Navigating Malaysia's Economic Transition towards a Decarbonised Future

"Climate change is the defining issue of our time - and we are at a defining moment."
António Guterres, Secretary-General of the United Nations

The long-term shifts in global temperatures and weather patterns, driven largely by fossil fuel burning, pose a major threat to humanity and the health of the planet. While some countries have seen economic growth no longer as strongly associated with greenhouse gas emissions in recent decades[1] (Cohen, Jalles, Loungani, & Marto, 2018), further progress has been slow. Even now, the physical risks stemming from a changing climate are already present and growing. This have threatened ecosystems, biodiversity and food security, and devastated infrastructure and people's lives and livelihoods. If climate change stays on its current course and emissions targets are unmet, the world could lose nearly 10% of GDP by 2050 (Swiss Re Group, 2021). Without clear action to build climate resilience, the fallout from the output loss would severely disrupt the global economy and financial system. Malaysia is not exempted from these risks.

At this juncture, Malaysia needs to move faster in managing a decarbonised future. A fundamental shift in national development planning and execution are therefore needed. The country must embark on a suite of adaptation measures by adjusting our behaviour and systems to increase resilience against the impact of climate change, as well as mitigation measures to reduce and prevent emissions from warming the planet even further. However, this shift is not without consequences. If not implemented properly, the transition risks will not be mitigated and could be detrimental to the economy. This article describes the current state of Malaysia's physical and transition risks and how it compares with other countries. It then analyses the key challenges for mitigation that could hinder an orderly transition and its effects on the macroeconomy. The implications of transition on the conduct of monetary policy, along with the role of investments in catalysing the transition are discussed. Finally, the article presents a potential policy roadmap to make mitigation more effective towards achieving our emissions targets.[2]

Malaysia's physical and transition risks associated with climate change

Climate-related risks stem primarily from two channels, namely physical and transition risks. Physical risks are associated with extreme weather events and gradual shifts in climate leading to property damage and business disruption. Meanwhile, transition risks occur from adjustments made in moving towards a low-carbon economy.

Malaysia faces rising physical risks from floods and sea level rise, which calls for urgent adaptation

Being a tropical and coastal[3] nation, Malaysia is not excluded from exposure to physical risks. According to the INFORM Risk Index,[4] relative to the global average, Malaysia is prone to acute risks stemming from event-driven natural hazards, namely floods, cyclones (Chart 2); and chronic risks driven by longer-term shifts in climate patterns particularly rising sea levels (Ercan, Mohamad, & Kavvas.M, 2012). Managing these adverse impacts calls for adaptation measures that are suited for local conditions. These include stormwater management, soil erosion prevention, reforestation, and building climate-resilient homes and infrastructure.

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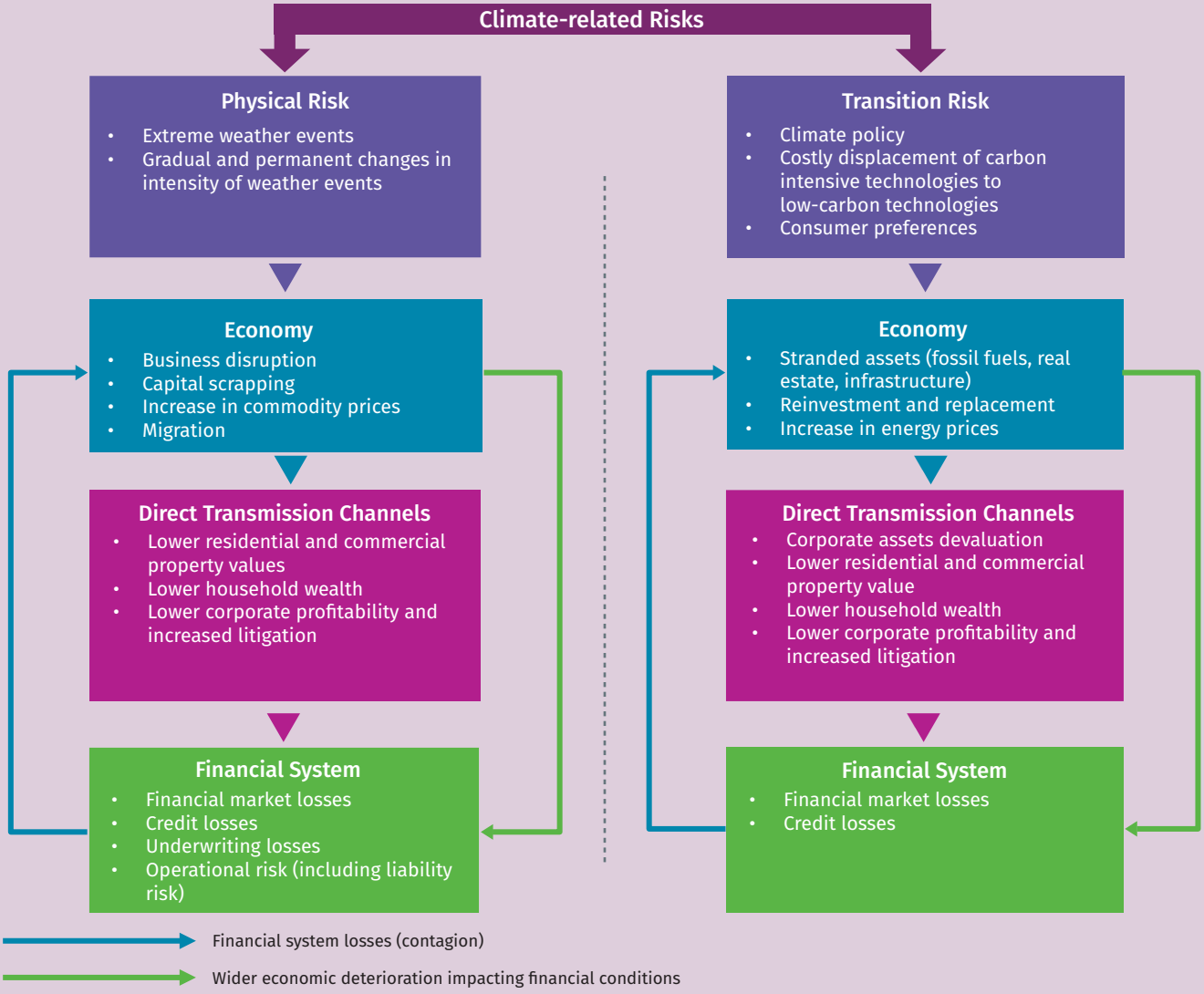
[1] The decoupling between economic growth and emissions are mainly due to the improving energy usage efficiency, decreasing cost of low- and zero-carbon energy sources and a growing number of countries introducing deliberate climate policies.
[2] Following the ratification of the Paris Agreement on 16 November 2016, Malaysia has submitted and revised its Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCC), where it intends to reduce its economy-wide carbon intensity against GDP by 45% in 2030, compared to 2005 levels. Beyond the Paris Agreement, the National Energy Policy (2022-2040) outlines Malaysia's target to become a net-zero emissions nation by as early as 2050.
[3] 13% of Malaysia's total land area is within 5km of a coast. About 70% of the total population lives in the coastal zones (Ehsan et. al., 2019).
[4] The INFORM Risk Index is a global, open-source risk assessment for humanitarian crises and disasters. INFORM is a collaboration between the Inter-Agency Standing Committee Reference Group on Risk, Early Warning and Preparedness and the European Commission.

Chart 1: Climate-related Risks Come from Two Channels - Physical and Transition Risks



Source: Network for Greening the Financial System (2020), "Guide for Supervisors: Integrating Climate-related and Environmental Risks into Prudential Supervision.

