders must be proactive and supportive of one another, to achieve collective progress in all aspects of development. These enablers will aid in the improvement of targets or strategies at the micro-level, which will have an impact on the macro-level.



Developers Commitment

- Committed developers ensure all the stakeholders in the supply chain commit to the requirements of sustainable construction. The commitment must be manifested suitably through the terms of contract between the parties.

Designation & Constructability

- For the construction process to be sustainable, the project design must be sustainable first. The project design must be in line with the end-user requirement. A conflict-free design is possible only with due consideration of designability and constructability aspects in the early stages of construction.
- In terms of benefits, the enabler helps in the reduction of rework, waiting times and over-processing.

Legislation

- Government policy support in the form of incentives, help in reducing the resistance of organisations to make their practices more sustainable.

Technologies & Tools

- Technology and tool focus on eliminating risk, making things measurable and comparable. Examples are dependency on available technology, tool customization, frameworks and benchmarks.

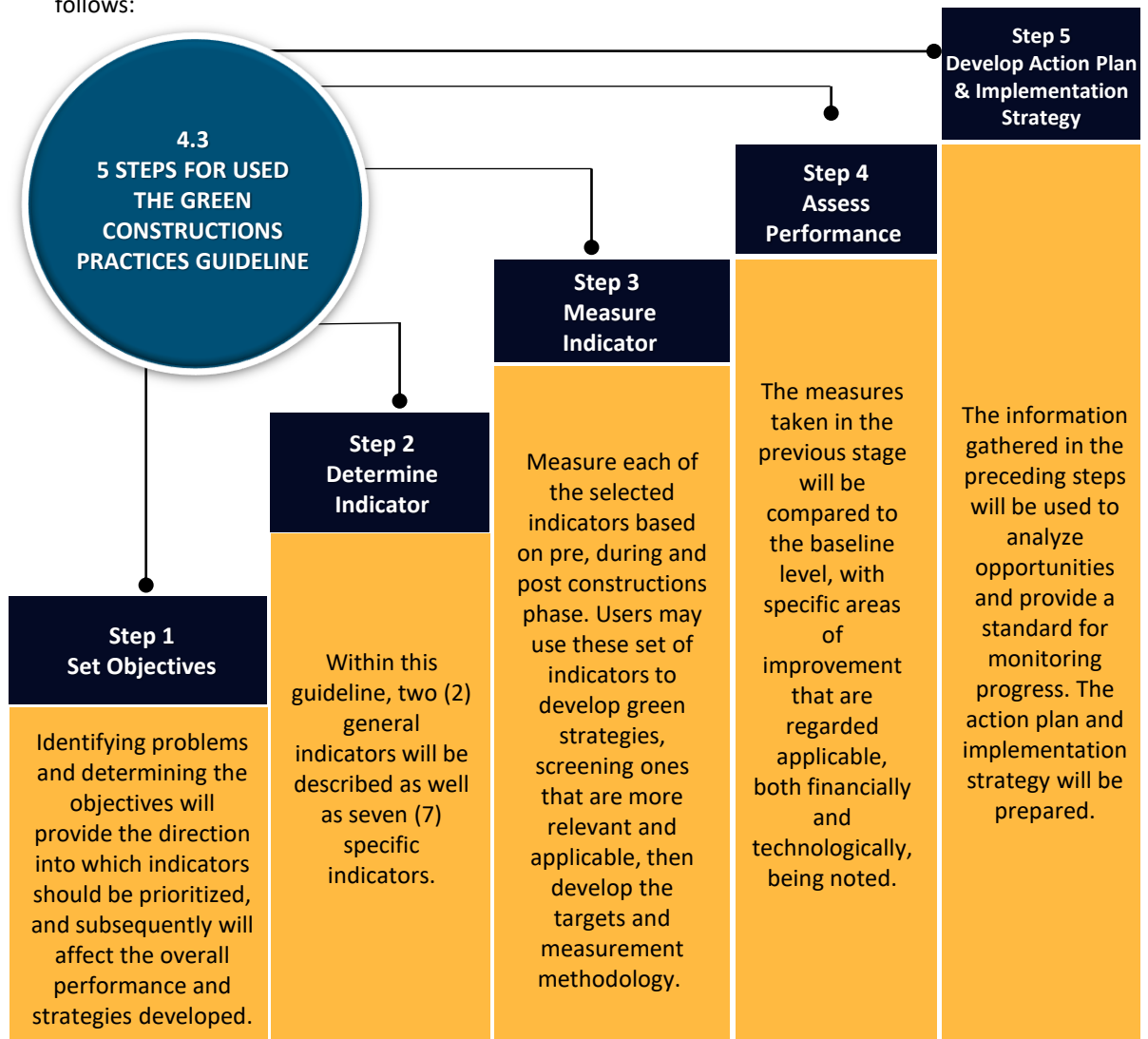
Market Demand

- Market focusses on the demand of the customer, influence of the customer, level of competition in the market and knowledge amongst customers.
- High market penetration also implies the presence of greater acceptability amongst user communities. Local support is strengthened when groups respond with community-focused sustainable activities.

Financial

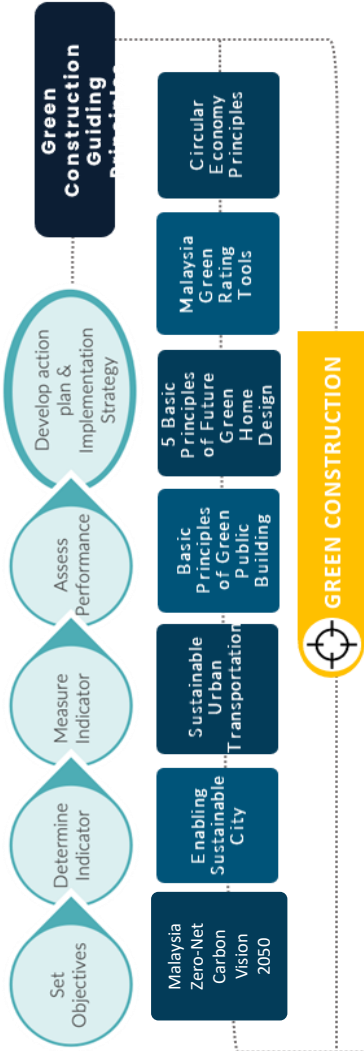
- The Government is encouraging local and foreign investors to venture into the development of green construction. The active participation of the investors will ensure the implementation of green construction in the future.
- The Government has provided several measures, including incentives to ensure continuous returns for medium to longer-term to the country's economic development and attract more investors.

The steps outlined below can be applied to develop actions and implementation plans in applying green construction practices in existing and future operations, based on indicators focusing on construction management, construction innovation, resourced and materials, demolition and construction waste, water consumption and energy consumption, noise and air quality and Biodiversity. Therefore, it is recommended for users of this Guideline to utilise the five (5) steps as follows:



4.4 Directive Framework for Achieving Green Recognition

STEPS OF GREEN PRACTICES IMPLEMENTATION



BARRIERS & CHALLENGES

- High Capital Cost
- Complexity Process
- Lack of Awareness
- Expensive Materials & Technology

GREEN PRACTICES GUIDELINE
5 principles

- Efficient usage of natural resources;
- Reduce negative environmental effects;
- Use less energy;
- Cost effective; and
- Reduce the amount of waste and pollution.

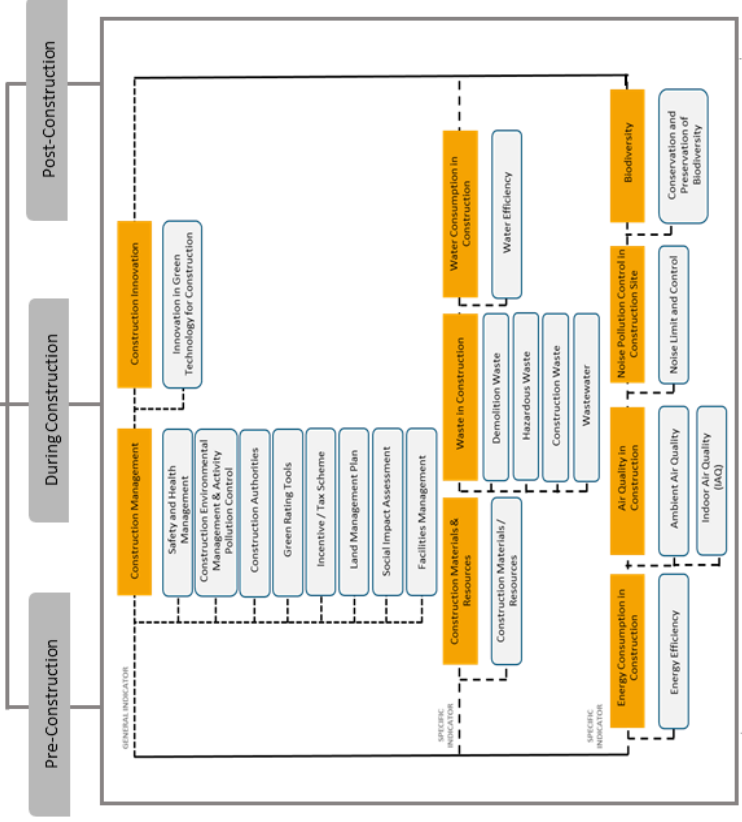
DRIVERS & OPPORTUNITIES

Strategic directions on green practices implementation in Malaysia's constructions industry with measurable performance.

KEY STAKEHOLDERS

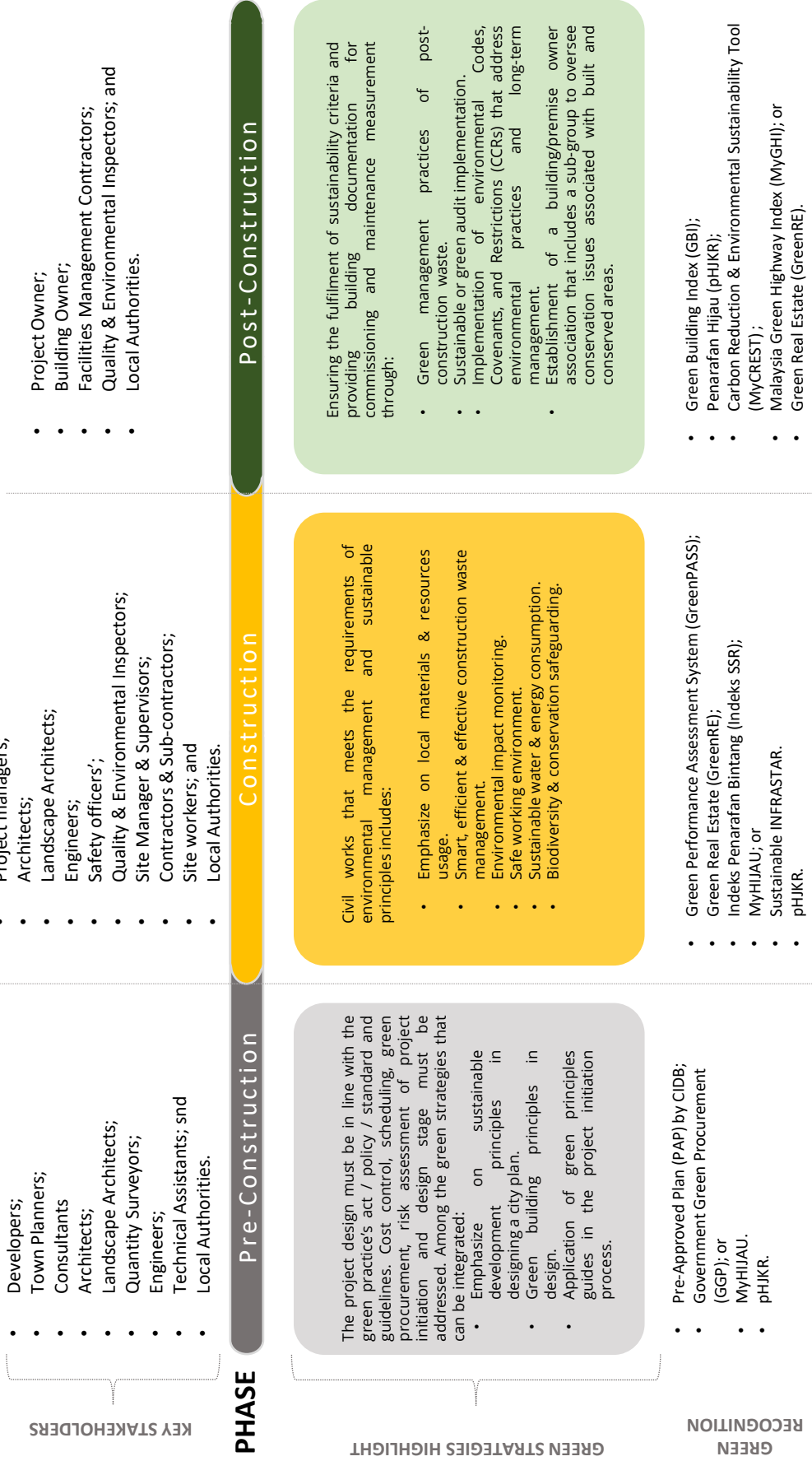
- Developer
- Town Planner
- Architect
- Landscape Architect
- Quantity Surveyor
- Engineer
- Technical Assistant
- Local Authority
- Project manager
- Quality & Environmental Inspector
- Site Manager & Supervisor
- Contractor & Sub-contractor
- Site worker
- Project Owner
- Building Owner
- Building Management

