

Determinants of the Green Economy in the Sustainable Development Strategy of the Malaysian Model

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Received: 12/02/2026 | Accepted: 14/06/2026 | Published: 19/10/2026

ABSTRACT

This study seeks to measure the impact and adoption of the green economy as a pivotal variable in achieving sustainable development within the Malaysian development model, while assessing the effectiveness of the strategies and visions extending to 2030. The study adopts a descriptive-analytical approach supported by quantitative indicators of green growth, analysing the performance of 79 standard indicators adopted in Malaysia's development framework. The findings of the estimation and analysis conclude that the structural transition towards a green economy requires a dynamic adjustment of the determinants of the economic function, in which economic growth is conditional on the non-degradation of the environment and on the use of waste as a resource with added value. The study also shows the need to model the household consumption function and environmental behaviour by adapting human capital (education), and to activate the role of public-private partnership (PPP). At the sectoral level, the flexibility of the environmental transition is concentrated in six main sectors: energy, industry, transport, construction, waste management and water. The performance assessment reflects Malaysia's position on the Green Growth Index issued by the Organisation for Economic Co-operation and Development (OECD, 2019): the country ranked fifth in Asia in the medium-performance category, which points to promising prospects for developing environmental policies and improving resource-use efficiency in the future.

Keywords: Green economy; Strategy; Sustainable development; Malaysian model.

INTRODUCTION

In recent years the world has undergone a major change in climate that we now feel in our daily lives. The Earth is warming, mainly because of global warming, which denotes an increase in the average global surface temperature as the amounts of carbon dioxide, methane and certain other gases in the atmosphere rise. Rising global temperatures will result in a higher sea level, changes in the quantity and pattern of rainfall, the expansion of tropical deserts, the shrinking of the Amazon forests and changes in agricultural yields.¹ These new variables compel countries at all levels to consider building an economic system that takes this dimension into account.

The green economy is a strategic tool proposed by the United Nations Environment Programme (UNEP) in a 2011 report entitled *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*. It aims to steer countries away from harmful patterns of production and consumption, known as the “brown economy”, in which economic growth depends largely on environmentally destructive activities, especially fossil

fuels such as oil, coal and gas. The brown economy is characterised above all by air and water pollution, together with a range of harmful effects on biodiversity.

The green economy seeks to reduce carbon emissions, thereby enhancing resource efficiency. Under a green economy, economic growth and employment are driven by private and public investment that reduces pollution and carbon emissions and preserves the ecosystem and biodiversity. This approach will undoubtedly deliver sustainable development in the long term that respects the rights of future generations.²

The importance of the green economy has led countries of all kinds to pursue it, albeit to varying degrees. Malaysia is among the countries seeking to build an economic system that takes the green economy concept into account. In industry, Malaysia counted 3,400 green enterprises in 2015, equivalent to 10% of all enterprises, and aims to reach 10,200 green enterprises in 2025 and 17,000 in 2030, equivalent to 50% of all enterprises.³ Likewise, in 2019 Malaysia ranked fifth in Asia on the dimensions of the Green Growth Index issued by the Global Green Growth Institute, having ranked fourth in 2005.⁴

This paper reviews Malaysia's experience in the field of the green economy and the main results achieved, by addressing the following research question:

What place does the green economy occupy in the Malaysian development model, and what mechanisms and future visions have been adopted to achieve it?

This main question gives rise to the following sub-questions:

- Which are the main sectors that have adopted the green economy concept in Malaysia?
- What are the main measures and future outlooks that Malaysia has adopted with regard to the green economy?
- What are the main green economy indicators in Malaysia?

To answer these questions, the study is divided into the following main sections:

- Section 1: Concepts of the green economy
- Section 2: Malaysia's strategy for the transition to a green economy and its future prospects
- Section 3: Green economy indicators in Malaysia

SECTION 1: CONCEPTS OF THE GREEN ECONOMY

This section addresses the theoretical framework of the green economy by examining its concept, its main intended objectives, its advantages and the principal sectors it concerns.

1.1 What Is the Green Economy?

The United Nations Environment Programme defines the green economy as one that results in improved human well-being and social equity while significantly reducing environmental risks and ecological scarcities. In its simplest form, a green economy can be seen as one that is low-carbon, resource-efficient and socially inclusive.⁵

In a green economy, growth in income and employment must be driven by public and private investment that reduces carbon emissions and pollution, increases the efficiency of resource and energy use, and prevents the loss of biodiversity and ecosystem services. The development path must also maintain, improve and, where necessary, rebuild natural capital as a source of public benefit, especially for the poor, whose security and way of life depend on nature.

The “green economy” concept does not replace sustainable development; rather, there is now a growing recognition that achieving sustainability rests almost entirely on getting the economy right. Successive decades of creating new wealth through the “brown economy” model have not addressed social marginalisation and resource depletion, and we remain far from achieving the Millennium Development Goals.⁶

The International Labour Organization defines the green economy as a low-carbon, resource-efficient and socially inclusive economy in which growth in income and employment is driven by public and private investment that reduces carbon emissions and pollution and enhances energy and resource efficiency, and that generates green jobs which ultimately reduce the environmental impact of enterprises and economic sectors to levels at which sustainability is achieved.