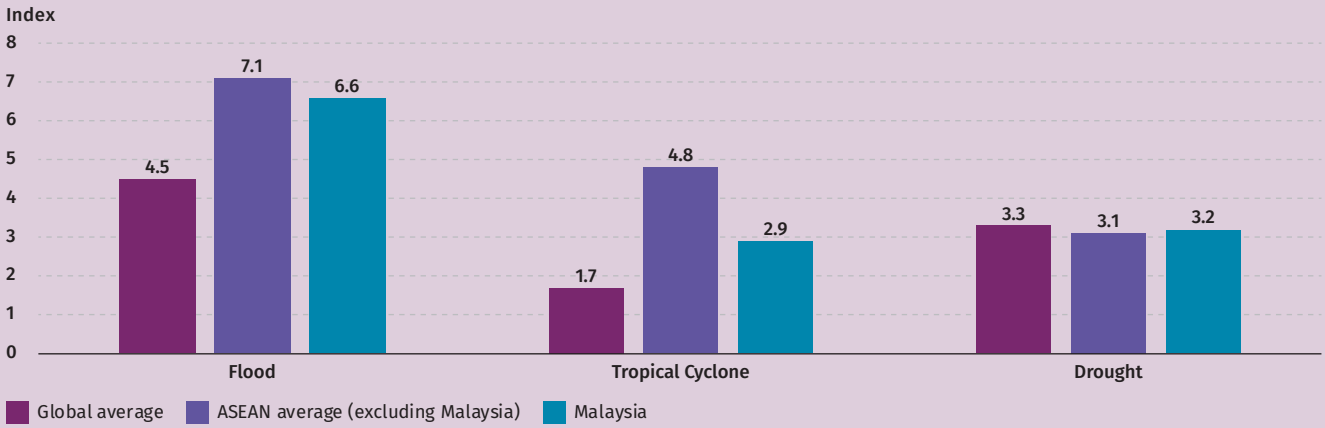
Malaysia appears relatively prepared against transition risks, but delaying mitigation efforts could compound physical risks

As climate policies, technology, consumer and market behaviour react to decarbonisation, certain economic sectors could face big shifts in operations, asset values or cost of doing business (Basel Committee on Banking Supervision, 2021). Based on a World Bank Study on the preparedness for a low carbon transition,[5] Malaysia is better positioned amongst the developing countries to decarbonise its economy. Malaysia is moderately exposed to trade-related climate policies imposed by other countries. It also has some degree of economic and institutional resilience[6] against the low-carbon transition of other countries (Chart 3), supported by its diversified economic structure and relative ease of doing business. Malaysia is well placed to leverage on this position by hastening mitigation efforts to reduce emissions. A delay in managing transition risks would on the other hand magnify physical risks and make adaptation costlier and less effective in the future.

[5] The score is a function of the degree to which countries are exposed to climate-related trade measures, the resilience of their economies and institutions to the external impacts of a low carbon transition, as well as their ability to diversify their asset bases and harness the opportunities presented by a low-carbon transition. The index uses Principal Component Analysis (PCA) to aggregate 4 indicators to measure "Exposure" and 11 indicators to measure "Resilience" respectively. More information can be found in Peszko et al. (2020).

[6] This is proxied by the Worldwide Governance Indicators (WGI) which captures the following 6 dimensions: voice and accountability, political stability and absence of terrorism, government effectiveness, regulatory quality, rule of law and control of corruption.

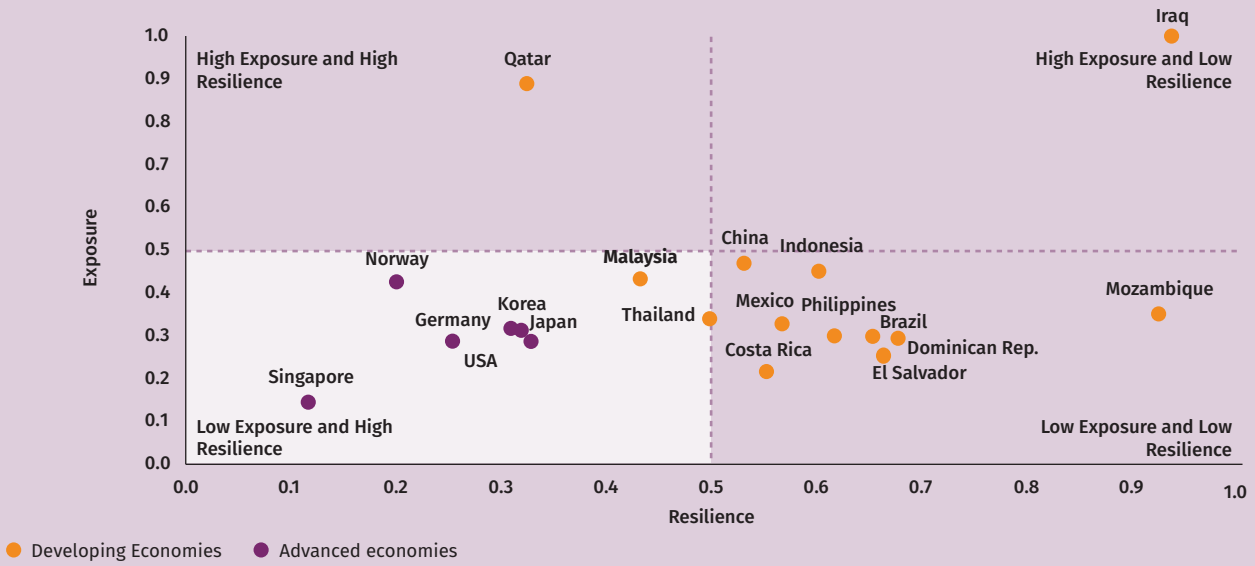
Chart 2: Relative to the Global Average, Malaysia is More Vulnerable to Physical Risks of Floods and Cyclones



Note: Index scaled from 0 to 10. The higher the index, the higher the climate risk

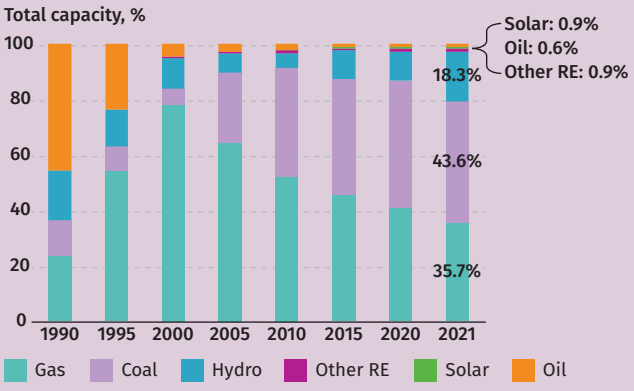
Source: INFORM Risk Index 2023

Chart 3: Countries' Preparedness for a Low-Carbon Transition



Source: Peszko et. al (2020), World Bank Group

Chart 4: Electricity Generation in Malaysia by Source



Source: Energy Commission

Chart 5: Energy Intensity in Selected Countries

Source: International Energy Agency

Key challenges to Malaysia's climate change mitigation

There is no one-size-fits-all approach to climate mitigation. Each country must therefore customise decarbonisation strategies by considering prevailing economic structures that would shape their transition pathways. For Malaysia, mitigation measures should address several key challenges to ensure an equitable and orderly transition.

a) High dependence on coal for power generation

Given the country's steady economic expansion, Malaysia burns more coal now than it did two decades ago, with 43.6% of electricity generated in 2021 (Chart 4). The high reliance on coal stems from it being the cheapest energy source relative to others. Yet, as the most polluting fossil fuel, this dependence is a major hurdle for an enduring low carbon transition. It also exposes the country to energy security risks from supply disruption and price volatility[7]. The Government has announced that it will phase out existing coal-fired power plants by 2040 and will no longer build new assets (Ministry of Economic Affairs, Malaysia, 2022). However, without aggressive capacity ramp-up in cleaner alternatives such as natural gas and other renewables, coal will remain a large part of our energy mix.

b) Low energy efficiency in the economy

Malaysia is among the relatively more energy-intensive economies, suggesting broad inefficiencies in energy consumption (Chart 5). Two main factors explain this. First, about 20% of the economy comprises of hard-to-abate sectors.[8] These are industries that rely heavily on fossil fuel as feedstock and for energy in their manufacturing processes. They also possess long-lived capital assets that are tightly integrated and complex. Decarbonising these sectors would be onerous. They cannot easily switch to renewables or be fully electrified due to technology constraints and prohibitive costs. These barriers require mitigation measures tailored to the circumstance inherent in each sector. Second, the prevalence of energy subsidies propagates inefficiency. Malaysia spends around 12% share of GDP on fossil fuel subsidies, much higher than several advanced economies and regional peers[9] (Chart 6). There are also direct subsidies on electricity usage through the Imbalance Cost Pass-Through (ICPT).[10] These subsidies artificially depress domestic energy prices, creating distortions by not penalising wasteful consumption. To illustrate, petrol consumption per capita in Malaysia rose by 45.1% over the last decade and is higher than in other regional economies (Chart 7). Initiating and sustaining energy price reforms that influence the behaviour of firms and consumers towards greater efficiency would therefore remove a key roadblock in transitioning to a green economy.

c) Significant reliance on fossil fuels for fiscal revenue and external competitiveness

Success in achieving climate pledges will inevitably result in a world that demands less fossil fuel. This trend would notably affect fossil fuel-producing countries, with ramifications on their fiscal position. For Malaysia, this shift poses an added significance given the declining crude oil production since 2004 (Chart 8) amid maturing oil fields (Bhattacharya & Hutchinson, 2022) and a lack of new large oil discoveries (United States Energy Information Administration (US EIA), 2021). The high reliance on petroleum-related taxes and royalties for the Federal Government revenue[11] needs to be addressed sooner rather than later. Designing a resilient tax system that generates new revenue streams and supports a green economy will be key in this transition.