GREEN CONSTRUCTION



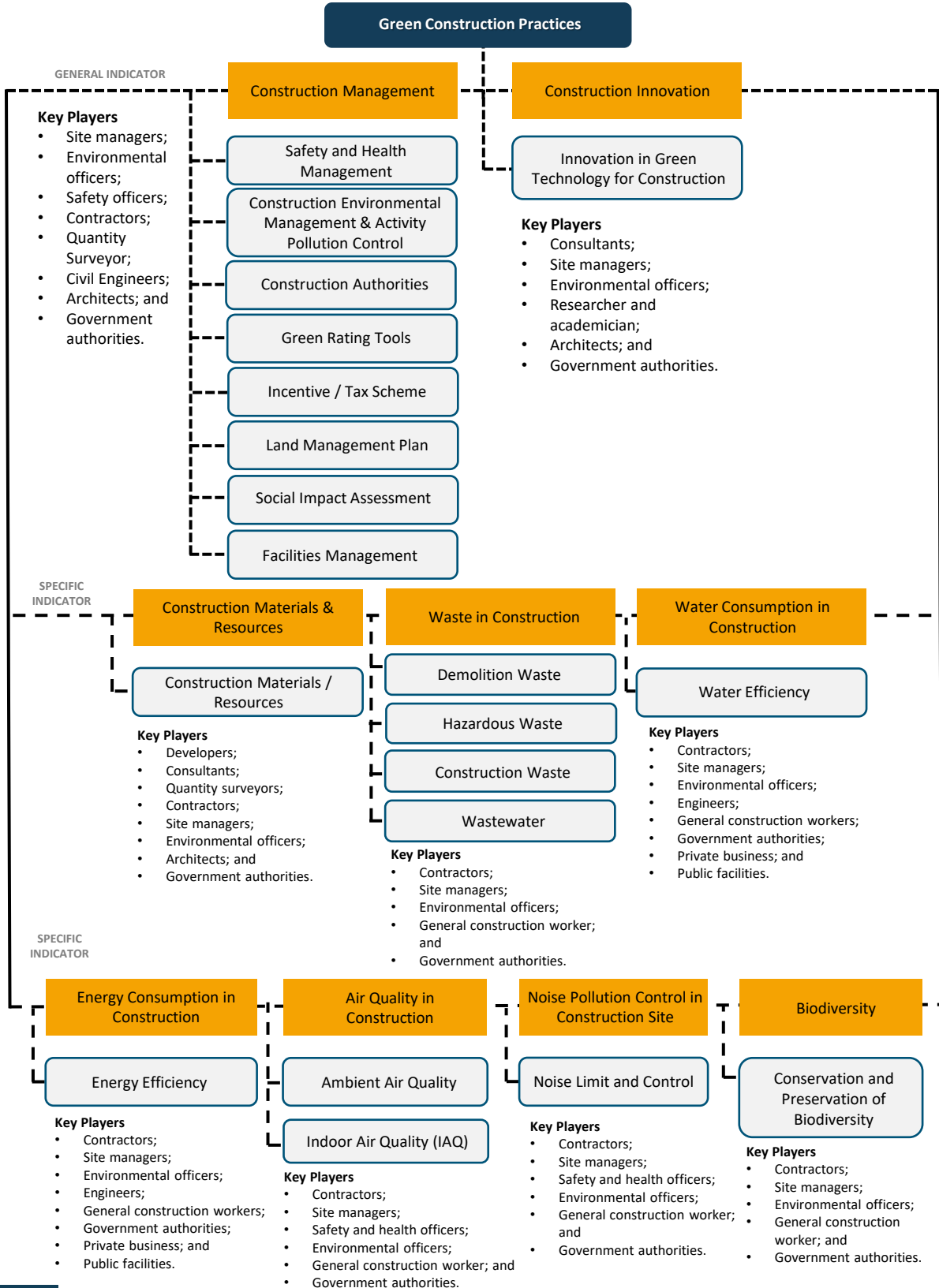
GREEN RECOGNITION

4.5 Involvement of Key Stakeholders in Green Construction



4.6 Green Construction Indicators

Each sector, including green construction, has its own set of indicators and approaches. Each approach from the key indicators in this guideline is based on the current scenario in Malaysia, which includes all companies, including multinational as well as small and medium enterprises. Each of the approaches under the indicators is stated in broad terms that can be tailored to the specific circumstances of the company.



4 . 6 . 1

CONSTRUCTION MANAGEMENT

4.6.1.1 GENERAL OUTLOOK



Construction management is a highly professional system that helps with project planning, coordination, and control from the beginning to the end of the project. It is a comprehensive approach aimed at completing projects on schedule and budget. Cost control, scheduling, procurement, and risk assessment are just a few of the many aspects that must be addressed in management.

4.6.1.2 GOAL SETTING

SCOPE



To assure that the entire construction process runs smoothly and according to plan, based on resource allocation, scope creeps' avoidance, and risk assessment during pre-construction phase, construction phase and post construction phase.

AIM



To introduce to the construction company the basic process for involvement in the indicator of management for the green construction industry during the pre-construction phase, construction phase and post-construction phase.

Additional Information / Fact

The effort to sustain construction management is aligned with United Nations and Green Technology Master Plan Malaysia targets as highlighted below:

United Nations (2015)

SDG 11: Sustainable Cities and Communities

11.3: By 2030, enhance inclusive and sustainable urbanization and capacity for participatory, integrated and sustainable human settlement planning and management in all countries.

SDG 12: Responsible Consumption and Production

12.7: Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

Green Technology Master Plan Malaysia
2017 - 2030







By 2030, target number of certified green building 1, 750 buildings

5 strategic thrusts for the development of conducive ecosystem for Green Technologies Growth:



- a) Promotion and awareness
- b) Institutional framework
- c) Research, Development and Commercialisation (R&D&C)
- d) Human capital development
- e) Market enables

4.6.1.3 Safety and Health Management



Pre-construction / During Construction / Post-Construction

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Manager/ Safety and Health Officers/ Construction Workers	Poor safety management resulted unsafe work methods.	To ensure that employers provide site workers with a safe working environment.	Fosters safety of workers by avoiding hazardous chemical exposure, excessive noise, mechanical risk, heat or cold distress, and unsanitary conditions. One of the things that the developer/project manager/safety and health officer/construction workers can undertake is to identify and implement the provisions of: a) Standard setting regulations; b) Enforcement; and c) Training consultation.	 Guidelines of Occupational Safety and Health in Construction Industry (Management) 2020	DOSH
				 Safety and Health Assessment System in Construction (SHASSIC) CIS (10)	CIDB
				 Occupational Safety and Health Act 1994 (Act 514)	DOSH
				 Inspection Guidance (Official Portal DOSH)	DOSH
				 Guideline SCORE	CIDB
Developers/ Project Managers/ Safety and Health Officers/ Architect/ Engineer	Inadequate facilities and poorest productivity among the workers.	To improve living conditions of construction workers.	Reference for designing, building, and managing worker amenities and accommodations.	 Guidelines for Contemporary Construction Workers' Amenities and Accommodation	CIDB



Pre-construction / During Construction / Post-Construction

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers/ Safety and Health Officers/ Architect/ Engineer	The construction industry in Malaysia was severely affected by the COVID-19 pandemic.	To improve working conditions of construction workers.	The implementation of health and safety (H&S) guidelines is one of the most important strategies to alleviate the adverse impacts of COVID-19 on the construction industry and help the industry adapt to the new normal.	 <i>Mygaris Panduan</i> #ReopeningSafely Guidelines Outdoor Work Areas	Malaysian National Security Council
				 <i>Mygaris Panduan</i> #ReopeningSafely Guidelines Indoor Work Areas	

4.6.1.4 Construction Environmental Management and Activity Pollution Control

Pre-construction / During Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Contractors/ Site Supervisors/ Project Managers/ Environmental Officers/ Construction Workers	Poor environmental management resulted negative impact to the environment such as water pollution, air pollution, noise pollution and etc.	To outline how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area.	Environmental monitoring enables construction and infrastructure projects to ensure compliance with environmental plans, permits and other regulations, while mitigating and minimizing environmental impact.	 Guideline for Environmental Management Plan (EMP)	DOE
			The monitoring and management of environmental conditions also help to protect against potential claims, it may even be a legal obligation on some construction sites, and responsible contractors are often favoured by clients.	 Guideline for Erosion and Sediment Control	JPS

4.6.1.5 Construction Authorities









Pre-construction / During Construction / Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Contractors/ Developers/ Local Authorities	The process of urbanization had resulted in huge effects land use patterns and urban populations.	To provide municipal and maintenance services, planning and control of land use, enforcement and supervision on development projects, besides managing and controlling financial budget and tax revenue in their administrative areas.	The Town and Country Planning Act 1976 (Act 172) establishes the federal, state and local planning authorities and includes the approval of development plans, permission of the land and building use, purchase notice and acquisition of land, and other provisions.	 Town and Country Planning Act 1976 (Act 172)	Federal Department of Town and Country Planning Peninsular Malaysia
			However, this regulation only applies to Peninsular Malaysia and not applicable to the states in East Malaysia. The states of Sabah and Sarawak have their Building Ordinances where the state governments are the planning authority.	 Development Board Act 1994 (Act 520)	CIDB

4.6.1.6 Green Rating Tools


Green Rating Tools in Malaysia					
Rating Tools	Certification Process	Phases of Assessment	Building Types	Reference Documents	Agency
 Green Building Index (GBI)	Voluntary	Design and Construction.	<ul style="list-style-type: none"> • Non-residential new construction; • Residential new construction; • Non-residential existing building; • Industrial new construction; • Industrial existing building; • Retail; and • Hotel. 	 GBI Rating Tools & Design (Official Portal GBI)	PAM and ACEM
 Green Real Estate (GreenRE)	Voluntary	Construction and Operation.	<ul style="list-style-type: none"> • New residential; • New non-residential; • Existing non-residential; and • Township development. 	 GreenRE Rating Tools & Design (Official Portal GreenRE)	REHDA
 Low Carbon City Framework (LCCF) Assessment Tool	Voluntary	Construction and Operation.	Township development	 Low Carbon City Framework (LCCF) Assessment Tool	KASA & MGTC
 Malaysian Carbon Reduction and Environmental Sustainability Tool (MYCREST)	Voluntary and mandatory for project under JKR worth RM 20 million and above	Design, Construction, Operation & Maintenance and Refurbishment Demolition.	<ul style="list-style-type: none"> • Design stage and • Construction stage; and • Operation and Maintenance. 	 Malaysian Carbon Reduction and Environmental Sustainability Tool (MyCREST)	CIDB
 Green PASS	Voluntary	Construction and Operation	<ul style="list-style-type: none"> • New building; and • Existing building. 	 Guideline Green Performance Assessment System in Construction (GreenPASS)	CIDB




Green Rating Tools in Malaysia

Rating Tools	Certification Process	Phases of Assessment	Building Types	Reference Documents	Agency
 Penarafan Hijau JKR (pHJKR)	Voluntary	Design and Construction.	<ul style="list-style-type: none"> Road sector (new and upgrading). Residential and non-residential buildings (new/upgrading/restoration/renovation and existing buildings). Note: Mandatory for project under JKR worth RM 20 million and above. 	 Penilaian Penarafan Hijau (pH JKR)	JKR
 Sustainability Index (SUSDEX)	Mandatory for all Sime Darby development project.	Design and Construction.	Township development	 Sustainability Index (SUSDEX) Rating Tools	Sime Darby
 Malaysia Green Highway Index (MyGHI)	Voluntary	Design and Construction.	Highway	 MyGHI (Official Portal)	Universiti Teknologi Malaysia (UTM) & Lembaga Lebuhraya Malaysia
 Melaka Green Seal	Voluntary	Design and Construction.	<ul style="list-style-type: none"> New Residential Building ; and New Non-Residential Building. 	 Garis Panduan Rujukan Meterai Hijau Melaka	Melaka Green Development Organisation (MGDO)
 CASBEE Iskandar	For urban development, city and building.	Design, Construction and Operation & Maintenance	<ul style="list-style-type: none"> Industrial building, commercial building, and residential building. Urban development; Basic concept and principle. 	 Comprehensive Assessment System for Built Environment Efficiency (CASBEE) Iskandar	Iskandar Malaysia (IRDA)


Green Rating Tools in Malaysia					
Rating Tools	Certification Process	Phases of Assessment	Building Types	Reference Documents	Agency
 Sustainable INFRASTAR	Voluntary	Design, Construction and Operation and Maintenance.	Infrastructure Project (except the building portion).	 Sustainable INFRASTAR Brochure	CIDB
 Quality Assessment System in Construction (QLASSIC)	Implemented on completed building projects and before the date of Vacant Possession (VP).	Based on architectural work, external work and basic mechanical and electrical fittings.	<ul style="list-style-type: none"> Category A: Residential (Landed). Category B: Residential (Strata). Category C: Non-residential (without centralised aircond). Category D: Non-residential (with centralised aircond). 	 QLASSIC Assessment Application Form  Website QLASSIC	CREAM
 Safety and Health Assessment System in Construction (SHASSIC)	Structure and Infrastructure.	Examine the safety and health at the worksite in construction projects.	Assessment should cover 25% to 75% of a project's physical progress and should include the construction planning and construction stages.	 SHASSIC  Website SHASSIC	CIDB






4.6.1.7 Incentive / Tax Scheme

Pre-construction / During Construction / Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers	Most developers and project managers are still unaware of the government's scheme or tax incentive for each usage of green technology during construction.	Green Investment Tax Incentives (GITA / GITE) a) Purchase of green technology equipment, as well as an Income Tax Exemption (ITE) for the provision of green technology services.	Tax incentives	 Green Investment Tax Incentives (Official Portal MGTC)	MGTC


Pre-construction / During Construction / Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers	Most developers and project managers are still unaware of the government's scheme or tax incentive for each usage of green technology during construction.	Processes linked to product integration, project organization and coordination, technology and practices diffusion, and worker flows all lead to the capacity to facilitate knowledge flows.	Provides and outlines the strategic goals related to green technology development, exposed towards the use of tax incentives and financial assistance scheme for each green technology uses during the stages of construction.	 Document Green Technology Master Plan 2017 - 2030	MOSTI
				 Tax Incentives (Official Portal MGTC)	MGTC
				 Green Technology Funding Scheme (Official Portal MGTC)	MGTC

4.6.1.8 Land Management Plan




Pre-construction / During Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers/ Consultants / Environmental Officers / Town Planners	Construction activities contribute to altering, restructuring and demolishing of the structure of landform, which probably produces soil erosion and sedimentation issues.	<p>Land resources are used for a variety of purposes which may include organic agriculture, reforestation, water resource management and eco-tourism projects.</p> <p>Land management plan to mitigate the negative effects of land use and to enhance the efficient use of resources with minimal impact on future generations.</p>	<p>Construction Zone: This zone will form the area where soil disturbance will occur during construction. Any storage of material and machinery during the construction period is to be strictly confined to this area.</p> <p>Vegetation Protection Zones: All vegetation located within the construction zone and/or within the vicinity of the proposed development site and marked on the plan to be retained.</p>	 Guideline for Erosion and Sediment Control in Malaysia	JPS