1.2 Objectives and Advantages of the Green Economy

The green economy aims to link the requirements of development with environmental protection. The Rio+20 Conference stressed that the green economy is one of the most important tools for achieving sustainable development, strengthening the capacity to manage natural resources sustainably, increasing the efficiency of resource use, reducing waste, and limiting the negative impacts of development on the environment.⁷

The green economy also aims to achieve economic prosperity and social security. These two goals consist in attaining the desired economic development without encroaching on environmental resources, creating jobs for the poor, and achieving social equality.

Many studies and reports have also demonstrated the benefits that the adoption of the green economy can bring, including the UNEP report issued in February 2011, which stressed the inevitability of its environmental, economic and social benefits. These can be summarised as follows:⁸

- **Addressing environmental challenges.** The green economy concept emerged primarily from the need to halt the environmental degradation imposed by unsustainable patterns of production and consumption over past decades. Reducing the ecological footprint is therefore an integral part of the design of the green economy initiative. Among the most important environmental benefits are the reduction of greenhouse gas emissions and improved resource-use efficiency through the “greening” of the various economic sectors. The mechanisms of transition to a green economy rest in particular on reducing carbon emissions from energy production and consumption, with improved energy efficiency and wider use of renewable energy forming a cornerstone of the transition. Key environmental objectives also include reducing and better managing waste, improving water management, protecting biodiversity, and halting the depletion of forests and fish stocks.
- **Stimulating economic growth.** The green economy aims to build a new model of economic development based primarily on large green investments in areas such as energy efficiency and renewable energy, green infrastructure and waste management, although some doubt the capacity of this concept to drive economic growth forward. According to the UNEP report, the empirical model projects long-term economic growth roughly equal to that projected for the brown economy.
- **Creating jobs and alleviating poverty.** The global shift to a green economy could offer enormous opportunities to create large numbers of “green jobs” across economic sectors, such as jobs related to renewable energy generation, improved energy-use efficiency, ecosystem protection, eco-tourism and waste management. In this context, policies supporting small and medium-sized enterprises are important, as these are a primary source of employment. The green economy also helps alleviate poverty, particularly in rural areas, by conserving natural resources and making good use of them in income-generating activities (agriculture, eco-tourism, renewable energy).
- **Recognising the value of natural capital and investing in it.** The green economy not only recognises the value of natural capital as a contributor to human well-being and a source of decent jobs, but also invests in natural capital (agriculture, freshwater, fisheries) in order to achieve sustainable economic progress.
- **Replacing fossil fuels with sustainable energy.** The current energy system, built on fossil fuels, is responsible for two-thirds of greenhouse gas emissions. Many countries, particularly oil-importing developing countries, also face challenges from the volatility of fossil fuel prices. Increasing the energy supply from renewable sources therefore reduces the risks of fossil fuel price instability and offers further benefits such as energy security and, hence, economic and financial security.

1.3 Sectors Concerned by the Green Economy

The most important sectors concerned by the green economy can be summarised in the following points:⁹

1. **Renewable energy.** Increasing the energy supply from renewable sources reduces the risks of high and unstable fossil fuel prices and mitigates the effects of climate change, since the current fossil-fuel-based energy system is one of the main causes of climate change and is responsible for the rising share of carbon emissions and greenhouse gases. Renewable energy represents a major economic opportunity, and this sector requires replacing investments in heavily carbon-dependent energy sources with investments in clean energy, which comprises:

- **Traditional renewable energy (biomass energy):** this relies on biomass and biogas and also includes organic plant and animal residues that can be processed through bacterial fermentation or thermal combustion.
 - **New renewable energy:** this comprises solar, wind, hydro and geothermal energy. A decisive element of the transition to the green economy is the development of environmentally sound technology and access to it. Today's technological means also help us find cleaner and more sustainable methods of production, so attention must be paid to scientific research and to ways of developing energy use so that it benefits the climate and reduces emissions.
1. **Green buildings.** The transition to a green economy requires a focus on green architecture, which means using environmentally friendly materials that conserve water, given the limited water resources, and that reduce electricity consumption despite rising demand for it, so as to cut the emissions that change the climate. The green transformation of the construction sector is an important economic and social issue in terms of creating new jobs and industries, and green building will have far-reaching effects that encourage the shift towards it in order to achieve sustainability and economic growth.
 2. **Sustainable transport.** The main feature of sustainable transport is that it uses renewable resources at rates that do not affect their renewal, and uses non-renewable resources at rates below the pace at which renewable substitutes are developed, in accordance with the principles of sustainable development.
 3. **Water.** Water is among the most important environmental indicators of sustainable development, the latter being measured by an index of the quality and quantity of available water and the per capita share of clean freshwater, noting that 35% of the world's population suffers from severe water scarcity.
 4. **Waste management.** This refers to the processes that allow materials to be recovered or reused, such as use as fuel, recovery of metals and organic matter, soil treatment or oil re-refining, in order to reduce the impact of waste and its accumulation on the environment and thereby improve the economic and environmental situation.
 5. **Sustainable agriculture.** This is an integral part of the concept of sustainable development. Sustainable agriculture is agriculture that must conserve and protect natural resources while allowing long-term economic growth, through the rational management of all the resources exploited so as to achieve, ultimately, a sustainable yield.

SECTION 2: MALAYSIA'S STRATEGY FOR THE TRANSITION TO A GREEN ECONOMY AND ITS FUTURE PROSPECTS

Having addressed the theoretical framework of the green economy in the previous section, this section examines the place of the green economy within the Malaysian development model and the economic sectors that have adopted the concept.