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[7] Malaysia imports 90% of its coal supply, mainly from Indonesia (Source: National Energy Balance, and Malaysia Energy Statistics Handbook 2020, Energy Commission).

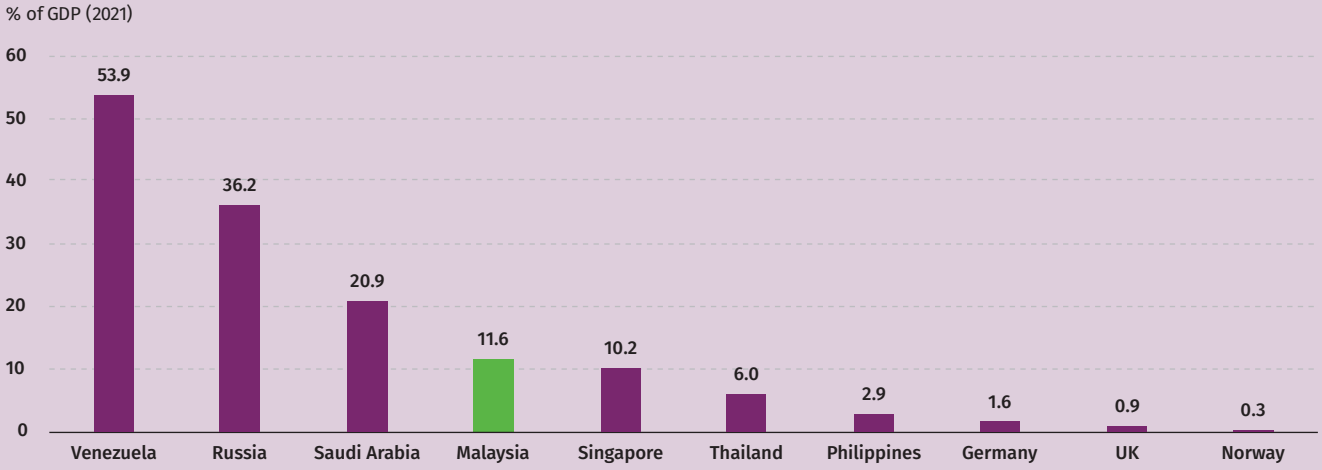
[8] Staff assessment based the three criteria by the International Energy Agency (IEA) to identify hard-to-abate sectors using 2021 national accounts data. These are: (i) long-lived capital assets; (ii) high temperature requirements for their production process; and (iii) trade considerations. For Malaysia, the sectors identified comprises oil and gas, palm oil, construction, steel, cement, and chemicals industries.

[9] These developed economies also shared the same trait of decoupling between economic growth and carbon emissions.

[10] The ICPT is a mechanism under the Incentive Based Regulation framework by Tenaga Nasional Berhad which allows electricity tariff charges to households and firms to reflect any changes (upward and downward) in fuel and other generation-related costs every six months in the form of either a rebate or a surcharge. Despite this, the government has provided subsidies in the form of rebates amounting to RM22.5 billion since 2015 through the ICPT mechanism to cushion the impact of high fuel prices. This includes the approved subsidy expenditure of RM10.8 billion for the period January to June 2023.

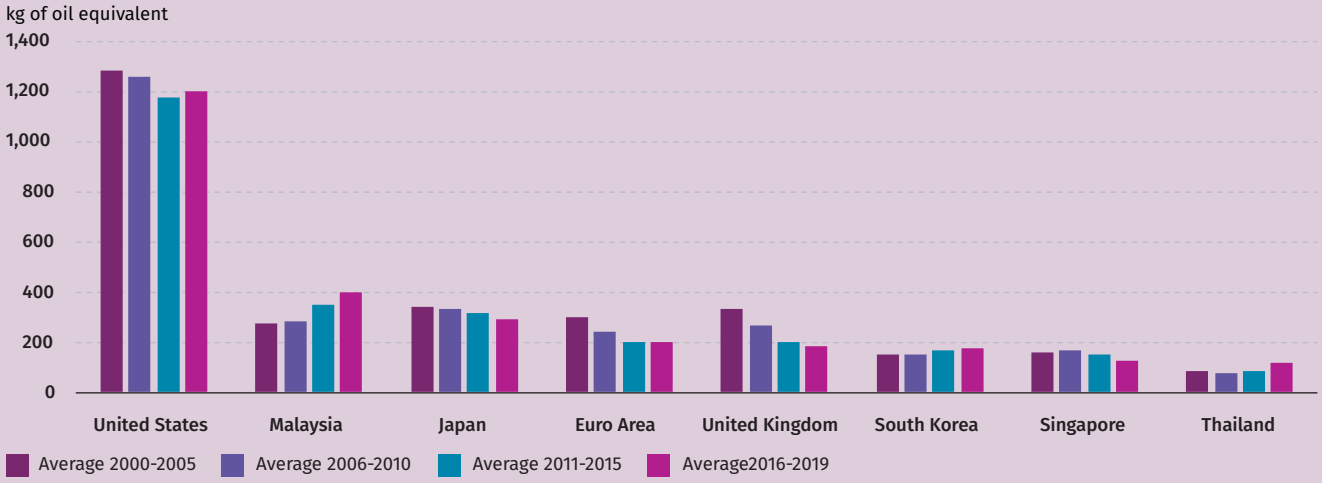
[11] Petroleum-related revenue is expected to contribute 27.3% to total government revenue in 2022, mainly supported by dividends from PETRONAS (Source: Ministry of Finance).

Chart 6: Fossil Fuel Subsidies in Selected Countries



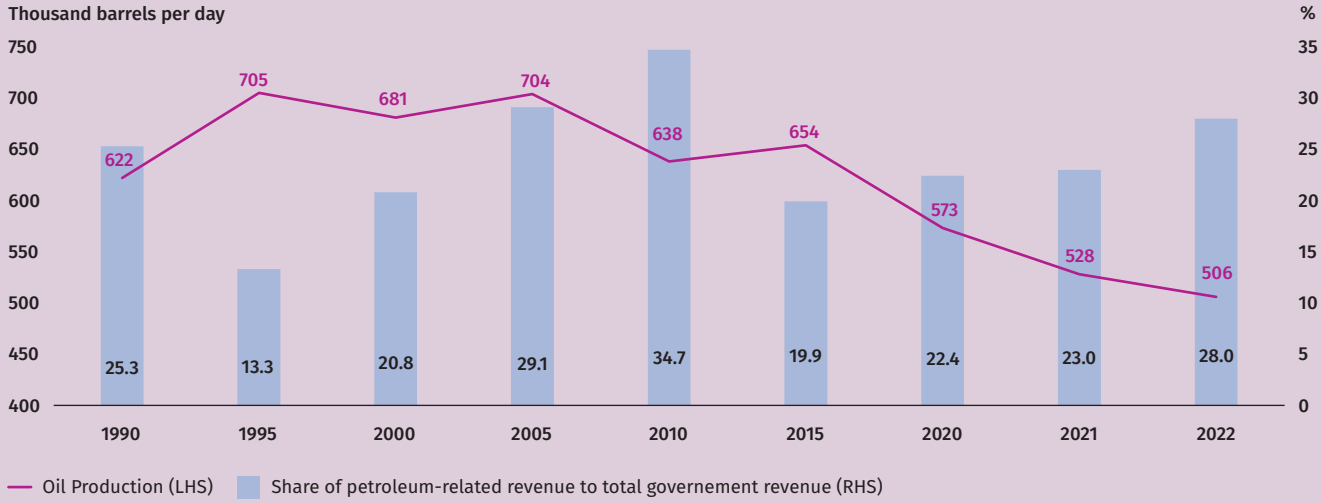
Source: International Monetary Fund (IMF)

Chart 7: Petrol consumption per Capita in Selected Countries



Source: US Energy Information Administration, World Bank, Bank Negara Malaysia estimates