Pre-construction / During Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers/ Consultants / Environmental Officers / Town Planners	Construction activities contribute to altering, restructuring and demolishing of landform which probably produce soil erosion and sedimentation issues.	Land resources are used for a variety of purposes which may include organic agriculture, reforestation, water resource management and eco-tourism projects. Land management plan is to mitigate the negative effects of land use and enhance the efficient use of resources with minimal impact on future generations.	<p>Before executing these activities:</p> <ul style="list-style-type: none"> excavation; earthwork; or site clearing. <p>developer needs to carry-out a preliminary land assessment.</p>	 <p>Standard Specifications for Buildings Works (2020 Edition)</p>	JKR
			<ul style="list-style-type: none"> Erosion: Identify any existing erosion (gully or tunnel). Waterways: Identify any existing waterways and/or wetlands. Pasture: Indicate any existing pasture areas located on the property, including areas that are either grazed or proposed for grazing. Fauna: Identify any faunal species of significance, and measures to be undertaken to protect these species. 	 <p>Government Building Scheduling Maintenance Guideline</p> <p>E-BOOK</p> <p>Environmental protection and enhancement works for projects can be bought at SIRIM STS website</p>	
			<ul style="list-style-type: none"> Native Vegetation: Provide a detailed assessment of the ecological vegetation communities that exist on the property, including any significant flora, its location and condition. Specify how indigenous vegetation will be managed. 	 <p>Guidelines on Land Disturbing Pollution Prevention and Mitigation Measure</p>	
			<p>Construction Zone: This zone will form the area where soil disturbance will occur during construction. Any storage of material and machinery during the construction period is to be strictly confined to this area.</p> <p>Vegetation Protection Zones: All vegetation located within the construction zone and/or within the vicinity of the proposed development site and marked on the plan to be retained.</p>	 <p>Environmental Essential for Siting of Industries</p>	DOE
				 <p>Manual BMPs Kawalan Hakisan dan Pemendapan</p>	





4.6.1.9 Social Impact Assessment

Pre-construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Consultant/ Developers/ Local Authorities	During the construction phase, residents may be disrupted and inconvenienced by detours, local road closures, dust, noise, heavy equipment traffic on existing roads, changes in the level of service, safety hazards, and interference with emergency services.	To predict and mitigate negative impacts and identify opportunities to enhance benefits for local communities and broader society.	<p>During the SIA, the proponent is usually expected to (State of Queensland, 2013):</p> <ul style="list-style-type: none"> Identify stakeholders' groups and communities impacted by the project; Collect baseline data covering key social issues of the impacted communities; Provide an overview of government legislation and policies that complement the mitigation measures for social impacts that are directly related to the project; Explain methods used to gather information, including a description of how the communities of interest were engaged during the development of the SIA; Identify potential direct social impacts and prediction of the significance of any impacts and duration and extent of each impact; List proposed mitigation measures; and Describe the monitoring framework that informs stakeholders on the progress of implementing mitigation measures and overall project implementations. 	 <p>The Manual for Social Impact Assessment (SIA) for Projects (2nd Edition)</p>	PLANMalaysia

4.6.1.10 Facilities Management (FM)

Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
<p>Quality Inspectors/ Quality Assurance/ Site Supervisors/ Contractor Facilities / Facility Management Manager or Contractor/ Construction Engineering Management</p>	<ul style="list-style-type: none"> Inadequate management of facilities raises the facility and assists' overall cost ownership. Bad management of facilities can increase the risk to customers. Weak standards can lead to injury on site. 	<ul style="list-style-type: none"> Help prevent equipment failures through preventative maintenance and ensures the premises are safe. A well-maintained facility creates a safe working environment, reduces energy output costs, and makes all business functions run smoothly and efficiently. Management spaces and data Come out with maintenance plan, building manual, maintenance office and system 	<p>Facilities management includes:</p> <ul style="list-style-type: none"> Lease management, including lease administration and accounting; Capital project planning and management; Maintenance and operations; Energy management; Occupancy and space management; Emergency management and business continuity; Real estate management; Communications infrastructure; and Testing and inspections. <p>Hard Facilities Management: Deals with physical assets such as plumbing, wiring, elevators, and heating and cooling.</p> <p>Soft Facilities Management: Focuses on tasks performed by people such as custodial services, lease accounting, catering, security, and groundskeeping. Property strategy.</p>	 <p>Handbook Registration Contractor Facilities</p>  <p>Certified Facility Management Manager (FMM)</p>  <p>Guideline Building Schedule Maintenance Government</p>	<p>CIDB</p>

EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
<p>Worker Safety</p>	 <p>Source: www.build-review.com</p>	<p>Providing workers with proper personal protective equipment to ensure the safety of workers.</p>
<p>Green Building Standards and Certification Systems</p>		<p>Used to assess a building or a construction project's performance from a sustainability and environmental perspective</p>
<p>Environmental Health and Safety Management (EHSM)</p>	 <p>Source: intellex.com</p>	<p>To safeguard workers from work-related accidents and illnesses and to identify and reduce physical, chemical, and biological dangers in the workplace</p>
<p>Virtual Reality (VR) for off-site safety training</p>	 <p>Source: balfourbeatty.com</p>	<p>Using a VR headset, the user experiences real-world scenarios that give different perspectives of a potentially dangerous situation.</p>
<p>Worker Amenities & Accommodations</p>	 <p>Source: propertyguru.com.my</p>	<p>A better quality of accommodation and site service is one of the strategies to encourage local citizen to work in the construction industry</p>
<p>Preliminary site assessments</p>	 <p>Source: stlandservices.com</p>	<p>Preliminary site assessments are undertaken to decide the most appropriate land-use in phrases of improvement and planning, or for construction purposes.</p>

4 . 6 . 2

CONSTRUCTION INNOVATION

4.6.2.1 GENERAL OUTLOOK



Innovation is a broad concept that covers changes to the process, products, and services. Despite its importance in the development and growth of the overall economy, applying innovation to the construction industry is not straightforward. Because each construction project is different, construction companies must modify their procedures and resources to cater the needs of each project. Thus, innovation must evolve from a process that can be managed, measured, and controlled randomly to one that can be managed, measured, and controlled systematically within the construction industry.

4.6.2.2 GOAL SETTING

SCOPE



The standardization of innovations in the construction industry, were directly integrated with the procedures of the construction companies during pre-construction phase, construction phase and post-construction phase.

AIM



To acknowledge a standard process that is universal and can be used by construction companies in Malaysia during the pre-construction phase, construction phase and post-construction phase.

Additional Information / Fact

The effort to sustain construction management are aligned with United Nations and Green Technology Master Plan Malaysia targets as highlighted below:

United Nations (2015)

SDG 9: Build Resilient Infrastructure, Promote Inclusive and Sustainable Industrialization and Foster Innovation

9.4: By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increase resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries acting in accordance with their respective capabilities.

9.5: 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.

SDG 12: Responsible Consumption and Production






12 a: Support developing countries to strengthen their scientific and technologic capacity to moves towards more sustainable patterns of consumption and production.

Green Technology Master Plan Malaysia
2017 - 2030

5 strategic thrusts for the development of conducive ecosystem for Green Technologies Growth:


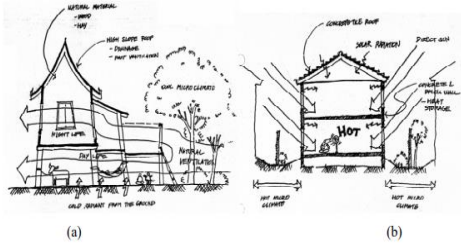


- a) Promotion and awareness
- b) Institutional framework
- c) Research, Development and Commercialisation (R&D&C)
- d) Human capital development
- e) Market enables

4.6.2.3 Innovation in Green Technology for Green Construction Practices

Pre-construction / During Construction / Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers		Processes linked to product integration, project organization and coordination, technology and practices diffusion, and worker flows all lead to the capacity to facilitate knowledge flows.	Provides and outlines the strategic goals related to green technology development.	 Document Green Technology Master Plan 2017 - 2030	MOSTI
Developers/ Project Managers/ Architects/ Engineers	Inadequate productivity, rising material costs, poor project performance, and skilled labour shortages.	To reduce project risk, enhance project performance, reduces waste as well increased prefabrication.	Modelling technology to produce, communicate, analyse and use digital information through the construction project life-cycle.	 Building Information Modelling (BIM) (Official Portal CIDB)	CIDB
		To coordinate the construction sector towards industrialization.	Building method that uses different means to a similar end when compared to conventional construction practices.	 A Guide to Enabling BIM in Projects	CIDB
Project Managers/ Architects/ Engineers	Workers are at risk of injury, uninvited visitors or trespassers.	Achieve visual environments that are comfortable and suited to the with function of the workplace.	Managing lighting in the workplace and making sure appropriate to the workplace.	 Guidelines on Occupational Safety and Health for Lighting at Workplace 2018	DOSH
Developers/ Project Managers/ Architects/ Consultants/ Local authorities	The construction industry is evolving in tandem with the rapid advancement of smarter technologies and systems.	Identify 12 key technologies, also known as "disruptive technologies," that will change the construction industry's landscape in the future.	A short-term strategy involves four enablers; people, integrated technology, the economy, and governance.	 Construction 4.0 Strategic Plan (2021-2025)	CIDB

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers/ Architects/ Consultants/ Local authorities	Lack of visualization and promotion in the term of innovation toward sustainable development	The innovation based on four major aspects; science, policy, industry and society	Quadruple Helix Model	None	None

EXAMPLE OF STRATEGIES

Strategies	Examples		Descriptions
Building Method	Bird-Friendly Design	 <p>Source: America Bird Conservancy (2015)</p>	<p>The steel mesh enveloping Zurich's Cocoon in Switzerland, designed by Camenzind Evolution, Ltd, provides privacy, reduces heating and cooling costs, and protects birds, but still permits occupants to see out.</p>
	Natural Ventilation Design for Houses in Thailand	 <p>Fig. 1 Sketch of Thai houses (a) traditional and (b) modern</p> <p>Source: Tantasavasdi et al (2001)</p>	<p>Natural ventilation has served as an effective passive cooling design strategy to reduce energy used by air-conditioning systems.</p>
Modelling Technology	3D Printing	 <p>Source: designingbuildings.co.uk</p>	<p>Construction 3D printing is a method for manufacturing, construction elements or entire buildings by means of a 3D printer printing, concrete, polymer, metal, or other materials, layer-by-layer.</p>
Construction Machine and Equipment	 <p>Source: needpid.com</p> <p>Source: needpid.com</p> <p>Source: the.balancesmb.com</p>		<p>Construction sites are safer nowadays, and workers are more efficient with the help of technology. It has enabled the organisation to enhance efficiency, improve teamwork, and take on more difficult projects.</p>

4.6.3

CONSTRUCTION MATERIALS & RESOURCES

4.6.3.1 GENERAL OUTLOOK



According to the United National Environmental Program (UNEP), at a worldwide level, construction is responsible for about 20%-50% of the consumption of natural resources. Compared with other industries, the building industry rapidly uses finite fossil fuel resources, which has prompted worries about supply issues, energy resource depletion, and severe environmental consequences. Moreover, the construction exploits natural resources such as forests for timber and development of land without proper control, contributing to Malaysia's environmental problems. Thus, the construction industry is one of the most resource-intensive industries.

4.6.3.2 GOAL SETTING

SCOPE



During pre-construction, construction and post-construction phase, sustainable construction practices are focused on minimizing negative impacts on the environment and maximizing the use of available resources.

AIM



- a) To protect and preserve the natural resources consumed in construction activities.
- b) To conserve natural resources for present and future generation.

Additional Information / Fact

The effort to sustain construction management are aligned with United Nations and Green Technology Master Plan Malaysia targets as highlighted below:

United Nations (2015)

SDG 12: Ensure Sustainable Consumption and Production Patterns

- 12.2: By 2030, achieve the sustainable management and efficient use of natural resources.
- 12.5: By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

Green Technology Master Plan Malaysia
2017 - 2030







By 2030, must achieve 28% recycling rate

**Sustainable Construction Practice
Construction Method - IBS**

By 2025 - 2030, new Technologies i.e., Automated brick laying etc. used in building construction.

4.6.3.3 Construction Materials / Resources

Pre-Construction / During Construction / Post-Construction

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers/ Project Managers / Architects / Engineers / Quantity Surveyors	From the extraction of raw materials through the end of a structure's life span, building materials contributed to a tremendous environmental impact.	Focuses on the sustainability and environmental impact of materials.	Green building materials a) Consider their environmental impacts (example: sustainable materials); b) Focus on enhancing the efficiency of resource consumption; and c) Reducing building impact on human health and the environment.	 Green Guideline Procurement 3.0	EPU / KASA / MGTC
				 Construction Materials Regulation Policy	CIDB
Developers / Project Managers	Purchasing activities for the building materials are mostly not from local areas.	To reduce the environmental impacts, especially during transportation and at the construction site.	Locally building materials a) Economic development measure; b) Environmental solution; and c) Retaining and recognizing the unique features of regional resources	 MyHijau e-Book	MGTC
Developers / Project Managers	Shortest material life cycles result in higher waster production.	Selecting long-lasting materials to significantly cut waste and maintenance and replacement costs.	Materials durability • Commonly, green building materials offer superior durability.		
Developers/ Project Managers/ Architects/ Engineers	Inadequate productivity, rising material costs, poor project performance, and skilled labour shortages.	To increase the productivity of the construction industry.	Reference related to materials, tools, labour, transport, water, light etc.	 Standard Specifications for Building Works 2020	JKR
		To increase the productivity of the construction industry through the adoption pf mechanization and modern practices.	Reference for designing, detailing and manufacturing of IBS component.	 Manual for Green Product Scoring System (GPSS) can be bought at SIRIM STS website	
				 IBS Catalogue For Precast Concrete Building System	CIDB

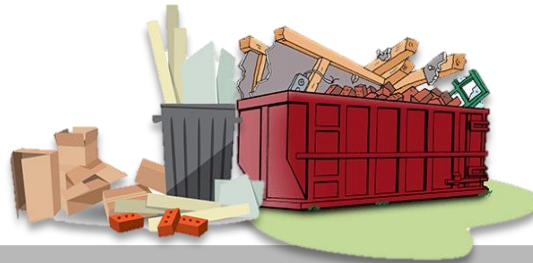
EXAMPLE OF STRATEGIES

Strategies	Examples	Sources
<p>Green Building Materials</p>	 <p>Source: buildingmaterials.com.my</p>	<p>Building materials derived from the soil such as unburnt bricks, clay mixes with corn cobs and lime, clay used to be used for construction purposes.</p>
<p>Local Building Materials</p>	 <p>Source: bmdam.org</p>	<p>Purchasing salvaged or recycled building materials can further reduce the embodied energy and carbon footprint.</p>
<p>Durability Building Materials</p>	<p>Masonry</p>  <p>Source: structuralengineeringbasics.com</p>	<p>Masonry is strong in resisting compression loads/stresses which makes it ideal to use for the construction of load bearing walls.</p>
<p>References related with construction materials, tools and etc.</p>	 <p>Source: DeWalt.com</p>	<p>Reference documents related to construction will help increase productivity and efficiency for the company in managing a project.</p>
<p>Industrialized Building System (IBS)</p>	 <p>Source: en.vietnampib.vn</p>	<p>A technical term for building a structure by putting together factory-made prefabricated components.</p>

4.6.4

WASTE IN CONSTRUCTION

4.6.4.1 GENERAL OUTLOOK



CIDB defined construction waste as materials that are unwanted or being generated during construction or demolition activities (CIDB, 2015). Malaysia's rapid development has raised the demand for concrete for construction purposes, but concrete trash is also increasing every year, and it has been identified as the most created waste from the construction industry. Malaysia is a developing country with less knowledge and abilities in waste management. Due to a lack of effective and proper waste management technologies, construction costs have increased, and resources have been wasted.