2.1 Sectors That Have Adopted the Green Economy Concept and the Vision for 2030

The Eleventh Five-Year Development Plan (Eleventh Malaysia Plan, 2016–2020) gave attention to the green economy, using the term *Green Growth*, which has become an urgent necessity owing to climate change, global warming and growing environmental pollution. Meeting this requirement calls for a radical change in the strategy of “*Grow first, clean up later*” towards a resilient model that takes carbon reduction into account, the dimensions of which are illustrated in the following figure:

Source: Prime Minister's Department, Economic Planning Unit, 2015, *Eleventh Malaysia Plan*, p. 14.

Figure 1 shows the mechanism of the transition to a green economy. The aim is not the quantity of growth but its quality, which is achieved by taking climate and the environment into account and preserving the nation's resources for later generations. Likewise, waste is not to be sent to landfills but treated as a resource that can be recycled and reused. Responsibility for achieving the green economy is also shared by all actors, whether government, the private sector or individuals, and the use of resources and energy must be subject to the principle of supply and demand, with due regard for constraints and an end to the intensive use of resources and energy.

The most important sectors that have adopted this approach can be briefly presented as follows:¹⁰

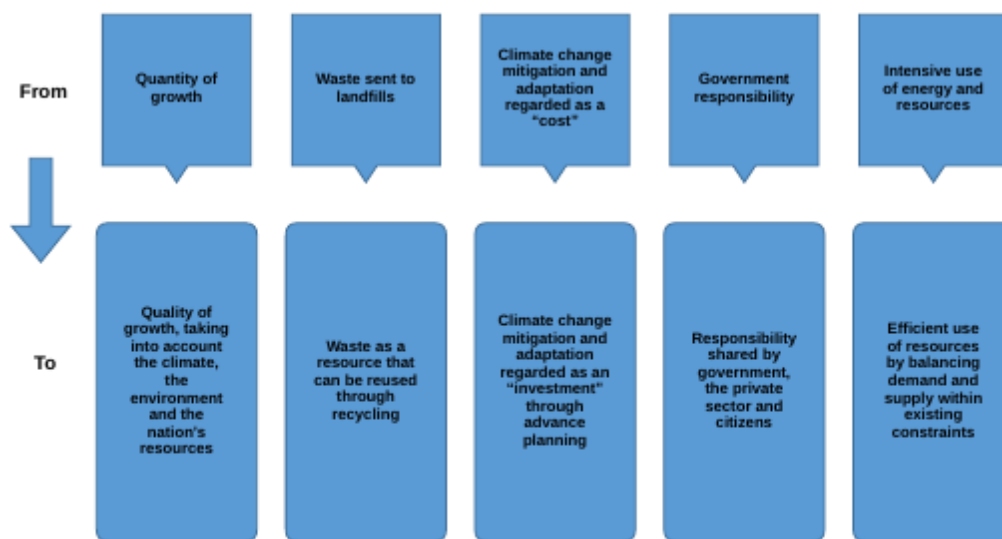


Figure 1: Dimensions and mechanisms of the transition to a green economy in Malaysia

2.1.1 The energy sector

The Malaysian government has made great efforts to achieve long-term sustainability in the energy sector by investing in infrastructure and diversifying energy sources, particularly by focusing on renewable energy and energy storage. A target has been set for renewable energy to contribute 30% by 2030. The following table shows the energy sector's targets.

Table 1: Energy sector targets in Malaysia for 2030

Area	Year		
	2020	2025	2030
Renewable energy	20%	23%	30%
Energy efficiency	/	10% reduction in electricity consumption	15% reduction in electricity consumption

Source: Ministry of Energy, Green Technology and Water (Malaysia), 2017. *Green Technology Master Plan Malaysia 2017–2030*, p. 9.

2.1.2 The industrial sector

Small and medium-sized enterprises dominate the industrial sector, accounting for 95% of it, and green manufacturing remains low. The Malaysian government considers that it can be achieved in three areas:

- Green energy: the focus is on renewable energy in order to produce clean energy;
- Green products: this means developing environmentally friendly products with a lower carbon footprint, although the development of such products is accompanied by higher prices;
- Green processes in economic transactions: this means efficient use of resources and reduced generation of waste, carbon emissions and used water. All of these mechanisms lower costs and raise operational efficiency.

ISO 14001 is an international certification focused on organisations' environmental management systems. An organisation holding this certification takes environmental issues into account in decision-making, and in 2017 Malaysia counted more than 500 small, medium and large enterprises certified to ISO 14001. The Energy Management Gold Standard, together with ISO 50001 certification, is likewise a programme that encourages companies to manage energy better and more efficiently; it was activated by the Asian Energy Centre in Malaysia. Several other certifications and programmes also motivate enterprises to move towards green manufacturing, and the Malaysian government aims to reach 17,000 green enterprises by 2030. This transition will undoubtedly pass through stages: the first stage consists of green energy initiatives, the second of green products, followed by the shift to green processes.

The following figure summarises the number of green industrial enterprises that Malaysia aims to reach by 2030.

