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BUSINESS AND INDUSTRY MODULE

Advocacy, Awareness, Capacity Building and Public Participatory Platforms (AACB)

WATER SECTOR TRANSFORMATION 2040

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None | Elementary | Intermediate | Advanced

1.0 Preface

Advocacy, Awareness, Capacity Building (AACB) and Public Participatory Platforms are two of the sub-sectors of the Water Sector Transformation 2040 (WST2040) spearheaded by the Academy of Sciences Malaysia (ASM) in collaboration with the Economic Planning Unit (EPU), Prime Minister's Department of Malaysia. Universiti Kebangsaan Malaysia (UKM) has been entrusted to develop the Integrated Water Resource Management (IWRM) modules to achieve the ambitious mission of transforming the water sector by accelerating the implementation of IWRM, enhancing the usage of innovative water technology, achieving economy of scales and making Malaysia the Regional Water Hub over four Malaysia Plans from the 12th MP (2021-2025) through the 15th MPs (2036 - 2040.

The AACB sub-sector focuses on five priority areas: the People as the main driver, and Governance, Information, Finance and Infrastructure as the enablers. The objectives are to ensure water security and sustainability and promote water as an economic opportunity. The AACB sub-sector has developed four modules for different groups of stakeholders, namely: 1) Business & Industry, 2) Government, 3) Community and 4) Academia.

Businesses and industries are the key drivers for the country's economy — playing an essential role in driving the water resources conservation and management of the country. The Business & Industry module aims to 1) provide guidance to businesses and industries; 2) benchmark their current water management practices towards sustainability; and 3) promote responsible practices in managing their water resources throughout the value chain. The targeted audiences of this module are Public-listed Companies in Bursa Malaysia, Halal Parks/Industrial Parks/Estate Parks as well as Small Medium Enterprises whereby this module will adopt the IWRM approach in guiding businesses and industries in sustainable water management practices.

We acknowledge the inputs from various stakeholders who have been instrumental in developing this AACB IWRM (Business & Industry) Training Module. We, hereby, would like to express our gratitude to the Economic Planning Unit (EPU) and the Academy of Sciences Malaysia (ASM) for the commitment to make businesses and industries be more sustainable.

Thank you.

2.0 Introduction

Water Sector Transformation (WST2040) has been launched by the Economic Planning Unit (EPU) to accelerate the implementation of Integrated Water Resource Management (IWRM) and provide a foundation for water sector transformation. The WST2040 agenda will take place over a 20-year time frame, spanning through four Malaysia Plans (i.e., 12th to 15th MP) until 2040. The EPU has appointed eight taskforces to work on various sub-sectors in achieving water security and sustainability as well as water as an economic opportunity whereby the eight taskforces are:

1. Advocacy, Awareness and Capacity Building
2. Integrated Water Sector Data Centre
3. IR4.0 in the various Water Sub-sectors
4. Water-Food-Energy Nexus
5. Virtual Water and Water Footprint
6. Climate Change Impact and Adaptation
7. Alternative Water Financing
8. Water as an Economic Sector

Advocacy, Awareness and Capacity Building (AACB) taskforce aims to advocate, raise awareness and build capacity among stakeholders through training and capacity building programmes to improve current water resources management systems and practices in Malaysia. In the AACB taskforce, four clusters have been identified based on the quadruple helix model, namely Government, Business & Industry, Community and Academic clusters. For each of the clusters, a training module that is a part of the AACB programme have been developed to deliver the capacity building materials for the aforementioned clusters. Each of these training modules are divided into three levels:

(i) The elementary level provides an overview of the landscape of business and industry sectors in Malaysia. Water consumption and wastewater generation in business and industry sectors, water-related policies, legal implications and economic incentives to accelerate IWRM implementation in Malaysia will be illustrated. The elementary level is designed to create AWARENESS about sustainable water management among support staff in companies.

(ii) The intermediate level provides the concepts that need to be adopted by the participants to shift the paradigm in water management where the participants are hoped to advocate for transformation in their management practices. The intermediate level is designed to promote ADVOCACY for IWRM among executive staff in companies.

(iii) The advanced level provides the six-step principles as the action framework and benchmark to be adopted and emulated by participants when they return to their organisations. The advanced level is designed to equip EHS and sustainability-related professionals as well as top management with the CAPACITY BUILDING capabilities to

accelerate the implementation of IWRM in their respective organisations and river basins.

Figure 2.1 shows the Water Sector Transformation (WST2040) framework to guide the rollout of the initiatives and programmes whereby strategies and roadmap are recommended and organised according to the objectives of the driver (i.e., People) and respective enablers (i.e., Governance, Information & RDCI, Finance and Infrastructure & Technology). Table 2.1 shows the strategies and roadmap for the Business & Industry cluster.

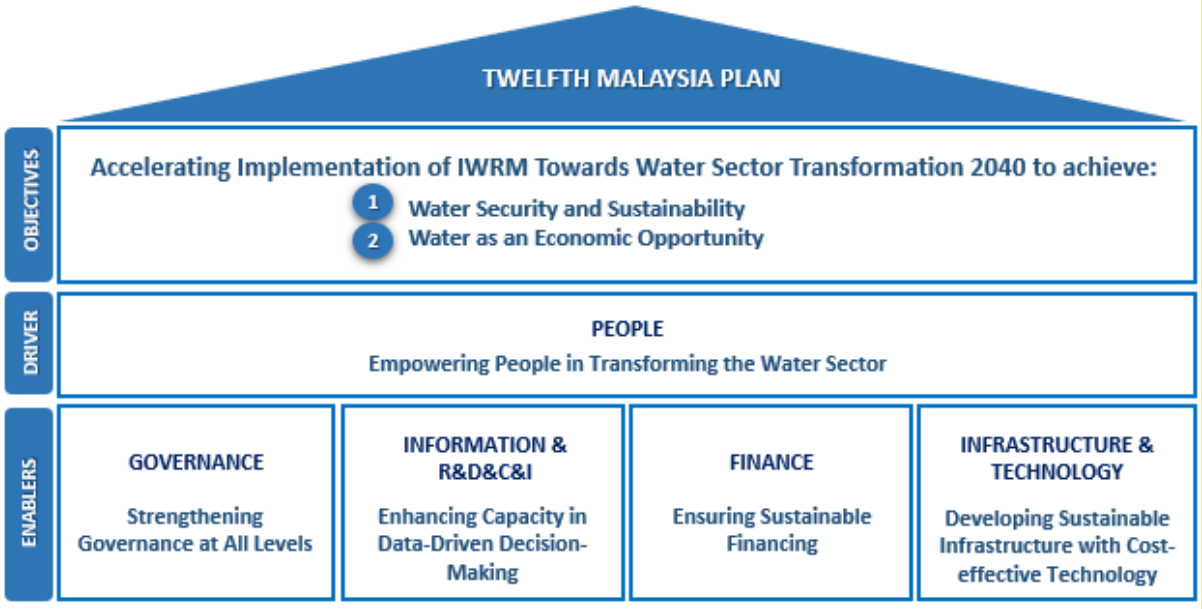


Figure 2.1 Water Sector Transformation (WST2040) framework

(i) PEOPLE

People have been identified as the driver for WST2040 that aims to empower people to drive water sector transformation. In the context of the Business & Industry cluster, human capital has been seen as the prime mover in driving AACB. To date, there are 952 companies listed under Bursa Malaysia (denoted as Cluster A), 247 industrial parks, halal parks and estate parks (denoted as Cluster B) and 5,652,560 small and micro-business and industry establishments in various sectors (denoted as Cluster C) all of which account for millions of workforces in the business and industry sectors of Malaysia. AACB for Business & Industry cluster covers the understanding of policy on IWRM, stakeholders involved, water cycle as well as the importance of IWRM to the people and the country.

Under the pillar of People, it is recommended for the Ministry of Environment and Water (KASA) to provide a holistic 'Training of Trainers' capacity building programme for the stakeholders of the Business & Industry cluster in which the capacity building module will include awareness-raising on demand management and how business and industry could play a role in addressing risks and environmental consequences of their operations and improving water efficiency and sustainability. It is targeted that in the 12th MP for the Business & Industry cluster, the first batch of 900 personnel from Clusters A, B and C will be trained as resource persons. The number of resource persons will propagate stepwise in which the training will be conducted quarterly by KASA to ensure 100% of business and industry entities in Clusters A and B will have attended the AACB 'Training of Trainers' programme by the 15th MP. Considering the big pool of business and industry establishments in Cluster C, the aim is to prioritise the critical sectors of Cluster C for the AACB capacity building programme.

To enhance the water management competency of the business and industry cluster, it is recommended that KASA develops a policy in making this competency certification mandatory for businesses and industries. Through a star-rating system, KASA can monitor and track the adoption and implementation of the six-step principles which can create a long-term ripple effect for businesses and industries in accelerating IWRM implementation. The targeted participants are EHS and Sustainability Professionals from the business and industry cluster for whom the AACB capacity building programme will enlighten the implications of an illegal discharge and methods to conserve water supplied to their business and industry operations. For those professional practitioners accredited by professional bodies like Board of Engineers Malaysia (BEM), Malaysia Board of Technologists (MBOT), Malaysia Green Building Council (MGBC), Malaysian Institute of Architects (PAM), etc, it is also recommended for the Ministry of Human Resources (MoHR) and Human Resource Development Corporation (HRDF) to provide Continuing Professional Development (CPD) points to encourage the professional practitioners to be equipped with IWRM knowledge and skills.

This training module is expected to deliver the means of reducing cost and risk as well as improving compliance and revenue of businesses and industries by adopting the six-step principles as the action framework (Figure 2.2). Through this module, the business and industry sectors can create partnerships with local authorities and communities in co-managing river basins and good branding for their companies through CSR initiatives. Given the current COVID-19 condition, free training gives incentive for businesses and industries to participate in the AACB capacity building programme.

Figure 2.2 The 2C2R implications for business and industry in adopting circularity in water management

(ii) GOVERNANCE

The objective of the governance pillar is to strengthen the governance of the water sector at all levels. It is recommended for KASA to form a strategic partnership with businesses and industries and the Department of Environment (DOE) to establish a resource person directory within their regional network. Under this strategy, a public-private partnership will be formed between KASA and business and industry entities to roll out the AACB 'Training of Trainers' for the business and industry cluster whereby competent trainers trained under the AACB programme will be appointed as resource persons for their respective zones and/or regions. A directory of resource persons will be established

and maintained by DOE and made available for public access so that businesses and industries can always refer and consult the resource persons of their respective zones and regions on the best management practices of water resources.

(iii) INFORMATION & RDCI

The objective of the information & RDCI pillar is to enhance data-driven decision-making for sustainability. Under this strategy, DOE will work with a communication team comprised of resource persons to publish and disseminate water best management practices in businesses and industries through public communications. The communication team will formulate a strategy on tracking and monitoring the effectiveness of the competency training as well as the behaviour of businesses and industries using communication strategy to help in getting the buy-in to promote the uptake of competency training. Furthermore, strategic communication also plays a role to promote star-rating as healthy brand competition which will further reinforce the values of IWRM. Short videos could be produced through competitions to promote awareness about water best management practices among the businesses and industries and easily disseminated to targeted groups through social media. Besides that, resource persons could assist their companies to report water management performance through sustainability reporting on environment, social and governance (ESG) initiatives. Through guarded-self-regulation, DOE and the Department of Drainage and Irrigation (DID) could work together to provide a checklist that takes into account IWRM aspects to facilitate businesses and industries to implement ESG beyond compliance.

(iv) FINANCE

The objective of the finance pillar is to strengthen financial capacity for water sector transformation. It is recommended for the Malaysian Investment Development Authority (MIDA) to introduce a new category in Green Incentives that are related to water management projects. This strategy aims to encourage more business and industry entities to adopt and implement water management projects such as water reuse and reclamation for non-portable purposes in their premises and operation sites. Any investments to enable business and industry entities to adopt these practices should be given tax incentives.

The Ministry of Finance (MoF) and the Inland Revenue Board of Malaysia (LHDN) should also give tax incentives to business and industry entities that successfully protect and upgrade the condition of their nearest water body whereby company tax exemption will be given to business and industry entities for their involvement and contribution in conserving water resources. To assist SMEs in adopting water best management practices, grants will be given as seed money to kick start the SMEs' IWRM initiatives. To recognise business and industry entities that succeed in applying water best management practices in their premises and operations, KASA is recommended to give the annual Water Sustainability Award as publicity for business and industry entities to improve their sustainability image.

(v) INFRASTRUCTURE & TECHNOLOGY

The objective of the infrastructure & technology pillar is to develop sustainable infrastructure with cost-effective technology. The infrastructure & technology pillar aims to set up one-stop training centres at the national and state levels in which DID will provide their existing training centres for the purpose.

3.0 Business and Industry in Malaysia

This chapter provides elementary participants with an overview of the landscape of business and industry sectors in Malaysia. The term “business” has a broad meaning. It refers to organisations or enterprising entities engaged in commercial, industrial or professional activities. Businesses can be for-profit entities or non-profit organisations that operate to fulfil a charitable mission or further social cause. An 'industry' is defined as a group of companies that are related based on their primary business activities and operations. In classifying industries, they are typically grouped into larger categories called sectors.

In AACB, the Business and Industry cluster is further classified into three sub-clusters as below:

CLUSTER A	•Bursa Saham Listed Companies
CLUSTER B	•Industrial Parks/Halal Parks/Estate Parks
CLUSTER C	•Businesses and industries listed under SME Corp.

3.1 Sectors

In Malaysia, different business and industry sectors are under the purview of different ministries. For example, the Ministry of International Trade and Industry (MITI) is responsible for planning, formulating and enforcing policies related to industrial development, international trade and investment. Besides increasing bilateral, multilateral and regional trade connections and collaborations, MITI also helps to stimulate foreign and domestic investments and promote Malaysia's manufacturing products and services exports. Meanwhile, the Ministry of Entrepreneur Development and Cooperatives (MEDAC) is responsible for coordinating the implementation of small and medium enterprise (SME) development programmes across all associated ministries and organisations. MEDAC serves as a primary point of reference for SMEs and entrepreneurs for research and data distribution, as well as providing business advising services to SMEs and entrepreneurs across the country. In Cluster A, there are 952 companies listed under Bursa Saham; Cluster B comprises of 247 Industrial Parks/Halal Parks/Estates Parks; and Cluster C has 5,652,560 establishments listed under SME Corp.

3.2 Bursa Malaysia Listed Companies

Bursa Malaysia is the stock exchange of Malaysia that was incorporated in 1976. As one of the largest bourses in ASEAN, Bursa Malaysia helps over 900 companies in Malaysia to raise capital across 50 economic activities through the Main Market for large-cap companies, the ACE Market for emerging companies of all sizes and the LEAP Market for up-and-coming SME companies. Table 3.1 shows the number of companies listed under Bursa Malaysia according to their industry and sector.

Table 3.1 The number of companies listed with Bursa Malaysia

No.	Industry	Sector	Total
1	Commercial	Commercial Printing/Forms	5
		Miscellaneous Commercial Services	18
		Personnel Services	1
		Advertising/Marketing Services	6
2	Communications	Specialty Telecommunications	6
		Major Telecommunications	4
		Wireless Telecommunications	4
3	Consumer Durables	Motor Vehicles	3
		Other Consumer Specialties	4
		Homebuilding	11
		Electronics/Appliances	10
		Automotive Aftermarket	3
		Recreational Products	2
		Home Furnishings	19
4	Consumer Non-Durables	Food: Major Diversified	1
		Household/Personal Care	5
		Tobacco	1
		Apparel/Footwear	15
		Food: Meat/Fish/Dairy	3
		Food: Specialty/Candy	16
		Beverages: Alcoholic	3
		Beverages: Non-Alcoholic	3
5	Consumer Services	Broadcasting	1
		Other Consumer Services	7
		Hotels/Resorts/Cruise lines	7
		Cable/Satellite TV	1
		Restaurants	3
		Publishing: Books/Magazines	2

		Media Conglomerates	1
		Casinos/Gaming	6
		Publishing: Newspapers	2
		Movies/Entertainment	1
6	Distribution Services	Medical Distributors	1
		Food Distributors	3
		Wholesale Distributors	30
		Electronics Distributors	2
7	Electronic Technology	Aerospace & Defence	2
		Computer Processing Hardware	1
		Electronic Components	4
		Telecommunications Equipment	3
		Computer Communications	2
		Semiconductors	10
		Electronic Production Equipment	4
		Electronic Equipment/Instruments	11
		Computer Peripherals	3
8	Energy Minerals	Oil Refining/Marketing	2
		Oil & Gas Production	1
9	Finance	Life/Health Insurance	1
		Real Estate Investment Trusts	17
		Financial Conglomerates	11
		Finance/Rental/Leasing	4
		Real Estate Development	72
		Investment Managers	2
		Property/Casualty Insurance	5
		Multi-Line Insurance	2
		Regional Banks	9
		Major Banks	2
		Investment Banks/Brokers	7

10	Health Services	Medical/Nursing Services	5
		Hospital/Nursing Management	2
11	Health Technology	Medical Specialties	6
		Pharmaceuticals: Major	7
		Pharmaceuticals: Other	1
		Biotechnology	1
12	Industrial Services	Environmental Services	3
		Oil & Gas Pipelines	1
		Engineering & Construction	66
		Oilfield Services/Equipment	18
		Contract Drilling	2
13	Miscellaneous	Miscellaneous	26
		Investment Trusts/Mutual Funds	20
14	Non-Energy Minerals	Forest Products	23
		Other Metals/Minerals	2
		Construction Materials	15
		Aluminium	6
		Steel	17
15	Process Industries	Industrial Specialties	12
		Pulp & Paper	4
		Chemicals: Agricultural	2
		Textiles	6
		Chemicals: Specialty	9
		Agricultural Commodities/Milling	51
		Containers/Packaging	20
		Chemicals: Major Diversified	1
16	Producer Manufacturing	Office Equipment/Supplies	5
		Miscellaneous Manufacturing	16
		Metal Fabrication	14
		Industrial Conglomerates	2

		Auto Parts: OEM	9
		Building Products	19
		Trucks/Construction/Farm Machinery	7
		Electrical Products	15
		Industrial Machinery	24
17	Retail Trade	Apparel/Footwear Retail	2
		Department Stores	2
		Speciality Stores	9
		Food Retail	4
		Electronics/Appliance Stores	1
18	Technology Services	Packaged Software	25
		Information Technology Services	35
		Internet Software/Services	4
		Data Processing Services	1
19	Transportation	Airlines	2
		Marine Shipping	6
		Other Transportation	13
		Trucking	4
		Air Freight/Couriers	8
20	Utilities	Gas Distributors	2
		Alternative Power Generation	2
		Water Utilities	4
		Electric Utilities	6
		TOTAL	952

3.3 Industrial Parks/Halal Parks/Estate Parks

An industrial park is designed as a zone for industrial use rather than for residential or commercial needs. Industrial parks usually house oil refineries, ports, warehouses, distribution centres and factories. Businesses may even be offered tax incentives such as tax increment financing to set up their operations in some of these industrial parks. Most industrial parks in Malaysia are developed by government agencies such as the State Economic Development Corporations (SEDCs), the Regional Development Authorities (RDAs), port authorities and municipalities. The locations of industrial parks and halal parks in peninsular Malaysia are shown in Figure 3.1, and in Sabah and Sarawak in Figure 3.2.