4.6.4.2 GOAL SETTING

SCOPE



Identify types of waste material and specify the amount diverted by weight or volume as well as the distance and the main mode of transport used to bring the waste during the pre-construction phase, construction phase and post-construction phase.

AIM



- a) To establish proper waste management practice in Malaysia during pre-construction phase, construction phase and post-construction phase.
- b) To identify roles and responsibilities of construction industry players during pre-construction phase, construction phase and post-construction phase.

Additional Information / Fact

The effort to sustain construction management are aligned with United Nations, European Union and Green Technology Master Plan Malaysia targets as highlighted below:

United Nations (2015)

SDG 12: Ensure Sustainable Consumption and Production Patterns

12.2: By 2030, achieve the sustainable management and efficient use of natural resources.

12.4: By 2030, 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.

European Union (2011)






95% - 97% of solid wastes (including construction and demolition waste) collected are dumped at the disposal sites.

Green Technology Master Plan Malaysia 2017 - 2030

By 2030, must achieve 28% recycling rate

Construction sector expected to expand by 10.3% per annum during RMK-11 where mainly generate number of wastes

4.6.4.3 Demolition Waste





Pre-Construction / During Construction / Post Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Project Managers / Waste Management Officers / Environmental Officers / Construction Workers	Materials made up a big part of the total amount of energy used, by products made, and waste made during the manufacturing process.	To reduce unsustainable construction / building wastes.	Reused and recycled building materials/ constructions a) Entitle the 3R's principles.		JPSPN
Project Managers / Waste Management Officers/ Environmental Officers	Not everyone is aware of the proper way to manage waste in the construction industry.	Brief and recommends appropriate separation, handling, recycling, reuse to management and workers.	On-site briefing / Toolbox talks.		CIDB
	Improper waste management, which resulted in dumping the waste in the landfills.	To facilitate the separation of materials for recycling, reuse or disposed.	Waste segregation		
Project Managers / Waste Management Officers / Environmental Officers / Construction Workers	Materials contributed to a large amount of energy in production, a large number and large amount of waste generated.	To reduce unsustainable construction / building wastes.	Follow the legislation by the authorities.		AGC
					

Pre-Construction / During Construction / Post-Construction




Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers / Project Managers	Wastes contributed from the packaging of materials/ resources.	To minimize the number of packaging.	Purchase of bulk or compacted materials/ resources.	None	None

4.6.4.4 Hazardous Waste



Pre-Construction / During Construction / Post-Construction

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Project Managers / Waste Management Officers / Environmental Officers /	Improper ways to manage the hazardous waste.	Proper ways to manage the hazardous waste and minimizing the impact towards the environment.	Hazardous waste management: a) Site selection and design criteria; and b) Scheduled waste storage, packaging, labelling and management containers.	 Guidelines for Packaging, Labelling and Storage of Scheduled Wastes	DOE
				 Environmental Quality (Scheduled Waste) Regulations 2005	
				 Environmental Requirements: A Guide for Investors	
Project Managers / Waste Management Officers / Environmental Officers	Illegal of disposal waste and improper hazardous waste management.	To provide practical methods for the design, construction, operation and maintenance of storage of hazardous materials.	Storage of hazardous chemicals.	 Guidelines on Storage of Hazardous Chemicals	DOSH





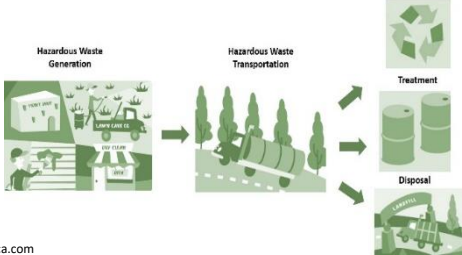
4.6.4.5 Construction Waste

Pre-Construction / During Construction / Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Project Managers / Waste Management Officers / Environmental Officers / Construction Workers	Large amount of waste generated.	To reduce the amount of construction waste.	Provision to the contractor related to the cost of all materials, scaffolding, tools, plant, labour, transport, water and light that are necessary for the construction.	 <p>Standard Specifications for Building Works 2020</p>	JKR
Project Managers / Waste Management Officers / Environmental Officers		To gain knowledge and build capacity on sustainable waste management and construction best practices.	To equip key players with the tools and understanding to implement C&D waste minimization & management strategies at all stages of a building or structure's life cycle.	 <p>Construction Site Waste Management & Sustainable Practices</p>	CREAM & EPIC
		Planning the facility modules and helping contractor records and analyses construction waste data.	Provide facilities to register and update the information related to construction waste.	 <p>C & D Waste Management System</p>	SWCorp

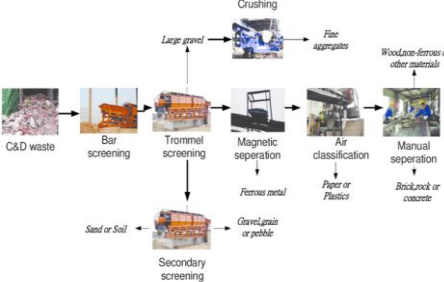
4.6.4.6 Wastewater

Pre-Construction / During Construction / Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Project Managers / Waste Management Officers / Environmental Officers	When discharged in large quantities, it can raise the temperature of receiving streams locally and disrupt the natural balance of aquatic life.	To treat wastewater, include physical water treatment, biological water treatment, chemical treatment, and sludge treatment.	Waste Treatment and Disposal Sewage.	 <p>EIA Guidelines Waste Treatment and Disposal Sewage</p>	DOE
				 <p>Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015</p>	

EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
<p>Reused and Recycled Materials</p>		<p>Construction waste has a tremendous impact on the environment. Recycling construction materials has the potential to drastically lessen the industry's environmental effect.</p>
<p>Legislation</p>		<p>The construction industry is highly regulated, with complicated legislation governing a wide range of topics such as planning approval and design and construction.</p>
<p>Purchased of Bulks or Compacted Materials</p>		<p>Contractors with many ongoing projects that have the same product requirements benefit the most from high volume purchasing.</p>
<p>On-Site Briefing/Toolbox Talks</p>		<p>A useful skill to maintain health and safety at the forefront of your employees' minds and make them aware of current dangers and problems at the sites.</p>
<p>Waste Segregation</p>		<p>Waste management is a critical component of sustainable construction.</p>
<p>Hazardous Waste Management</p>		<p>Many hazardous wastes provide a significant health risk to everyone who gets into contact with it. This could be a chemical by product, a contaminated solid, or something in the between.</p>

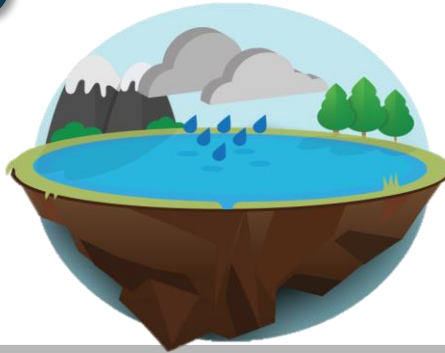
EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
Storage of Hazardous Chemicals	 <p>Source: safetystoragesystem.co.uk</p>	<p>Prevents spoiling. Separates incompatible chemicals while avoiding chemical reactions that could result in fire, explosions, or hazardous fumes. It protects against contamination. Avoids hazardous exposure.</p>
Waste Treatment and Disposal Sewage	 <p>Source: arviatechnology.co</p>	<p>To remove contaminants from sewage in order to generate effluent appropriate for disposal to the surrounding environment or reuse, hence preventing water pollution from raw sewage discharges.</p>
	 <p>Source: medium.com</p>	<p>The major purpose of solid waste management is to reduce and eliminate the negative resulting from waste products on human and environmental health.</p>
Facility Modules in Construction Waste	<p>Waste hierarchy: (Original source: Envirowise)</p>  <p>Source: wbdg.org</p>	<p>There are 5 actions should be taken: Eliminate, Reduce, Reuse, Recycle and Dispose. This is a crucial practice for organizations to follow in order to reduce waste and increase recycling efforts.</p>
Tools in Handling Construction Waste	 <p>Source: wbdg.org</p>	<p>Equipment for collecting trash, recycling, and food waste containers serviced by hauler, dumpsters, carts, compactors and open top containers and equipment for internal collection and transportation.</p>

4.6.5

WATER CONSUMPTION IN CONSTRUCTION

4.6.5.1 GENERAL OUTLOOK



The use of water in construction sites is related to employees' essential demands where there are the following facilities: sanitary, housing, dining place, laundry, and kitchen when preparing meals. Water is also consumed in the extraction, production, manufacturing, and delivery of materials and products to the site, and the actual on-site construction process may be used during the demolition process, especially to suppress dust. According to the National Water Services Commission (SPAN), an estimated 70% of Malaysians consume more water than is necessary due to the abundance of water and adequate rainfall for granted in Malaysia. However, nearly a million people were impacted significantly by the most recent water cut in the Klang Valley region due to polluted rivers.

4.6.5.2 GOAL SETTING

SCOPE

The waste and the misuse of water in construction sites have been identified as critical problems during pre-construction phase, construction phase and post-construction phase. Thus, develop a framework for improving sustainable water use practices in construction project.

AIM

To quantify water consumption during new construction activities and to indicate how to reduce total water consumption within the construction project management.

Additional Information / Fact

The effort to sustain construction management are aligned with United Nations and Green Technology Master Plan Malaysia targets as highlighted below:

United Nations (2015)

SDG 6: Clean Water and Sanitation

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

6.5: By 2030, integrated water resource management at all levels.





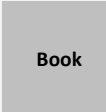

Green Technology Master Plan Malaysia
2017 - 2030




By 2030, 30% treated effluent to be recycled.

60% of towns in Malaysia installed Rainwater Harvesting Systems.

By 2030, reduced 20% of Non-Revenue Water (NRW).

4.6.5.3 Water Efficiency

Pre-Construction / During Construction / Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers / Project Managers/ Environmental Officers /	Freshwater scarcity at the construction site.	To collect the rainwater that has been used for domestic and commercial purposes.	Rainwater Harvesting System.	 Rainwater Harvesting Guidebook	DID
Project Managers / Environmental Officers	Water quality conditions that do not meet specific criteria.	To come out a with water quality monitoring plan.	Water Quality Monitoring Standard.	 Malaysia Ground Water Quality Standard Index	DOE
				 National Water Quality Standards for Malaysia	
Developers / Project Managers / Environmental Officers / Safety and Health Officers / Architects / Engineers	The leading source of pollutants causing water quality impairment due to human activities were urban runoff.	To reduce runoff of rainwater into the streets, lawns and other sites, especially at the surrounding of the construction sites.	Implement Urban Storm Water Management.	 Urban Storm Water Management (MSMA)	DID
	Floods will either increase contaminants and sediments from urban and agricultural runoff during high rainfall causing a decrease in water quality.	To reduce and manage flood risks to human health, environment, economic activity and the surrounding of construction sites.	Flood Risk Management.	 Book Guidelines for Landslide Vulnerability Assessment and Risk Analysis for Critical Infrastructure in Malaysia	CIDB
Developers/ Project Managers/ Environmental Officers/ Architects/ Engineers	The most significant source of emissions is leaking equipment.	To identify some of the problems identified with LDAR Programs.	Practices used to increase the effectiveness of Leak Detection and Quantification (LDAR) program.	 Guidance Document on Leak Detection and Repair	DOE

Pre-Construction/During Construction/Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers / Project Managers	Water wastage	<p>To ensure the effective use of water in construction activities and site accommodation on building sites.</p> <p>Baseline:</p> <p>a) Water consumption in construction sites is estimated at 29.6 m³/ RM million contractors' output at constant price.</p> <p>b) Water consumption on site accommodation is estimated as 20 Litres/ person/ day for full time employee.</p>	<p>Monitor water bills monthly for the duration of the project until its completion.</p>	 Construction Industry Standard 20:2021	CIDB
		<p>To maximise water consumption efficiency in buildings and reduce the use of supplied processed water</p>	<p>Water Efficient Fitting</p>	 Guidelines for Voluntary Water Efficient Products and Labelling Scheme  Construction Industry Standard 20:2021	SPAN CIDB

Did you Know!

Currently, water demand in Malaysia is approximately 53% for domestic and industrial usage while the remaining 47% is used for agriculture.