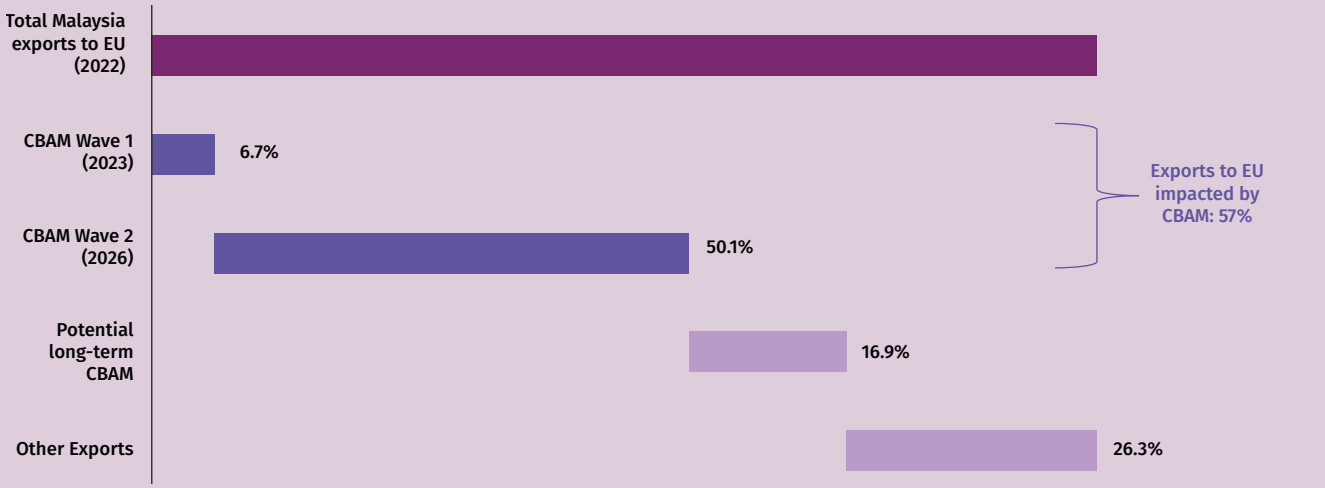
Chart 8: Malaysia's Oil Production and Petroleum-related Revenue as Percentage of Total Government Revenue



Source: Ministry of Finance, PETRONAS

Meanwhile, the phase-in of tariffs to address carbon leakages, namely the Carbon Border Adjustment Mechanism (CBAM)[12] could affect up to 57% of Malaysia's exports to the EU by 2026 if the equivalent emissions standards are not complied by domestic manufacturers (Chart 9). These exports include raw materials such as cement, iron and steel, and aluminum as well as consumer appliances. While this accounts for 5% of total exports, Malaysia's trade competitiveness and investment attractiveness would be further eroded should other countries impose similar regulations.[13] As global capital flows shift towards greater environmental, social and governance (ESG) compliance, this could lead to divestments and write-offs of stranded assets domestically, especially in the hard-to-abate sectors. Therefore, Malaysia must be cognisant of global decarbonisation developments when pursuing its own transition and manage the likely economic repercussions accordingly.

Chart 9: Impact Estimation of CBAM on Malaysia's Exports to EU



Note: Malaysian exports affected under CBAM are based of existing primary imports by the EU that is subject to the EU ETS Market. Exports affected by Wave 1 are based on EU's initial list of products at most risk of carbon leakage (e.g. cement, iron and steel, and aluminum). Exports affected by Wave 2 are based on the remaining products covered by the EU ETS (e.g. E&E, machinery, and rubber products). Meanwhile, the potential long-term CBAM affected exports are items planned to be covered by the EU ETS (e.g. vegetable oils).

Source: Bank Negara Malaysia estimates based on World Wide Fund for Nature (WWF) Malaysia, Boston Consulting Group (BCG), using data from Department of Statistics Malaysia and EU Commission

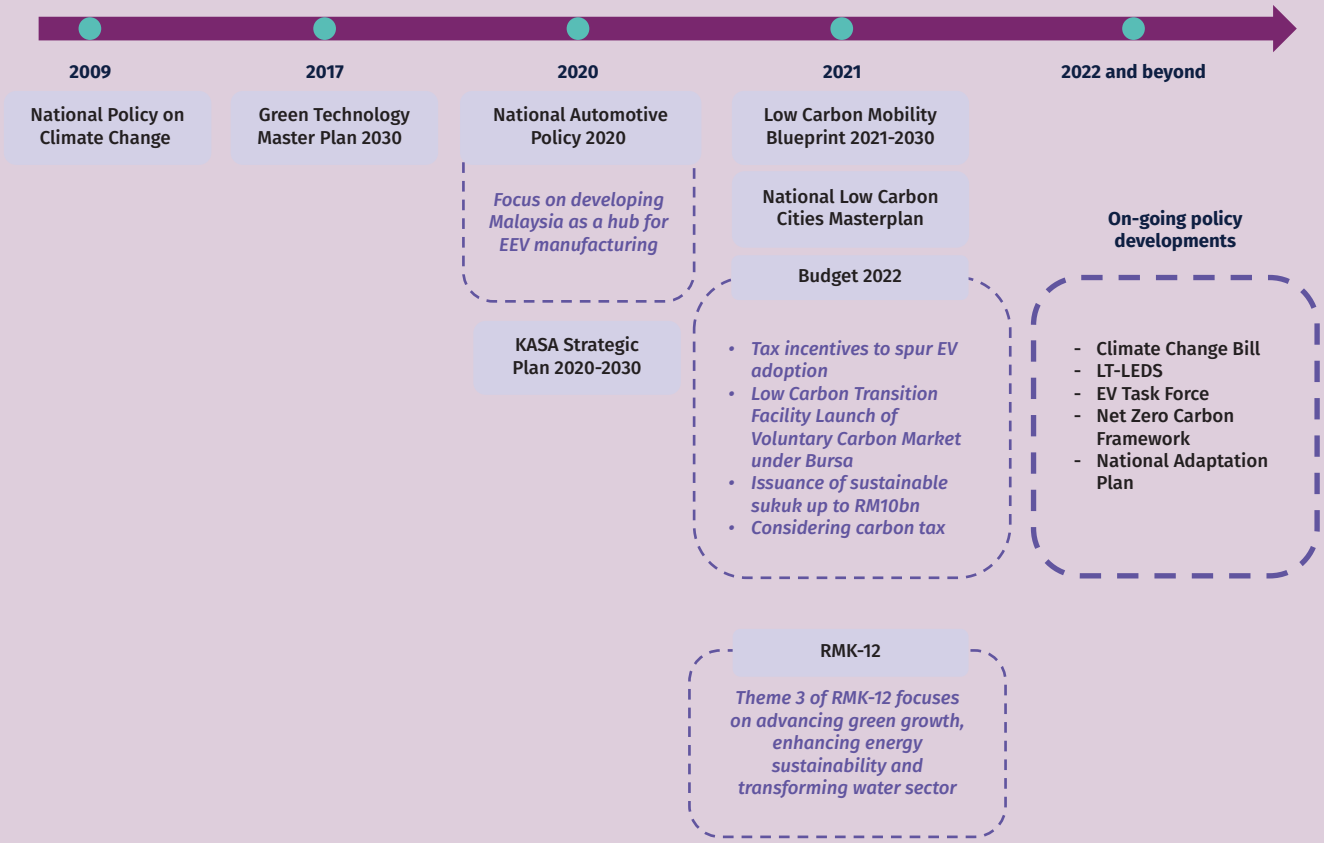
d) Climate policies are fragmented and not sufficiently ambitious

Climate action in Malaysia started in 2009 and have gathered pace since 2020 (Chart 10), with the setting of selected targets on mitigation. A range of sustainability-related regulations is in the pipeline. This includes the Climate Change Bill, Long-Term Low Emission Development Strategy (LT-LEDS), Net Zero Carbon Framework and National Adaptation Plan.

However, other countries are carrying out their climate action at a faster and broader pace. This is evident in Malaysia's low ranking (54th) under the climate policy category of the 2023 Climate Change Performance Index[14], even relative to regional peers (Chart 11). When comparing similar mitigation strategies within ASEAN (Table 1), most strategies in Malaysia are still not in place, notably on legislation. Climate legislation is a vital pillar of climate governance, as successful climate action requires a legal basis. Pledges are not credible unless the measures enacted to achieve them are rooted in law (Eskander, Fankhauser, & Setzer, 2021). In this regard, the passing of the Climate Change Bill is paramount in facilitating an orderly transition by laying the groundwork for effective mitigation.