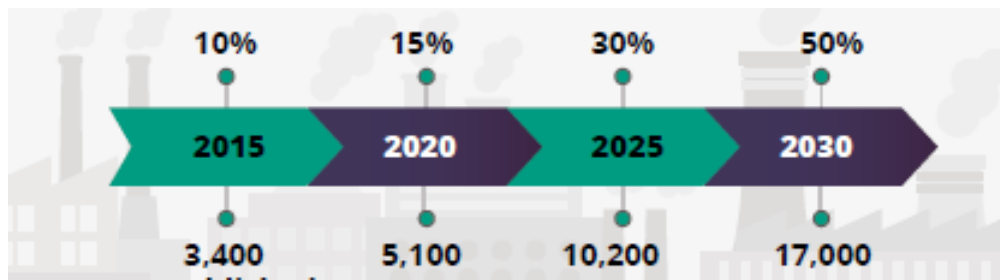


Figure 2: Expected number of green industrial enterprises by 2030

Source: Ministry of Energy, Green Technology and Water (Malaysia), 2017. *Green Technology Master Plan Malaysia 2017–2030*, p. 51.

2.1.3 The transport sector

The transport sector is one of the sectors responsible for carbon emissions, and it has therefore been targeted by relying on new transport technologies such as energy-efficient vehicles. Public transport must also work to lower its carbon share: modern rail-based transport reduces carbon dioxide emissions, with the quantity of CO₂ emissions avoided estimated at 977.5 kilotonnes in 2020, and 2,000 electric buses are planned to be on the road by 2030. As for private transport, reliance on energy-efficient vehicles will reduce CO₂ emissions by 199.7 kilotonnes in 2020. In addition, petroleum diesel is to be replaced with palm-oil-based biodiesel: 230,000 tonnes were produced in 2013, reducing CO₂ emissions by 719.7 kilotonnes, and 576,000 tonnes will be produced in 2020, reducing CO₂ emissions by 1,802.5 kilotonnes. Electric vehicle technology is also to be reinforced. The Malaysian government has also taken economic measures to encourage vehicles with green engines by imposing lower taxes on them.

2.1.4 The construction sector

The construction sector consumes 40% of the world's generated energy and 12% of its water, and contributes 40% of total waste. In Malaysia, residential and commercial buildings consumed 15% of total energy in 2014. Green buildings take into account the consumption of energy and water and the reduction of waste generation.

Green building design officially began in Malaysia in 2001 with the application of Malaysian Standard MS 1525 to commercial buildings with a floor area of more than 4,000 square metres, which addresses efficient energy management. Another standard, MS 2680, which covers the use of renewable energy in residential buildings, has been in effect since July 2017.

The Malaysian government was a pioneer in this project: 54 government buildings belonging to 25 ministries were built in Putrajaya, Malaysia's administrative capital. These government buildings reduced electricity consumption by 14,758 megawatt-hours, equivalent to 10.94 kilotonnes of carbon dioxide. Industrial buildings, in addition to government buildings, have also begun moving in this direction.

Green building materials have also become a concern for enterprises, as Malaysia relies on the national eco-labelling programme known as SIRIM Eco-Label. Through this programme, environmentally friendly building materials are produced, such as cement containing recycled materials like fly ash, as well as building materials that use few raw materials and are of low hazard, high-pressure laminates, roofing sheets and partitions, waterproofing materials, paints that use fewer volatile organic compounds and less hazardous chemicals, and exterior wall paints designed to reduce the indoor temperature of buildings by about 5 to 10%.

Malaysia aims to reach 1,750 green buildings by 2030 and is working towards a "net-zero-energy building" scenario by 2040, to be pursued through the enactment of an "Energy Efficiency and Conservation Act" that will regulate energy standards in buildings and the energy performance standards of electrical appliances.

2.1.5 The waste sector

The public sector manages waste through its storage, collection, transport, treatment and disposal. Waste can be divided into seven main categories: solid waste, sewage, mining waste, construction waste, waste containing hazardous materials, agricultural waste and radioactive waste. Daily solid waste was estimated at 33,130 tonnes in 2013, rising to 40,566 tonnes in 2016.

Landfilling remains one of the most widely used methods of waste treatment: there are 161 landfill sites, of which 14 are sanitary landfills using modern technology to generate electricity and energy, while the remaining 147 are non-sanitary. The main challenge facing the authorities is weak individual awareness, so the consumption pattern of individuals, which generates large quantities of waste, must change. Despite the rising recycling rate, citizens must be active participants in reducing waste and must comply with government initiatives such as waste separation (paper, glass, etc.). In the same context, the government encourages public–private partnership in waste collection and recycling. The following table presents the targets for waste recycling in 2030.

Table 2: Waste sector targets for 2030

Area	Year	Measures and actions taken		
	2020	2025	2030	
Waste treatment and disposal	Recycling rate of 22%	Recycling rate of 25%	Recycling rate of 28%	• Establishment of the National Waste Management Committee; • Improved coordination among Malaysia's federal entities; • Formulation of a policy on waste outside residential areas; • Coordination of work between the public and private sectors; • Development of competition between the public and private sectors; • Raising citizens' awareness through educational programmes; • Emphasis on the use of waste as a resource.
	Establishment of a waste-to-energy plant producing 500 to 600 kWh of electricity from burning one tonne of waste.	/	Establishment of 3 waste-to-energy plants.	
Resource recovery	500 palm oil mills operating on biogas, which is used as energy to run the mills, with liquid effluent used as fertiliser.	/	/	

Source: Ministry of Energy, Green Technology and Water (Malaysia), 2017. *Green Technology Master Plan Malaysia 2017–2030*, p. 129.