By 2050, it is predicted that water demand in Malaysia will increase by 103% for domestic usage, industrial usage and agriculture sector. (Source: National Water Resource Study 2000 - 2050, 2000)

Water consumption categories and usage (domestic)

Categories Categories	Average Benchmark (litres/ person/ day)
Domestic	200
Outdoor (not including irrigation)	357

(Source: Construction Industry Standard (CIS) 20:2021)

EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
<p>Water Quality Monitoring Standard</p>	 <p>Source: environment.com.my</p>	<p>Water quality monitoring (monitoring) is often recommended for construction activities to provide assurance of compliance with regulatory requirements and to ensure that.</p>
<p>Urban Storm Water Management</p>	 <p>Source: www.epa.gov</p>	<p>Urban stormwater management, simply stated, is everything done within a catchment to remedy existing stormwater problems and to prevent the occurrence of new problems.</p>
<p>Rainwater Harvesting System</p>	 <p>Source: www.uf.com</p>	<p>Rainwater harvesting systems range from simple rain barrels to more elaborate structures with pumps, tanks, and purification systems.</p>
<p>Flood Control and Disaster Management</p>	 <p>Source: eponline.com</p>	<p>The common techniques used for flood control are the installation of rock beams, rock rip-raps, sandbags, maintenance of normal slopes with vegetation and construction or expansion of drainage.</p>
<p>Water Leak Detection and Repair Programs</p>	 <p>Source: aus-test.com.au</p>	<p>A leak detection system monitors the flow of water through a pipeline. When abnormal behavior is detected, the system cuts off the water flow to the entirety of the household by closing a valve within the leak detector.</p>
<p>Water Efficiency Fittings</p>	 <p>Source: ice.org.uk</p>	<p>The use of water efficient fittings helps in reducing wastage of water as well as in reducing the overall carbon footprints.</p>

4.6.6.1 GENERAL OUTLOOK



UNEP in the 2019 Global Status Report for Buildings and Construction stated, building construction and operations accounted the biggest share of global final energy use (36%) and energy-related carbon dioxide emissions (39%). The total energy demand includes the energy consumed in various operations during the transportation of building materials and components for construction and destruction. This occurred because the materials production, transportation, erection, and installation processes which consume embodied energy and emit carbon dioxide which has negative environmental consequences.

4.6.6.2 GOAL SETTING

SCOPE



Reduce the increase in energy demand in the building industry, notably for heating and cooling, and make buildings and construction more sustainable during pre-construction phase, construction phase and post-construction phase.

AIM



To reduce energy demand, enhance renewable energy capacity and strengthen the buildings and infrastructures during pre-construction phase, construction phase and post-construction phase.

Additional Information / Fact

The effort to sustain construction management is aligned with United Nations, 12th Malaysia Plan, Renewable Energy Roadmap 2035 (MyRER) and Green Technology Master Plan Malaysia targets as highlighted below. This target supports Malaysia's global climate commitment is to reduce its economy-wide carbon intensity (against GDP) of 45% in 2030 compared to 2005 level.

United Nations (2015)

SDG 7: Affordable and Clean Energy

By 2030, reduce 15% in electric consumption in 2030.
By 2030, 8,885MW renewable energy installed capacity

12th Malaysia Plan (2020 – 2025)

The government will no longer build new coal-fired power plants and a comprehensive National Energy Policy will soon be introduced.

Renewable Energy Roadmap 2035 (MyRER)





In 2021, the Ministry of Energy and Natural Resources of Malaysia (KeTSA) set a target to reach 31% of RE share in the national installed capacity mix by 2025.

Green Technology Master Plan Malaysia 2017 - 2030






By 2030, increase 30% renewable energy.




By 2030, 15% reduction in electricity consumption.

4.6.6.3 Energy Efficiency

Pre-Construction, During Construction & Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Developers /Architects/ Consultants/ Engineers	Greenhouse gas emissions from Malaysia's existing buildings and communities contribute more than 40% of carbon dioxide to the environment.	To ensure the effective use of energy in construction activities and site accommodation at building sites.	Provide a simple yet useful guideline to practising building designers in Malaysia for design decisions to be made quickly for the promotion of energy efficiency in buildings.	 Building Energy Efficiency Technical Guideline For Active Design  Building Energy Efficiency Technical Guideline For Passive Design	JKR
			Provide details of energy obtain from hour meter, electrical metering, purchasing record and other relevant document for all on-site construction related activities	 Construction Industry Standard 20:2021	CIDB
			Efficient Road Lightings <ul style="list-style-type: none"> Design road lightings that comply with JKR specifications, MS 825 Part 1: 2007 or the latest edition, and other relevant standards; and Incorporate the latest energy-efficient road lighting (LED, induction, ceramic, metal halide, plasma, etc.) and energy saving device technologies. 	 Penarafan Hijau JKR Manual (Building Sector) New Non-Residential Building	JKR
			Provide Energy Efficiency Management Guideline for non-residential building which is applicable for Air-conditioned space > 4,000m ² .		

Pre-Construction/Post-Construction

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Property Owners / Tenants / Occupants	The expectation is that 75% of this population will live in urban areas. This signifies that the rate of energy consumption will increase due to the use of modern home appliances, particularly air conditions and refrigerators.	<p>In 2018, Malaysia announced that it had set a target of 20% renewable energy in its generation mix by 2025 (Sustainable Energy Development Authority, 2018)</p> <p>30% compulsory reliance on renewable energy (RE) for future commercial and residential developments in Kuala Lumpur (Kuala Lumpur City Hall's (DBKL), 2021)</p>	<p>Net Energy Metering (NEM) 3.0 A scheme that introduced by the government to allow greater access to users who wish to install solar photovoltaic (PV) systems on their roofs.</p>	 <p>Net Energy Metering (NEM) 3.0 9 (Official Portal SEDA)</p>	SEDA
			<p>Feed-in-Tariff This mechanism allows electricity produced from indigenous renewable energy resources to be sold to power utilities at a fixed premium price.</p>	 <p>Feed-in-Tariff (Official Portal SEDA)</p>	
			<p>Large Scale Solar (LSS) Promote renewable Energy through the installation of solar systems on residential and government premises primarily for self-consumption and any excess energy.</p>	 <p>Guidelines on Large Scale Solar Photovoltaic Plant For Connection to Electricity Networks</p>  <p>Guidelines For Solar Photovoltaic Installation Under The Programme Of NEM Rakyat And NEM GoMen In Peninsular Malaysia</p>	SEDA
Property owners/ Developers/ Project Managers/ Consultants	Unnecessarily wasting fuel resources and negatively impacting the environment, such as pollution and global warming.	Improving energy use and benchmarking energy performance in its operations.	Provide an organisation with the steps, procedures, and instruments required to develop, implement, and maintain its own Energy Management System.	 <p>Guidelines on The Development & Implementation of An Energy Management System for Building Facilities</p>	BSEEP

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Property owner/ Developer/ Project Manager/ Consultant	Unnecessarily wasting depleting fuel resources and negatively impacting the environment, such as pollution and global warming	<ul style="list-style-type: none"> Improving energy use and benchmarking energy performance in its operations Energy monitoring 	Provide an organisation with the steps, procedures, and instruments required to develop, implement, and maintain its own Energy Management System	 Building Energy Management Guidelines and Criteria for Electrical Energy System Evaluations	BSEEP
Property owner/ Developer/ Project Manager/ Energy Manager	Electricity bill, inflation and greenhouse gas emissions from the use of electrical equipment and appliances	Meet the requirements for minimum energy usage	Energy efficient products; <ul style="list-style-type: none"> Air conditioner Domestic Fan: MS2574:2914 Lamps: MS2598:2014 	 Guide on Minimum Energy Performance Standard Requirements for Air Conditioner with Cooling Capacity  Website Suruhanjaya Tenaga	Suruhanjaya Tenaga

Did you Know!

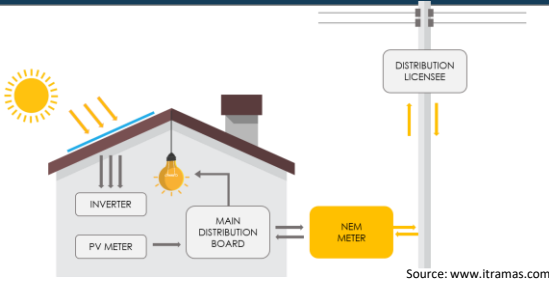
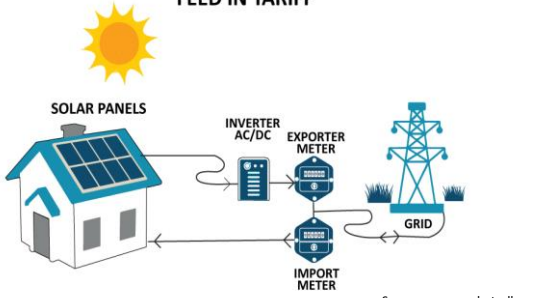


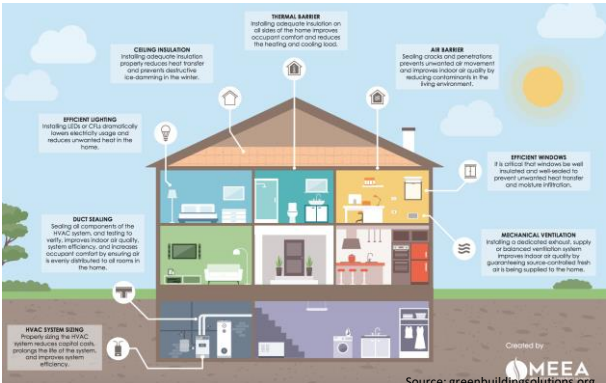
The energy performance of building types were established from the Common Carbon Metric for buildings To minimize the energy consumption for building operations.

(Source: MGTC, KeTTHA, Malaysia 2010)

Building Types	Energy Intensity (kWh/m ² /yr)	Carbon Emission Intensity (kh CO ₂ e/m ² /yr)
Office	200	128.6
Hospital	357	229.6
Hotel	521	335.0
School	43	27.6
Residential	87	55.9
Bungalow	58	37.3
Semi-detached	24	15.4
Apartments/condominium (multi-storey)	33	21.2
Affordable homes	62	39.9

(Source: Construction Industry Standard (CIS) 20:2021)

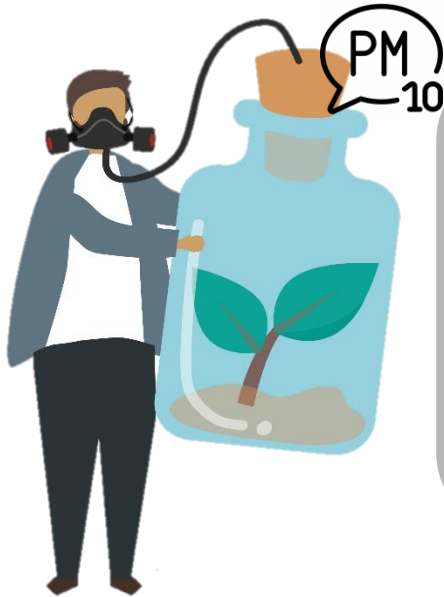
EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
<p>Net Energy Metering</p>	 <p>Source: www.itramas.com</p>	<p>Net energy metering (NEM) allows electricity customers who wish to supply their own electricity from on-site generation to pay only for the net energy they obtain from the utility.</p>
<p>Feed In Tariff</p>	 <p>Source: www.sunhotsell.com</p>	<p>A feed-in tariff is a policy tool designed to promote investment in renewable energy sources. This usually means promising small-scale producers of the energy—such as solar or wind energy—an above-market price for what they deliver to the grid.</p>
<p>Energy Efficient Lighting</p>	 <p>Source: jsctzm.en.made-in-china.com</p>	<p>Energy-efficient lighting involves replacement of traditional lamps with the energy-efficient such as fluorescent lamps, CFL lamps and LED lamps.</p>
<p>Motion Sensors for Lighting</p>	 <p>Source: www.safewise.com</p>	<p>A motion sensor light triggers a response when motion is detected. They can be installed indoors, on walls, ceilings, and in doorways, or outside, on the exterior of buildings and homes.</p>
<p>Building Energy Efficiency</p>	 <p>Source: greenbuildingsolutions.org</p>	<p>The energy efficiency of a building is the extent to which the energy consumption per square metre of floor area of the building measures up to established energy consumption benchmarks for that building under defined climatic conditions.</p>

4.6.7

AIR QUALITY IN CONSTRUCTION

4.6.7.1 GENERAL OUTLOOK



Land clearing, the use of diesel engines, demolition, burning, and working with toxic materials are all construction activities that contribute to air pollution. All construction sites generate a lot of dust, typically from concrete, cement, wood, stone, and silica, which can travel for long distances. Construction dust is classified as PM10, which has a diameter of less than 10 microns and is invisible to the naked eye. Diesel is also responsible for carbon monoxide, hydrocarbons, nitrogen oxides, and carbon dioxide emissions. Oils, glues, thinners, paints, treated woods, plastics, cleaners, and other hazardous chemicals commonly used on construction sites contribute to air pollution.

4.6.7.2 GOAL SETTING

SCOPE



- The procedures apply to any construction site where personnel work, as well as the surrounding environment.
- The Guideline is applicable to ensure the indoor air quality is during pre-construction phase, construction phase and post-construction phase.

AIM



To suggest several strategies for managing air quality on the construction site and ensure it achieves a certain standard that impose by the government during pre-construction phase, construction phase and post-construction phase.

Additional Information / Fact

The effort to sustain construction management are aligned with 12th Malaysia Plan, World Green Building Council and United Nations Framework Convention on Climate Change targets as highlighted below:

12th Malaysia Plan (2020 – 2025)

- Malaysia committed becoming a carbon neutral nation by as early as 2050.
- Carbon pricing and carbon tax will be introduced alongside other carbon reduction measures after a review of the low-carbon development strategies by the end of 2022.

World Green Building Council (2019)







Building generate nearly 40% of annual global carbon dioxide emissions.

United Nations Framework Convention on Climate Change (2020)








Malaysia intended to reduce the greenhouse gas emission intensity by 45% cross the economy in 2030.