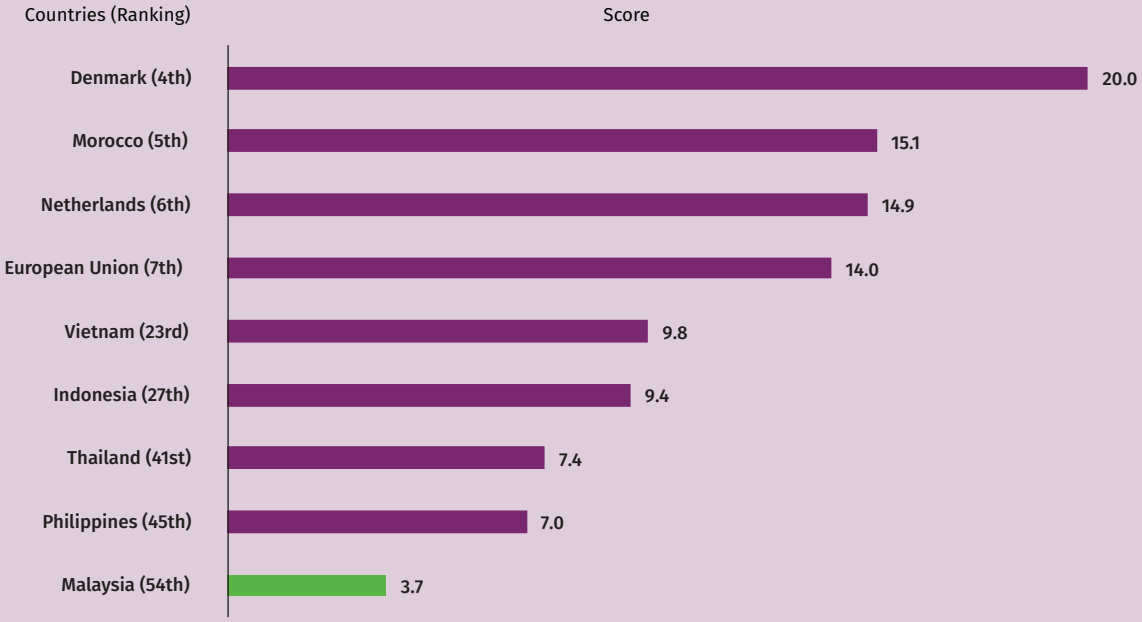
[12] CBAM will be implemented through carbon tax in phases (or "waves") starting from 2026, with prior mandatory emissions reporting starting from 2023.
[13] Include Singapore, China, USA, Japan, Hong Kong, Thailand, and Vietnam.
[14] The Climate Change Performance Index (CCPI) aims to enhance the comparability of global climate protection efforts and progress. It weighs the climate performance of 59 countries (which collectively account for more than 90% of emissions) in the aspect of GHG emissions, renewable energy, energy use and climate policy. The 'climate policy' category, which accounts for 20% weightage in the index, covers a qualitative assessment on the most recent climate policy framework developments at the national and international level.

Chart 10: Timeline of Climate Mitigation Policies in Malaysia



Source: Various policy announcements and policy documents

Chart 11: 2023 Climate Change Performance Index: 'Climate Policy' Category



Source: Climate Change Performance Index (CCPI) as at February 2023

Table 1: Comparison of Mitigation Strategies in ASEAN

	National Net Zero target	*Net-Zero Policy Framework & Legislation*	*Coal power phase out*	*Carbon market mechanism*	*Carbon tax*
Singapore	By 2050	Carbon Pricing Act (2018) and Supply Act (2022)	🟡	🟢	🟢
Indonesia	By 2060	Law 32/2009 Environmental Protection and Management	🟢	🟡	🟢
Vietnam	By 2050	Law on Environmental Protection (2014)	🟢	🟡	🔴
Thailand	By 2065	Constitution of Thailand (2017)	🔴	🟢	🔴
Malaysia	By 2050	🟡	🟡	🟢	🟡
Philippines	Reduce emissions by 75% below BAU by 2030	🟢	🟢	🔴	🔴

🟢 Policy already in place

🟡 Policy currently under planning

🔴 No policy in place

Source: Various news flows, Grantham Research Institute on Climate Change and Environment

Macroeconomic effects of a low-carbon transition

Decarbonisation at both the global and domestic levels, with the attendant climate policies, technology development, and shift in preferences, could pose shocks to Malaysia's development path, growth prospects and potential output, through material impact across economic sectors and labour conditions.[15] This will lead to fundamental changes in modes of production, demand patterns, income levels, trade dynamics and competitiveness (Organisation for Economic Co-operation and Development (OECD), 2017). If not managed well, these changes could lead to considerable dislocations such as rising cost pressures, job losses and a hollowing out of investments (Chart 12).

Global decarbonisation policies could influence the demand and prices for major commodities. As more countries adopt carbon pricing, the eventual lower global demand for fossil fuel products could adversely affect Malaysia's petroleum-related exports and investment activities.[16,17] Furthermore, the prospect of rising prices of key metals and minerals in coming years may also weigh on terms of trade and contribute to imported inflation. This may occur as global demand for renewable energy surges while supply plays catch up in a scenario of concerted efforts to meet emissions targets (Boer, Pescatori, Stuermer, & Valckx, 2021).[18]

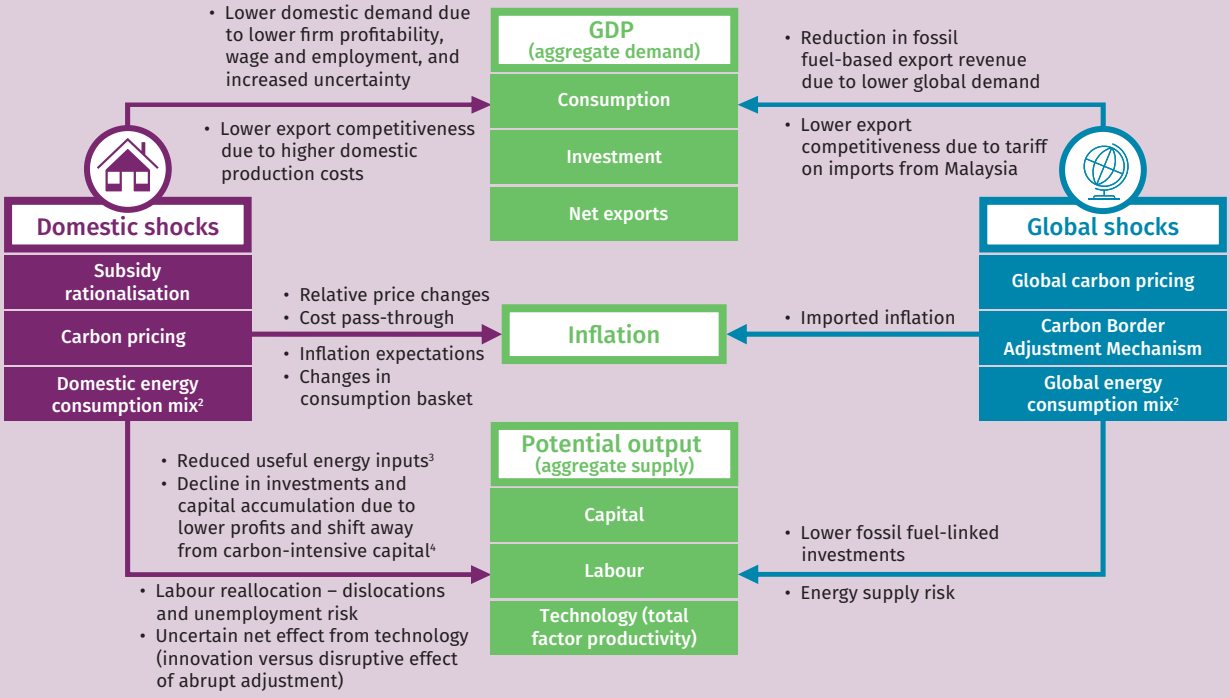
[15] The transition away from fossil fuels and carbon-intensive production and consumption will likely impact all sectors to varying degrees with sectors that are more difficult to decarbonise affected more than others.

[16] While lower petroleum-related exports reduce fiscal revenue, subsidy rationalisation and carbon pricing would potentially increase the fiscal space through reduced spending and additional revenue generation. The impact on the macroeconomy via fiscal policy would then depend on the net impact to revenue, and how the Government utilises its revenues to manage the decarbonisation process.

[17] The trajectory of pre-tax fossil fuel prices, however, is highly uncertain. Prices could remain relatively high and even increase over time despite falling demand in scenarios of stringent climate policy action, if it remains relatively cost-effective to use fossil fuel in the near term (compared to renewable energy sources) and given increasing marginal extraction costs over time (Network for Greening the Financial System (NGFS), 2021).

[18] There may also be indirect spillovers from global climate policy action more broadly via global inflation (for instance, as production costs rise in other countries).