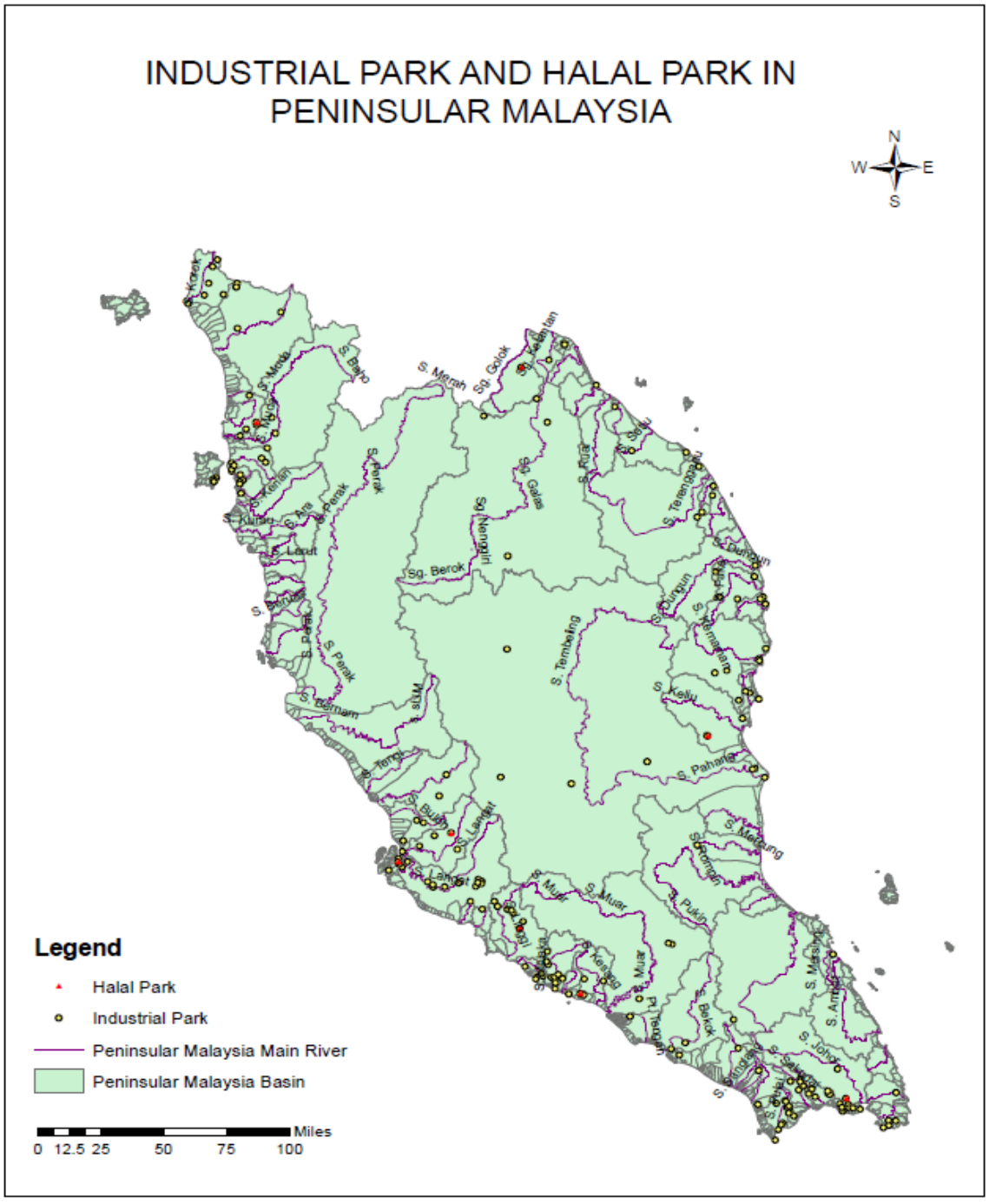


Figure 3.1 Industrial parks and halal parks in peninsular Malaysia

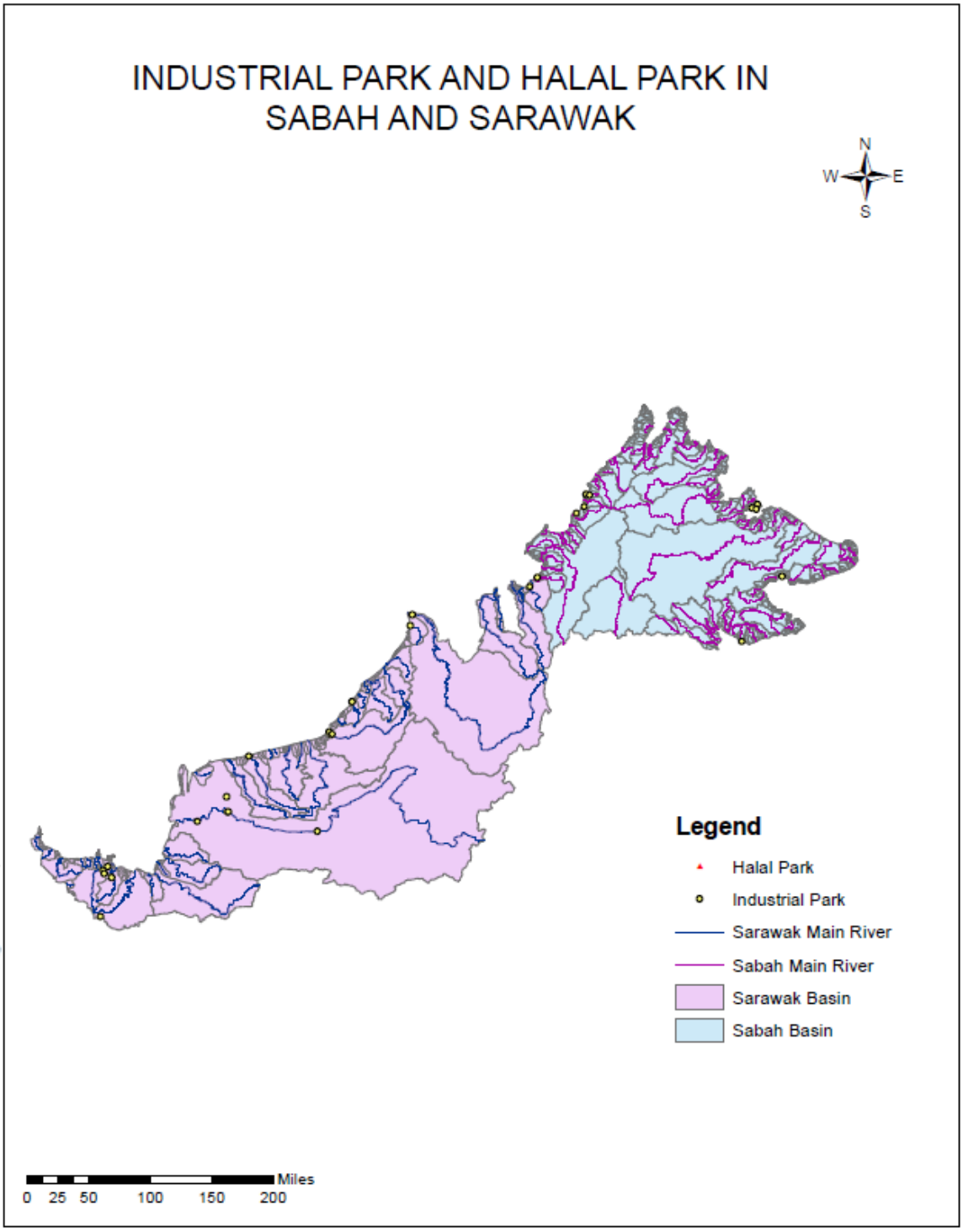


Figure 3.2 Industrial parks and halal parks in Sabah and Sarawak

3.4 Businesses and Industries Listed Under SME Corp.

Small and medium enterprises (SMEs) as well as microenterprises play an important role in helping to increase Malaysia's growth, employment and income. According to SME Corp, SMEs are important economic agents for Malaysia based on their GDP contribution of 35.9% in 2019, which was above the standard benchmark for a developing nation. According to the National SME Development Council, SMEs cover sectors in agriculture, construction, manufacturing, mining & quarrying and services (Table 3.2), and SMEs are defined in two ways as stated below and as illustrated in Figure 3.3:

1. For the manufacturing sector, SMEs are defined as firms with a sales turnover not exceeding RM50 million OR the number of full-time employees not exceeding 200.
2. For all other sectors, SMEs are defined as firms with a sales turnover not exceeding RM20 million OR the number of full-time employees not exceeding 75.

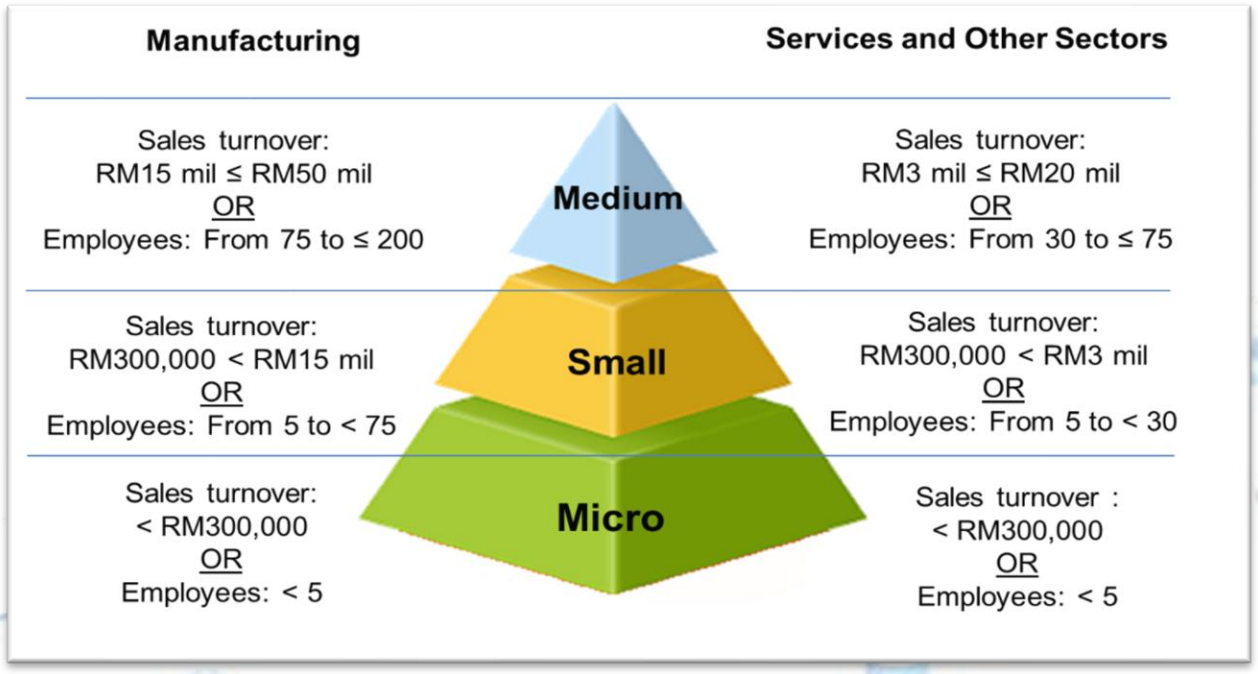


Figure 3.3 Detailed definition of SME categories, namely micro, small and medium (SME Corp, 2013)

Table 3.2 Total number of SMEs in the various sectors (Source: https://newss.statistics.gov.my/newss-portalx/ep/epFreeDownloadContentSearch.seam?cid=1417929)

No.	Sector	Number fo SME
1	Agriculture	186,444
2	Construction	630,063
3	Manufacturing	1,039,662
4	Mining and Quarrying	20,674
5	Services	3,775,717
Total		5,652,560

4.0 Water Management in Businesses and Industries

This chapter illustrates water management in business and industry sectors by providing an elementary background understanding about water consumption and wastewater generation, water-related policies, legal implications and economic incentives to accelerate IWRM implementation in Malaysia. The 2030 Agenda for Sustainable Development laid down a set of 17 interconnected global goals that are intended to serve as a roadmap to a better and more sustainable future for all. Sustainable Development Goal 6 (SDG 6) particularly aims to ensure availability and sustainable management of water and sanitation for all. SDG 6 has eight targets to be achieved by 2030 which include six "outcome-oriented" targets and two "means of achieving" targets:

Target 6.1	•Safe and affordable drinking water
Target 6.2	•End open defecation and provide access to sanitation and hygiene
Target 6.3	•Improve water quality, wastewater treatment and safe reuse
Target 6.4	•Increase water-use efficiency and ensure freshwater supplies
Target 6.5	•Implement IWRM
Target 6.6	•Protect and restore water-related ecosystems
Target 6.a	•Expand water and sanitation support to developing countries
Target 6.b	•Support local engagement in water and sanitation management

Figure 4.1 SDG 6 and targets

4.1 Water Consumption vs Wastewater Generation

Businesses and industries entail a lot of processes, such as fabricating, processing, washing, diluting or transporting a product which involve water consumption and sanitation throughout product manufacturing and service provision. In Malaysia, the non-domestic metered water consumption has been increasing steadily whereby approximately 4.72 billion litres of metered water were consumed per day for non-domestic use in 2019. Figure 4.2 shows the non-domestic metered water consumption in Malaysia from 2012 to 2019. Some sectors use a large amount of water to produce their products such as food, paper, chemicals, refined petroleum or primary metals, and the water consumed by these business and industry entities may come from water operators supplying from the nearest water resource. Table 4.1 shows the water consumption volume according to sectors.

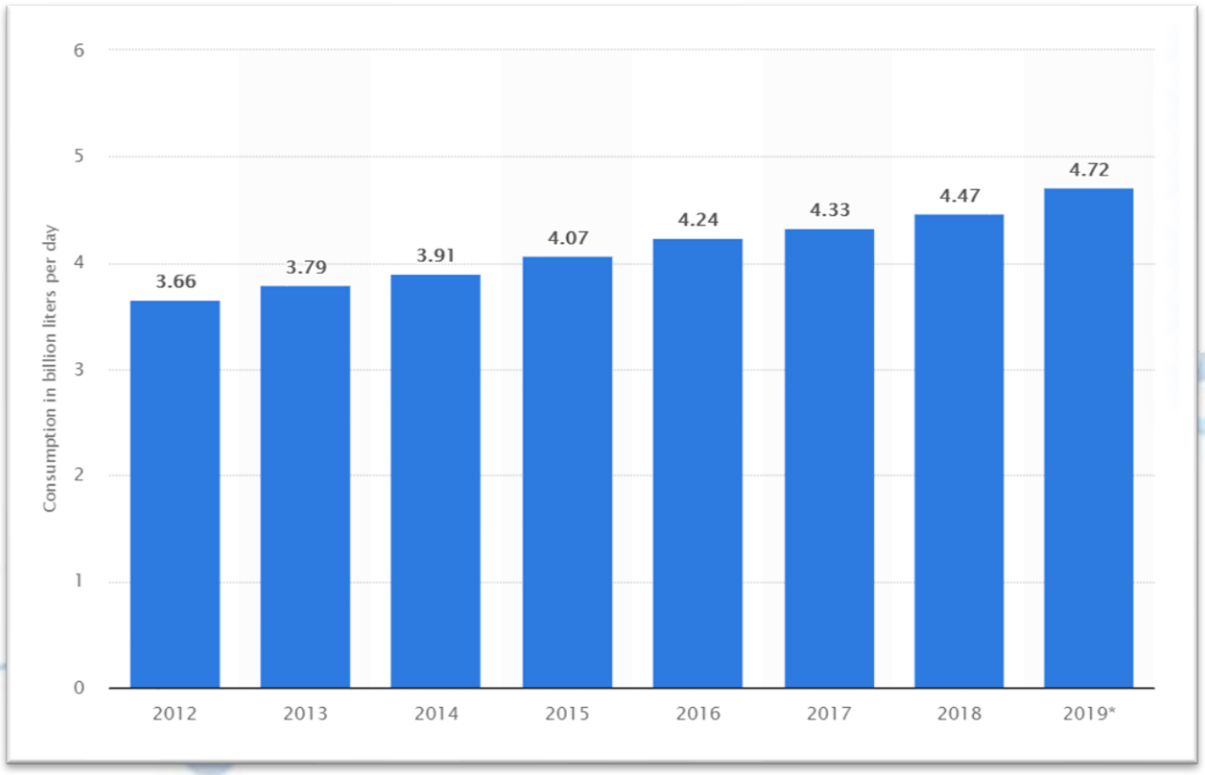


Figure 4.2 Non-Domestic Metered Water Consumption in Malaysia from 2012 To 2019

Table 4.1 Water Consumption Volume According to Sectors

No.	Sector	Water Consumption (m^3)
	Agriculture	
1	Oil Palm	872,615
2	Rubber	10,635,080
3	Livestock	117,342
4	Forestry & Logging	No data
5	Fisheries & Agriculture	2,577,381
6	Others	1,537

Construction		
7	Civil Engineering	5,290
8	Residential Buildings	418
9	Non-Residential Buildings	No data
Manufacturing		
10	Electrical & Electronics Products	435,877
11	Food, Beverages & Tobacco	1,458,874
12	Transport Equipment & Other Manufacturers	115,493
13	Petroleum, Chemical, Rubber & Plastic	688,484
14	Wood, Furniture, Paper Products & Printing	10,580
15	Non-metallic, Mineral Products, Basic Metal & Fabricated Metal Products	3,076,000
16	Textile, Wearing Apparel, Leather & Footwear	No data
Mining and Quarrying		
17	Petroleum & Natural Gas	37,060,000
18	Mining (bauxite, gold, coal, iron ore, tin, ilmenite, amang retreatment & other mining)	23,772
19	Quarrying (granite, limestone, sand extraction & other stone)	1,732
Services		
20	Wholesale & Retail Trade, Food & Beverages and Accommodation	13,500
21	Information & Communication and Transportation & Storage	335,969
22	Health, Education and Arts, Entertainment & Recreation	495,000

According to the 2010 Census Report by the Department of Statistics, the estimated volume of wastewater generated by municipal and industrial sectors was 2.97 billion m^3 per year. Figure 4.3 shows the proportion of population equivalent (PE) served by various sewerage systems. According to the main sewerage operator in Malaysia, Indah Water Konsortium, the dominant wastewater treatment types in Malaysia are preliminary (removal of rags, rubbish, grit, oil and grease), primary (removal of settleable and floatable materials) and secondary (biological treatment to remove organic and suspended solids). According to PRNewswire, the largest users of water treatment plants in Malaysia are from the agriculture and food sectors. Malaysians rely on agriculture as it is one of the three main standard pillars in the country's economy followed by the oil & gas industry where the rising demand for oil and oil-based products has increased the demand for water treatment in this industry. Malaysia has also emerged as an Electronics and Latex hub which further promotes large scale usage of high grade treated water in this industry. Textile, tannery, pharmaceuticals, automobile and electronics are some other key sectors that demand extensive water treatment. Table 4.2 shows the wastewater generation according to sectors.

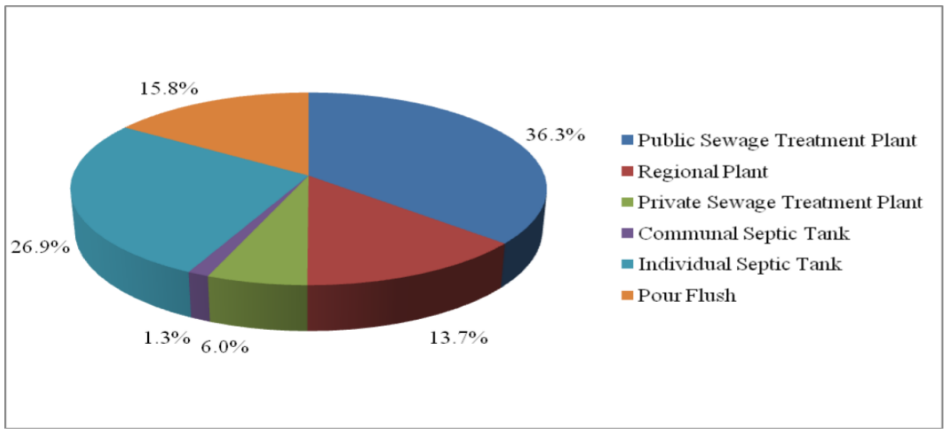


Figure 4.3 Proportion of Population Equivalent (PE) Served by Various Sewerage Systems

Table 4.2 Wastewater Generation Volume According to Sectors

No.	Sector	Wastewater Generation (m^3)
Agriculture		
1	Oil Palm	104,177
2	Rubber	2,277,850
3	Livestock	336,678
4	Forestry & Logging	No data
5	Fisheries & Agriculture	2,159,912
6	Others	756
Construction		
7	Civil Engineering	No data
8	Residential Buildings	No data
9	Non-Residential Buildings	No data
Manufacturing		
10	Electrical & Electronics Products	190,450
11	Food, Beverages & Tobacco	804,712
12	Transport Equipment & Other Manufacturers	No data
13	Petroleum, Chemical, Rubber & Plastic	129,699
14	Wood, Furniture, Paper Products & Printing	No data
15	Non-metallic, Mineral Products, Basic Metal & Fabricated Metal Products	471,000
16	Textile, Wearing Apparel, Leather & Footwear	No data
Mining and Quarrying		
17	Petroleum and Natural Gas	154,000

18	Mining (bauxite, gold, coal, iron ore, tin, ilmenite, amang retreatment & other mining)	No data
19	Quarrying (granite, limestone, sand extraction & other stone)	No data
Services		
20	Wholesale & Retail Trade, Food & Beverages and Accommodation	No data
21	Information & Communication and Transportation & Storage	330,220
22	Health, Education and Arts, Entertainment & Recreation	490,925

Figure 4.2 shows the quadrant of water consumption and wastewater generation of different sectors in Malaysia. Petroleum & natural gas, rubber & plastic and oil palm sectors are the top three water-consuming industries; however, petroleum & natural gas industries have better water efficiency with relatively lower wastewater generation. In contrast, fisheries & agriculture and rubber sectors have relatively lower water efficiency where the wastewater generations are as much as half of the water consumption or more. In this context, there is a need to implement IWRM to ensure the sustainability of water resources in Malaysia.

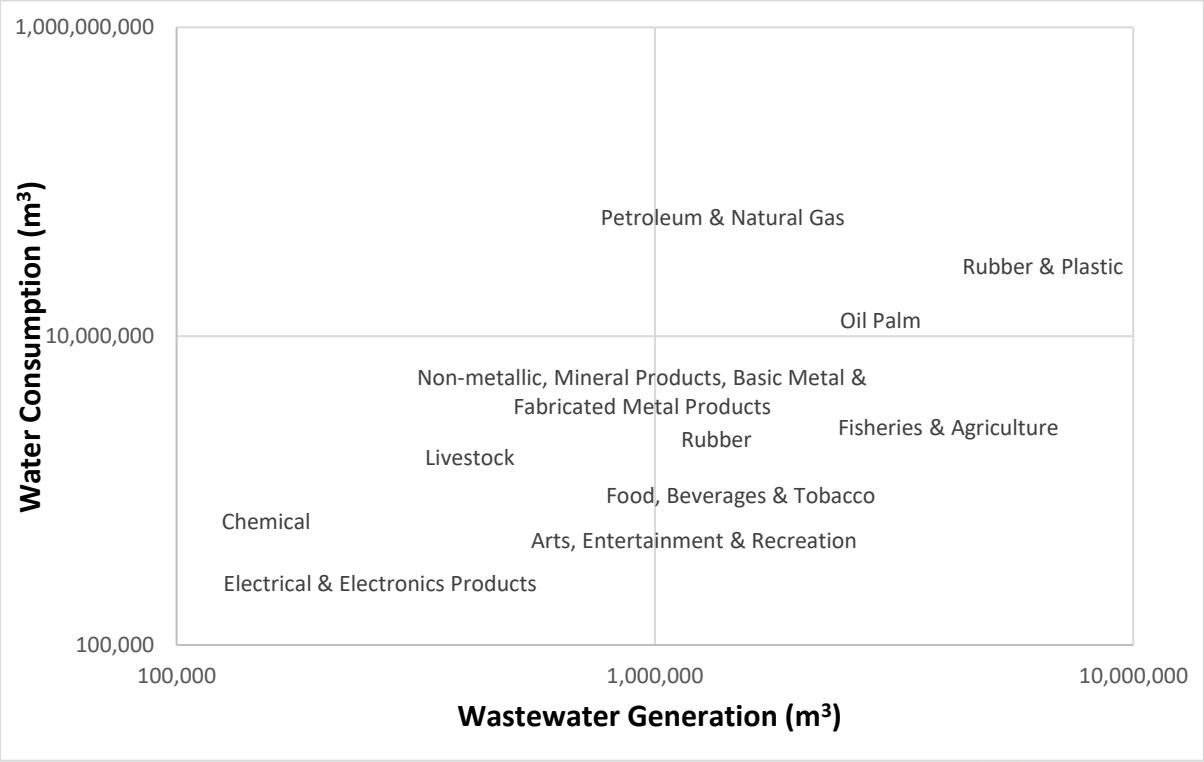


Figure 4.2 Water Consumption and Wastewater Generation (m^3) According to Sectors in Malaysia

4.2 Water-related Policies, Legal Implications and Economic Incentives for Business and Industry

(i) Policies

The Malaysian government has introduced several water-related policies to direct water resources management in the country (see Figure 4.3). The National Water Resources Policy (NWRP) 2012 which is laid out based on the IWRM approach emphasises that the security and sustainability of water resources shall be made a national priority to ensure adequate and safe water for all through sustainable use, conservation and effective management of water resources and enabled by a mechanism of a shared partnership involving all stakeholders. The NWRP is intended to serve as a directional focal point to help bring together stakeholders including government agencies, non-government organisations, academia, research institutions, the private sector and communities to help translate the strategic plans into actions. The 2009 National Policy on Climate Change helps to ensure climate-resilient development to fulfil national aspirations for sustainable development in which one of the principles focuses on strengthening the implementation of climate change actions that contribute to environmental conservation and sustainable use of natural resources that includes water. The 2009 National Green Technology Policy identifies green technology as a driver to accelerate the national economy, promote sustainable development, and promote technology in the management and utilisation of water resources and wastewater treatment. The 2016 National Integrated Water Resources Management Plan aims to infuse IWRM principles and practices into the planning and management operations. The 2017 Green Technology Master Plan provides a strategic framework and roadmap for the green initiative and programmes in Malaysia, and water has been identified as one of the sectors in which the policy aims to achieve the targets as shown in Figure 4.4. In the context of water management, green technology plays a significant role to bridge multiple mandates and policy directions as business and industry can harness the potential of green technology in the IWRM.