4.6.7.3 Ambient Air Quality





Pre-Construction & During Construction

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Consultants / Site Managers / Environmental Officers / Project managers	During site operations, dust, emission and odours pollutants (e.g. CO ₂ , SO ₂ , NO ₂ and PM ₁₀) are generated from various operations of construction equipment and transportation, which these small particles can penetrate the lung and cause respiratory illness among construction workers and people surrounding.	Reducing air pollution can help construction workers become healthier and improve productivity to work at the construction site.	<p>The ambient air monitoring can be conducted every month, depending on the duration of the construction phase.</p> <p>Best Practice Management</p> <ul style="list-style-type: none"> Water sprinklers will be provided to avoid dust generation during transport and material unloading. Dense plantation will be carried in and around the applied area to help in combating air pollution. Conduct The ambient air quality monitoring in the surrounding periodically. 	 Guidelines on Land Disturbing Pollution Prevention and Mitigation Measure	DOE
			 Air Pollution Index (API) Calculation		
			<p>LCCF Calculator</p> <ul style="list-style-type: none"> The LCCF Calculator assesses each criterion in terms of GHG emissions and GHG sequestration/absorption. 	 Low Carbon Cities Framework 2017	KASA
			<p>MYCREST</p> <ul style="list-style-type: none"> Calculation of GHG Emission. Cover design and performance-based. 	 Guideline Design Stage Certification MYCREST  Guideline Construction Stage Certification MYCREST	CIDB
<p>GreenPASS</p> <ul style="list-style-type: none"> Calculation of GHG Emission. Cover performance based only. 	 Guideline Green Performance Assessment System in Construction (GreenPASS)	CIDB			

4.6.7.4 Indoor Environmental Quality

During Construction & Post-Construction					
Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Property Owners/ Tenants/ Occupants	Enhance the indoor air quality in buildings, thus, contributing to the comfort and wellbeing of occupants.	Poor indoor air quality (IAQ) has been tied to symptoms like headaches, fatigue, trouble concentrating, and irritation of the eyes, nose, throat and lungs.	<ul style="list-style-type: none"> Enforce Smoking Restriction at Premises. Design and maintain good indoor environmental quality (IEQ) in an occupied space by establishing minimum indoor environmental quality (IEQ) performance. Monitoring and control of carbon dioxide levels (CO₂), which are effective to ensure the comfort and harmony of building users and plant rooms. Use only zero/low VOC paints. The building design must comply with the Indoor Mold Prevention Guideline. 	 JKR Standard Indoor Environmental Quality (IEQ) for office buildings	JKR
				 Construction Industry Standard 20:2021	CIDB
				 Guidelines on Control of Molds Contaminant and Remediation	DOSH
				 Guidance Note on Ventilation Indoor Air Quality (IAQ) for Public Area Setting	
Post-Construction					
Property Owners/ Tenants/ Occupants	Enhance the indoor air quality in buildings, thus, contributing to the comfort and wellbeing of occupants.	Poor indoor air quality (IAQ) has been tied to symptoms like headaches, fatigue, trouble concentrating, and irritation of the eyes, nose, throat and lungs.	<p>Guideline Ventilation and Indoor Air Quality (IAQ) During Covid-19 Pandemic.</p> <p>To guide public on improving ventilation and indoor air quality; and to reduce the risk of airborne transmission, especially during a pandemic.</p>	 Guidance Note on Ventilation Indoor Air Quality (IAQ) for Healthcare Facilities Setting	DOSH
				 Guidance Note on Ventilation Indoor Air Quality (IAQ) for Residential Setting	
				 Guidance Note on Ventilation Indoor Air Quality (IAQ) for Non-Residential Setting	

EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
Wash Bay	 <p>Source: catchmentsandcreeks.com.au</p>	<p>The purpose of a wash bay or vehicle washing system may not be restricted to just sediment control, but can include dust, pollution, and weed (seed) control.</p>
Dust Control Water Spray	 <p>Source: dustaside.com.au</p>	<p>The use of air-and-water spraying systems can reduce dust the concentration by up to 80% and they contribute to a significant reduction of dust concentration in the air.</p>
Low-Volatile Organic Compounds (VOCs) Paints	 <p>Source: nipponpaint.com.my</p>	<p>Low VOC refers to volatile organic compounds that are not harmful to the environment and humans.</p>
Good Indoor Environmental Quality	 <p>Source: santosknightfrank.com</p>	<p>A space with good indoor air quality is one that is low in toxins, contaminants and odors. Good air quality possible when spaces are well ventilated (with outside air) and protected from pollutants brought into the space or by pollutants off-gassed within the space.</p>

4.6.8

NOISE POLLUTION CONTROL

4.6.8.1 GENERAL OUTLOOK



Noise pollution at the construction site has become one of the noise pollution contributors in urban area where development in keep on going with the needs of construction projects. Noise pollution produced at construction site is harmful to the health of those who involved in the construction projects and stay at the site for a long period of works.

4.6.8.2 GOAL SETTING

SCOPE



Contribute to attaining, particularly in the long term, a considerable and sustainable reduction in the incidence and severity of occupational noise pollution during pre-construction phase, construction phase and post-construction phase.

AIM



To identify effective and practical actions that can be implemented to manage hazardous noise at every stage of the construction process – including before work begins on site.

Additional Information / Fact

The effort to sustain construction management are aligned with Department of Occupational Safety and Health and Department of Environment findings as highlighted below:




Department of Occupational Safety and Health (2019)

91% of reported occupational disease reported in 2019 were related to exposure to excessive noise at work.






Department of Environment (2019)

Maximum permissible noise levels range from 83 dBA for heavy two-wheeled vehicles to 84 dBA for trucks at construction site and communities' area.

4.6.8.3 Noise Limit and Control

Pre-Construction					
Key Players	Key Issue	Goal / Rational	Strategies	Reference Document	Agency
Contractors / Safety Officers / Construction workers / Supervisor / Consultant	Noise produced higher than 90dBa will cause harmful to human health in terms of physically or mentally.	Protecting employees in a construction site and communities surrounding from construction noise.	<p>Noise Exposure Control Plan.</p> <ul style="list-style-type: none"> List of equipment to be used with noise level at the worker position at a distance of 1m; Measures to reduce the noise exposure level, example by maintaining or providing barriers and enclosures; Restriction on working hour, rotating workers within the hearing protection zone and arrangement for doing loud work outsidess working hours; Audiometric testing; noninvasive hearing test that measures a person's ability to hear different sounds, pitches, or frequencies; Identify and mark noise level of plant, processes and work with warning signs; Carry out site induction to workers and contractors, which includes information related to noise level, noise exposure control and proper use and maintenance of PHP; and Selection and provision of appropriate Personal Hearing Protector (PHP). 	 Guideline Industry Code of Practice for Management of Occupational Noise Exposure and Hearing Conservation 2019	DOE
	Employee that works on construction site expose to noise pollution in long time period that will cause injuries towards their health.			 Occupational Safety and Health (Noise Exposure) Regulations 2019	 Guidelines for Environmental Noise Limits and Control Third Edition 2019
Sixteen percent of worldwide disabling hearing loss was due to occupational noise.					

EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
Noise Barriers	 <p>Source: mrsb-roadsafety.com</p>	<p>A noise barrier (also called a sound wall, noise wall, sound berm, sound barrier, or acoustical barrier) is an exterior structure designed to protect the inhabitants of sensitive land use areas from noise pollution.</p>
Controlling noise from construction site	 <p>Source: dosh.gov.my</p>	<p>Typical management decisions that reduce worker exposures to noise are moving workers away from the noise source, restricting access to areas, rotating workers performing noisy tasks, and shutting down noisy equipment when not needed.</p>
Sound Absorbing Materials	 <p>Source : theconstructor.org</p>	<p>Many common building materials, such as gypsum board, wood, concrete, brick and tile, are reflective and do not absorb much sound. Softer materials, such as carpet, foam padding, and fiberglass insulation, are far better at absorbing sound.</p>
Ear Protection	 <p>Source : safetyandhealthmagazine.com</p>	<p>There are several options for hearing protection available that include ear plugs, earmuffs, and hearing bands, which are also known as canal caps.</p>
Proper Saw Cutter Practices	 <p>Source - bigrentz.com</p>	<p>For concrete sawing, the most important PPEs include safety glasses, respirators, and hearing protection. Of course, proper clothing, footwear, and hard hats also are necessary and sensible for most construction sites.</p>

4.6.9

B I O D I V E R S I T Y

4.6.9.1 GENERAL OUTLOOK



Commercial developments, housing estates, infrastructure, and public sector projects all have the potential to disrupt natural environments, harming wildlife and plant species. The construction sector also consumes a significant number of resources, many of which are created or obtained through processes that have an influence on biodiversity. As a result, the building sector plays a vital role in protecting sensitive sites and minimizing environmental harm. There are other chances to improve biodiversity by including habitat creation into a building or development project.

4.6.9.2 GOAL SETTING

SCOPE



Has a critical role to play in conserving sensitive sites and minimizing ecological damage during pre-construction phase, construction phase and post-construction phase.

AIM



- a) To strike a balance between nature and man-made settlements;
- b) To assess the impact of construction products and procedures on biodiversity; and
- c) Avoid development in environmental sensitive areas.

Additional Information / Fact

The effort to sustain construction management are aligned with Convention on Biological Diversity, United Nations, National Policy on Biological Diversity, Green Technology Master Plan and The International Union for Conservation of Nature Red List of Threatened Societies findings and targets as highlighted below:

Convention on Biological Diversity (2019)

Malaysia's commitment to maintain at least 50% of forest and tree cover in perpetuity, as pledged at the 1992 Rio Earth Summit.

National Policy on Biological Diversity (2016 – 2025)

By 2025, biodiversity conservation has been mainstreamed into national development planning and sectoral policies and plans.

United Nations (2015)

SDG 15: Life on Land and SDG 16: Life Below Water
By 2030, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts.

Green Technology Master Plan (2017 – 2030)






Sustainable exploitation of Malaysian biodiversity

The International Union for Conservation of Nature Red List of Threatened Societies (2008)

2008 IUCN Red List, Malaysia is home to 1,141 threatened species, including plants and animals.

4.6.9.3 Conservation and Preservation of Biodiversity

Pre-Construction, During Construction & Post-Construction

Key Players	Key Issues	Goal / Rational	Strategies	Reference Documents	Agency
Contractors/ Environmental Officers / Site Managers / Engineers	A total of 567 plant species out of the 1,600 Peninsular Malaysia plant species assessed in the Malaysia Red List have been classified as threatened should be a cause for alarm.	Malaysia's commitment to maintain at least 50% of forest and tree cover in perpetuity.	<p>Conservation and Preservation of Biodiversity</p> <ul style="list-style-type: none"> Using plants to control stormwater runoff. Plants can play an important role in reducing runoff and removing contaminants in runoff. Removing trees and other vegetation may require permission from the local council. Before removing trees from a site, consider their value to the environment and/or the community. Observation of the site and adjacent sites by using IoT will provide information about the types of trees and plants that grow well in an area, and their effect on wind and sun on the site. 	 Environmental Impact Assessment Guideline in Malaysia 2016	DOE
				 Environmental Impact Assessment Guidelines for Development in National and State Parks 2017	
				 Environmental Impact Assessment Guidelines Development in Coastal Areas and Marine Parks 2017	
				 Garis Panduan Perancangan Pembangunan di Kawasan Bukit dan Tanah Tinggi 2009	PLANMalaysia
			 Garis Panduan Perancangan Pembangunan Kawasan Sensitif Alam Sekitar 2017		

Did you Know!

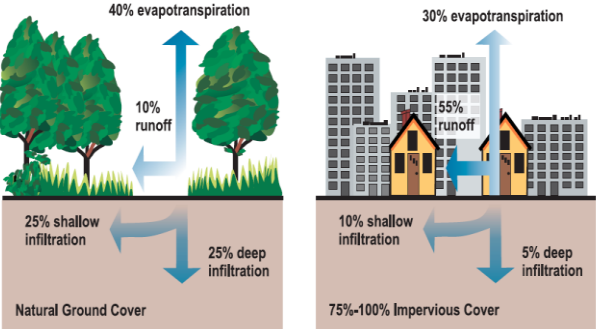



Carbon (C) sequestration by growing and managing forests has been recognized as the main mitigation strategy for the changing climate. Forests are essential terrestrial C sinks because they store a large amount of C in vegetation and soil and interact with atmospheric processes through the absorption and respiration of CO₂.

Carbon Sequestration rate of grassland, bamboo and water bodies

Natural Vegetation	tCO ₂ / ha/ yr
Grassland	200
Bamboo	378
Tropical Wetlands	2.56

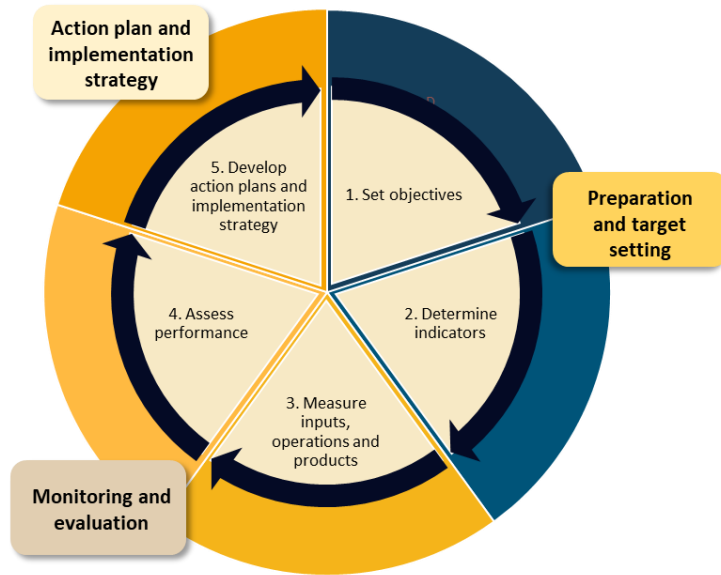
(Source: Construction Industry Standard (CIS) 20:2021)

EXAMPLE OF STRATEGIES

Strategies	Examples	Descriptions
<p>Trees as a Stormwater Runoff</p>	 <p>Source: www.cwp.org</p>	<p>Trees are increasingly recognized for their importance in managing runoff. Their leaf canopies help reduce erosion caused by falling rain. They also provide surface area where rainwater lands and evaporates. Roots take up water and help create conditions in the soil that promote infiltration.</p>
<p>Declare as a Forest Reserve</p>	 <p>Source: foe.malaysia.org</p>	<p>Forest reserves are portions of state lands where commercial harvesting of wood products is excluded in order to capture elements of biodiversity that can be missing from sustainably harvested sites.</p>
<p>Forest Monitoring using GIS</p>	 <p>Source: a-a-f-s.org</p>	<p>GIS enhances forest management by assisting landowners and forest managers to evaluate and analyze the species diversity, age and size of timber, timber density, and volume.</p>
<p>Preliminary Study (Environmental Impact Assessment)</p>	 <p>Source: doe.gov.my</p>	<p>Preliminary assessment is the stage of the EIA procedure that should normally be initiated at the pre-feasibility study stage of the development of an activity. Project options are identified at this stage and any significant residual environmental impacts are made known.</p>

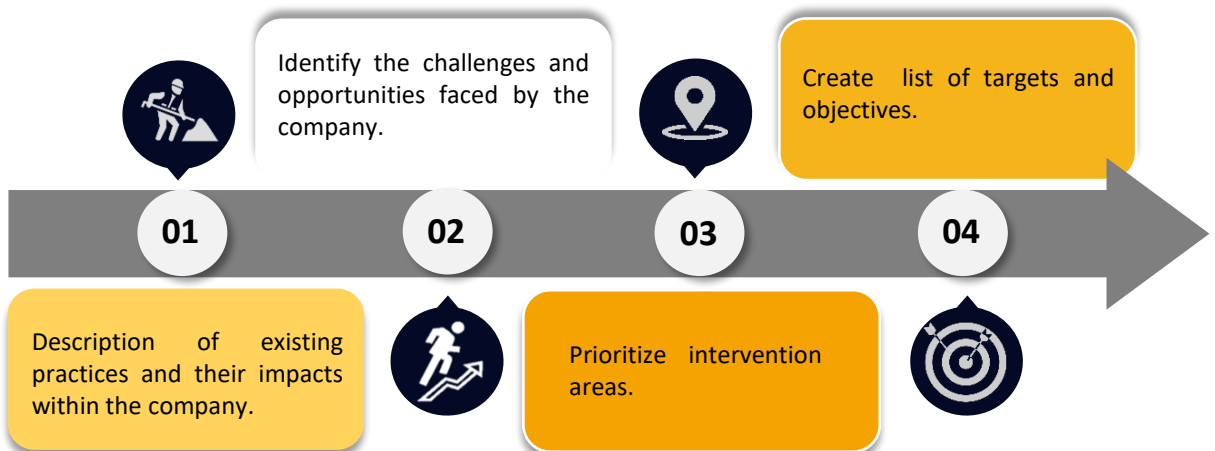
4.7 Implementation and Action Plan

The figure below illustrates five main steps that are highlighted in the green construction process. "Preparation and target setting", as well as "Monitoring and Evaluation", are the two key stages of these five activities. An Action plan and Implementation Strategy will precede for the final stages.