Chart 12: Potential Transmission Channels of Transition Risks to the Macroeconomy[1]



Note:

[1] Transition risks stem from climate policies, technology development, and shifts in consumer preferences. These risks are not mutually exclusive. The chart depicts key channels of the transitions risks but these are not exhaustive. Financial sector feedback, monetary and fiscal policy considerations are excluded. For example, how revenue from carbon pricing is recycled, and the fiscal policy stance (whether budget neutral) will have demand and supply implications.

[2] Alongside climate policies, technology development (for example, in relation to energy efficiency, renewable energy or other low-carbon technologies) and shifts in consumer preferences could influence the global and domestic energy consumption mix and the speed of shift towards less carbon-intensive goods and services.

[3] Reduced useful energy inputs is in the absence of offset from efficiency gains or substitution with clean energy when carbon-based energy inputs decline.

[4] Additionally, risk of stranded assets. Green investments and capital accumulation provide partial offset (not expected to match capital intensity of high-carbon sectors).

Source: Bank Negara Malaysia illustration nominally based on Andersson, Baccianti, and Morgan (2020) and Drudi, Moench, Holthausen, and Weber (2021)

On the domestic front, the literature predicts that the implementation of carbon pricing could cause production costs to rise and profits to decline over the short-to-medium term. This negative wealth shock could lead firms to curtail investments to lower their long-term desired capital stock (International Monetary Fund (IMF), 2020) and reduce their carbon-based energy inputs. This reallocation of capital will also trigger a reallocation of labour, with possible dislocations and wage effects in sectors most affected by carbon pricing. Consumption could be lower, thus affecting growth. Potential output growth could be constrained in the absence of offsetting adjustments in the factors of production and technology, which are costly and may take a long while.[19] Energy components in the headline inflation basket will likely experience price increases especially as carbon pricing progresses over time.[20] The pass-through of costs associated with carbon pricing

[19] These adjustments include energy efficiency gains, substitutions in the energy mix towards green energy, the accumulation of green capital stock, and appropriate enhancements to human capital. If the necessary technology for the generation, storage and transmission of clean energy alternatives cannot keep up with the pace of transition, energy prices would likely be systematically increased (Drudi, Moench, Holthausen, & Weber, 2021).

[20] These are final goods, namely fuel for transportation, and electricity and gas for household consumption. The duration and extent of the direct impact on headline inflation would depend on innovation in renewable energy. This could lower prices and increase energy efficiency, and reduce the expenditure share, if there is no offsetting demand increase (Andersson, Baccianti, & Morgan, 2020). More generally, as production and consumer preferences gradually shift toward less carbon-intensive goods and services (which may also occur without accompanying climate policies) and as these items enter the consumption basket, this will help moderate inflationary pressures (Network for Greening the Financial System (NGFS), 2020).

to consumers could also raise inflation.[21] These potential inflation effects could occur subsequent to subsidy rationalisation, which would involve the removal of blanket subsidies and price ceilings.

The extent of impact from the global and domestic transmission channels described above would depend on three inter-related elements:

First, the initial characteristics of Malaysia's carbon dependence will influence the response to mitigation policies. These include energy intensity in the economy, encompassing the relative proportions of carbon-based energy and renewable energy use, as well as the initial size of the fossil fuel trade balance. In general, countries that have carbon-intensive production structures are more exposed to higher inflation and factor input adjustments, while those that rely on fossil fuel export revenue are susceptible to adverse terms-of-trade shocks. The capacity and speed for structural transition towards low-carbon industry and domestically produced renewable energy sources will influence the impact of the shocks (Holland, Hurst, Kara, & Liadze, 2021). Further, as both carbon-intensive and fossil fuel revenue-dependent countries are expected to experience disproportionate declines in investment (including via lower capital inflows), real exchange rate depreciation plays a shock absorber role that facilitates expenditure switching and current account balance adjustments (IMF, 2022a).

Secondly, the design and phasing of mitigation measures matter greatly for whether the expected economy-wide shifts remain manageable and produce equitable outcomes. An orderly approach to climate policies – *prompt and gradually more stringent* – helps keep Malaysia coordinated with other countries.[22] It is also conducive for capacity building by the private sector, including adjusting factors of production and managing the risk of stranded assets. Based on global level scenarios, an orderly approach represents the best chance of effectively managing both physical and transition risks over the long run (Network for Greening the Financial System (NGFS), 2022). Conversely, a disorderly approach – *delayed and uncoordinated* – will risk greater policy spillovers from policy divergence across countries, and more abrupt and aggressive climate policies, that may require strong counter responses by other domestic economic policies. Climate policies have been shown to disproportionally impact certain vulnerable groups,[23] thus a critical aspect is to design mitigation policies which ensure that the costs and benefits of transition are distributed equitably. This may include compensation measures in the form of cash transfer programmes, tax exemptions, enhancement to social security payments as well as employment programmes (Feng, Hubacek, Liu, Marchán, & Vogt-Schilb, 2018; United Nations Development Programme (UNDP), 2021).

Third, uncertainty about the direction in climate policy and operating environment could bring about more adverse effects. Doubts regarding the commitment to progressive carbon pricing, in particular, increase the likelihood of a temporary period of higher inflation, even if transition has an overall depressive effect on economic activity. This is because a future fall in income is not anticipated and thus inflationary pressures from higher production costs dominate deflationary demand effects (Ferrari & Nispi Landi, 2022).[24] More generally, uncertainty regarding the trajectory and effective management of future policies leads to higher risk aversion. This raises investment risk premia, resulting in more volatile global commodity prices and financial markets, and reduced FDI and capital spending domestically, lowering potential output. Households' precautionary savings may rise, dampening expenditure. Hence, a credible climate policy path with gradual and progressive commitments is necessary to enable economic agents to adjust and adapt without being too negatively impacted by the transition.

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[21] This is the indirect effect on inflation from carbon taxation which could potentially feed through firms' cost structure based on their emissions, and cost spillovers given linkages across sectors.

[22] Given that countries are increasingly implementing climate policies to match their climate ambitions, early action puts Malaysia in an advantageous position to mitigate climate policy spillovers (for example, via CBAM). There is also a case for an internationally coordinated approach via carbon price floors that are differentiated according to countries' development level and contribution to emissions. This could enhance the transparency of countries' actions, address competitiveness concerns and achieve long-term temperature goals (International Monetary Fund (IMF), 2019).

[23] Higher energy prices from carbon taxes and removal of fossil fuel subsidies will have a greater direct impact on firms and workers in energy-intensive sectors. Indirect impacts via increases in prices of goods and services with large energy inputs, such as public transportation, electricity, and food, will hurt poorer households the most (Feng, Hubacek, Liu, Marchán, & Vogt-Schilb, 2018; Eurofound, 2021).

[24] If the temporary period of higher inflation driven by the lack of credibility of future carbon taxes contributes to a de-anchoring of inflation expectations, the transition can become inflationary in the long term too.

Implications of transition on the conduct of monetary policy

While decarbonisation can be thought of as primarily emanating from the supply side, there are key differences against traditional supply shocks. Namely, it is anticipated, permanent, and generates revenues that can be channelled back to the economy (Bank of England (BoE), 2022; International Monetary Fund (IMF), 2022b).[25] The transition process would necessitate permanent resource reallocations and relative price adjustments across sectors. Hence, there is a case for monetary policy to accommodate these developments[26] amid the presence of downward nominal rigidity.[27] For instance, accommodating higher inflation allows wages in the expanding sectors to increase thus setting the right price incentives for the movement of labour towards these sectors. Relative price adjustments across sectors will also favour the reallocation of factors of production towards expanding sectors (Guerrieri, Lorenzoni, Straub, & Werning, 2021),[28] which in turn can support sustainable growth.

On the other hand, the energy price shocks are salient[29] and progressive in nature. This increases the risk of more generalised and persistent inflation, which could subsequently affect inflation expectations and heighten the risk of second-round effects and wage-price spirals. In balancing the upside risks to inflation and downside risks to growth, how climate shocks may evolve will be an important consideration for the central bank to maintain the credibility of its monetary policy framework. Communicating the potential economic consequences, both in terms of growth and the nature and drivers of inflation, and how this will weigh on monetary policy action would be equally important.

The monetary policy response will depend on how decarbonisation evolves, particularly whether it remains orderly. This will involve taking into account interactions with climate and fiscal policies, and, as a small open economy, exchange rate effects.

An orderly transition will require careful consideration of the phasing in of subsidy rationalisation and carbon pricing. These policies should also be accompanied by attendant support policies such as incentives for green investment, and protection for the most vulnerable segments of the economy. The orderliness of transition will have a bearing on the effectiveness of monetary policy responses via the transmission mechanism. For instance, if changes in climate policies, market behaviour and technology are particularly disruptive, the resulting stranded assets can impair the financial system and consequently weaken the transmission mechanism (Drudi, Moench, Holthausen, & Weber, 2021).