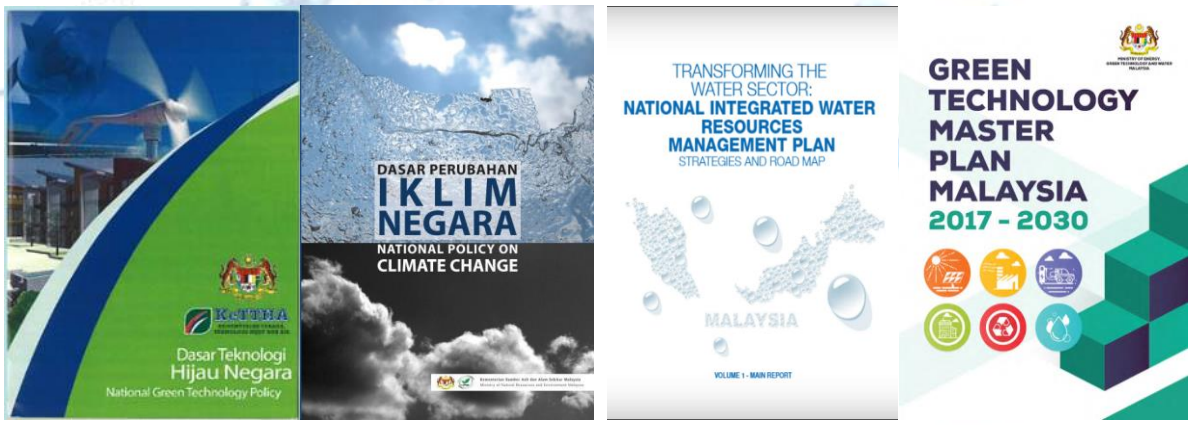


Figure 4.3 Policies that are related to water management in Malaysia

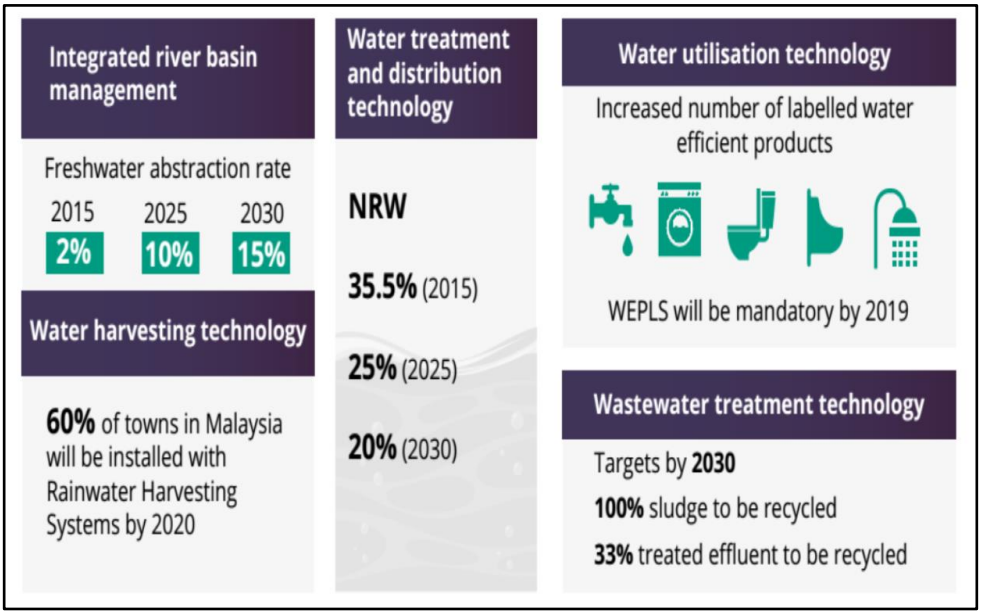


Figure 4.4 Water management landscape in Malaysia (Source: Ministry of Energy, Green Technology and Water, 2017)

(ii) Legal Implications

Besides policies, several legislations have also been enacted to address the issue of water pollution in Malaysia such as the Water Services Industry Act 2006, the Environmental Quality Act 1974 and the Penal Code with the respective provisions:

- **Section 61(1)** of the **Water Services Industry Act 2006** prescribes that anyone who allows effluent or noxious matter into the public sewer shall be liable to **a fine not exceeding RM100,000.00** or to **imprisonment for a term not exceeding one year** or to **both**.

- **Section 121(1)** of the **Water Services Industry Act 2006** states that those who contaminate or cause the contamination of a water supply with the intention to cause death, knowing that it could likely cause death or that it would endanger lives, can be **sentenced to death** if someone dies as a result.

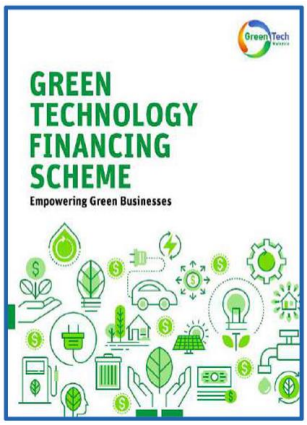
- **Section 25(3)** of the **Environment Quality Act 1974** prescribes that any person emitting, discharging or depositing any environmentally hazardous substances, pollutants or wastes into any inland water shall be liable to **a fine not more than RM100,000** or **imprisonment of not more than five years** or **both**.

- **Section 34B(4)** of the **Environmental Quality Act 1974** provides that any person found to have been polluting waters shall be liable to **a fine not exceeding RM500,000** or to **imprisonment for a period not exceeding five years** or to **both**.

- **Section 430** of the **Penal Code** provides for a much severe punishment whereby an accused, if found guilty, will be facing **imprisonment term of between 5 to 30 years or a fine** or **both**.

(ii) Economic Incentives

To assist the implementation of water management initiatives in business and industry, the Malaysian Green Technology Corporation provides Green Technology Financing Schemes to empower green business and industry in which water is one of the sectors covered in this scheme (Figure 4.5). The financing scheme offers businesses and industries an opportunity to adopt green technology in the management and utilisation of water resources which covers better quality of water supply to users, efficient use of water resource, rainwater harvesting, recycling & reuse, reduced use of chemicals, use of green materials and/or equipment.



No	Criteria	Sample Projects
A	***Scope:*** Adoption of Green Technology in the management and utilisation of water resources ***Type of Water:*** Fresh water (tap or portable), water for industrial processes, agriculture and grey water. 1. Management and utilization of water resource: • Better quality of water supply to users • Efficient use of water resource • Rainwater harvesting • Recycling & reuse • Reduction use of chemicals • Use of green materials and/or equipment	• Better water treatment technology • Leakage monitoring and minimization • Lower grade water for industrial process • Recycling and reuse of water • High efficient treatment plant

Features	Producer of Green Technology	User of Green Technolgy	ESCOs
Purpose	To finance investment for the production of green products	To finance investment for the utilization of green technology	To finance investment or assets related to energy effiecient project and/ or energy performance contracting
Financing Size	Maximum: RM100 million per group of company	Maximum: RM50 million per group of company	Maximum: RM25 million per group of company
Financing Tenure	Up to 15 years	Up to 10 years	Up to 5 years
Eligibility	Company or Business must be legally registered Malaysian with a simple majority of at least 51% Malaysian shareholding Minimum paid-up capital must be10% or RM50,000 of project cost, whichever is higher		
Participating Financial Institutions (PFIs)	All Commercial Financial Institutions, Islamic Financial Institutions and Development Financial Institutions as per BNM & other participating entities duly approved by MOF		
Government Incentives	Rebate of 2% per annum on interest/ profit rate (limited to the first seven (7) years only) for each loan/financing. 60% government guarantee on Green Technology Cost.		
Interest/ Profit Rate	Determine by Participating Financial Institutions (PFI's) for financing		
Source of Fund	Participating Financial Institutions (PFI's)		
Implementation Agencies	Ministry of Environment and Water, Credit Guarantee Corporation Malaysia Berhad (CGC) and MGTC		

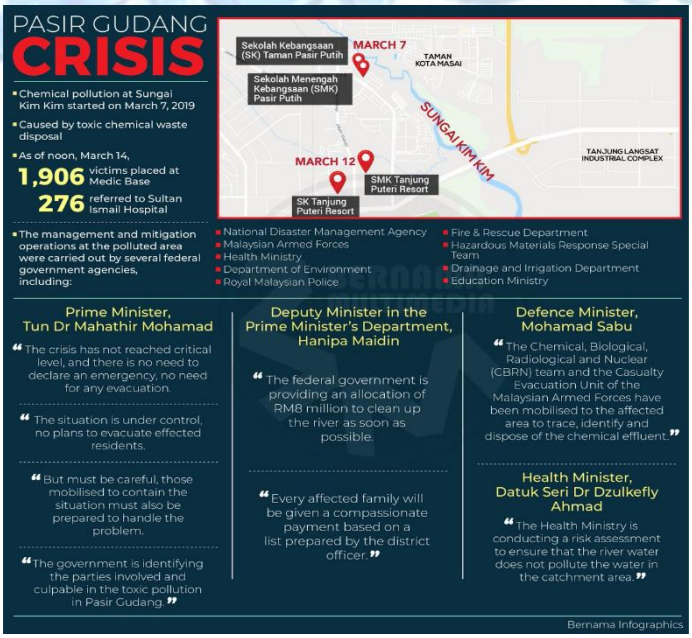
Figure 4.5 Green Technology Financing Schemes Offered by Malaysian Green Technology Corporation (Source: https://www.gtfs.my/)

4.3 Integrated Water Resources Management (IWRM) in Business and Industry

A 'business-as-usual' approach is no longer sustainable. Business and industry shall lead the change to mitigate the significant environmental, social, and economic losses. Failing to manage water effectively will cause serious impacts on biodiversity, freshwater availability, climate action and human health. Integrated water resources management (IWRM) has been commonly cited and accepted as the foundational principle in water management. The 2000 Global Water Partnership defines IWRM as a process that promotes the coordinated development and management of water, land and related resources to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.

As noted by Hassing et al. (2009), instituting IWRM, like many major institutional changes, takes time because the processes required to adapt to existing institutions and build the capacity of new ones are complex. In tracking the progress towards IWRM, business and industry entities generally need to work hand-in-hand with the development of the national governance structure and roll out water resources management initiatives with their stakeholders along the value chain. This is because water management is a system-based issue that requires a systemic solution. Since business and industry are not particularly adept at this, they tend to focus on their system or whatever is in front of them at the time. Of course, businesses and industries do not own the system, but it does not prevent them from engaging with the government to push for appropriate water sector reform.

Business and industry sectors as a vital stakeholder and economic engine have been historically underrepresented in the IWRM conversation and the work plans of those agencies leading the development of IWRM. The challenge that remains, however, is to take global, local and locally desired development goals and translate those into business opportunities as much as risk reduction. Hence, how business and industry can support IWRM initiatives (at the basin scale) while also benefitting businesses is essential to secure future water rights where different stakeholders along the value chain can organise themselves around their shared interests and mobilise to identify and solve water problems and invest in water opportunities. In this context, IWRM as a broader policy framework provides these stakeholders with a platform to function and contribute to water resource management.



5.0 Paradigm Shift in Water Management

This chapter aims to provide intermediate participants with the concepts that need to be adopted for shifting the paradigm in water management where the participants are hoped to advocate for transformation in their management practices. Securing water quantity and quality has been one of the world's most significant challenges today where worldwide demand for water increases with the expansion of population, urbanisation, and economic development. It is exacerbated by climate change where it is projected that by 2030 the global water demand will increase by 50% and water demand will outstrip supply by 40% if the path of 'business-as-usual' were to be continued. Water issue affects the present and future generations and has significant implications on business and industry, society, and the environment, in which business and industry entities in resource-constrained areas are likely to be the most impacted in terms of water allocation. Hence, business and industry have an important role in addressing water challenges whereby a paradigm shift in water management is urgently needed.

5.1 Commodity vs Resource

Determining the 'value' of water whether it is a commodity or resource entails more than just estimating its true cost whereby the concept of 'value' looks into externalities such as pollution, to understand and manage impacts and dependencies on watersheds and how these impacts and dependencies interact with societies and economies. Water valuation determines the value of water to various stakeholders under different circumstances such as structures & processes, environmental functions and human benefits as shown in Figure 5.1. The WBCSD Business Guide to Water Valuation (https://www.wbcsd.org/Programs/Food-and-Nature/Water/Resources/Business-Guide-to-Water-Valuation-an-introduction-to-concepts-and-techniques) provides a guide to determine prices, costs and values for six water-related dependencies and consequences. The process is currently difficult and needs to be simplified. Until then, water costing methods can be used to assess the potential for water reduction, reuse, and recycling.

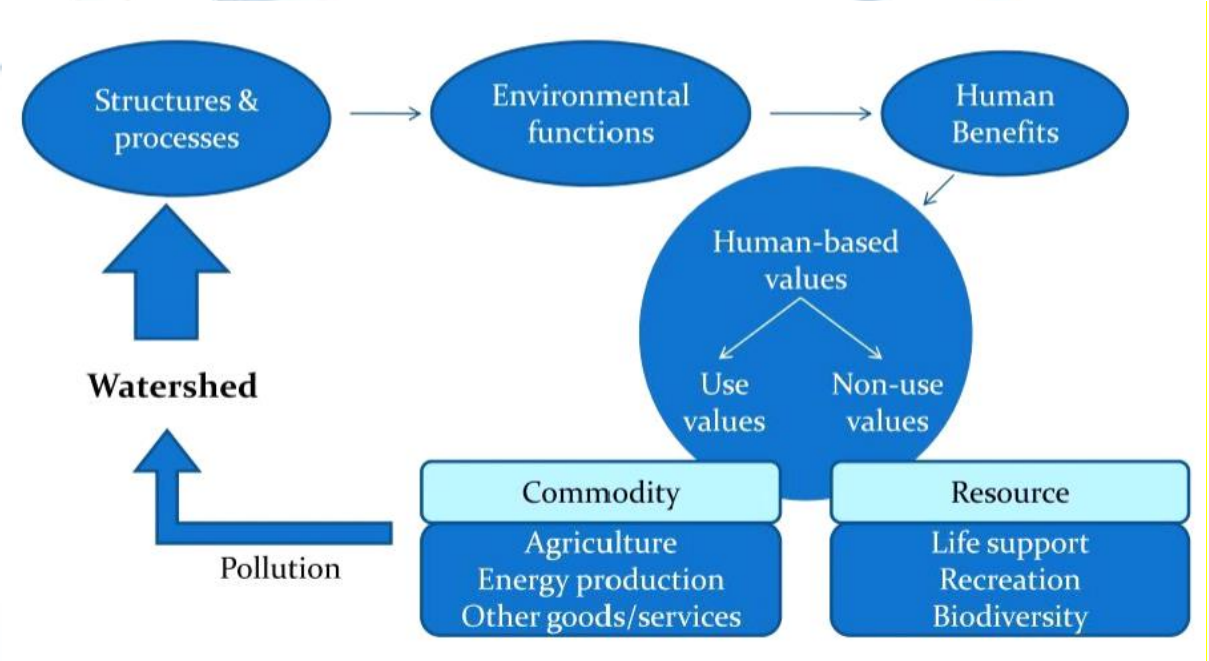


Figure 5.1 Human-based values (Commodity vs Resource) (Source: https://www.yumpu.com/en/document/read/42536671/a-commodity-a-resource-pdf-water-resources-board-state-of-)

5.2 Abundant vs Limited

Water exists in various forms, and it is constantly moving on above and below the Earth's surface through the 'water cycle'. The water mass on Earth is constant over time; however, it depends on a wide range of fluctuating climatic variables such as ice partitioning, the amount of freshwater, saline water, and atmospheric water. Figure 5.2 shows the water cycle depicting annual renewable water supply per person per basin (m^3) whereby evaporation, condensation, precipitation, infiltration, runoff and subsurface flow are all ways that water moves. These processes are dependent on the climate variation wherein according to the Intergovernmental Panel on Climate Change (IPCC), if current trends continue, temperatures may rise by 3.7 to 4.7 ^oC by 2100 (IPCC 2014). Under such circumstances, climate change will have a substantial impact on the water cycle, thus affecting the availability of water.

Business and industry entities all rely heavily on water, and this reliance on water, to some extent, can have either a positive or negative impact. Negatively, business and industry entities can cause water pollution, whereas positively, businesses and industries could contribute to improved water quality. While impacts are often assessed, some business and industry entities fail to understand the link between their reliance on water in industrial operations and the environmental impact. Understanding the connections between business and water can enable better water management.

Business and industry entities are major water users amounting to 10% and 57% of total water consumption in Asia and in Europe, respectively. Hence, a shift of consumption pattern is required considering that water is a finite resource. According to the benchmark data from several industries, businesses and industries can reduce their water consumptions by up to 50% (Andrews et al., 2011). Addressing water use is critically needed for business and industry entities to contribute to water security in the watersheds where they operate in which IWRM offers circular water management within the ecological limit.

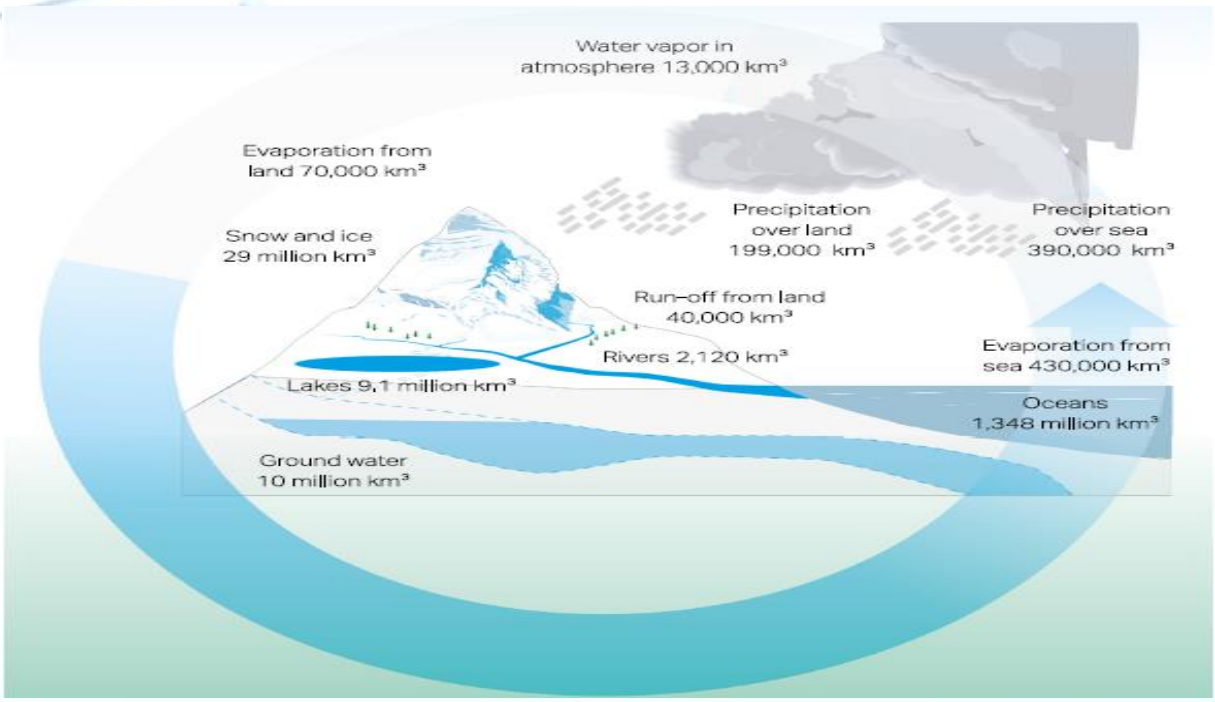


Figure 5.2 The water cycle depicting annual renewable water supply per person per basin (m^3)
(Source: WBCSD, 2017)

5.3 Infinite Growth vs Ecological Limits

As shown in Figure 5.3, watersheds are critical to regional water supplies because they capture and store rainfall, maintain and control river flows and recharge groundwater reservoirs. Healthy watersheds provide reliable water supplies whereby groundwater, surface water and municipal drinking water systems are sources of water to all sectors of businesses and industries as well as to the communities. The water needs to be treated to bring it up to the requisite quality for business and industry operations (e.g., cooling towers, boilers, etc.). Wastewater produced is either discharged directly or recycled after on-site treatment. The way businesses and industries deal with water will impact not only the local environment but also on the ecological limits. Therefore, business and industry entities should work across sectors and involve other water users in the watersheds in which they operate to improve water security and risk mitigation.

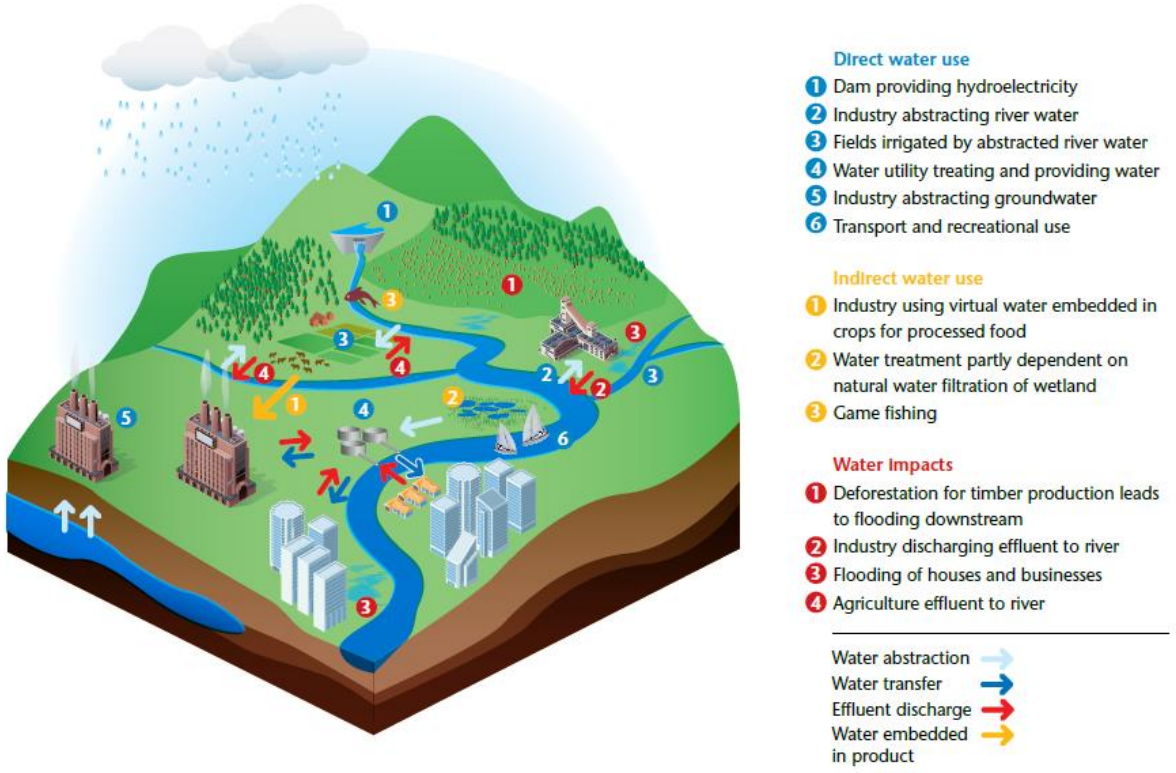


Figure 5.3 Link between business and water (Source: WBCSD, 2012)

5.4 Waste vs Conservation

According to Rodriguez (2018), more than 80% of the wastewater generated by society is currently discharged to the environment without treatment or recycling, and this has a major implication on the health of the ecosystem health and society (Figure 5.4). The way water and its services are traditionally managed is not sustainable whereby the investment planning, design and operating models of water extraction, treatment, usage and the subsequent wastewater discharge back into water bodies are linear in nature. Hence, a shift from a linear approach to a circular water management is needed to

lower the consumption of water and promote the 5Rs (Reduce, Reuse, Recycle, Restore and Recover). To foster a paradigm shift from a linear economy towards a circular economy, wastewater should no longer be considered as a problem but as a solution that may contribute to the provision of sustainable infrastructure services, improving operators' financial viability and the quality of the environment, and reinforce the systems' resilience.