4.8 Preparation and Target Setting

Before a particular company initiates the construction process, the most crucial step is to determine the main target or objective for the project, as this will have an impact on the indicators involved, such as resources and management. Figure 3.2 below depicts the recommended procedure that associated companies can use to establish the project's targets and objectives.



After selecting the project's targets and objectives, the indicators involved will be identified, along with the appropriate action plan, based on the project's situation. Table below shows an example of an action plan based on the indicators that are relevant the construction project.

Indicator	Action Plan	Target Setting	Green Technology Master Plan
Construction Management	<ul style="list-style-type: none"> ▪ Conserve existing natural areas and restore damaged area. ▪ Maximize open space & green spaces. ▪ Erosion and Sedimentation Control (ESC) Plan. ▪ Conducting environmental monitoring regularly. ▪ Designation of safety engineer. ▪ Conducting health and safety risk assessment. ▪ Provide health and safety training. ▪ Promote recycle and reuse practices. ▪ Internal training for sustainable consumption. ▪ Develop green policies or standards of operations. ▪ Develop more forest city concept. 	<ul style="list-style-type: none"> ▪ Implement green construction practices throughout the pre-construction, construction, and post-construction phases. 	<ul style="list-style-type: none"> ▪ By 2030, target number of certified buildings is 1,750 buildings.
Innovation	<ul style="list-style-type: none"> ▪ Increase product dependability and durability. ▪ Reuse or recycle materials. ▪ Incorporate product design that applied sustainable practices. ▪ Develop effective and efficient construction process, materials, technologies and etc. ▪ Encourage more IBS System Building. 	<ul style="list-style-type: none"> ▪ Enhance construction processes, materials, and technology in sustainable and effective ways. 	Not Applicable
Resource/ materials management	<ul style="list-style-type: none"> ▪ Use less packaging. ▪ Reused building materials. ▪ Used building materials extracted and manufactured within the construction site or region. ▪ Forest management and compliance the requirements from Malaysia. ▪ Use environmentally friendly refrigerants and clean agents. ▪ Use zero Ozone Depleting Potential (ODP). 	<ul style="list-style-type: none"> ▪ Reduce waste and costing costs. ▪ Reduce environmental impact, especially from transportation. ▪ Efficient use of building material resources. 	<ul style="list-style-type: none"> ▪ By 2030, must achieve 28% recycling rate. ▪ By 2025-2030, new technology (Example: Automated brick laying etc. used in building construction).
Energy Efficiency	<ul style="list-style-type: none"> ▪ Develop energy efficient design. 	<ul style="list-style-type: none"> ▪ Reduce 40% GHG emission by 2030. 	<ul style="list-style-type: none"> ▪ By 2030, increase 30% renewable energy. ▪ By 2030, 15% reduction in electricity consumption.

Indicator	Action Plan	Target Setting	Green Technology Master Plan
Waste Management	<ul style="list-style-type: none"> ▪ Separate hazardous waste, domestic waste and construction waste. ▪ Waste is segregated and labelled. ▪ Install waterproof covers. ▪ Track the hazardous waste properly. ▪ Hire waste management company. ▪ Select an appropriate competent person for waste management at the site. ▪ Identify waste streams. ▪ Introduce waste management systems. ▪ Engage and educate everyone at the site. ▪ Install wastewater treatment facilities. ▪ Install portable toilet at the site. ▪ Keep drainage system and discharge point clean. ▪ Check regularly the quality of effluent at the site. 	<ul style="list-style-type: none"> ▪ Waste minimization. ▪ Reduce environmental impacts. 	<ul style="list-style-type: none"> ▪ By 2030, must achieve 28% recycling rate. ▪ Construction sector expected to expand by 10.3% per annum during RMK-11 where mainly generate a number of wastes.
Water Management	<ul style="list-style-type: none"> ▪ Reuse of rainwater. ▪ Remain existing water bodies. ▪ Rainwater Harvesting System (RWHS). ▪ Design of system using portable water supply. ▪ Manages water consumption using sub-meters. ▪ Link sub-meters to the Environmental Management Systems (EMS). ▪ Make room for more water – flood management. 	<ul style="list-style-type: none"> ▪ Implement green construction practices throughout the pre-construction, construction, and post-construction phases. 	<ul style="list-style-type: none"> ▪ By 2030, 30% treated effluent to be recycled. ▪ 60% of towns in Malaysia installed Rainwater Harvesting Systems by 2020.
Air Quality	<p>Ambient Air Pollutions</p> <ul style="list-style-type: none"> • Water sprinkler to avoid dust generation during transport and material unloading. • Dense plantation to help in combating air pollution. • The ambient air quality monitored quarterly. 	<ul style="list-style-type: none"> • Reducing air pollution can help construction workers become healthier and improve productivity to work at a construction site. 	Not Applicable

Indicator	Action Plan	Target Setting	Green Technology Master Plan
Air Quality	<p>Indoor Air Pollutions</p> <ul style="list-style-type: none"> • Enforce Smoking Restriction at Premises. • Design and maintain good indoor air quality in an occupied space by establishing minimum indoor air quality (IAQ) performance. • Monitoring and control of carbon dioxide levels (CO₂). 	<p>Reducing air pollution can help construction workers become healthier and improve productivity to work at a construction site.</p>	<p>Not Applicable</p>
Noise Quality	<ul style="list-style-type: none"> ▪ Using sound-absorbing materials. ▪ Moving the noisy work away from other workers. ▪ Operating hours for construction sites. ▪ Maintained prime movers/diesel engines. 	<ul style="list-style-type: none"> ▪ Waste minimization. ▪ Reduce environmental impacts. 	<ul style="list-style-type: none"> • Protecting employees in a construction site and communities surrounding from occupational noise.
Biodiversity	<ul style="list-style-type: none"> ▪ Environmental Impact Assessment. ▪ Direction framework. ▪ Mainstreaming biodiversity conservation in development planning. ▪ Preserve conservation areas. ▪ Avoid development in the environmental sensitive area. 	<ul style="list-style-type: none"> ▪ Malaysia's commitment to maintain at least 50% of forest and tree cover in perpetuity. 	<ul style="list-style-type: none"> ▪ Sustainable exploitation of Malaysian biodiversity

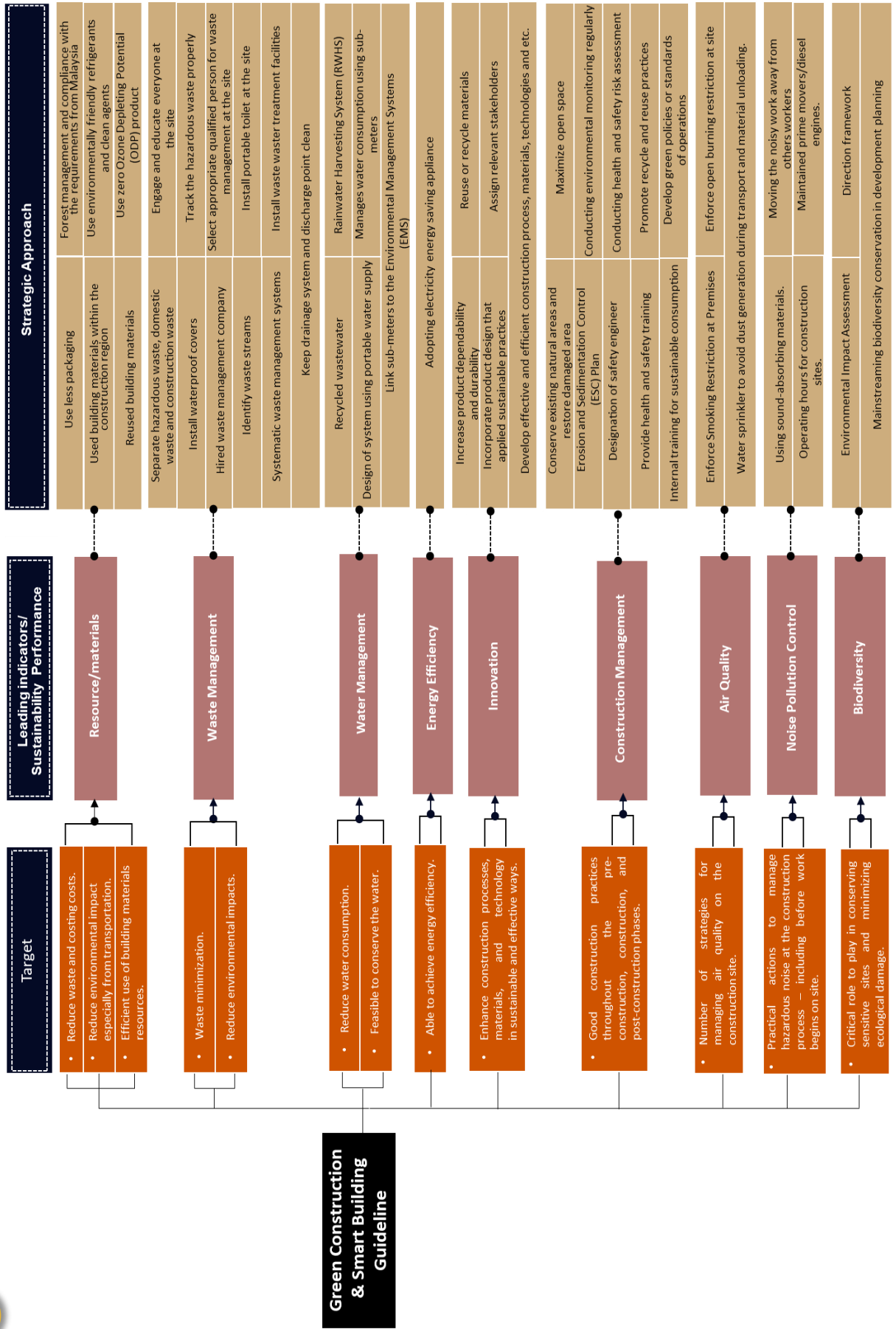


4.9 Monitoring and Evaluation

Continuous monitoring and evaluation are deemed important to ensure the successful implementation of green construction practices. Contractors and developers must adhere to the standard operating procedure and self-regulation themselves whether they are able to comply with the recommended guidelines. Contractors and developers shall issue a periodic performance monitoring report on the implementation of green construction practices based on this guideline.

Indicator	Monitoring & Evaluation aspects	Responsibility
Resource/ materials	<ul style="list-style-type: none"> Perform and coordinate the quality control inspections by using inspection check sheets to improve quality of the building, reduce defect rates, and reduce re-work during the construction phase. 	Quality Control
	<ul style="list-style-type: none"> Monitoring laboratory and field testing of construction material and completed works. Reviewing contractor's compliance with specifications, requirement for construction methods and personnel. 	Quality Assurance
	<ul style="list-style-type: none"> Reviewing construction plans and preparing quantity requirements. 	Quantity Surveyor
	<ul style="list-style-type: none"> Record materials purchase and ordering history on the logbook to ensure that the construction project is completed within its projected budget. 	Quantity Surveyor
Construction waste & wastewater	<ul style="list-style-type: none"> Record of scheduled waste category generate, stored, treated, recovered, destroyed, disposed, handled at the construction site on the Electronic Scheduled Waste Information System (E-SWIS) every month. 	Environmental Officer
	<ul style="list-style-type: none"> Record every collection of construction and demolition waste on the logbook. 	Environmental Officer
	<ul style="list-style-type: none"> Sorting and weighing the recyclable construction waste. 	Environmental Officer
	<ul style="list-style-type: none"> Prohibition of open burning activities at construction sites. 	Environmental Officer / Site supervisor
	<ul style="list-style-type: none"> Conducting water quality monitoring every three (3) months. 	Environmental Officer
	<ul style="list-style-type: none"> Record monthly online erosion and sediment control inspection. 	Environmental Officer
Water consumption monitoring	<ul style="list-style-type: none"> Monitor and record water consumption bills at the construction site. 	Site supervisor
Energy consumption monitoring	<ul style="list-style-type: none"> Monitor and record monthly electricity bills and usage rates of electricity generation at construction sites. 	Site supervisor
Innovation	<ul style="list-style-type: none"> Checklist the method or equipment that implement the eco-innovations at the construction site. 	Project manager
Construction management (HSO &EO); Air Quality and Noise Level monitoring	<ul style="list-style-type: none"> Conducting Environmental, Safety and Health auditing to monitor compliance with industry standards, laws, and guidelines on environmental and safety and health aspects at least twice a year. 	Internal and external auditor
Biodiversity	<ul style="list-style-type: none"> Monitor the changes of land use and protective area by using Aerial photographs and geographical information that can be obtained from Terralink and Google Earth. 	Engineer