The monetary policy response will vary according to the Government's revenue recycling choices which can have different macroeconomic impacts,[30] and thus underlies differentiated paths for macroeconomic stabilisation that are consistent with the monetary policy mandate (Darracq-Pariès, Dees, Hurst, & Liadze, 2022). In addition, these choices as well as the credibility of fiscal and climate policies could influence monetary policy space as captured by the natural rate of interest. Revenue recycling that fosters innovation and enhances productivity could raise the natural rate of interest. However, policy uncertainty could reduce it, given lower investment and higher savings (Drudi, Moench, Holthausen, & Weber, 2021).

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[25] Generally, carbon tax revenues can be recycled via public investment, tax reduction, transfers to households and reimbursement of public debt.

[26] Namely the reallocation of capital and labour to less carbon-intensive economic activities, and the higher relative price for carbon-intensive goods and services.

[27] A situation where nominal wages are resistant to reductions, despite changes in the broad economy that suggest a lower wage is optimal (Case, Fair, & Oster, 2012).

[28] In contrast, when nominal wages are rigid downwards, monetary policy action which lowers spending and inflation may not facilitate reallocation, but instead further increase unemployment, especially in sectors that are contracting. This therefore imparts a degree of inflationary bias to optimal monetary policy (Guerrieri, Lorenzoni, Straub, & Werning, 2021).

[29] Price changes which are more important for consumers, and potentially have a larger bearing on the overall price trend (Bank for International Settlements (BIS), 2022). The saliency of energy prices is due to their pervasive role in production chains.

[30] Among the revenue recycling options, public investment leads to the most beneficial effects on GDP and higher short-term inflationary pressures. It also contributes to long-run potential output via capital stock expansion (Darracq-Pariès, Dees, Hurst, & Liadze, 2022).

Under normal conditions, the exchange rate reinforces the desired effect of monetary policy (Drudi, Moench, Holthausen, & Weber, 2021). A disorderly transition, however, increases the risks of real exchange rate effects which amplify rather than absorb shocks, and the weakening of the exchange rate channel of the transmission mechanism. This could become important in informing monetary policy strategy, especially if exchange rate effects amplify rather than buttress the disruptive impacts on the economy.

Role of investment in catalysing the low carbon transition

The world must invest massively in climate adaptation and mitigation to meet the Paris Agreement targets. Between 2022 and 2050, over USD270 trillion is required to decarbonise the global economy, mostly in the transport, energy, building and industry sectors (Swiss Re Group, 2022). For Malaysia, it is estimated that investments worth RM350 billion to RM450 billion will be needed over the next three decades to achieve its emissions targets (World Wide Fund for Nature (WWF) Malaysia; Boston Consulting Group (BCG), 2021). The significant capital expenditure not only supports an orderly transition, but also unlocks new opportunities in the green economy.

Reallocating resources to fund green investments on a large scale is, however, inherently challenging. Embarking on green infrastructure projects and low-carbon technologies typically involves high upfront capital outlays, long gestation, technical limitations, and unproven commercial viability (Georgieva & Adrian, 2022). Such constraints are particularly prevalent in the private sector in emerging market economies due to the lack of reliable market intelligence on green economy, macroeconomic fluctuations, and policy uncertainties.

Exploring existing and new economic opportunities

To insulate against physical and transition risks, capital formation in Malaysia will need to increasingly pivot toward assets that support climate adaptation and mitigation. The potential impact of CBAM is a case in point, in which raising domestic capacity in cleaner production methods along the supply chain would safeguard trade competitiveness. Moreover, Malaysia can leverage on its unique advantages to seize latent opportunities arising from decarbonisation. For instance, the country produces around 20% of global palm oil output,[31] which also generates large quantities of effluent and biomass waste. This calls for more investment that would deeply integrate circular economy practices within the oil palm industry and broaden the research in biofuel development.

Investment in new and emerging technologies is also key to unlocking new opportunities in the low-carbon transition. More capital is therefore needed to support innovative green energy solutions especially at the commercialisation phase. Namely, carbon capture, utilisation and storage (CCUS) technology would help decarbonise the hard-to-abate sectors, while developing hydrogen as an alternative to fossil fuels would improve Malaysia's energy mix.

Improving investment climate and funding mechanisms to drive green investments

Making Malaysia's investment climate more conducive and attractive to the private sector, including foreign players, to invest in or acquire green technology assets is equally crucial. This includes setting a clear transition roadmap, ensuring adequate supply of green talent, and providing attractive incentives which can alleviate the cost burden of asset acquisition. Reducing information asymmetries and improving the risk-return profile of prospective investments is critical in spurring private sector involvement, including the financial institutions. Towards this end, the Bank introduced the Climate Change and Principle-based Taxonomy[32] to facilitate financial institutions in assessing and classifying economic activities that contribute to adaptation and mitigation strategies.

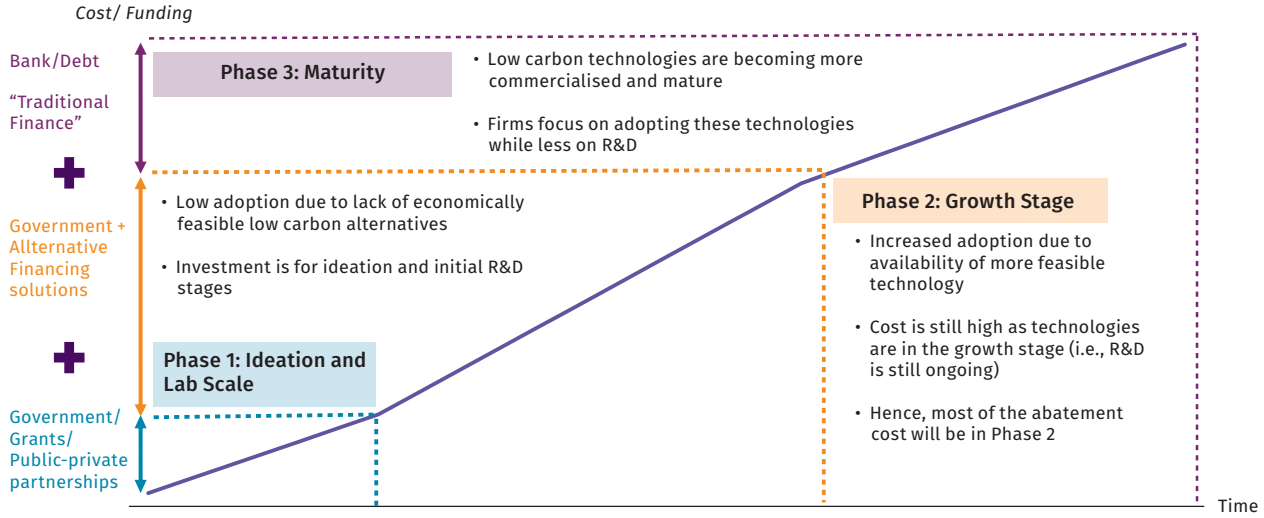
[31] Malaysia Palm Oil Council, 2022

[32] For further information, please see "Climate Change and Principle-based Taxonomy" document (link: https://www.bnm.gov.my/documents/20124/938039/Climate+Change+and+Principle-based+Taxonomy.pdf).

Various strategies towards promoting green investment have been identified under the New Investment Policy (NIP), in line with ESG being the overarching theme for the National Investment Aspirations (NIAs). Effective implementation of these strategies is crucial in creating a conducive investment ecosystem and attracting high quality investment to catalyse the green transition.[33]

In addition, overcoming financing barriers and attracting investors are key in increasing green investments. Specifically, **enhancing the funding mechanisms** would ensure that adequate capital is available across all phases of technological feasibility and commercial viability (Chart 1A). Funding for the ideation, research and development stage should be mainly sourced from the Government and public-private partnership, given the large upfront outlay and the need for technical assistance from public institutions. Equity-based and alternative financing are more effective in the growth stage, given the long gestation and higher risk-return trade-off. Finally, traditional financing typically plays a larger role at the maturity phase to ensure business continuity.