Figure 5.4 From waste to resource (Source: Diego Juan Rodriguez (2018) (https://blogs.worldbank.org/water/wastewater-treatment-critical-component-circular-economy)

5.5 Low vs High Cost

Table 5.1 shows the list of water tariffs in respective states of Malaysia, ranging from RM 0.84 to RM 3.30, based on the consumption block. As compared with other countries in the region (see Table 5.2), the Malaysian commercial water tariff is still cheap, posing a substantial obstacle to more efficient water use throughout the lifecycle of business and industry entities. The treatment cost for sewage services in Malaysia is relatively cheap compared to other countries in the region where, as Table 5.3 shows, premises receiving individual septic tanks services and premises with connected sewerage services are only charged RM 2.00 per head per month and RM 2.50 per head per month, respectively.

The overall cost of water management differs significantly from the tariff of water when considering the cost of water throughout the entire water management cycle (intake, storage, transport, various treatments, disposal, energy, chemicals, etc.). As a result, the investment in proper water management systems is often deemed not viable because the return on investment (ROI) is frequently underestimated. Hence, the investments of business and industry entities on water infrastructure need to take into account water-related expenditures within the fence, including direct and indirect costs associated with water management, the true value of water within the fence, which includes

water-related risks (e.g., the lack of sufficient water for production) and water value which includes all of the above as well as monetisation of water by other watershed users.

As shown in Figure 5.5, the overall cost of water covers perceived and other costs. Most business and industry entities more often than not only take into account the perceived cost, but they seldom take into account the "other" costs which include associated expenditures with water use such as energy costs for transporting water, labour costs to manage water systems, regulatory costs, the costs of chemicals for pre-treating water to be used in industrial processes, and the costs of treating wastewater (capital equipment and operating costs) before discharge. As a result, businesses and industries undervalue the impact of water costs on their operations. Furthermore, business and industry entities also miss out on the opportunities to reduce operating expenses by carefully managing their water. Reducing water use, reusing water and recycling wastewater are crucial considerations rather than optional voluntary actions for business and industry entities when addressing total water expenses.

Table 5.1 The list of water tariffs in respective states of Malaysia

STATES/AREAS	WATER OPERATORS	Block (m^3)	COMMERCIAL RATE (RM)
Pahang	Pengurusan Air Pahang	0-227	0.92
		>227	0.84
Sarawak	Kuching Water Board	1-25	0.97
		>25	1.06
Perlis	Syarikat Air Perlis	no info	no info
Terengganu	Syarikat Air Terengganu	0 - 70	0.95
		>70.1	1.15
Perak	Lembaga Air Perak	0 - 10	1.20
		11-20	1.40
		>20	1.61
Selangor	Pengurusan Air Selangor	35	2.07
		>35	2.28
Kedah	Syarikat Air Darul Aman	0-1000	1.40
		>1001-10,000	1.60
		>10,001-50,000	1.80
		>50,001	2.10
Kelantan	Air Kelantan	0 – 50	1.76
		>50	1.80
Sabah	Sabah State Water Department	0 - 70	1.60
		>70	2.00
Penang	Perbadanan Bekalan Air Pulau Pinang	0 - 20	0.85
		20 - 40	1.05
		40 - 200	1.30
		>200	1.45
Negeri Sembilan	Syarikat Air Negeri Sembilan	0-35	1.85
		>35	2.70
F.T. Labuan		0 – 35	1.70

	Jabatan Bekalan Air, Wilayah Persekutuan Labuan	> 35	2.20
Johor	Ranhill SAJ	0 – 35	2.80
		> 35	3.30
Melaka	Syarikat Air Melaka	0 – 50	2.00
		> 50 – 100	2.05
		> 100	2.15

Table 5.2 Water Tariff Comparison with other Countries

COUNTRY	RM/m^3/1000L
Myanmar	0.08
Brunei	0.34
Cambodia	0.59
Malaysia	**0.88**
Lao PDR	1.01
Indonesia	1.13
Thailand	1.59
Viet Nam	1.59
Philippines	2.77
Singapore	5.57
Japan	5.62
New Zealand	6.70
Australia	10.60

Table 5.3 The Tariff of Sewage Services in Malaysia

Category	Rate based on number of employees
Premises receiving Individual Septic Tanks services	RM 2.00 per head per month
Premises with Connected Sewerage Services	RM 2.50 per head per month

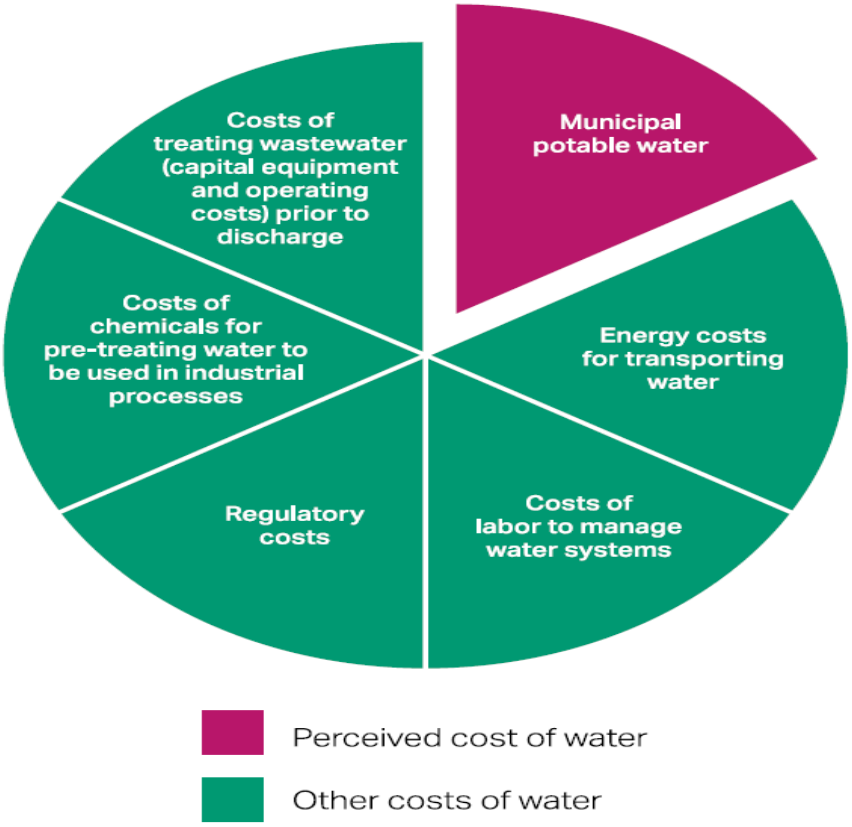


Figure 5.5 Actual and perceived costs of water in business and industry entities (Source: WBCSD, 2017)

5.6 Environmental Impact vs Business Risk

Making sound policy decisions for environment conservation and improving water stewardship is essential in managing business risks, for instance, in minimising risks related to water supplies with a negative impact on the environment. Business and industry entities can address current and future business risks caused by climate change and environmental pollution by implementing efficient use of water, allocating water to high value uses and shifting to more sustainable management practices. Policies and investments that can assist business and industry entities in mitigating environmental impacts include planning the allocation of water resources, providing clear guidelines on water quality, adopting incentives to increase water efficiency, and investing in infrastructure to secure water supplies.

Risks associated with water affect every area of business and industry, either directly or indirectly. As water is essential in the manufacturing and delivery of products, mismanagement of water poses a threat to almost all businesses. Veolia created 'The True Cost of Water', an economic evaluation tool based on the risk and benefits of reducing, reusing, and recycling water. Aside from direct and indirect expenses, the tool accounts for costs associated with risks (Figure 5.6) such as risks to operations (e.g., water shortages, flooding), financial and regulatory risks, and reputational risks (e.g., temporary loss of operating licence). Businesses and industries can mitigate risks related to water by taking the 5Rs approach, i.e., reduce, reuse, recycle, restore, and recover, when developing a water management strategy. The 5Rs approach ensures that all opportunities to mitigate water-related risks are identified and acted upon to secure business operating licenses.

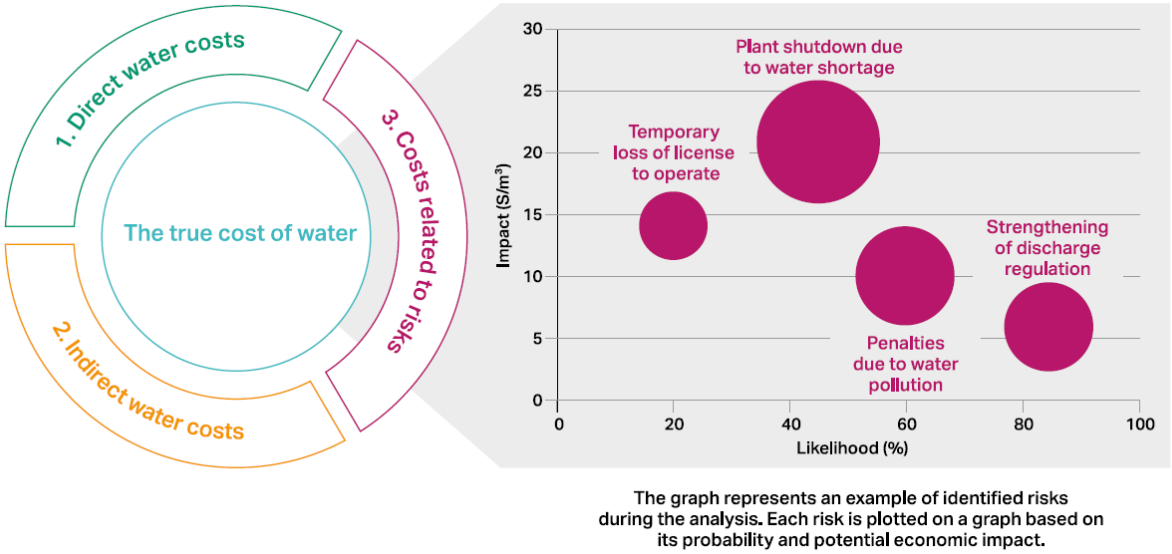


Figure 5.6 The True Cost of Water tool looks at the financial implications of water-related risks Adapted from The True Cost of Water, 2014, Veolia (Source: WBCSD, 2017)

5.7 Inside the Fenceline vs Watershed

The Natural Capital Protocol (https://capitalscoalition.org/capitals-approach/natural-capital-protocol/?fwp_filter_tabs=guide_supplement) provides a framework for identifying, quantifying (e.g., amounts, extents) and assessing (e.g., relative importance, worth) direct and indirect (negative or positive) impacts on business and industry activities as well as reliance on the water by business and industry entities. Understanding the true costs of water in business and industry processes inside the fenceline is critical to reducing, reusing and recycling water. Considering the value of water and the associated risks improves the chances of success in monetising water as a resource for other users, thus making water recycling more viable.

The location of the local water source (upstream/downstream) also affects the cost of water. Figure 5.7 shows how water consumers interact with one another within the fenceline whereby water becomes one of the significant aspects to be considered when a company is one of the top water consumers within the watershed. Therefore, the costs that should be taken into account include the cost of infrastructure to reduce, reuse and recycle water, the cost of operational controls to optimise water conservation, the cost of operation and maintenance to maintain water reductions, and the cost of implementation and follow up (including regulatory).

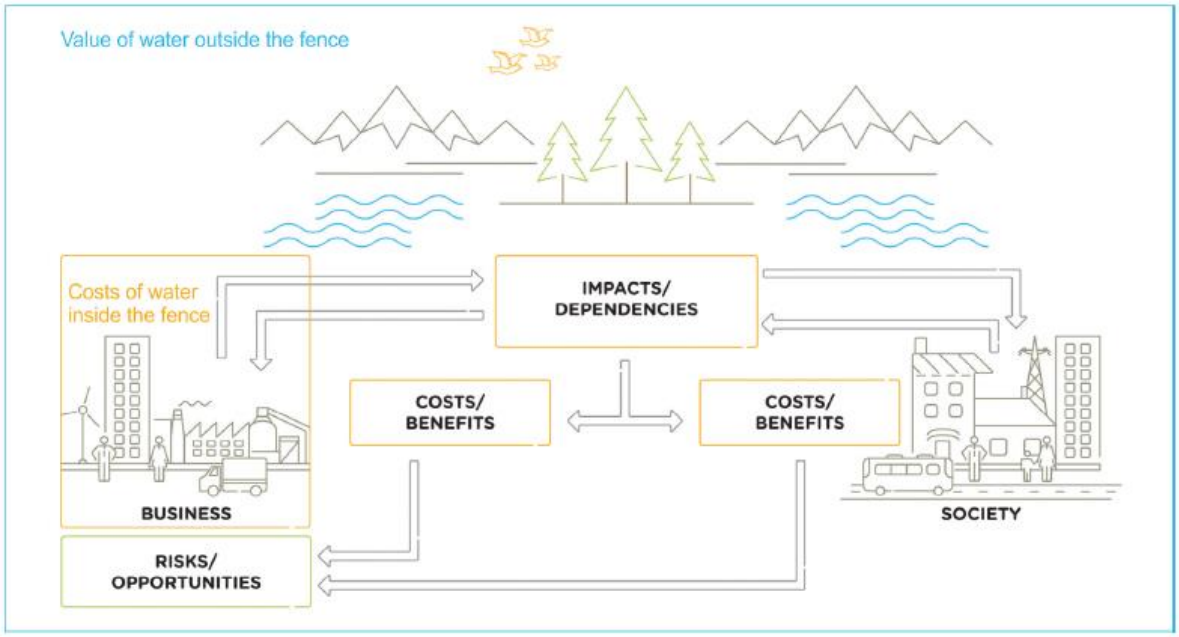


Figure 5.7 Costs of water inside the fence, the value of water outside the fence (including externalities), based on the impacts and dependencies of water Source: Natural Capital Protocol (Source: WBCSD, 2017)

5.8 Operations vs Value Chain

In accelerating IWRM implementation in business and industry sectors, a paradigm shift that takes into account water risks throughout the value chain, which encompasses the upstream supply chain, operations and downstream product consumption, is needed. As explained by Moore (1993), successful businesses are those that evolve rapidly and effectively. Yet innovative businesses cannot evolve in a vacuum. They must attract resources of all sorts, drawing in capital, partners, suppliers, and customers to create cooperative networks. A company is viewed not as a member of a single industry but as part of a business ecosystem that crosses a variety of industries. In a business ecosystem, companies co-evolve capabilities around an innovation whereby they work cooperatively and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations.

In the context of water, 'collective action' has long been recognised as an important component in addressing complicated water challenges, such as access to safe water, sanitation, and hygiene, that is essentially an ecosystem of stakeholders as shown in Figure 5.8. Figure 5.9 illustrates the transformation from linear supply chains to complex, dynamic and connected value webs, comprising stakeholders coming together to address water challenges. Traditional supply chains are likewise undergoing this transformation from value chains to business ecosystems where the traditional supply chains focusing on operations are replaced by 'value webs' of stakeholders that deliver items from suppliers to consumers. As water is central to the business and industry sectors, the paradigm shift to business ecosystems and 'value webs' from traditional business and industry operations provide a new opportunity for the stakeholders to mobilise resources collectively to address water-related risks affecting business growth, economic development, and social wellbeing.

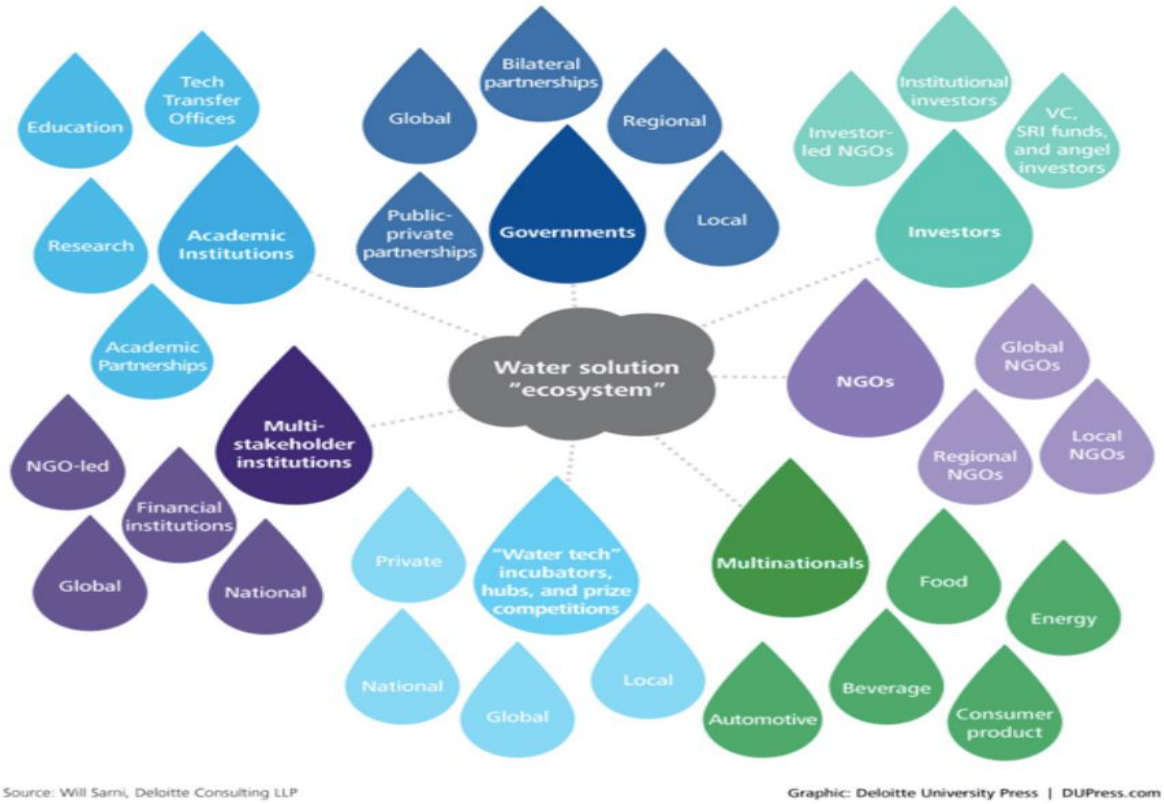


Figure 5.8 The ecosystem surrounding water (Source: https://www.greenbiz.com/article/water-turning-value-chain-risk-ecosystem-opportunity)

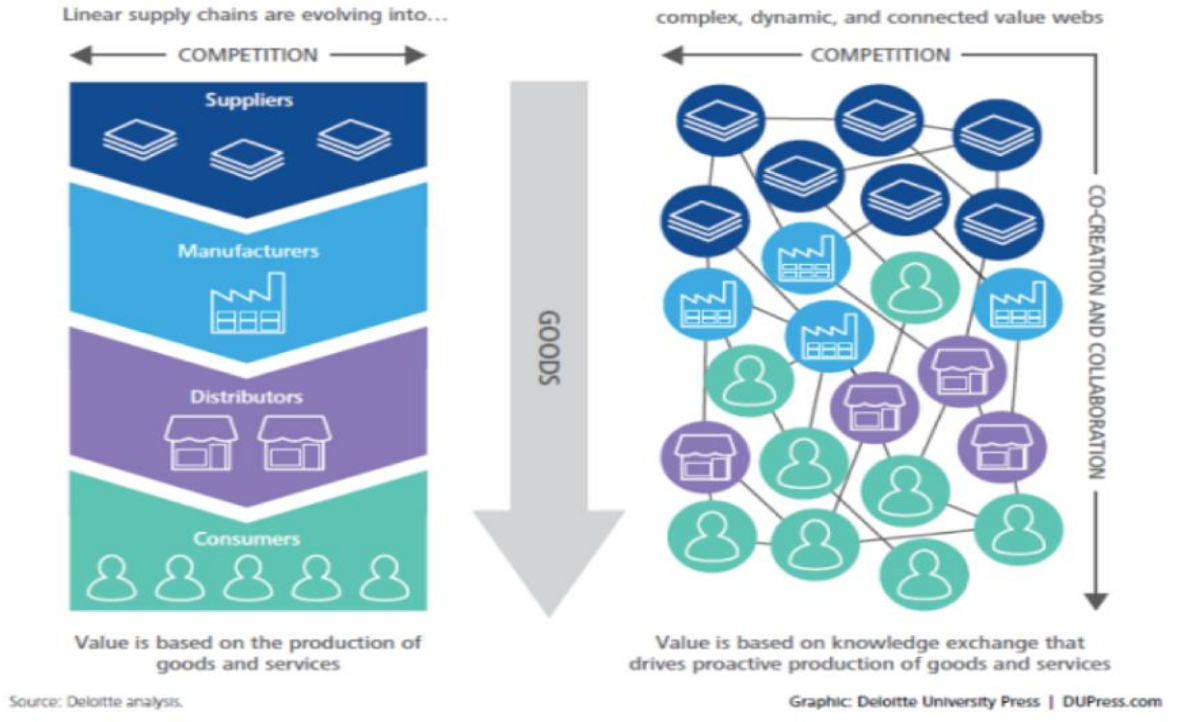


Figure 5.9 The transformation from linear supply chains to complex, dynamic and connected value webs (Source: https://www.greenbiz.com/article/water-turning-value-chain-risk-ecosystem-opportunity)

6.0 Action Framework

This chapter lays out the six-step principles as the action framework to be adopted by advanced participants and guides the participants to adopt the principles in their organisations. Sustainable water management is essential for the continuity of business and industry operations, especially when the cost of 'business as usual', such as the cost of action in addressing issues like pollution, is far more significant. In realising SDG 6, WBCSD has laid down an action framework to guide business and industry entities in acting responsibly and sustainably in managing their water resources. This undertaking can reduce physical, regulatory and reputational risks of business and industry entities and become a benchmark in the market whereby improving water management performance can also help in answering environmental, social and economic challenges.