SECTION 3: GREEN ECONOMY INDICATORS IN MALAYSIA

Since 2017, agreement has been reached on a set of indicators that can be regarded as green indicators. These can be used to monitor progress towards sustainable development, and the list is based on the work of the United Nations and the Organisation for Economic Co-operation and Development. The green economy indicators adopted in Malaysia are shown in the following figure:

Source: Department of Statistics Malaysia, https://www.dosm.gov.my/v1/index.php?r=column/cone&menu_id=ZDU2TmFuYzYzMTVpa2R5YzI1citFZz09 (accessed 15 September 2021).

As Figure 3 shows, the green economy indicators adopted in Malaysia, numbering 79, fall into five main branches:¹¹

- **Branch 1 comprises economic, demographic and social indicators** related to sustainable development, 33 in number. These are in turn divided into a core set of 15, which are available in all countries, have priority and can be relied upon for comparison between countries, and a non-core set of 18, which have no priority for international comparison and can be adapted to countries' needs. Demographic indicators include the population by sex, the population growth rate and the share of the population living in urban areas, among others. Economic indicators include real gross domestic product, GDP per capita, the industrial sector's share of gross domestic product, the poverty line and the inflation rate, among others;
- **Branch 2 comprises environment and resource productivity indicators.** It contains 9 indicators, 6 of them core and 3 non-core. These cover carbon emissions (carbon dioxide emissions in million tonnes per year; per capita carbon dioxide emissions in tonnes per year) and energy (per capita energy consumption, the share of renewable energy in total energy supply, the share of bioenergy¹² in total energy produced, etc.);
- **Branch 3 comprises natural assets.** It includes renewable resources, such as freshwater abstraction per capita, forest areas, the proportion of land area covered by forest and total fish catch, and non-renewable resources, such as mineral resources and mineral extraction rates. Branch 3 also includes agricultural land, such as the share of agricultural land in total land area, the growth rate of agricultural land area and the use of

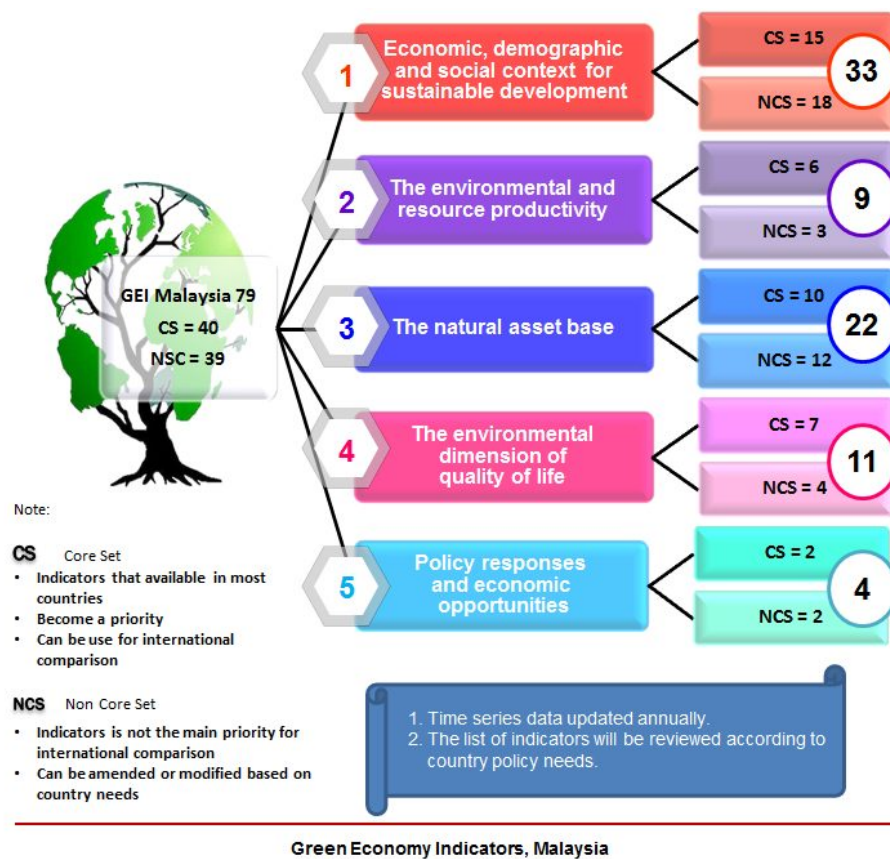


Figure 3: Structure of the green economy indicators adopted in Malaysia

chemical fertilisers. This branch also covers biodiversity and ecosystems, measured through a set of indicators including the number of known animal species, the proportion of marine protected areas and the area of terrestrial protected areas;

- **Branch 4 comprises the environmental dimension of quality of life.** It includes a group of indicators, among them the environmental health and risks index and the environmental services and amenities index, which contains several variables for its measurement, chief among them: the proportion of the population using an improved drinking water source, the proportion of the urban population using an improved drinking water source, the proportion of the rural population using an improved drinking water source, the proportion of the population using improved sanitation facilities, total waste collected and the type of treatment applied, and the proportion of household wastewater that is treated;
- **Branch 5 comprises policy responses and economic opportunities.** It contains 4 indicators, 2 of them core: environmental protection expenditure as a share of gross domestic product and the number of environmental agreements joined. The non-core indicators are the number of products and services that meet local and international environmental standards and the number of regulated pollutants, whether in air, water, etc.