4.10 Framework of Green Construction Practices



WHEN	WHAT & WHO	WHERE	HOW	WHY
<p>PHASE</p> <p>Pre-Construction</p>	<p>ACTIVITIES</p> <ul style="list-style-type: none"> Initial meeting to discuss the project; Planning the design; Estimating costs and offer cost-saving options; Managing project scope; Identifying potential issues & outlining solutions; Determine any options for value engineering; Site selection and feasibility study; Evaluating soil condition on site; Checking existing utilities; Determining equipment required; Check for green building options and viability; Life-cycle analysis; and Outlining contingencies for both client and contractor. 	<p>RELATED ACT/POLICY/ GUIDELINES & STANDARD</p> <p>Conversion of Land Use Section 124, National Land Code of Malaysia, 1965 (Act 56).</p> <p>Planning Permission Section 19, Town and Country Planning Act, 1976 (Act 172);</p> <ul style="list-style-type: none"> Prohibition of development without planning permission. <p>Building Plan Approval Section 70 (1), Street, Drainage And Building Act, 1974 (Act 133);</p> <ul style="list-style-type: none"> No Person shall erect any building without the prior written permission of the local authority. <p>Sub-Division Section 135 – 139, National Land Code of Malaysia, 1965 (Act 56).</p> <p>Certificate of fitness for occupation</p> <ul style="list-style-type: none"> Local Government Act, 1976 (Act 171). Electricity Supply Act, 1990 (Act 447). Water Services Industry Act, 2006 (Act 655). 	<p>GREEN PRACTICES STRATEGIES AND ACTION PLAN</p> <ol style="list-style-type: none"> Site inventory Analysis on Greenery. Carbon Accounting on Site; <ul style="list-style-type: none"> carbon sequestration (preservation mature tree). carbon sequestration (restoration – Planting new tree). Environmental Management Plan. Emphasize on sustainable development principles in design of city plan. Green building principles in design. Application of green principles guides in project initiation process. Use local and eco-labelling construction materials and resources. 	<p>GREEN RECOGNITION/INITIATIVES</p> <ul style="list-style-type: none"> Pre-Approved Plan (PAP) by CIDB Government Green Procurement (GGP) MyHIJAU <p>Designing Assessment Tools</p> <ul style="list-style-type: none"> GBI MyCrest GreenRE pH JKR SUSDIX MyGHI Melaka Green Seal
	<p>Key Stakeholder</p> <ul style="list-style-type: none"> Developer Consultant Town Planner Architect Landscape Architect Quantity Surveyor Engineer Technical Assistant Local Authority 			

WHEN

PHASE

During Construction

WHAT & WHO

ACTIVITIES

Civil Works

- Site preparation & machinery; Earthwork & Site Excavation;
- Technical and engineer works; Demolition And Site Clearance;
- Drainage Works;
- Geotechnical Works; and
- Pavement Works.

Other related construction activities

- Project management & monitoring;
- Waste Management;
- Sewerage Management;
- Occupational Safety And Health Management;
- Maintenance Works; and
- Storing of materials & machinery.

Key Stakeholder

- Project manager
- Architect
- Landscape Architect
- Engineer
- Quality & Environmental Inspector
- Site Manager & Supervisor
- Contractor & Sub-contractor
- Site worker
- Authority

WHERE

RELATED ACT/POLICY/ GUIDELINES & STANDARD

- National Construction Policy 2030;
- Environmental Quality Act 1974;
- Environmental Impact Assessment Guideline in Malaysia, 2016;
- Guidelines for Erosion and Sediment Control; and
- Manual Saliran Mesra Alam (MSMA), 2012.
- A Reference Guide for Malaysian Carbon Reduction and Environmental Sustainability Tool;
- Guidelines for Environmental Noise Limits and Control Third Edition 2019;
- Water Quality Index Malaysia Standard;
- Air Quality Index Malaysia Standard;
- Construction Industry Standard (CIS), CIDB;
- MS ISO 14001: 2015 – Environmental Management Systems;
- Occupational Safety and Health (Noise Exposure) Regulations 2019;
- Guideline Green Performance Assessment System in Construction (GreenPASS); and
- Inspection Guidance. etc.; and
- Buildings Works (2014 Edition)

HOW

GREEN PRACTICES STRATEGIES AND ACTION PLAN

- Emphasize on local materials & resources usage;
- Environmental impact monitoring;
- Safe working environment;
- Sustainable water & energy consumption;
- Biodiversity & conservation safeguarding;
- Erosion and Sedimentation Control (ESC) Plan;
- Emission Calculation and Reporting;
- 7R Waste Management Practices;
- Rainwater harvesting;
- Water cycling system;
- Using plants to control stormwater runoff;
- Link sub-meters to the Environmental Management Systems (EMS);
- Make room for more water – flood management;
- Water sprinkler to avoid dust generation during transport and material unloading;
- Dense plantation to help in combating air pollution;
- Moving the noisy work away from other workers; and
- Operating hours for construction sites.

WHY

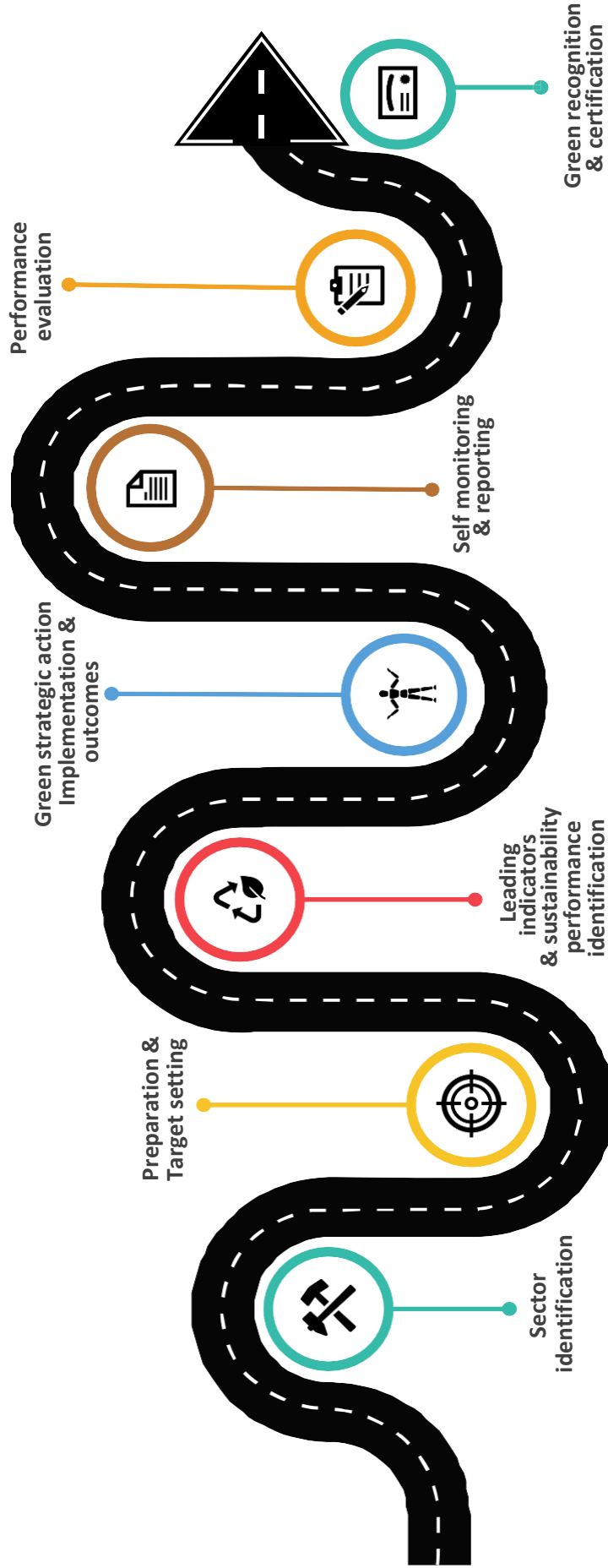
GREEN RECOGNITION/INITIATIVES

- Construction Assessment Tools**
- GBI
 - MyCrest
 - GreenRE
 - pH JKR
 - SUSDIX
 - MyGHI
 - Melaka Green Seal
 - LCFE Assessment Tools
 - Green Performance Assessment System (GreenPASS)
 - Green Real Estate (GreenRE)
 - Indeks Penarafan Bintang (Indeks SSR)
 - MyHIJAU
 - Sustainable INFRASTAR

WHEN	WHAT & WHO	WHERE	HOW	WHY
<p>PHASE</p>	<p>ACTIVITIES</p> <ul style="list-style-type: none"> Housekeeping; waste management practices of post construction; Facilities Management; Sustainable or green audit implementation; Implementation of environmental Codes, Covenants, and Restrictions (CCRs) that address environmental practices and long-term management; Inspection; Establishment of a building/premise owner association that includes a sub-group to oversee conservation issues associated with built and conserved areas. Maintenance Management 	<p>RELATED ACT/POLICY/ GUIDELINES & STANDARD</p> <ul style="list-style-type: none"> Environmental Quality Act 1974; A Reference Guide for Malaysian Carbon Reduction and Environmental Sustainability Tool; Guideline Green Performance Assessment System in Construction (GreenPASS); GreenRE Rating Tools & Design Reference Guide GBI Rating Tools & Design Reference Guide; Manual Penarafan Hijau (pH JKR, National Solid Waste Management Policy; Solid Waste and Public Cleansing Management (Licensing) (Undertaking or Provision of Collection Services for Construction Solid Waste) Regulations 2018; Guidelines on Control of Molds Contaminant and Remediation; JKR Standard Indoor Environmental Quality (IEQ) for Office Building; Standard Specifications for Buildings Works (2014 Edition) 	<p>GREEN PRACTICES STRATEGIES AND ACTION PLAN</p> <ul style="list-style-type: none"> Lighting system control; Automatic photo-sensors; Natural Lighting Design; Energy Efficiency Assessment; Use of renewable energy such as solar streetlight; Composting system; Rainwater Harvesting; Timer Irrigation system; Planting a rooftop garden; 	<p>GREEN RECOGNITION/INITIATIVES</p> <ul style="list-style-type: none"> Green Building Index (GBI) Penarafan Hijau (pHJKR) Carbon Reduction & Environmental Sustainability Tool (MyCREST) Malaysia Green Highway Index (MyGHI) Green Real Estate (GreenRE)
<p>Post-Construction</p> <ul style="list-style-type: none"> Housekeeping Building Operation 	<p>Key Stakeholder</p> <ul style="list-style-type: none"> Project Owner Building Owner Building Management Quality & Environmental Inspector Local Authority 			

4.11 Roadmap towards Green Recognition & Certification

The Green Construction Guideline presents the guidelines and proposed activities that developers can take to apply green construction practices. This guideline is driven by the future development of a Green Certificate, which recognizes green construction practices in Malaysia. Through the implementation of green and best practices in construction, the developers may apply for green recognition by the Government of Malaysia, leading to the Green Certification of the construction industry. This roadmap is developed to ensure that Green Construction is facilitated in implementing green practices.





4.12 Way forward Malaysia for Green Construction Sector

According to World Green Building Council, a 'green' building is one in its design, construction or operation, reduces or eliminates negative impacts and can create a positive impact on our climate and natural environment. It constructs based on green features and designs that enable re-use and recycling and green materials such as solar energy. However, it is relatively challenging for Malaysia to have more green buildings in the current climate. According to the Green Economy Tracker, over 90 percent of Malaysia's electricity comes from fossil fuels. Malaysia is also well-known as the world's third-largest exporter of liquefied natural gas and the second-largest exporter of palm oil. In addition, there is a lack of awareness of green buildings long before Covid-19. People often consider the price, the condition of the property, the views it offers without considering whether the property is 'green' or even energy-efficient.

To promote implementing of green construction, there has several policy recommendations for the government to consider:

01

- Strong enforcement of rules and regulations are needed to ensure wider compliance to environmental standards.

02

- Encourage industrial players to use green technology in construction sectors by providing small grants.

03

- Attract impact investors by promoting and emphasising the uniqueness, strengths and opportunities of having green buildings in Malaysia.

04

- Give additional tax deductions to GBI-certified buildings, where building owners could enjoy income tax deductions equivalent to the additional capital expenditure needed to obtain the GBI certification

05

- Organise advocacy campaigns with Malaysia Green Building Council to educate the benefits of having green buildings.



(Source: BusinessToday; EMIR Research, 2021)

Did you Know!

According to GBI's published data, the incremental construction cost of going green (inclusive of material and technological costs) ranges from 0.7 percent to 11 percent besides registration and renewal fees. Although an initial costing is required, GBI-certified buildings could yield at least 30 percent to 40 percent energy savings for their dwellers, compared with the average baseline building. Higher energy savings could achieve in buildings with higher levels of certification; and



4.13 Conclusion

Sustainable construction practices implement green building that is energy-efficient and eco-friendly to reduce environmental impact. Besides, sustainable construction helps the environment by preserving natural resources, but it may also help your financial line. According to the US Environmental Protection Agency, sustainable construction extends and complements the traditional building design principles of economy, utility, durability, and comfort. Green construction practices can be integrated into construction buildings, infrastructure, and utilities at any stage, from design and construction to renovation and demolition.

Furthermore, green technology in the construction industry is rapidly evolving. Green technology assists the construction industry by developing new structures containing one or more ecologically friendly solution components. Sustainable construction has upped the bar for the whole construction sector by creating new livability and sustainability criteria.

There is hardly any denying that businesses are always looking for alternative solutions to help cut down on costs. Nonetheless, construction businesses can benefit from green energy solutions in many ways. Sustainable construction is not just about maintaining the environment, but sustainable solutions make sense for a construction company. It is important to note that businesses adopting green solutions are more likely to attract clients than their counterparts. This particular type of benefit relates

to the company's corporate social responsibility, whereby they are inclined to give back to society in one way or another. Clients will see that the given company is concerned with preserving the environment, thus increasing their company's chances of being selected for a particular job.

The Malaysian construction industry plays an essential role in generating wealth, developing socio-economic infrastructures and buildings. In addition, the industry is providing job opportunities to more than one million people. With the dedication of all stakeholders, continuous efforts to reinforce the achievement and assure the success of the green industry supported by the sustainable development implementation can be realised. Therefore, it is hoped that this Guideline serves as a beneficial approach to moving into sustainable and green construction development.

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