Business and industry entities often underestimate the risks of pollution as well as externalities of their operations where it could be of burden to other stakeholders. Ineffective management of wastewater will cause significant risk to business whereby it will affect the value chain partners downstream. Hence, business and industry entities need to go beyond their business scope to adequately assess and manage the risks. A paradigm shift in managing water resources is therefore needed to flip the current water management practices towards a sustainable one.

The action framework covers the following six steps to be focused on by business and industry entities:

To realise IWRM, business and industry entities should collaborate to develop standardised and transparent mechanisms at the sector and industry clusters, and basin levels that would build a shared vision and monitor progress. Engagement with various stakeholders, i.e., public authorities, communities, and academia, is critical to establish an enabling environment that offers incentives for investments in water infrastructures that safeguard public health and the environment cost-effectively.

6.1 Incorporate Principles of Circularity Across Operations

The principles of circularity improve resilience towards water scarcity, optimise cost and ensure the continuity of the operations. The 5Rs approach — reduce, reuse, recycle, restore, and recover — are key 'fit-for-purpose' practices to incorporate circularity in water consumption that involves the treatment of wastewater to quality that is suitable for its intended use while at the same time giving the least risk to the user. Moreover, this approach allows business and industry entities to overcome constraints such as lack of capital, technology, and skilled manpower that are required to process wastewater to the required quality for their next intended applications. Business and industry entities shall first incorporate the principles of circularity in their business processes and operations (Figure 6.1), applying water management solutions through:

Reduce – Reduce water losses and increase water efficiency by relooking into the in-house water consumption and wastewater generation patterns through water supply and wastewater treatment system designs. Lower wastewater generation by increasing water-consumption efficiency or substituting materials or minimising the use of hazardous chemicals in business and industry processes.
Reuse – Reuse water, with minimal or no treatment, within and outside the fence for one or more processes as well as ensure wastewater and resources are safely reused.
Recycle – Recycle wastewater within and outside the fence by implementing closed-loop processes and creating by-product synergies between industries and other sectors.
Restore – Return water to the original source at a similar or better quality than when it was taken.
Recover – Retrieve resources (other than water) from wastewater to be (re)used.

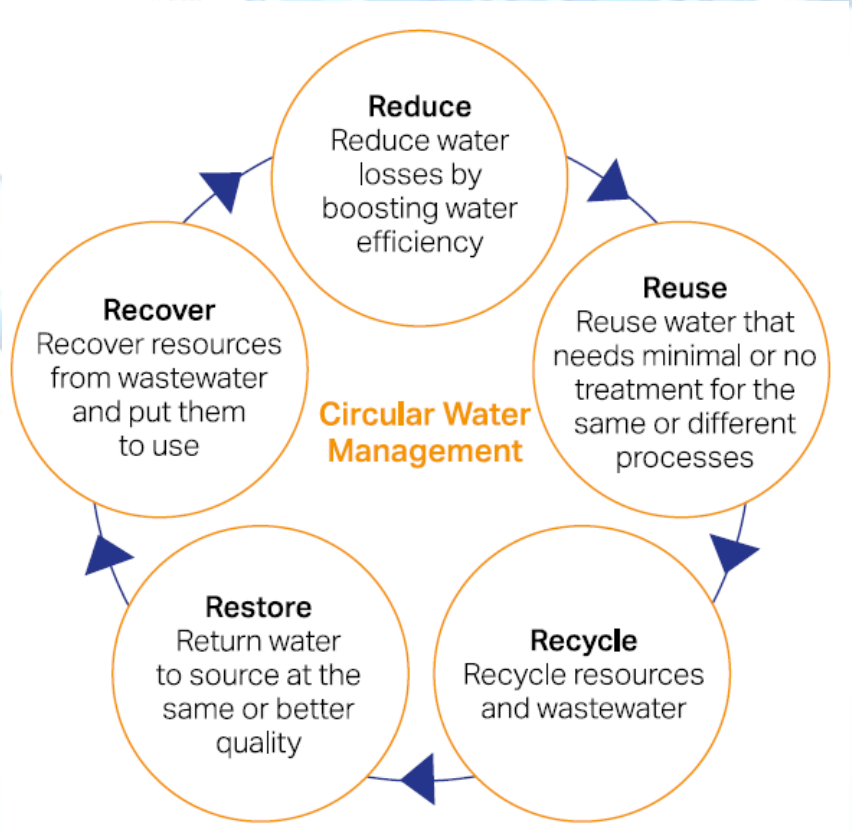


Figure 6.1 Circularity in water management (Source: WBCSD, 2017)

6.2 Establish Targets and Metrics Based on Science and Context

Regulatory standards set the monitoring requirements where business and industry entities most likely use compliance as a target proxy. However, such an approach might not lead to adequate action to prevent pollution of freshwater or increase recycling and reuse of wastewater. Business and industry entities should set targets for the scientific and environment-specific condition of freshwater and biodiversity, and effluent quality should be improved beyond compliance.

In this context, science-based targets outline how much and how rapidly business and industry entities need to reduce specific environmental impacts and dependencies. Science-based targets should be set to limit pollution by wastewater. The water circularity at the site can be measured through water sourcing, consumption, and discharge as contributions to a net reduction in water demand within the basin. These targets and metrics go beyond effluent quality and can lead to decisions that promote the recycling and reuse of wastewater.

6.3 Invest in Public and Private Sector Partnerships

Enhanced access to technological knowledge, compliance, financing, and influence are some of the incentives for collaboration whereby partnerships span from infrastructure sharing to collaboration with partners in the sector to form a knowledge-sharing consortium. Proactive action to improve wastewater management should be taken in conjunction with the public sector in identifying ways of using current wastewater treatment capabilities.

Public-private partnership (PPP) models for industrial wastewater is generally based on the basic notion that municipal wastewater treatment plants or utilities may provide the business and industry entities with treated wastewater. Such models could take a bilateral approach, with public and private companies trying to resolve a common problem, or a multilateral approach, where various institutions and groups develop a common solution. Figure 6.2 shows a joint venture between Air Selangor and Indah Water Konsortium to recycle wastewater for industrial use.

RECYCLING INITIATIVE

AIR SELANGOR, IWK IN WATER TIE-UP

SPV to produce non-potable treated water for distribution to industrial businesses

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PENGURUSAN Air Selangor Sdn Bhd and Indah Water Konsortium Sdn Bhd (IWK) have teamed up to embark on a sustainable water recycling initiative.

The collaboration, supported by the Environment and Water Ministry and the National Water Services Commission, brings together the country's largest water service provider and the national sewerage company.

The initiative will be carried out by Central Water Reclamation Sdn Bhd, a special purpose vehicle (SPV) that is 60 per cent owned by Air Selangor and the rest by IWK.

The agreements, as well as a cooperation letter, were signed at a ceremony yesterday, witnessed by Environment and Water Minister Datuk Seri Tuan Ibrahim Tuan Man and Selangor Menteri Besar Datuk Seri Amirudin Shari.

IWK said treated bio-effluent from its treatment plants would be chanelled to Central Water for further treatment.

The SPV's plant will produce non-potable treated water that will be distributed by Air Selangor through a dedicated pipe network to industrial businesses.

Central Water's maiden project will be to operate a reclaimed water treatment plant in Setia Alam, Selangor, that can produce four million litres per day (MLD) of non-potable treated water with plans to subsequently increase the capacity to 7.5 MLD.

The companies said the collaboration would pave the way for the development of reclaimed water use in Selangor, Kuala Lumpur and Putrajaya.

Apart from the Setia Alam plant, Air Selangor and IWK have identified other collaboration opportunities in respect of IWK treatment plants, including the plants at Pantai 2, Kuala Lumpur, and Seksyen 23, Shah Alam.

"This collaboration will optimise the nation's available water resources while protecting the environment, and highlights the long-term commitment of Air Selangor and IWK to the sustainable development of Malaysia's water industry.

"It also supports the government's target to recycle 33 per cent of the nation's treated effluent by 2030 under the Green Technology Master Plan 2017-2030," they said.

Furthermore, this would also help meet the ministry's strategic direction to produce 1,500 MLD of recycled water from treated bio-effluent.

Pengurusan Air Selangor Sdn Bhd chief executive officer (CEO) Suhaimi Kamaralzaman (left) exchanging documents with Indah Water Konsortium Sdn Bhd CEO Narendran Maniam at a signing ceremony in Kuala Lumpur yesterday. With them are Environment and Water Minister Datuk Seri Tuan Ibrahim Tuan Man and Selangor Menteri Besar Datuk Seri Amirudin Shari (second from left). PIC COURTESY OF PENGURUSAN AIR SELANGOR SDN BHD

Figure 6.2 Joint venture between Air Selangor and Indah Water Konsortium in recycling wastewater initiative for industrial use (Source:https://rehdaselangor.com/wp-content/uploads/20210317_AIR-SELANGOR-IWK-IN-WATER-TIE-UP-min.pdf)

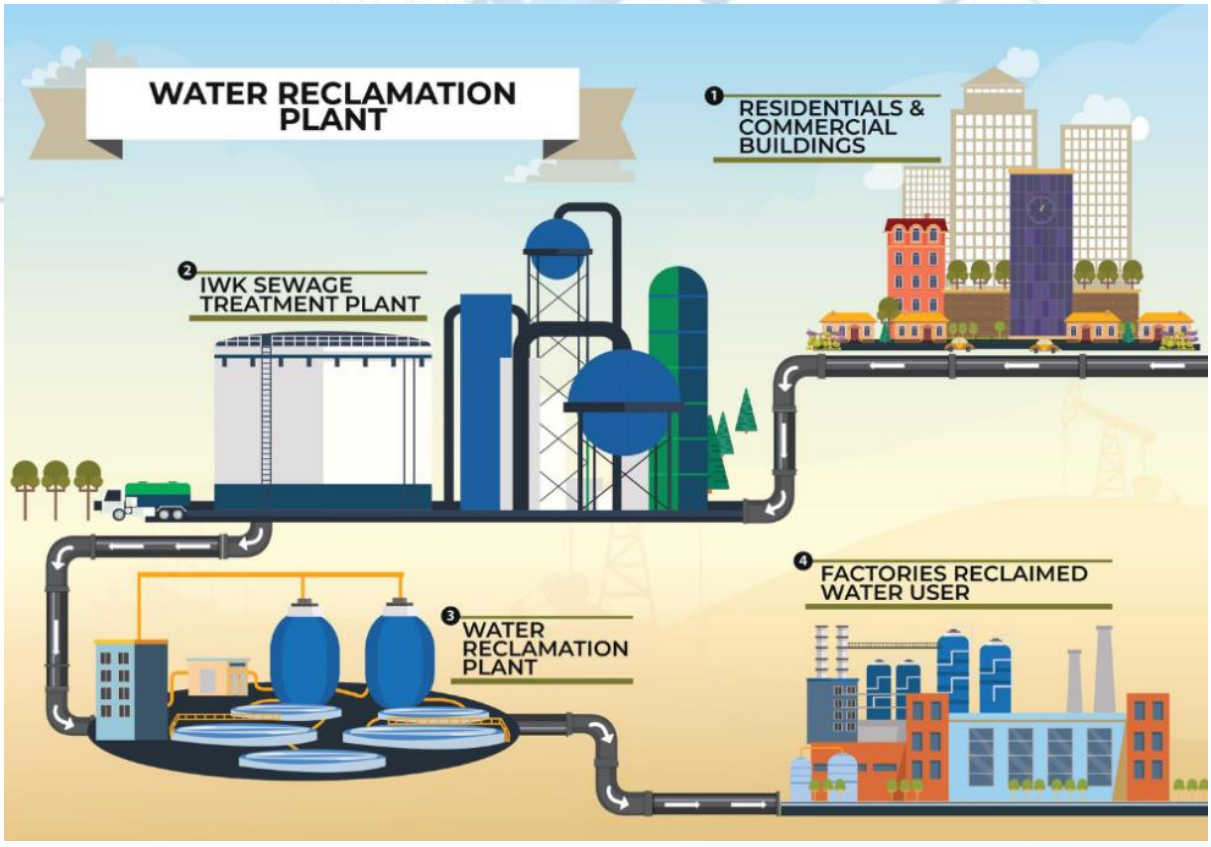


Figure 6.3 Schematic illustration of wastewater reclamation (Source: https://www.malaysiakini.com/advertorial/568568)

6.4 Support and Incentivise Value Chain Performance

Business and industry entities collaborate with upstream and downstream partners in the value chain and incentivise them to adopt best management practices in the conservation of water, treatment of wastewater, reuse, and safe release of effluent. An integrated approach to minimise the release of hazardous chemicals is an excellent example of business and industry to prevent pollution and assure a safer production.

Most major companies have a supplier code of conduct that incorporates expectations for water management constituting part of the criteria for regular screening or assessing suppliers that is supported by corrective action and capacity-building. The capacity and the competence of people operating wastewater treatment plants and technologies are the major challenges in water management. Companies should assist capacity building activities in different business and industry entities and value chain partners including the implementation of uniform training and certification programmes.

6.5 Value Water to Minimise Negative Externalities and Incentivise Reuse

As a resource, the value of water differs from that of water prices and costs. During the assessment of water costs, the economic, social, and environmental effects of water as well as its dependence should be considered. Assessment of water can have three main influences on the management of the business and industrial water and wastewater: lowering the consumption of freshwater, limiting the release of hazardous material into freshwater sources, and promoting wastewater reuse and recycling.

Understanding the value of water in a basin setting can lead to the understanding of how water contamination has a detrimental effect on society, the environment, and the economy. Applying methodologies such as the Natural Capital Protocol will improve our understanding of the detrimental effects of freshwater contamination when analysing the cost-benefit of various investments.

In many regions, there is no financial incentive for wastewater reuse and recycling mainly due to the very low water tariffs. To make the reuse and recycling of water attractive in the long run, business and industry entities should assess the values of the added benefits of ensuring supplies, and the reduced environmental and social impacts resulting from the reduction of freshwater abstraction. These values should be used as variables to determine water prices for industries.

6.6 Improve Disclosure Beyond Compliance

Only 10% of corporations reported water-related risks in the 2019 CDP Global Water Report. As the freshwater contamination risk is widespread and interrelated, and its potential is significantly negatively affected by socio-economic growth and environmental integrity, all enterprises are required to report these risks.

The small percentage of companies reporting water contamination risks can be due to the risk of regulatory fines and sanctions, which are minimal and financially inconsequential, associated with freshwater pollution. The impact of freshwater contamination should be understood by business and industry entities not only within their activities and assets but also downstream and throughout the entire value chain. This is most significant because freshwater contamination can compromise the

water supply. Integrated water resource management and integration into the supply chain have, therefore, become essential ways to understanding the risk profile of the business and industry entities and to fully capture the impact of freshwater contamination.

Water and Effluents Standard 303 of the Global Reports Initiative (GRI) (Figure 6.4) gives explicit guidelines for business and industry entities on what should be reported for wastewater including information relating to water interactions as a shared resource, water discharge effect management, and water discharge.

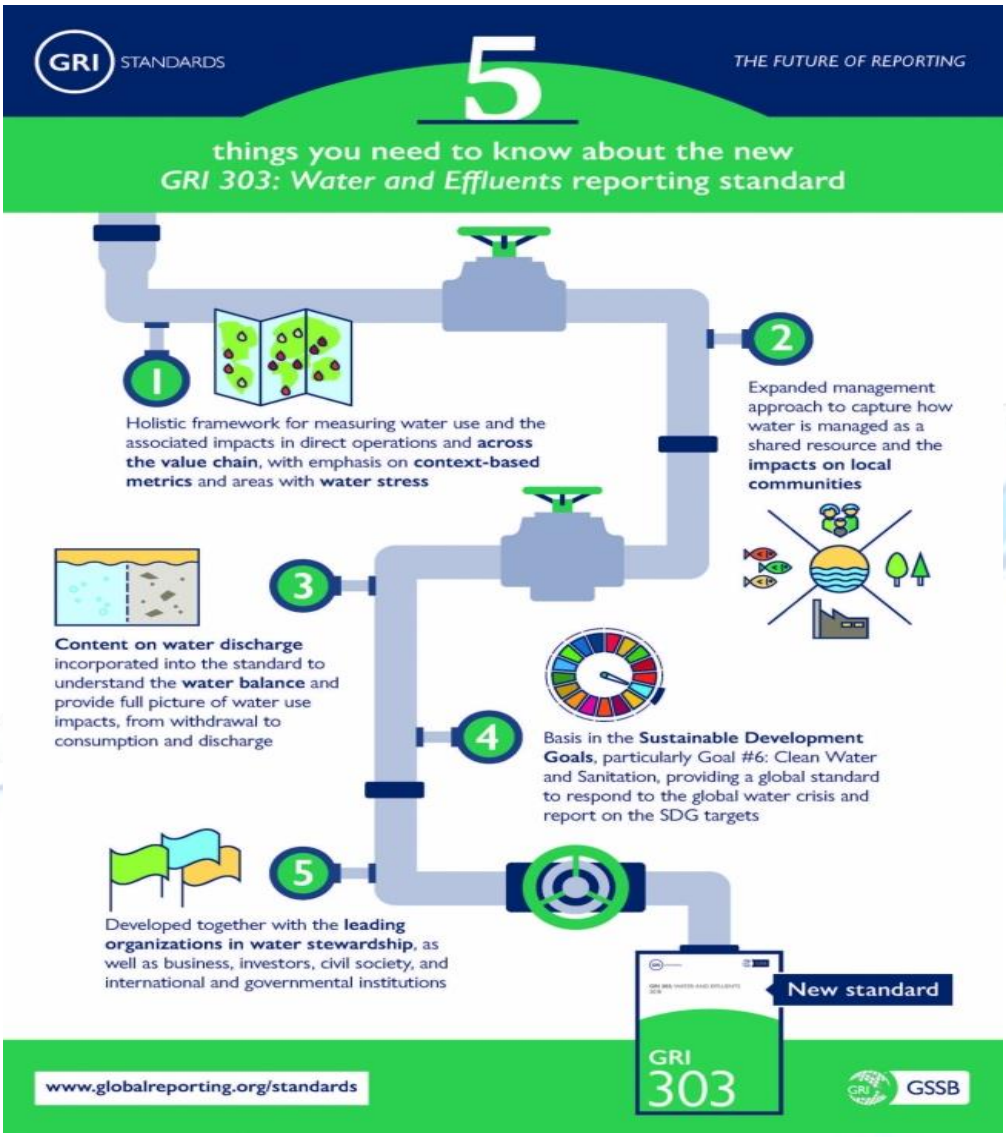


Figure 6.4 Water and Effluents Standard 303 of the Global Reports Initiative (GRI) (Source: https://www.3blmedia.com/News/Five-Things-You-Need-Know-About-Updated-GRI-Water-Standard)

7.0 Case Studies (Sectors)

This chapter showcases the water best management practices taking place in business and industry sectors that provide a benchmark for advanced participants to emulate when they return to their organisations. There are several key success factors highlighted by WBCSD as shown in Figure 7.1. To succeed in implementing IWRM in business and industry entities, the primary factor is the support of top management whereby the success of water reduction, reuse and recycling initiatives require effective communication with the internal and external stakeholders convincing them about the value of water.

In implementing IWRM in business and industry entities, it is essential to integrate the principles of circularity in water management (5Rs approach) whereby all variables are open and the adjustments relating to sustainability can be most beneficially integrated. A flexible approach in considering alternatives is a starting point to ensuring a good return on investment (ROI) and a reduction in operational expenditure (OPEX). Instead of adding the design at the end of the unit operation processes, sustainability begins at the conceptual stage of the rollout. For instance, a wastewater plant can be constructed as a treatment facility for recycling water or bolt-on connections for future wastewater treatment modules.

A change in perception of the value of wastewater and the economics of water relies on the shift from concerns of cost, value, and human resources to recognition of potential value, savings, and revenues in which product energy recovery and wastewater chemicals can also generate values. To attain the change of the value of wastewater, due diligence in monitoring water-consumption-related performance can lead to realising effective and sustainable wastewater recycling. In decision making and systems design, tools such as water balances and water maps aid key performance indicators in supporting decision making and prioritisation through understanding the connection between water and process economies. It is essential to understand, acknowledge and act on the existing water footprint whereby performance data must also be disseminated internally as well as externally.

The choice of treatment that provides water with suitable quality for the purpose it is to be used is an essential factor whereby ‘fit-for-purpose’ treatment is necessary for the recycling of water. To attain ‘fit-to-purpose’ treatment, the guidelines specifying the quality of water for each type of application need to achieve separation and application of several treatments that satisfy the quality of final applications as well as explore ‘fit-for-purpose’ water quality standards, supporting the recovery of resources, and providing incentives for deploying technology in ensuring efficient water consumption and wastewater treatment.

Business and industry entities share the same water sources with other regional consumers; therefore, they should also be responsible for water resources conservation. Business and industry entities must take into account the interest of other users when assessing where water should be abstracted from a basin and examining recycled water sinks (for example, feeding recycled water into a river, reservoir or groundwater aquifer). Good basin governance can only be achievable if good relationships have been created between water boards and water companies. Other users' knowledge and insights on the water balance in a basin will help to establish a well-thought-out IWRM in the area. The following section showcases water best management practices in the sectors of agriculture, construction, manufacturing, mining, and quarrying, and services according to the six principles laid down in the action framework.

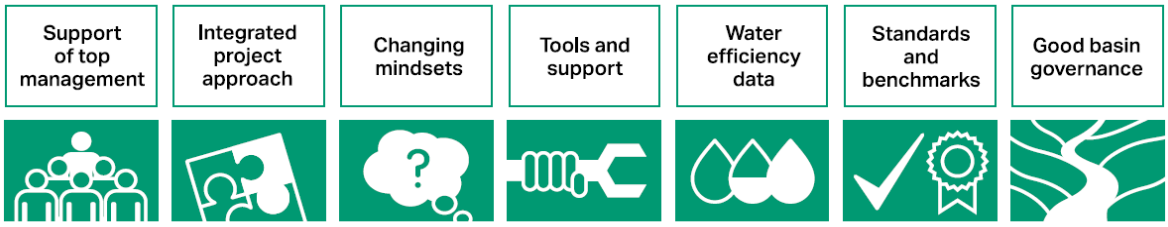


Figure 7.1 Key success factors in reducing, reusing, and recycling water (Source: WBCSD, 2017)

7.1 Agriculture

7.1.1 Oil Palm

IOI Plantation has installed water alarm and level detectors at the palm oil refinery effluent ("PORE") treatment plants to alert the operators whenever there are any malfunctions or when the level of the recycled water supply goes low. They have also adopted eco-themed oleochemical processes that use physical separation instead of chemical treatment to reduce the use of water. Their plantation is also equipped with a rainwater harvesting system where rainwater is collected to refill water for cooling and non-critical housekeeping purposes. IOI Plantation has also invested in the tertiary treatment system, such as reverse osmosis (RO) treatment plant to treat wastewater and reject water from the cogeneration plants to supply clean RO water for cooling towers. In terms of smart partnership and capacity building, IOI Plantation has collaborated with industry experts to share information and address challenges through social and environmental projects, partnerships, and associations, such as Proforest, Earthworm Foundation, Aidenvironment, Global Environment Centre, MPOA, Sustainable Palm Oil Choice Member and International Sustainability & Carbon Certification (ISCC). To ensure IOI Plantation always aligns with the latest industry's best practices, it has been part of their commitment (Table 7.1 and Figure 7.1) towards transparency for concerned stakeholders via third party verification by participating in a few programmes and training, such as Dow Jones Sustainability Indices, FTSE4Good Bursa Malaysia Index and Training on Social Impact Assessment.