We now present the evolution of the green economy indicators in Malaysia, published by the Department of Statistics Malaysia, over the period from 2010 to 2017, focusing on the core sets only.¹³

Table 3: Evolution of the main green economy indicators adopted in Malaysia, 2010–2017

Code	List of GEI Malaysia	Unit of measurement	Data availability (f)									
(a)	(b)	(e)	2005	2009	2010	2011	2012	2013	2014	2015	2016	2017

This table focuses on the core set of indicators adopted in Malaysia. For example, the share of renewable energy in total energy supply shows continuous growth, rising from 2.1% in 2010 to 4.7%, while the share of renewable energy in the total generation mix, which uses different fuels to generate electricity, rose from 5.5% in 2010 to 10% in 2017.

1	Economic, demographic and social context for sustainable development												
1.1	Demographic patterns and trends												
1.1.3	Percentage of urban population	Percentage			71.0	71.7	72.4	73.0	73.6	74.3	74.8 ^p	75.5 ^e	
1.1.4	Growth rate of urban population	Percentage			3.1	2.6	2.5	3.2	2.5	2.5	2.1 ^p	2.1 ^e	
1.2	Economic growth, structure of economy and productivity												
1.3	Labour												
1.3.1	Labour force participation	Percentage			63.7	64.5	65.6	67.3	67.6	67.9	67.7		
1.3.4	Labour productivity [GDP per person employed]	RM (constant prices 2005)			69,227	70,028 ^r	71,156	70,510 ^r	73,091	75,548 ^r	78,218		
1.4	Poverty, income distribution and other social issues												
1.4.2	Percentage of population living in poverty and extreme poverty [measured by National/Regional poverty lines]	Percentage P=Poverty E=Extreme poverty			P - 3.8 E - 0.7	n.a.	n.a.	P: 1.7 E: 0.2	n.a.	P: 0.6 E: n.a.	n.a.	P: 0.4 E: n.a.	
1.4.3	Poverty Line Income	RM PM: Pen. Msia *Sabah includes Labuan	PM - 763 Sabah - 1,048 Swk - 912	n.a.	n.a.	PM - 830 Sabah - 1,090 Swk - 920	n.a.	PM - 930 Sabah - 1,170 Swk - 990	n.a.	PM - 960 Sabah - 1,180 Swk - 1,020			
1.4.4	Number of families living in squatter settlements*	Number			88,443	80,180	71,662	64,129	63,662	68,361*			
1.4.6	Total gross enrolment ratio in primary education [both sexes]	Percentage			96.2	95.9	96.4	97.1	97.9	97.2	97.2		
1.4.7	Total public expenditure on education as a percentage of GDP	Percentage			3.9	4.2	4.4	4.3	4.3	4.1 ^e	4.0 ^p		
1.4.8	Total expenditure on health to GDP	RM (million) at constant 2010 prices			14,575	17,192	19,078	20,172	21,085	22,088 ^e	22,276 ^p		
1.5	Inflation and commodity prices												
1.5.1	Consumer price index	Percentage			1.7	3.2	1.6	2.1	3.2	2.1	2.1		
1.6	International trade and tourism												
1.6.2	Terms of trade index [base year as determined by the reporting country]	Index			100.0	105.5	105.1	103.0	103.0	99.7	96.4 ^e		
1.6.3	International tourist arrivals in % to population	Number of tourist ('000)			24,557.2	24,714.3	25,032.7	25,715.5	27,437.3	25,721.3	26,757.4		
	Percentage				85.9	85.0	84.8	85.1	89.3	82.5	84.6 ^e		