IOI Plantation manages water by enforcing these measures and practices:

1. Installing water-gate at strategic locations along the main and collection drains to keep the water table at an optimum level.
2. Maintaining the optimum level of water to counter potential shortfall and risk of fire.
3. Maintaining riparian reserves to minimise soil run-off. Riparian reserves also serve as a filtration system to preserve the quality of water entering the waterways.
4. Planting legume cover crops as a soil conservation measure to prevent run-off into the waterways and avoid any planting on steep terrain.
5. Monitoring and treating all palm oil mill effluent (POME) and wastewater before discharging into the natural waterways. The treated POME will be used for land application.

Table 7.1 Target and Approach Used in IOI Plantation

Target	Approach
• 100% treated POME for upcycling use for oil palm plantation operations. • Minimise pollution and waste generation.	• Green initiatives in resource-based manufacturing to increase water recycling, reduce wastage and increase reprocessing waste material and energy efficiency.

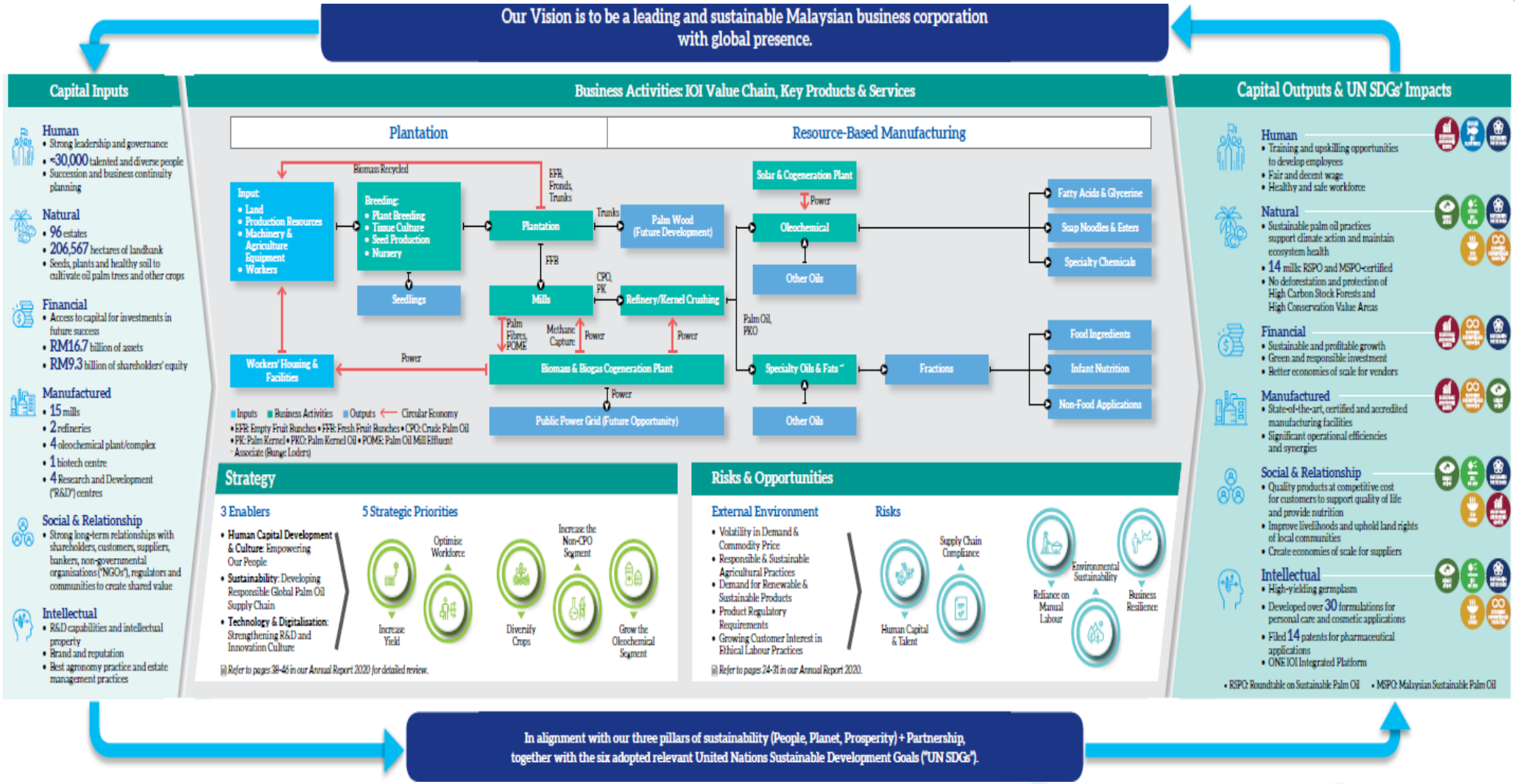


Figure 7.1 IOI Plantation Value Creation Model

7.1.2 Rubber

FGV						

FGV Holdings Berhad manages water as an important aspect in their rubber plantation whereby they monitor their impacts on water systems closely as most of their water supply is extracted from nearby rivers. Their operations are located in 135 significant river systems in which many of them are monitored regularly to identify if there is any deterioration of water quality. Besides, all water discharged from their mills will undergo treatment to ensure the Biochemical Oxygen Demand (BOD) meets the regulatory standard. As for water monitoring, samples are taken every month and sent to an accredited laboratory for quality testing. FGV advocates for the responsible use of pesticides, herbicides and fertilisers and the use of chemicals remains the least preferred option whereby they optimise their chemical usage to ensure minimum impact on the environment while ensuring maximum profitability and taking into consideration the leaf and soil nutrient status. As for the capacity building, competency training and awareness related to sustainability and certification are given to their employees to ensure continuous improvement of FGV operations in the aspect of the environment. FGV has undertaken a socialisation programme to raise awareness and understanding of FGV's sustainability commitments (Figure 7.2) among FGV's operations, subsidiaries, suppliers and contractors whereby FGV has embedded sustainability into operations by enhancing job descriptions to create a working culture that complies with sustainability aspects.

Figure 7.2 Relevant SDGs that are Aligned with FGV's Commitments

7.1.3 Livestock

QL Resources Berhad is an integrated agro-based business group, producing nourishing products from agricultural resources in Integrated Livestock Farming. As an agriculture processing industry, QL Resources Berhad can be a major producer of wastewater particularly organic waste with high biochemical oxygen demand resulting in low oxygen levels or even anoxic conditions in natural water. QL Resource Berhad applies best practices for data monitoring to ensure that wastewater discharged follows the Department of Environment's requirements, including, but not limited to, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solids, and Oil & Grease. As QL Resources Berhad starts to track their water withdrawal, the company analyses all collected data in greater detail to consolidate an action plan to reduce water withdrawal. QL Resources Berhad has also added biodiversity and water security into their materiality matrix (Figure 7.3).

Material Matters Across 3 Themes		ILF
Environmental Responsibility	Waste & effluent management	✓
	Biodiversity	✓
	Climate change & emissions	✓
	Water security	✓
Social Responsibility	Business growth	✓
	Food quality & safety	✓
	Biosecurity	✓
	Local community	✓
	Workplace: Fair labour practice	✓
	Workplace: Occupational safety & health	✓
	Workplace: Talent attractions & retention	✓
Governance	Uphold business integrity	✓

Figure 7.3 Mapping of Material Sustainability Matters Across the Three Themes

7.1.4 Fisheries & Agriculture

MSM						

MSM Malaysia Holdings Berhad reduces waste by equipping their manufacturing line with cutting-edge nano-filtration waste treatment systems that is able to process the discharge produced in their refineries. The resulting salt residue can be reused for resin regeneration while the rest of the residue is filtered and cleaned before being discharged. Waste stream management is outsourced to a supplier licensed by the Department of Environment to collect, transport, process and dispose of the waste following the local regulations and standards. As vast water quantities are used in the sugar refinery process, sustainable water management measures have been adopted to ensure the efficiency of water usage within their operations. The amount of water used and reused in their daily operations are constantly measured and monitored (Figure 7.4). For example, water consumption in MSM Johor has been reduced for FY2020 due to a process improvement activity.

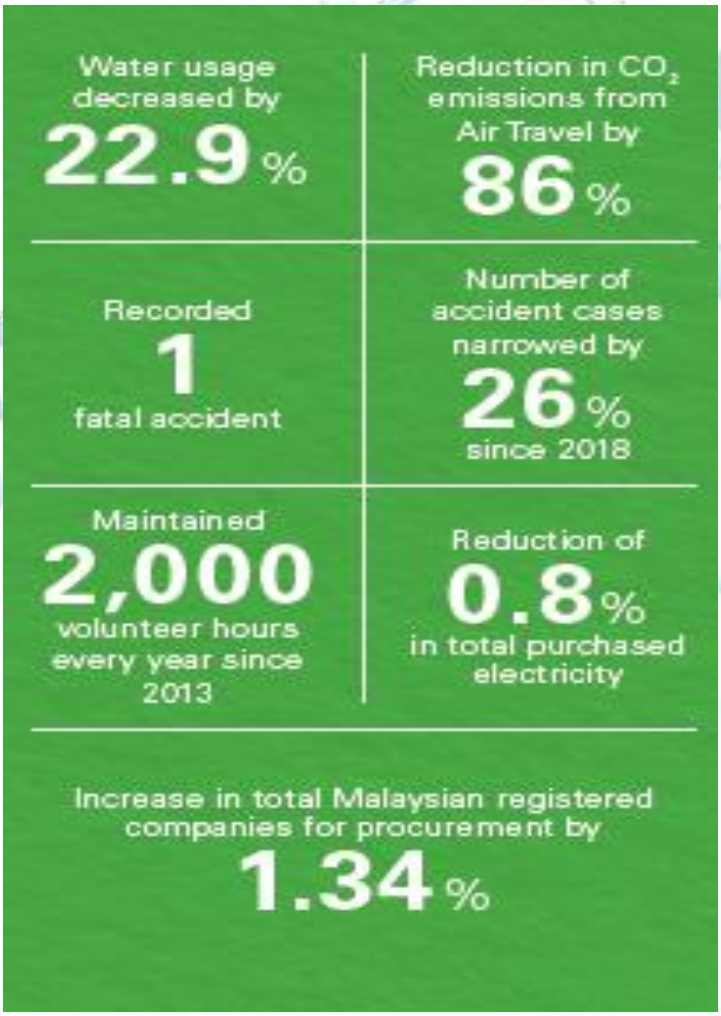


Figure 7.4 Sustainability Achievement

7.2 Construction

7.2.1 Civil Engineering

UEM SUNRISE consider the environment in their projects as they work with experts to incorporate designs that have elements that help reduce water consumption by reusing the building materials wherever possible (Table 7.2). During the construction phase, they use a systematic monitoring system to measure wastewater discharge to minimise and control the potential impact that construction activities have on the environment and nearby communities. For buildings design, they put water-saving wares and fittings and use a rainwater harvesting system in bathrooms for toilet flushing. To minimise the impact of construction and operational activities on water quality, they regularly monitor discharge at project sites, such as diesel, oil, paint, solvents, cleaners, other harmful chemicals, construction debris, and dirt. UEM measure Total Suspended Solids (TSS) monthly to ensure that they do not exceed the water quality standards set by the National Water Quality Standard of Malaysia (NWQS). As for supply chain partners, UEM make sure that all their business partners commit to these matters:

- Generate minimal levels of pollution.
- Consume resources, such as raw materials, energy, and water efficiently.
- Practise environmental conservation and conserve biodiversity.

Table 7.2 UEM Sunrise Water-Saving Initiatives

UEM Sunrise Water-Saving Initiatives	
Embun Residences, The Maris @ Desaru	• Rainwater harvesting system for irrigation • Dual flush toilets • Low flow taps on water basins
Completed project retrofits	• Smart controllers • Low flow sprinkler heads
Landed developments such as Estuari Greens and Aspira Gardens	• Rainwater harvesting systems for irrigation and flushing of toilets
Commercial properties in Solaris Dutamas and Puteri Harbour District	• Auto-close water taps • District cooling system

7.2.2 Residential Buildings

ECOWORLD						

EcoWORLD believes that by embedding green design and installing green features into its properties, it can reduce environmental impacts after its buildings have been occupied. EcoWORLD's construction concept include features such as recycled water sources for landscaping which reduces the usage of clean tap water, minimal earthwork cut and fill, water-efficient fittings or devices used to reduce water usage within the development, and rainwater harvesting systems. To ensure it continues to operate within permissible regulatory limits, its developments are subject to regular environmental monitoring by external consultants. Through monitoring activities, EcoWORLD evaluates the impacts on water quality and by using the results obtained, it follows the regulatory requirements by developing measures to limit the environmental impacts. Sustainable procurement policy is applied to all procurement activities undertaken to encourage EcoWORLD's partners to provide solutions, materials and goods that are eco-friendly. Under this policy, EcoWORLD recommends product specification requirements such as Programme for the Endorsement of Forest Certification and Forest Stewardship Council. This policy is circulated to all partners and employees to ensure all parties fully understand the requirements and wherever possible, create more discussions about promoting sustainable options in their business practices (Figure 7.5).

Figure 7.5 EcoWorld Green Realisation Plan

7.2.3 Non-Residential Buildings

AME ELITE CONSORTIUM BERHAD						

AME Elite Berhad implement the Green Building Index (GBI), spanning all aspects of the development whereby they integrate sustainable site planning and management, efficient use of natural resources, environmental quality and compliant materials and sourcing. Their projects also retain a high percentage of green areas to promote a nature-oriented working and living environment for their clients. They always maintain an Environment Management Plan Report to monitor waste and effluent management for their industrial parks and take remedial action where appropriate. As they recognise the importance of water efficiency in daily operations to achieve more sustainable utilisation of resources, the industrial buildings are designed to GBI requirements such as installing rainwater harvesting systems, reusing water from detention ponds for the upkeep of landscaping amongst various practices that help conserve natural resources (Figure 7.6). They also use water from the testing and commissioning of pump flow systems that are recycled for reuse, thereby eliminating the discharge of used water into the environment. Moreover, they also use Integrated Building System (IBS) in construction and engineering operations that help reduce water usage in the construction process due to the high mechanisation.

Figure 7.6 Rainwater Harvesting Tank at i-Park's Factories

7.3 Manufacturing

7.3.1 Electrical & Electronics Products

Globetronics builds its sensors and encoders for a variety of automation and industrial applications. Water used in manufacturing sites forms a crucial part of the process for most of the production lines, as unclean water can cause high particle counts that disrupt the ability to produce a quality product. To overcome this problem, Globetronics uses the proper filtration and distilling equipment to always ensure a high-quality water supply to manufacturing lines. Industrial and sewage effluents are measured against a range of parameters to ensure that is compliant with all industry standards. This is measured and reported in the monthly ESG meeting and all subsidiaries comply with effluent discharge. Scheduled production shutdowns to improve UPH and regular preventive maintenance are performed on facilities chiller, cooling tower, strainer, vacuum, transfer pump and circulation pump to reduce the usage of water. For the wafer sawing process, water that is normally discharged to the drain is circulated back to the tank instead. Effluent discharged is measured against legally set parameters which are disclosed in Figure 7.3 whereby all subsidiaries effluent discharge is within the parameters.

Table 7.3 Parameters for Effluent Discharge

Effluent Discharge Parameters	
Biological Oxygen Demand (BOD)	Copper (Cu)
ph Value	Manganese (Mn)
Suspended Solid	Nickel (Ni)
Chemical Oxygen Demand	Tin
Oil and Grease	Zinc (Zn)
Mercury (Hg)	Boron (B)
Cadmium (Cd)	Iron (Fe)
Chromium Hexavalent (Cr6+)	Silver (Ag)
Arsenic (As)	Aluminium (Ag)
Cyanide (as CN-)	Selenium (Se)
Lead (Pb)	Free Residue Chlorine (as Cl2)
Chromium Trivalent (Cr3+)	Sulphide (as S2-)
Colour, ADMI (Adjusted pH)	Ammoniacal Nitrogen

7.3.2 Food, Beverages & Tobacco

Nestlé						

Nestle is one of the world's largest food & beverage companies whereby water is a crucial for its operations. Nestle minimises the impact on water resources by continuously looking for opportunities to better manage its water consumption and wastewater discharge. It takes proactive measures to ensure that water-related activities do not disrupt local water quality and availability. Nestle also engages with external parties regularly to encourage water conservation. As its operations are guided by the Commitment on Water Stewardship in the Nestle Policy on Environmental Sustainability, the Nestle Global Water Stewardship Ladder (Figure 7.7) serves as a point of reference to address the water management issues specific to its operational context by setting out a roadmap for effective shared water consumption and management.

To reduce water consumption, Nestle has upgraded its equipment in Chembong Factory even though the reduction is limited. Furthermore, it also takes a collaborative multi-stakeholder approach to reduce water consumption along its value chain. Nestle is also engaged in ongoing research with rice suppliers on the use of semi-aerobic rice intensification farming methods which consume up to 40% less water than conventional techniques. In addition, it also educates contract farmers and relevant agencies on water conservation practices through the provision of awareness and instructional programmes. To improve industry capacity and support the development of effective regulations, Nestle works with local authorities and stakeholders to share best management practices and environmental performance information. Nestle also regularly engages with relevant regulators, industry players, water utility companies and other stakeholders on the matters of water management.

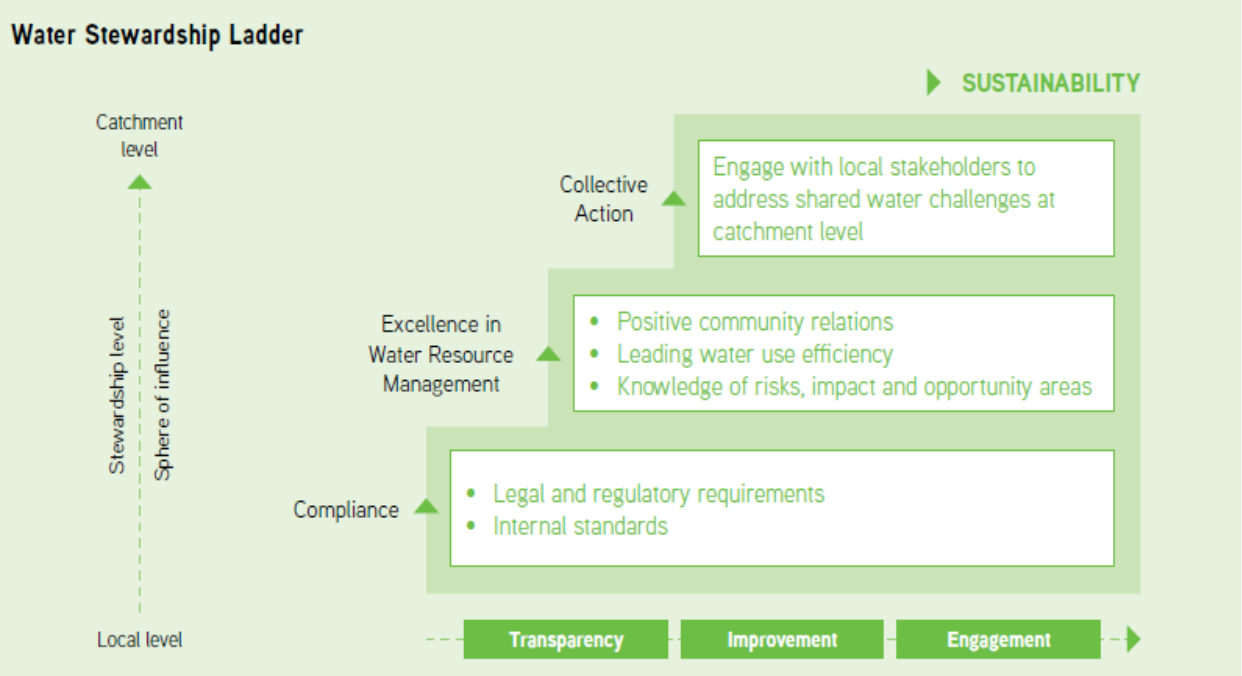


Figure 7.7 The Nestle Global Water Stewardship Ladder

7.3.3 Transport Equipment & Other Manufacturers

MBM RESOURCES BERHAD						

MBM Resources Berhad (MBMR) manufactures automotive parts which sees water conservation as an important aspect as maintaining the water treatment process is crucial to help reduce the consumption as water can be reused or recycled. MBMR constantly monitors its water consumption to meet its goal of lowering water usage. Below are the current water conservation practices in MBMR:

- Water treatment for manufacturing operations in HASB and OMI.
- Rainwater harvesting at Menara MBMR (monitored by MBMR Properties Sdn Bhd).
- Water recycling for manufacturing chiller systems.

MBMR believes that sharing the results of the materiality assessment can be a starting point for continuing the communication and retaining participation for sustainability initiatives. The response and input from all stakeholders are incorporated into the broader sustainability strategy (Figure 7.8).

Figure 7.8 Sustainability in MBMR

7.3.4 Chemicals

CCM CHEMICALS DIVISION						

CCM Chemicals acknowledge that water is one of the key resources utilised within their operations and the product manufacturing process is dependent on this valuable resource whereby they minimise water usage in their operations and throughout the supply chain to safeguard the environment, reduce water consumption, and ensure a resilient future for the business. CCM Chemicals commit to ensuring that effluent discharge is safe for the environment and does not affect human health by complying with the Department of Environment's stringent regulatory standards and equipping all the manufacturing plants with a wastewater treatment plant. To reduce the operational water footprint, CCM Chemicals initiated a 3Rs Sustainability Programme for Polymer Washed Water in 2016. Additionally, instead of disposing a huge amount of washed water as waste and spending a considerable amount on the disposal of this wastewater, they reduced the disposal costs by more than half between 2015 and 2016. CCM Chemicals have embarked on a wastewater recovery project to ensure zero treated effluent is discharged from their coagulation plant. Wastewater generated from the coagulation plant is collected and treated in the wastewater recovery plant before being recycled for use in the plant's operations. In addition, the CCM Chemicals chlor-alkali plant operates an ion-exchange system for its water demineralisation process and its brine solution purification process. Through this project, a low concentration of sodium hydroxide is recovered after the regeneration process and is used in another unit operation whereby they managed to reduce the amount of wastewater discharged from the wastewater treatment process and reduce the effluent discharged into the environment.

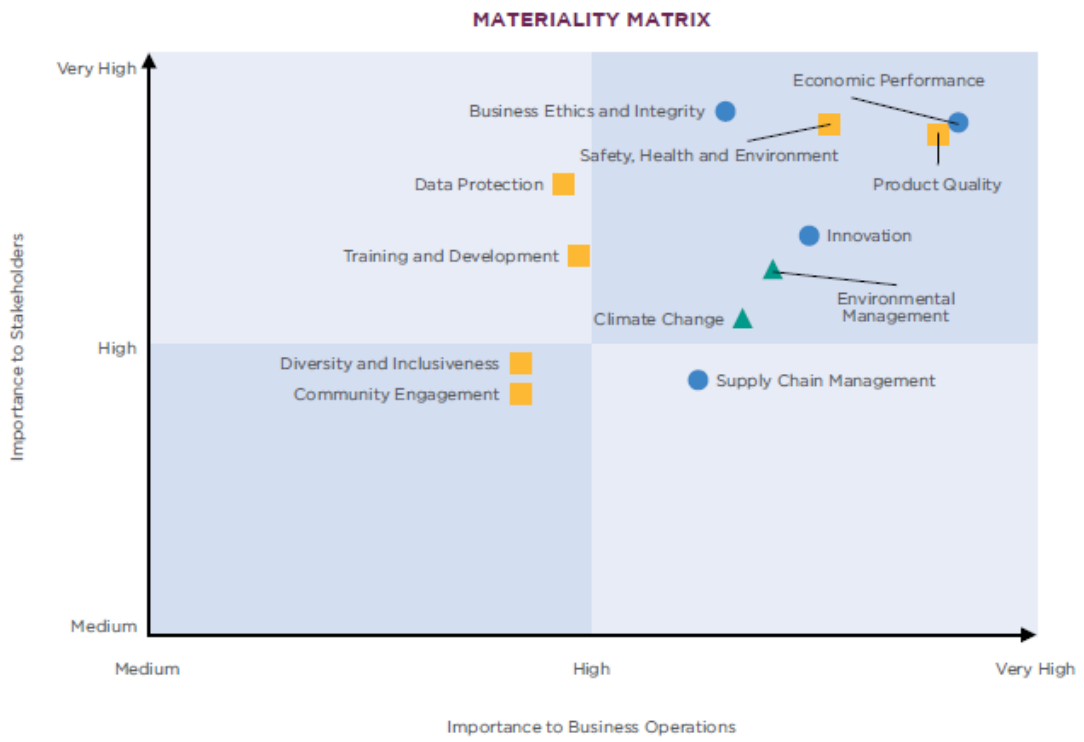


Figure 7.9 Materiality Matrix of CCM Chemicals

7.3.5 Rubber & Plastic

TOP GLOVE TOP QUALITY, TOP EFFICIENCY						
	💧	💧	💧		💧	💧

Top Glove Corporation Berhad need a sufficient and clean water supply for the glove manufacturing process. At the same time, they do continuously monitor their water consumption and implement initiatives to recycle and reuse water in all their factories to decrease dependency on the municipal source. TOP GLOVE have implemented a few solutions to overcome the problem such as Reverse Osmosis Water Treatment Plant, ensuring continuous water supply for factories' operations, and alleviating flood issues (Figure 7.10). The treatment plant can treat and produce 400 m^3/hour of clean water (for 2 phases of this project) that benefits 9 factories. The plant also functions for flood mitigation by alleviating flood through diverting approximately 120 m^3/hour (phase 1) and 450 m^3/hour of water (phase 2, commenced in June 2020) from drain to pond to be treated and supplied to factories' water supply. Furthermore, TOP GLOVE also recycle and reuse water via in-house water recycling facilities at every factory to treat, recycle, and reuse the water in factories making it possible for housekeeping purposes such as flushing, ROTP initiative, and rainwater harvesting.

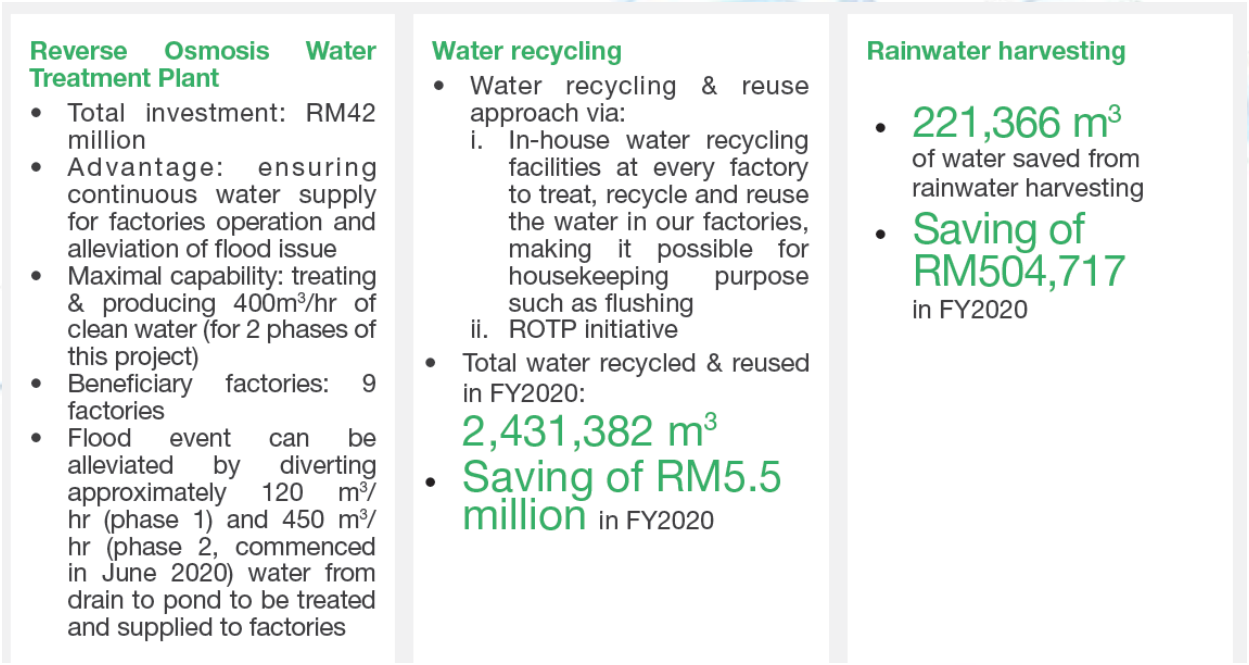


Figure 7.10 TOP GLOVE Water Management Plan to Mitigate Water Risk

7.3.6 Wood, Furniture, Paper Products & Printing

Muda Holdings Berhad ensures full compliance with applicable environmental laws and regulations to reduce its environmental risk and footprint. Both Kajang and Tasek Paper Mills are equipped with biological effluent treatment plants where all the used water has to go through a series of physical, chemical, and biological treatment processes to ensure the quality of the effluent meets the standards prescribed by the Environmental Quality (Industrial Effluent) Regulations 2009. To maintain efficiency, the biological treatment plants are consistently and properly maintained to ensure optimal operation level to prevent the risk of breakdown as the failure of the biological effluent treatment plants will result in contamination of the rivers.

Table 7.4 MUDA Holdings Berhad Principal Risk

Principal Risk	Mitigating Actions
a. **Supply of raw material for manufacturing of paper** Adequate supply of waste paper is key to the continuous operations of the paper mills. Local demand has outpaced supply from the domestic market resulting in risk of shortfall in supply from domestic market and increased cost.	The Group will strengthen its collection centres to maximise procurement of the material from local suppliers. At the same time, the paper mills are establishing a network of supplies from overseas to mitigate the risk of shortfall in supply.
b. **New entrants into local market** With the new capacities from existing and new paper mills, Malaysia will become a net exporter of paper roll in the near future. The net selling price of paper roll is expected to be lower with the stiff competition.	Continue its effort to achieve gross output at optimum level in order to lower production costs and stay competitive by implementing productivity and quality improvement programmes.
c. **Credit Exposure and Liquidity** The Group's revenue is mostly made up of domestic sales with credit terms granted. Therefore, trade receivables are subject to the risk of delay in collections. This will cause additional provision for doubtful debts or bad debts written off which will impact the profitability of the Group. The tight cash inflows will in turn cause the delay in payments to suppliers which may lead to liquidity problems if the risks were not well managed.	Extension of credit term and credit period to customers are managed in accordance with Credit Control Policy and Procedures to mitigate the risks of bad debts. There were no over commitment in inventories which could affect the Group's liquidity. Credit facilities of the Group were constantly monitored to ensure availability of sufficient working capital.
d. **Compliance with Department of Environment ("DOE") Requirements** The manufacturing process of paper mills and carton plants in the Group produces sludge, ash, ink and trim waste, emits dusts particles and effluent discharge which have to be treated and/or disposed of in accordance with the requisite regulations. Breach of any of the regulations may result in plant closure and health hazards to employees and the community.	The Group has invested in waste water treatment plants, a 24-hour continuous emission monitoring system linked to the DOE to monitor dust particles and filter press for the treatment of sludge and also other ancillary equipments and facilities to ensure proper handling and disposal of waste, emission and effluent to comply with the regulatory requirements.

7.3.7 Non-metallic, Mineral Products, Basic Metal & Fabricated Metal Products

PRESS METAL						

Press Metal Aluminium Holdings Berhad deems water as an essential resource for its operation, particularly for cooling purposes. Every subsidiary withdraws piped water from local water treatment plants. At its smelting plants, industrial wastewater is discharged because most of the water is used in the cooling process and evaporates upon use. However, at PMBA and PMI, treated industrial water is discharged to sewage drains due to anodising and mould cleaning process. Across all entities, water is also used for domestic purposes in canteens, hostels, and office departments as well as for hydrant pumps in case of emergencies. All domestic wastewater is treated in septic tanks before being discharged into the rivers in compliance with relevant legislation and guidelines. Press Metal Aluminium Holdings Berhad plants are located in areas that are not stressed for water and experience above-average rainfall. As such, no significant water-related risks were recorded in FY2020 and there was no issue sourcing water for operational use. Despite that, the company continues to pay close attention to water resource management and aims to optimise water usage. To avoid any future problems, Press Metal Aluminium Holdings Berhad has implemented broad measures to manage and reduce unnecessary water use. Its water management teams have installed flowmeters at key locations within plants to effectively monitor its daily water withdrawal. Regular inspections of water pipelines are also conducted to identify any potential damage or leakage. To promote water conservation among the employees, stickers are placed at selective water appliances and washrooms to remind them about the importance of saving water. Individual subsidiaries have also carried out several measures to improve water management. The company has also mapped water management practices and produced a water balance diagram to provide a comprehensive review of potential areas of improvement for water use across operations. Furthermore, a rainwater harvesting system is implemented at its smelting plant, PMBtu, to reduce the reliance on potable water. To minimise tap leakage after use, retrofitted water appliances have been equipped with automatic sensors.

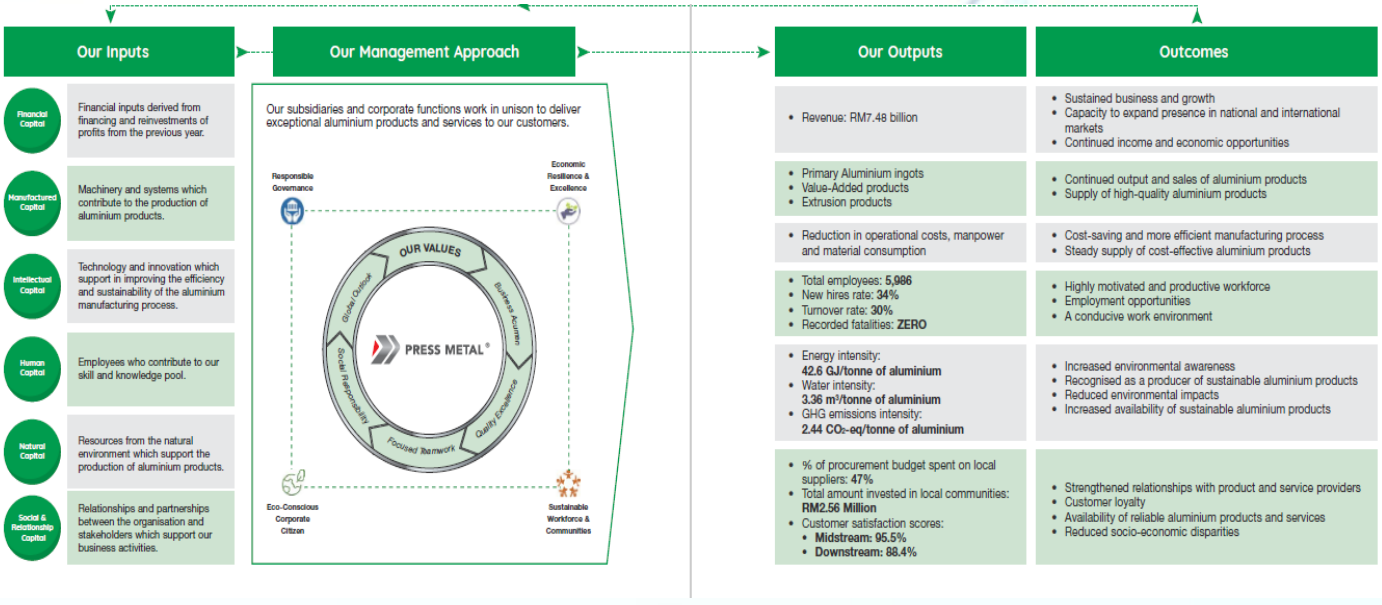


Figure 7.11 Press Metal Aluminium Holdings Berhad's Management Framework

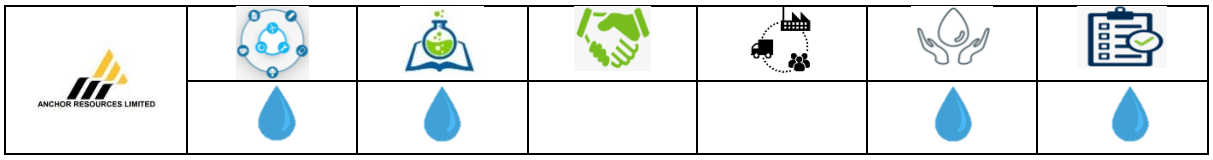
7.4 Mining & Quarrying

7.4.1 Petroleum & Natural Gas

PETRONAS follows PETRONAS's Guidelines on Water Practices (WAPS) to minimise the impact of discharge on surrounding water bodies. WAPS covers the following systems: cooling water, ion exchange, reverse osmosis & electrode ionisation, steam generator system, condensate, wastewater discharge, collection & treatment, and sludge handling. PETRONAS is in the process of setting water reduction targets for its operations. Preliminarily, water audits were conducted following WAPS to assess consumption patterns. In 2019, three audits were completed, another two were conducted in 2020 with five more in the following year. For the water quality report, PETRONAS measures the Chemical Oxygen Demand (COD) of its wastewater which indicates how much oxidisable material it contains. The higher the COD, the lower the dissolved oxygen level in a water body which is harmful to living organisms. All water discharged by PCG is channelled into rivers and the sea and not to enclosed water bodies. In 2019, PETRONAS conducted a water quality study in collaboration with Universiti Putra Malaysia (UPM) that observed whether there was a risk of pellets entering the monsoon drains. The project achieved the desired end goal of zero risks of environmental spills leading to PC LDPE winning a Gold Award at the Malaysia Productivity Corporation Team Excellence Convention in 2019. PETRONAS also collaborated with PETRONAS Downstream Business in a water assimilative capacity study to better understand the conditions required for healthy aquatic life to enhance the wastewater discharge quality beyond regulatory compliance. PETRONAS ensures that contractors comply with the HSE requirements throughout the procurement process. In 2019, PETRONAS enhanced their HSE requirements to include compliance with the newly implemented Road Transport Operational Guideline (RTOG) for improved and safe supply distribution.

Figure 7.12 Petronas Sustainability Strategy

7.4.2 Mining (bauxite, gold, coal, iron ore, tin, ilmenite, amang (tin tailing) retreatment & other mining)



Anchor Resources Limited recognises the critical importance of water management to ensure the efficient, safe and sustainable use of water as well as the protection of water resources and ecosystem around its sites. In order not to adversely impact the environment, the gold and granite dimension stone operations of Anchor Resource Limited recycle the water that the operations utilise in a closed water system. Effluents from both the gold mining and the granite dimension stone operations are stored within the ponds on site. AASB uses water supplied by Syarikat Air Terengganu Sdn. Bhd. while GGTM captures and utilises rainfall-runoff only. AASB utilises closed water systems and stores the effluents within the mines to minimise water withdrawal and avoid discharging wastewater into the surrounding waterways.

Table 7.5 Water Used for the Activities of AASB and GGTM

Lubuk Mandi Gold Mine (AASB)	Bukit Chetai Granite Dimension Stone Mine (GGTM)
• Operations of tailing plant to produce semi-processed gold concentrated ore • Hygiene purposes	• Excavation of granite rocks and production of granite blocks • Slabbing and sizing to granite strip-slabs and to granite tiles • Hygiene purposes

7.4.3 Quarrying (granite, limestone, sand extraction & other stone)

MINETECH RESOURCES BERHAD						
	💧	💧			💧	💧

Minetech Resources Berhad acknowledge water resource management is essential to protect the sites' surrounding ecosystem. In order not to adversely impact the environment, they minimise their water consumption through constant innovative initiatives within the business divisions. Minetech Resources Berhad reuse most of their natural water. Pipes are connected from storage ponds that store harvested rainwater and water from these ponds is used for washing and cleaning activities within quarries and construction sites. Consequently, both quarries and construction sites use minimal water from water authorities. To prevent any untoward incidents in their quarries, they manage all discharges and wastes coming from construction sites and factories utilising chemicals and diesel in accordance with the laws and regulations governing environmental protection.

Figure 7.13 Minetech's Controls Established to Handle These Materials and Wastes

7.5 Services

7.5.1 Accommodation

BERJAYA BERJAYA LAND BERHAD						

Berjaya Land Berhad practice best water management practices at their branches. For example, in the Port Dickson Division, they collect and use stormwater for landscaping irrigation and construction cleaning purposes. In Kensington Gardens, stormwater is stored in underground tanks, while in The Tropika and Bayu Timur, On-Site Detention (OSD) tanks are installed to manage the stormwater in compliance with the Urban Storm Water Management Regulation. The Tropika uses GreenRE RB V3.1 Bronze Award as the standard for its Water Efficient Fittings. Such fittings are based on WEPLS, resulting in 10 to 15% savings of water. Sub-meters are installed for better monitoring and control of water usage. The Cold-Water Schematic System Design used in The Tropika identifies the possibility of operational failures prior to the construction and improves the monitoring as well as the distribution of water. The PI Division also installs self-closing pillar tap fittings and dual flush cistern and hand dryers in some of its complexes to reduce water wastage. Bedding and towel laundry in the BHR consumes a significant amount of energy and water. BHR offer guests towels and linens reuse options to reduce water usage. Other initiatives in water conservation include the installation of water flow regulators in the water tap system and the installation of water sub-meters to improve the monitoring of water consumption and early detection of a leak. At The Clubs' golf courses, reclaimed water is used for watering. The golf course area requires specific irrigation care as compared to the other green areas. Water from the river, man-made ponds, and rainwater is used for general cleaning to minimise the usage of potable water.

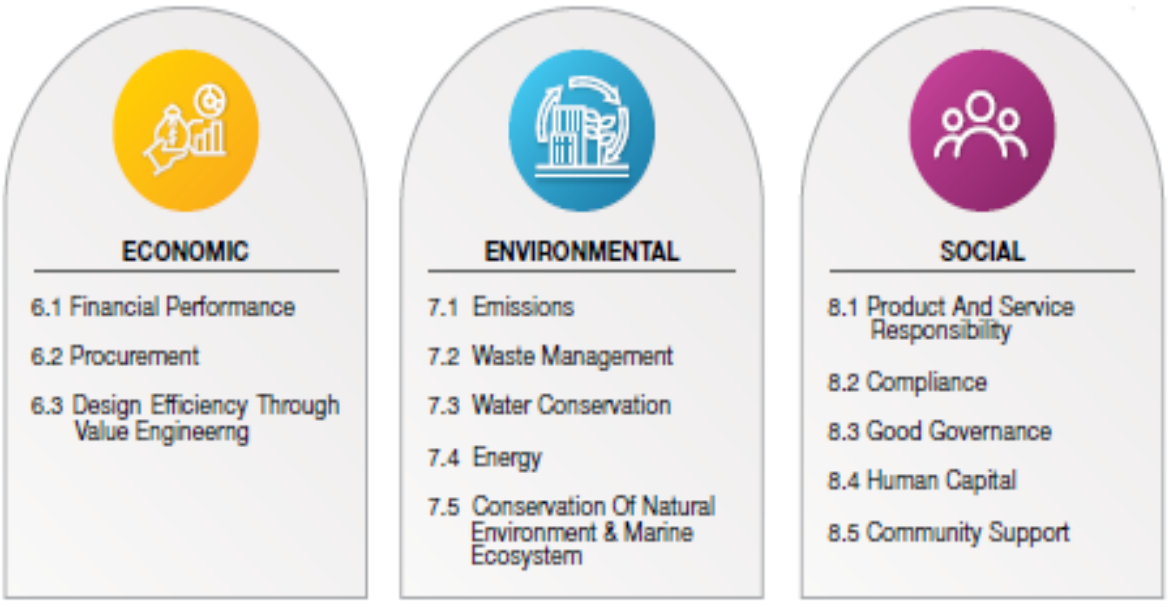


Figure 7.14 Berjaya Land Berhad Sustainable Pillars

7.5.2 Information & Communication and Transportation & Storage

TM						

Telekom Malaysia handle their water management by continuing to recycle water from the surau in Menara TM to reuse for other applications such as watering plants around their buildings. Telekom Malaysia also hold campaigns to raise awareness of water conservation among TM employees.