1.6.4	Inbound Tourism Expenditure	RM (million)			63,077.5	58,315.9 ^r	60,556.7 ^r	65,443.3 ^r	71,998.8 ^r	69,119.6	82,098.2	
2	The environmental and resource productivity											
2.1	Carbon emissions											
2.1.1	GHG emissions (million tonnes CO ₂ equivalent per year)	Million tonnes CO ₂ equivalent			288.66		n.a.	290.23	n.a.	n.a.	n.a.	n.a.
2.1.2	GHG emissions per capita (tonnes CO ₂ equivalent per capita per year)	Tonnes CO ₂ equivalent			11.06		n.a.	9.97	n.a.	n.a.	n.a.	n.a.
2.1.3	GHG emissions intensity of GDP (tonnes CO ₂ equivalent/ thousand RM)	tonnes CO ₂ equivalent			0.53		n.a.	0.41	n.a.	n.a.	n.a.	n.a.
2.2	Energy											
2.2.2	Energy consumption per capita [total or final]	toe PM=Pen. Msia			PM - 1.56 Sabah - 0.82 Swk - 1.26	PM - 1.56 Sabah - 1.01 Swk - 1.62	PM - 1.57 Sabah - 1.33 Swk - 2.09	PM - 1.75 Sabah - 1.11 Swk - 2.13	PM - 1.76 Sabah - 1.10 Swk - 2.10	PM - 1.8 Sabah - 1.0 Swk - 1.8		
2.2.5	Renewable Energy Share from TPES	Percentage			2.1	2.3 ^r	2.8	3.5	3.9	4.7		
2.2.6	Renewable Energy Share from Generation Mix	Percentage			5.5	7.6	7.4 ^r	8.6 ^r	9.7	10.0		
3	The natural asset base											
3.1	Renewable resources											
3.1.2	Total freshwater abstraction [thousand m3 per capita]	MLD R=rivers D= storage dams G=Groundwater			R - 12,516 D - 2,451 G - 204	R - 12,746 D - 2,540 G - 223	R - 13,165 D - 2,623 G - 228	R - 13,826 D - 2,689 G - 219	R - 13,968 D - 2,613 G - 244	R - 13,907 D - 2,796 G - 252	R - 14,431 D - 3,065 G - 254	
3.1.4	Forest area	Hectares			17,930,036	17,930,625	18,013,521 ^r	18,056,099	18,273,201	18,267,308 ^r	18,119,338	
3.1.5	Proportion of land area covered by forest [percentage]	Percentage			54.8	54.5	54.7	54.9	55.6	55.3	54.9	
3.1.9	Fish catch, total [marine and freshwater]	Number			581,048.4	526,507.4	634,376.3	530,205.0	520,514.9	516,465.3	407,387.3	
3.2	Non-renewable resources											
3.2.1	Mineral resources: stocks or reserves of selected minerals, including fossil fuels and raw materials (iron ore)	Tonnes			80,000,000	76,000,000	67,000,000	55,000,000	50,000,000	50,000,000	50,000,000	
3.2.2	Extraction rates of selected minerals, including fossil fuels and raw materials (iron ore)	Tonnes			3,368,942	8,077,879	10,886,022	12,134,258	9,615,323	1,625,000	1,012,000	
3.3	Land and agriculture											
3.3.1	Proportion of agricultural area to total land area	Percentage			16.0	40.0	40.0	40.0	41.0	41.0	41.0	41.0

3.3.9	Chemical fertilizers used, kilogram per hectare of crop land	Tonnes			1864533 ^e	1,482,271 ^e	1,573,817 ^e	1,576,119 ^e	1,878,576 ^e	1,611,689 ^e		
3.4	Biodiversity and ecosystems											
3.4.4	Proportion of marine protected areas to territorial waters, %	Percentage				1.4	1.4	1.4	1.4	1.4	1.4	1.4 ^e
3.4.5	Area of terrestrial protected areas	Hectares			1,860,000	1,860,000	1,860,000	1,860,000	1,860,000	1,860,000	1,930,772	
4	The environmental dimension of quality of life											
4.1	Environmental health and risks											
4.1.1	Concentration of particulate matter (PM10) in urban air [main cities]	µg/m ³				42	45	46	48	46	56	91
4.2	Environmental services and amenities											
4.2.1	Proportion of total population using an improved drinking water source	Percentage			94.2	94.4	94.7	95.1	95.3	95.5	95.7	
4.2.2	Proportion of urban population using an improved drinking water source	Percentage			96.7	96.8	96.9	97.0	97.1	97.2	97.2	
4.2.3	Proportion of rural population using an improved drinking water source	Percentage			89.7	90.1	90.7	92.5	92.6	93.0	93.5	
4.2.4	Proportion of total population using an improved sanitation facility	Percentage			98.4	n.a	n.a	99.3	n.a.	99.5	n.a.	99.7
4.2.5	Proportion of urban population using an improved sanitation facility	Percentage			99.3	n.a	n.a	99.6	n.a.	99.7	n.a.	99.8
4.2.6	Proportion of rural population using an improved sanitation facility	Percentage			96.5	n.a	n.a	98.5	n.a.	98.5	n.a.	99.1
5	Policy responses and economic opportunities											
5.1	Regulations and management											
5.1.1	Percentage of Environment Protection expenditure to GDP	Percentage				0.1	0.1	0.1	0.1	0.1	0.1	

The statistics of the Global Green Growth Institute on the ranking of countries on the Green Growth Index, which relies on the indicators adopted in Malaysia together with others, can be presented in the following figure:

Source: Prepared by the author on the basis of the 2020 report of the Global Green Growth Institute.

5.1.2	Participation in multilateral environmental agreements [list and number of MEAs]	Number/ list			12	12	12	12	13	13	13		
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Source: Department of Statistics Malaysia (see note 13).