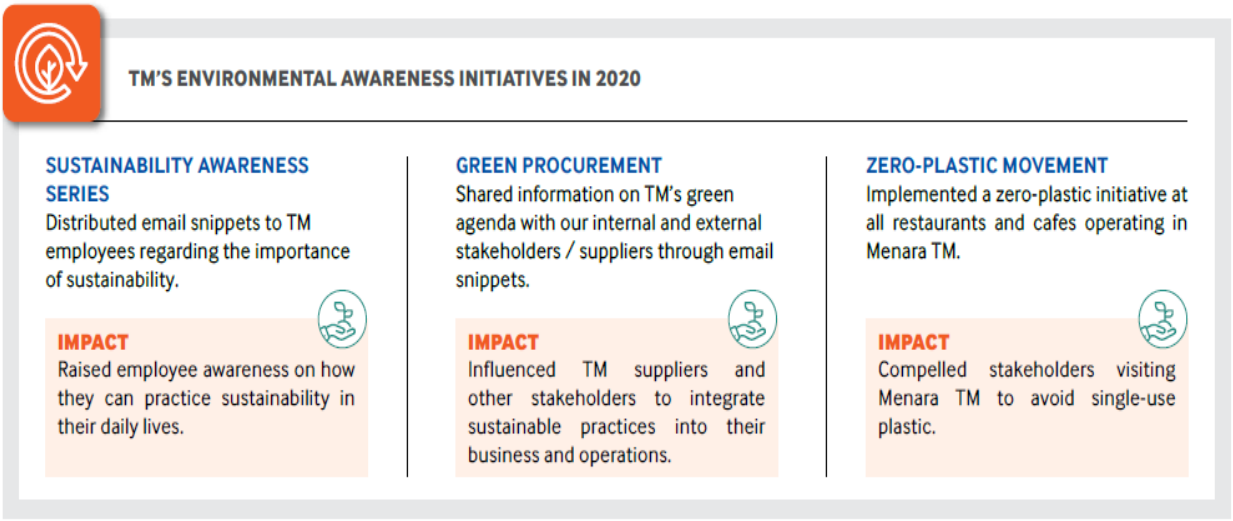


Figure 7.15 TM's environmental awareness initiatives

7.5.3 Arts, Entertainment & Recreation

SUNWAY						
	💧	💧		💧	💧	💧

Sunway Group have installed rainwater harvesting systems that have been a key initiative across SUNWAY major operational sites with high water consumption. Approximately RM158,000 has been invested in rainwater harvesting systems for 8% of their sites, and more installations are currently being planned. The total amount of rainwater stored is used for landscape maintenance and cleaning outdoor areas. Sunway Lagoon Theme Park also uses rainwater to top up its Rapid River ride, which saves about RM4,000 or 1,656 m³ per year. Sunway discharge the run-off into water bodies nearby such as lakes and rivers. For example, water from Sunway Spun Pile and Paving Solutions is discharged into the Batang Kali River in Selangor. To ensure that they comply with all regulations, SUNWAY conduct periodic monitoring of Total Suspended Solids (TSS) at each final discharge point to check the quality of wastewater discharge. The silt trap is a temporary ponding area built to collect and store sediment from water run-off and helps in separating silt and other particles thus improving the quality of water before it is reintroduced back into the drainage system. In 2020, there was no report of non-compliance with any regulations regarding water quality. SUNWAY quarry business division has designated locations for water discharge points where the water samples are tested quarterly. The water samples are within specification as per the Environmental Management Plan (EMP) under the Department of Environment.

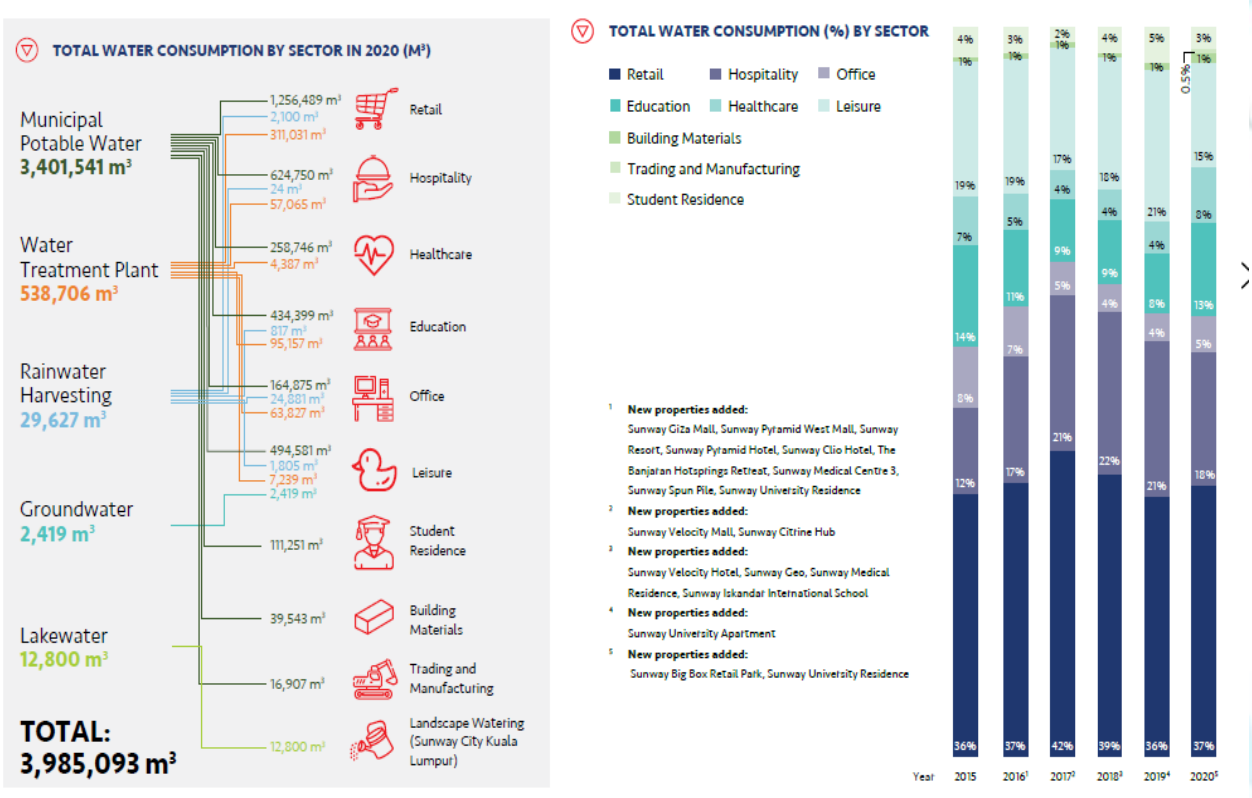


Figure 7.16 Sunway's water consumption

8.0 Conclusions

Water demand is expected to exceed sustainable supply by 40% in 2030 whereby water supplies are under increasing stress due to population and economic expansion, urbanisation, climate change, and various issues. This could result in water competition between various consumers such as communities, businesses, and industries. This competition has an impact on business and industry's day-to-day operations increasing both operational risks and costs. At the same time, government agencies are tightening regulations on water discharge and extraction making it more difficult for business and industry to stay in compliance. Hence, forward-thinking business and industry entities are increasingly establishing internal and external water-efficiency targets whereby accelerating IWRM implementation has been the goal to make a very strong case for widespread adoption of water reduction, reuse, and recycling practices, as well as a circular approach to water management in general.

This AACB module has laid out the why, what, and how circular water management is practised in order to provide business and industry with the action framework that they need to start reducing, reusing, and recycling water. Acknowledging water consumption and wastewater regeneration in the respective sector provides a baseline for business and industry to better strategise their companies' water management. Water-related policies, legal implications, and economic incentives have been discussed to provide an overview of what would be the drivers, implications, and incentives for business and industry to be aware of whether their current management practices in water management are sustainable and to act responsibly in managing their water resources throughout the value chain.

The amount of water accessible on the earth remains constant; however, water usually follows the same cycle, affected by climate change thus impacting the local or regional water supply and storage. Underlying the IWRM concept, a paradigm shift is needed in transforming water management practices towards circularity whereby understanding the concept of the global water cycle is essential to recognise the risks and costs of current water management practices as well as the benefits of circular water management. In this context, risk-based water management is essential for managing the water resource throughout the value chain as water-related risks affect all sectors of business and industry as all sectors rely on water as an input for their operations.

Water-related risks can be mitigated by adopting circular water management practices based on the 5Rs approach (water reduction, reuse, recycle, restore water reserves, and resource recovery). A six-steps action framework has been laid out in this module to guide businesses and industries to perform best management practices in their premises and value chains. Local case studies are provided for respective business and industry sectors to emulate, in which collaboration models provided can drive the IWRM implementation in businesses and industries. Circular water management practices present immense potential for business and industry, not only providing them significant efficiency but also huge cost savings to meet companies' water targets.

Hence, business and industry entities need to make a significant paradigm shift to achieve circular water management throughout the value chain. Business and industry sectors need to consider the true costs of water and acknowledge that water management as circular water management practices are the norm rather than the exception to realise the full potential of circular water management for the sustainability of water resources.

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Appendix

No.	Name	LATITUDE	LONGITUDE
1	Alam Jaya Industrial Park	1.50849180	103.573466
2	Bnadar Penawar Industrial Park	1.55946068	104.211673
3	Cemerlang Industrial Area, Johor Bharu	1.55464100	103.822948
4	Desa Cemerlang Industrial Area	1.55089157	103.831270
5	Eco Business Park I	1.58336033	103.724241
6	Eco Business Park II	1.59870330	103.681690
7	Eco Business Park III	1.48441271	103.938107
8	Frontier Industrial Park	1.54904366	103.832196
9	Gemilang Industrial Area, Johor Bharu	1.56771450	103.820279
10	Harvestgreen @ Sime Darby Business Park	1.46385043	103.942231
11	I-Parc @ Tanjung Pelepas	1.37269566	103.562848
12	I-Park @ Indahpura	1.63020107	103.610436
13	I-Park @ Senai Airport City	1.59800475	103.680220
14	I-Park @ SILC Iskandar City	1.46644557	103.586701
15	Indahpura Industrial Park	1.62718197	103.605947
16	Johor Technology Park	1.57521127	103.652411
17	Johor Port Free Zone	1.44390889	103.906211
18	Kempas Industrial Area	1.55280058	103.710046
19	Kota Murni Industrial Park	1.82728052	102.921187
20	Kota Tinggi Industrial Park	1.70237820	103.877859
21	Kulai Industial Park	1.69446688	103.421801
22	Kulai Iskandar Data Exchange	1.69446688	103.421801
23	Masai Industrial Area, Pasir Gudang	1.49015966	103.890265
24	MEDINI	1.41582487	103.625790
25	Mengkibol Industrial Park	2.00524278	103.277784
26	Mesing Industrial Park	2.40497161	103.850096
27	Muar Furniture Park	2.02528516	102.682003
28	Nusa Cemerlang Industrial Park	1.44554936	103.603699
29	Nusajaya Tech Park	1.43353118	103.596130
30	Palm Oil Industrial Cluster (POIC), Tanjung Langsat	1.46324678	103.965395
31	Pasir Gudang Industrial Area	1.46130319	103.908525
32	Pekan Nenas Indsutrial Area	1.49399163	103.525435
33	Pengerang Intergrated Petroleum Complex (PIPC)	1.35961801	104.170814
34	Pengerang Industrial Park (PIP)	1.38861170	104.168393
35	Pengerang Maritime Industrial Park (PMIP)	1.34436141	104.139119
36	Pengerang Eco Industrial Park (PEIP)	1.38638959	104.210998
37	Pontian Industrial Area	1.48631141	103.419002
38	Port of Tanjung Pelepas Free Zone	1.36216263	103.553352
39	Segamat Industrial Park II	2.46602030	102.924512
40	Segamat Inland Port Industrial Park	2.47384706	102.903470
41	Senai Airport City Industrial Area	1.64108868	103.663098
42	Senai Airport Free Zone Industrial Area	1.63235207	103.662855
43	Senai Industrial Estate 1,2,3, and 4	1.62579263	103.661883
44	Setia Business Park I	1.50430155	103.580866
45	Setia Business Park II	1.57956995	103.729146

46	Sime Darby Business Park, Bandar Universiti Pagoh	2.13297231	102.734446
47	Sime Darby Industrial Park,Pasir Gudang	1.46794848	103.902521
48	Simpang Renggam Industrial Park	1.83236988	103.306303
49	Southern Industrial Park Logistic Clusters (SILC)	1.47537040	103.597362
50	Sri Gading Industrial Park	1.86393909	102.999352
51	Tangkak Industrial Park, Tangkak	2.24227316	102.530286
52	Tanjung Bin Pertochemical Maritime Industry Centre	1.33154762	103.537221
53	Tanjung Langsat Industrial Complex	1.46324678	103.965395
54	Tanjung Langsat Port Area	1.45620205	104.007345
55	Tanjung Piai Maritime Industrial Park	1.26673367	103.519562
56	Tebrau Industrial Area	1.53277271	103.747381
57	Wawasan Industrial Area, Batu Pahat	1.78691419	102.965823
58	Bakar Arang Industrial Park	5.62103190	100.473431
59	Bandar Darulaman Industrial Park	6.23629267	100.424105
60	Bukit Kayu Hitam Industrial Park	6.49011612	100.416036
61	Bukit Kayu Hitam Special Border Economic Zone	6.51294905	100.421163
62	Bukit Selambau Industrial Park	5.69155177	100.621466
63	Gurun Industrial Park	5.82586496	100.492825
64	Kedah Rubber City	6.33849959	100.675579
65	Kedah Science & Technology Park	6.49011612	100.416036
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69	Padang Meha Industrial Park	5.50401170	100.595536
70	Sungai Petani Industrial Park	5.64621240	100.534323
71	Tikam Batu Industrial Park	5.57822419	100.440171
72	Gua Musang Industrial Park	4.84380408	101.978495
73	Jeli Industrial Park	5.70119946	101.841979
74	Kemubu Industrial Park	6.04352276	102.217383
75	Pengkalan Cheap I Industrial Park	6.14480776	102.300338
76	Pengkalan Cheap Ii Industrial Park	6.14103606	102.300896
77	SME Bank Factory Complexs Pengkalan Cheap I	6.13812249	102.304742
78	SME Bank Factory Complexs Pengkalan Cheap II	6.13812249	102.304742
79	Staphonal Industrial Park	5.66283134	102.207027
80	Tanah Merah Industrial Park	5.80876947	102.146659
81	Tok Bali Intergrated Fisheries Park (TBIFP)	5.88916750	102.487729
82	Alor Gajah Industrial Estate	2.36229710	102.203397
83	Ayer Keroh Business Industrial Park	2.26359522	102.287808
84	Ayer Keroh Industrial Estate	2.25663993	102.294821
85	Batu Berendam Free Trade Zone	2.23114242	102.254212
86	Bukit Rambai Industrial Park	2.26939493	102.183023
87	Cheng Technology Park	2.26294933	102.231067
88	Composite Technology City	2.26536375	102.249183
89	Elkay Industrial Park	2.25370782	102.419031
90	HICOM Pagoh Industrial Park	2.42235072	102.206845
91	Jasin Industrial Park	2.19510118	102.250516

92	Masjid Tanah Industrial Park	2.33005567	102.078476
93	Melaka World Solar Valley	2.34016858	102.211160
94	Merlimau Industrial Estate	2.15856782	102.415535
95	Rembia Industrial Estate	2.36159312	102.202006
96	Smart Industrial Centre (SIC) Bukit Rambai	2.28702208	102.173074
97	Taman Tasik Utama Industrial Park	2.28057330	102.268667
98	Tangga Batu Industrial Estate	2.25477827	102.141572
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100	Telok Mas Industrial Estate	2.16340594	102.329678
101	Arab Malaysia Industrial Estate	2.86372064	101.809002
102	Chembong Industrial Park	2.60651806	102.068522
103	College Heights Industrial Park	2.85229743	101.830810
104	Galla Industrial Park	2.72995397	101.901246
105	Malaysia Vision Valley	2.82259752	101.795261
106	Nilai Industrial Park	2.83816320	101.827999
107	Nilai Utama Industrial Park	2.84602216	101.808809
108	Oakland Industrial Park	2.69840925	101.920440
109	Senawang Industrial Park	2.68146272	101.977414
110	Senawang Industrial Estate	2.67885714	101.978886
111	Sendayan Techvalley	2.68071637	101.833684
112	Sungai Gadut Industrial Park	2.65806470	102.009467
113	Techpark @ Enstek	2.72958438	101.765266
114	Tuanku Jaafar Industrial Park	2.67515952	101.999535
115	Bentong Industrial Park (I, IIA & IIB)	3.48968449	101.938032
116	Gebeng Industrial Park	4.00603633	103.370826
117	Harbour Park Industrial Park	3.96861501	103.421603
118	Kechau Tui Industrial Park, Kuala Lipis	4.27341343	101.974102
119	Malaysia China Kuantan Industrial Park (MCKIP)	4.01562582	103.347652
120	Maran Industrial Park	3.58503937	102.780881
121	Muadzam Shah Industrial Park	3.07399611	103.068442
122	Pahang Technology Park (Gambang)	3.74540701	103.125204
123	Pekan Automotive Park (Pap)	3.54392833	103.399224
124	Peramu Industrial Park	3.53761860	103.386235
125	Semambu Industrial Park	3.85105813	103.329473
126	Tanjung Agas Oil & Gas And Logistic Industrial Park	3.48671650	103.456217
127	Temerloh Industrial Park	3.44974297	102.344000
128	Batu Kawan Industrial Park	5.22803204	100.444787
129	Bayan Lepas Free Industrial Zone Phase 1	5.31528935	100.286959
130	Bayan Lepas Free Industrial Zone Phase 2	5.31281003	100.283278
131	Bayan Lepas Free Industrial Zone Phase 3	5.32358123	100.302332
132	Bayan Lepas Free Industrial Zone Phase 4	5.30751317	100.292830
133	Bayan Lepas Industrial Park	5.30007507	100.290953
134	Bayan Lepas Free Technoplex	5.29730822	100.289365
135	Bukit Minyak Industrial Park	5.30836677	100.455766
136	Bukit Tengah Industrial Park	5.34277757	100.439701
137	Mak Mandin Industrial Park	5.41540018	100.392315

138	Penang Science Park	5.29252556	100.438164
139	Penang Science Park North	5.29903063	100.438006
140	Penang Science Park South	5.28509058	100.437952
141	Prai Free Industrial Zone	5.36243136	100.391875
142	Prai Industrial Park	5.37421678	100.390624
143	Seberang Jaya Industrial Estate	5.39860111	100.405882
144	Batu Kawan Industrial Park	5.22798930	100.444787
145	Chuping Industrial Park	6.51336137	100.259900
146	Chuping Valley Industrial Area (CVIA)	6.61634131	100.281984
147	Jejawi Industrial Park	6.44076377	100.233110
148	Kuala Perlis Industrial Park	6.38864102	100.140019
149	Padang Besar Industrial Park	6.65763294	100.310324
150	Pauh Putra Technology Park	6.44567170	100.344288
151	Bandar Sultan Sulaiman Industrial Park	3.03451978	101.374327
152	Banting Industrial Park, Banting	2.81502181	101.550635
153	Bukit Changgang Industrial Park	2.81913850	101.616292
154	Bukit Raja Industrial Park	3.06749774	101.473034
155	Eco Business Park V, Bandar Puncak Alam	3.22585796	101.456422
156	Elmina Industrial Park, Shah Alam	3.21081755	101.495879
157	Kapar Bestari Industrial Park	3.10237463	101.378068
158	Kota Seri Langat (PNBD) Industrial Park	2.84939766	101.518805
159	Mahkota Industrial Park, Banting	2.83087602	101.547401
160	Port Klang Free Zone (PKFZ)	2.92023771	101.294451
161	Pulau Indah Industrial Park (PIIP)	2.99058692	101.351857
162	Selangor Bio Bay (SBB)	2.95482959	101.354640
163	Serenia Industrial Park	2.84423110	101.698059
164	Subang Aerotech Park	3.13077829	101.556079
165	Tanjung Industrial Park	2.97332638	101.403034
166	Technology Park Malaysia	3.04810818	101.688927
167	UMW I Ligh Value Manufacturing Park	3.37496080	101.583015
168	Zurah Industrisl Park	3.50654142	101.624708
169	Gong Medang Industrial Area	5.75717636	102.596174
170	Sungai Bari Industrial Estate	5.48775500	102.690573
171	Batu Rakit Industrial Estate	5.47923143	103.004089
172	Gong Badak Industrial Estate	5.39158324	103.077014
173	Cenering Industrial Estate	5.27257597	103.162287
174	Bukit Khor Industrial Estate, Marang	5.21429300	103.158206
175	Wakaf Tapai Industrial Estate	5.11309076	103.095396
176	Batu 7 Industrial Estate, Dungun	4.71833726	103.396596
177	Pulau Serai Industrial Estate	4.78715786	103.402866
178	Ajil Industrial Estate	5.08121886	103.068626
179	Kerteh Industrial Estate	4.59181940	103.446809
180	Kertih Biopolymer Park (KBP)	4.58096213	103.430541
181	Bukit Labohan Industrial Estate	4.55001179	103.460838
182	Teluk Kalong Industrial Estate	4.27731441	103.463191
183	Jakar I, II & III Industrial Estate	4.21471770	103.425528

184	Mak Lagam Industrial Estate	4.20240169	103.428016
185	Perasing Industrial Estate	3.95900552	103.307854
186	Bukit Besi Industrial Estate	4.74732950	103.176126
187	Al-Muktafi Billal Shah Industrial Estate	4.59589738	103.199339
188	Ketengah Jaya Industrial Estate	4.58051174	103.302314
189	Ceneh Bari Industrial Estate	4.14333495	103.239574
190	Cherul Industrial Estate	4.12813610	103.171740
191	Kota Kinabalu Industrial Apark (KKIP)	5.98041138	116.073384
192	Sapangar Special Industrial Area	5.98170488	116.073456
193	SEDCO Light Industrial Estate Kolombong, Inanan, Kota Kinabalu	5.97425677	116.114935
194	Lok Kawi Industrial Estate, Penambang	5.83483512	116.048912
195	Lok Kawi Industrial Estate, Papar	5.75774753	115.961393
196	Palm Oil Industrial Cluster (POIC), Lahad Datu	5.02037453	118.374359
197	Sandakan Furniture Hub (POIC Sandakan)	5.82125309	118.026917
198	SEDCO Light Industrial Estate, Sandakan	5.86574543	118.090827
199	Seguntor Industrial Area, Sandakan	5.80934052	118.073156
200	SEDCO Light Industrial Estate, Tawau	4.25239561	117.900098
201	Sipitang Oil & Gas Industrial Park (SOGIP)	5.00468289	115.500128
202	Bintulu Light Industrial Estate	3.18547764	113.049265
203	Demak Laut Industrial Park (Phase I, II, III & IV)	1.59965507	110.447142
204	Kota Samarahan Industrial Estate	1.47493738	110.492510
205	Hulu Lanang Industrial Park	2.24050024	111.856792
206	Jepak Industrial Park	3.15267289	113.076778
207	Kapit Light Industrial Park	2.01622086	112.913837
208	Kemena Industrial Estate	3.15746577	113.087896
209	Kuala Baram Industrial Estate	4.56630467	114.026329
210	Lawas Light Industrial Estate	4.89381372	115.413087
211	Mukah Light Industrial Park	2.89979835	112.105421
212	Pending Industrial Estate	1.55535310	110.392383
213	Piasau Industrial Estate	4.43800706	114.005810
214	Rantau Panjang Shipbuilding Industrial Estate	2.42349828	111.841869
215	Samalaju Industrial Park	3.54388682	113.316864
216	Sama Jaya High Tech Park	1.52133475	110.405387
217	Sarikei Light Industrial Park	2.13019632	111.500653
218	Tebedu Industrial Park	1.01048449	110.357573
219	Upper Lanang Industrial Estate	2.24532623	111.861032
220	Iskandar Halal Park	1.52349715	103.925072
221	Kedah Halal Park	5.66336088	100.532138
222	Pasir Mas Halal Park	5.99868910	102.056198
223	Melaka Halal Hub, Serkam	2.16444746	102.394663
224	Gambang Halal Park	3.74098913	103.127111
225	Selangor Halal Hub, Pulau Indah	2.97109566	101.346258
226	Tanjung Manis Halal Hub	3.14909228	101.652191
227	Pedas Halal Park (MIEL)	2.56419962	102.046734