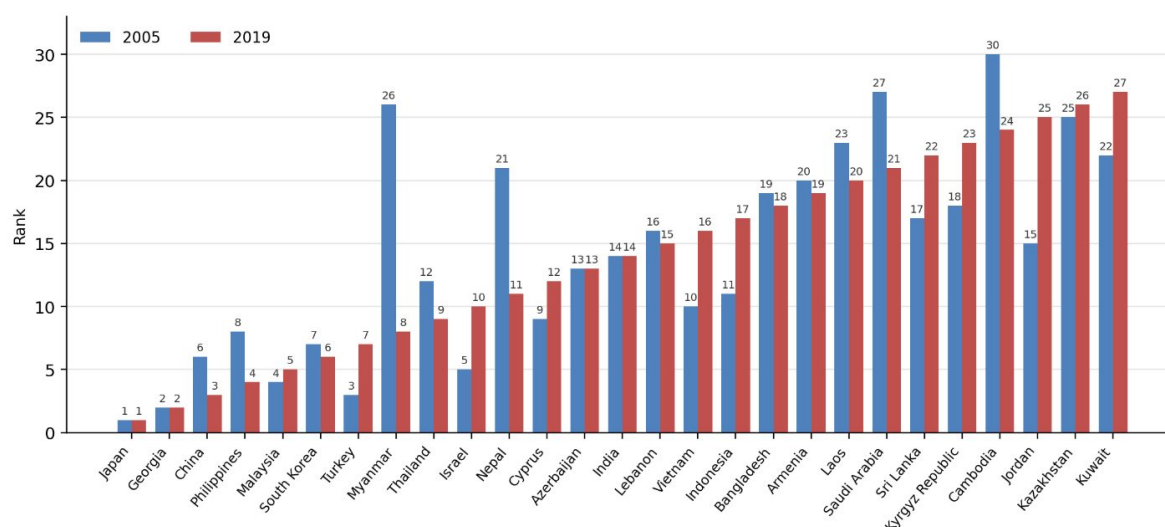


Figure 4: Ranking of Asian countries on the Green Growth Index, 2005 and 2019

Figure 4 shows that Japan led the ranking, taking first place in both 2005 and 2019, as one of the countries that has made great strides in this field, followed by Georgia, which also maintained its position. China improved its ranking, moving from sixth to third place, and the Philippines did likewise, moving from eighth to fourth. Malaysia ranked fifth in 2019 and fourth in 2005. The Arab countries, by contrast, are at the bottom of the ranking: Kuwait ranked 27th in 2019, Saudi Arabia 21st and Jordan 25th.

According to this index, Malaysia's performance falls within the medium category, with a score of 55.44%, as do Georgia, the Philippines and China, whereas Japan falls within the high-performance category, with a score of 61.83%.

CONCLUSION

A recent study published by the World Bank in 2021 under the title "Preparing to Contain Internal and External Migration Caused by Climate Change"¹⁴ projects that by 2050 the number of people displaced from their areas will reach 216 million owing to climate change resulting from greenhouse gas emissions such as carbon dioxide and nitrogen oxide. These climatic changes will lead to water supply shortages and reduced crop yields. To avoid this, countries must move towards the green economy as an alternative to the brown economy.

The green economy is one of the principal tools capable of achieving sustainable development for later generations while preserving available resources, the ecosystem and ecological diversity. In this paper we have tried to shed light on the Malaysian experience, which is young in the transition towards the green economy, and on the main mechanisms adopted to achieve this goal.

The main findings are as follows:

- The green economy is a strategic tool for achieving sustainable development, especially in light of the sharp climatic changes of recent years;
- Malaysia's experience in the transition to a green economy is a young one, but it can be relied upon and its lessons drawn on by Arab countries, Algeria in particular;
- Malaysia's orientation towards the green economy requires it to change an economic pattern that focused on the volume of growth without regard to its quality, especially the preservation of the ecosystem. Malaysia also considers that waste must be treated as a resource to be reused; that achieving this transition is a participatory process among the state, the private sector and individuals; and, finally, that the efficient use of resources ensures a balance between demand and supply while taking available capacities into account;

- Individuals must change their attitudes towards waste, which can only be achieved by adapting the education system to the requirements of the green economy;
- Malaysia has set out a strategic vision to meet the requirements of the green economy, extending to the year 2030.

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NOTES

- ¹ For further reading, see: Wikipedia (Arabic edition), “Global warming” [in Arabic], https://ar.wikipedia.org/wiki/%D8%A7%D9%84%D8%A7%D8%AD%D8%AA%D8%A8%D8%A7%D8%B3_%D8%A7%D9%84%D8%AD%D8%B1%D8%A7%D8%B1%D9%8A (accessed 15 September 2021).
- ² United Nations Environment Programme (UNEP), 2011. *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*, p. 2. https://sustainabledevelopment.un.org/content/documents/126GER_synthesis_en.pdf (accessed 10 September 2021).
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- ⁴ Global Green Growth Institute (2020). *Green Growth Index 2020: Measuring Performance in Achieving SDG Targets*. Republic of Korea, pp. 1–131.
- ⁵ United Nations Environment Programme (UNEP) (2011). *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication* [Arabic edition].
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⁷ Hamama, M., & Ben Aoun, T. (2020). The green economy in Algeria as a cornerstone for achieving sustainable development [in Arabic]. *Journal of Economic Alternative* (University of Djelfa), 7(1), 4–34.

⁸ Ibid., p. 36.

⁹ For further detail, see: Brika, S., & Bouthelja, M. (2017). The sustainable green economy for achieving development in Algeria [in Arabic]. *Journal of Contemporary Economic Studies*, (3), 53–62; Hamama & Ben Aoun, op. cit., p. 37.

¹⁰ For further detail on this point, see the report of the Ministry of Energy, Green Technology and Water (Malaysia), 2017. *Green Technology Master Plan Malaysia 2017–2030*, pp. 22–196.

¹¹ For further detail, see Appendix 1, which lists the variables adopted in Malaysia as green economy indicators.

¹² Bioenergy is a form of renewable energy derived from living organic material known as biomass.

¹³ For further detail, see: https://www.dosm.gov.my/v1/uploads/files/1_Articles_By_Themes/Green_Economy_Indicator/GEI%202018_9Mac2018/5_DATA%20SIRI%20MASA%20GEI%202017.pdf (accessed 30 July 2021).

¹⁴ <https://openknowledge.worldbank.org/bitstream/handle/10986/36248/AUS0002521ovAR.pdf?sequence=13&isAllowed=y&deliveryName=DM115894>