Chart 1A: Green Technologies Funding Phase



Note: 60% of the technology is expected to be feasible today/in the near future, 5% which would require public financing and 35% which depends on implementation of carbon pricing *(BCG: Securing our future: Net Zero Pathways for Malaysia 2021)*

Source: Bank Negara Malaysia, adapted from American Energy Innovation Centre

[33] For further information, please see the New Investment Policy, 2022

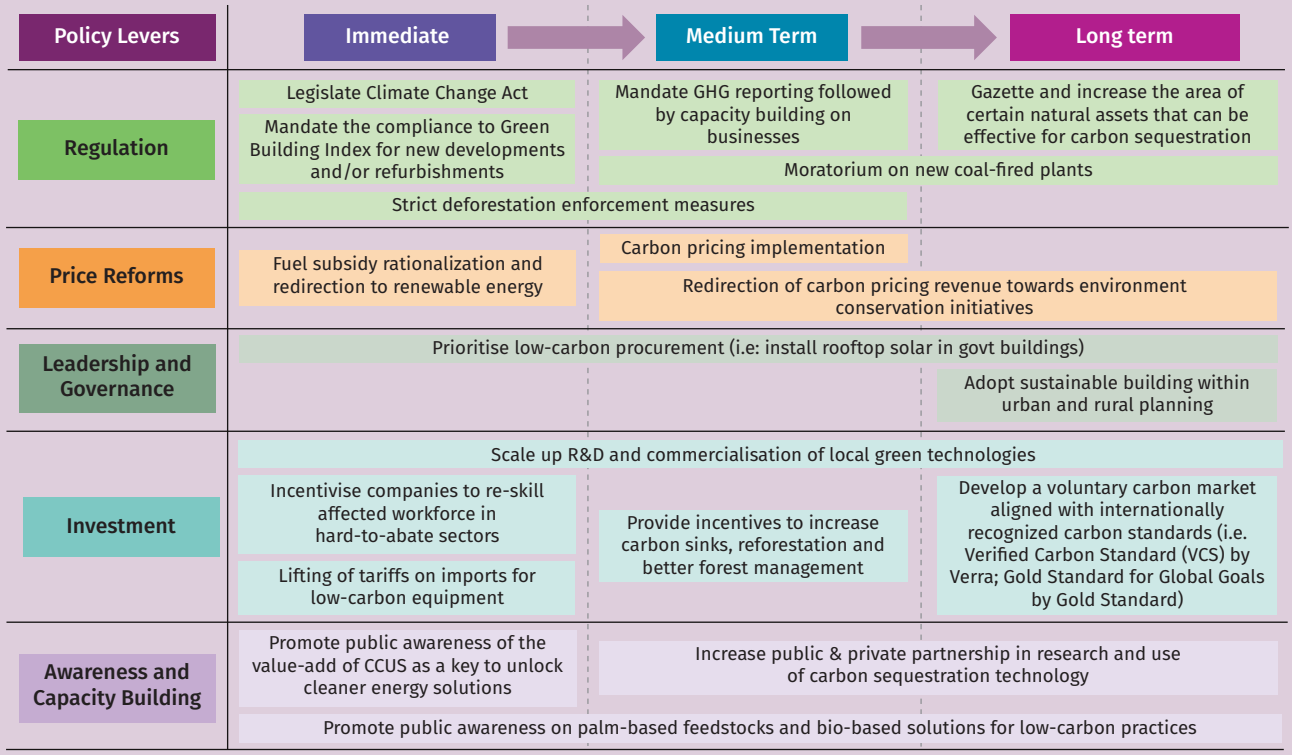
Full steam ahead: Building blocks to galvanise climate mitigation towards a greener economy

With the economic and financial effects of climate change steadily affecting our lives and livelihoods, Malaysia needs to step up its own adaptation and mitigation efforts. This requires a whole-of-nation approach towards climate mitigation with inclusive participation and strong commitment from all stakeholders. From the top, the Government plays a crucial role to enable a conducive ecosystem for orderly transition. A high degree of clarity on the country's vision, strategies, plans, timelines and milestones is therefore paramount. This would provide strong market signals that would spur firms to adjust towards low-carbon practices and encourage households to live more sustainably. Chart 13 shows a roadmap that captures some of the key of measures that the Government could consider in making mitigation more effective towards reducing emissions. These measures are grouped into five broad levers comprising *regulation, price reform, leadership and governance, investment as well as awareness and capacity building*. They are also prioritised according to immediate actions as well as medium and long-term reforms.

Under the lever of *regulation*, there is a pressing need for a regulatory framework aimed at controlling emissions and polluting activities. Here, enacting the Climate Change Bill is key towards laying the legislative foundation for effective climate action. Equally important is mandating Green Building Index compliance in the construction sector and stricter enforcement to protect Malaysia's carbon sinks.

The next lever is implementing *price reforms* to address the problem of externalities when market players do not internalise the economic costs and benefits of decarbonisation. Chiefly, the rationalisation of fossil fuel subsidies could shift firm and household behaviour towards greater energy efficiency. The savings from rationalisation could then be rechannelled to hasten renewable energy development. This would reduce the associated green premiums and promote wider usage of sustainable alternatives.

Chart 13: Potential Policy Roadmap towards Decarbonisation



Source: Bank Negara Malaysia assessment based on OECD climate policy solutions

Meanwhile, establishing a carbon accounting framework[34] is crucial in preparing the private sector towards adopting carbon pricing. This can take the form of either a carbon tax or emissions trading scheme (ETS). These instruments are empirically shown to induce countries to decarbonise, where the average annual growth rate of emissions are two percentage points lower compared to countries without carbon pricing.[35] However, carbon pricing implementation needs to be carefully designed to achieve the intended outcome and prevent negative spillovers. For example, while the EU area has managed to reduce their emissions by an average of 2.2% annually since its ETS started in 2005, the cap[36] for rate of emission reduction needs to be raised to at least 4% of emissions annually for 2021-2023 to achieve the Paris Agreement target (Zaklan, 2021). The appropriate carbon price level[37] must also be considered as the global average price of USD6 per tonne of emissions based on IMF's estimations is too low to curb global warming in line with the Paris Agreement. Hence, the Government would need to balance between an appropriate initial price and its subsequent increments that provides sufficient time for firms to adapt, while at the same time reflect the actual cost and appropriate incentives to effectively reduce emissions.

[34] For further details on carbon accounting framework, please refer to the Box Article on 'Measuring the Journey Towards a Low Carbon Economy' in Chapter 2.2, BNM Annual Report 2022.
[35] This is based on *Carbon Pricing Efficacy: Cross Country Evidence* (Best, Burke, & Jotzo, 2020) which uses 142 countries over a period of 20 years .
[36] An ETS cap is the limit placed on the emission rights to trade within the region.

Equally important is for the Government to 'walk the talk' in spearheading the decarbonisation agenda. The Government could *lead by example* by advancing low carbon procurement practices and adopting sustainable urban and rural development as green technologies and building materials become widely available.

Catalysing green *investments* is key. Lifting the tariffs on imports of green technologies could jumpstart the transition. Providing incentives to spur domestic development of such technologies not only reduces reliance on imports over time but raises Malaysia's knowledge and productive capabilities and creates high-value green jobs. These are jobs that promote sustainability and decrease waste, energy use and pollution.

Lastly, strategies are needed to step up *awareness and capacity building* initiatives to deepen public-private partnerships in research and inspire stakeholders to act collectively towards managing climate risks. Together, this will reinforce the effectiveness of the other policy levers in ensuring an orderly transition.

Conclusion

For Malaysia to achieve substantial emissions reductions, embarking on the necessary adaptation and mitigation will be vast in scale and complex in execution. Yet the consequences from its delay could be far greater with lasting implications on Malaysia's growth prospects, potential output and livelihoods. Hence, navigating the economic transition is critical, and would entail tailored solutions such as to wean off coal and decarbonise the hard-to-abate sectors. Equally crucial is the adept balancing to manage the ensuing costs and dislocations, while seizing the opportunities to create green jobs and attract investments that help our emissions targets. Above all, the climate pledges must be matched by concrete, measurable action. While the Government leads the way in setting the green agenda, its implementation is ultimately the collective responsibility of all stakeholders. The pace, breadth, and impact of decarbonisation on the wider economy will consequently determine the degree of monetary policy response. An equitable and orderly transition to a green economy will allow Malaysia's growth and development to be more resilient, sustainable, and inclusive, thereby securing a cleaner and liveable future for the next generation.

Moving forward, the Bank will continue with its engagements with key stakeholders, involvement at international platforms such as the NGFS, and capacity-building to better understand and analyse climate risk effects to act pre-emptively. The Bank will also continue to prepare the banking sector to be more resilient in the face of climate change and continue to support the transition process within its operational mandate.[38]

[37] Based on IMF's estimations, the recommended carbon price is USD75 per tonne of carbon emissions by 2030 as to curb emissions in line with the Paris Agreement (Black, Parry, and Zhunussova, 2022).

[38] Challenges remain given the lack of availability and liquidity ESG instruments and investments. To facilitate and support the development of a deeper domestic ESG bond market, the Bank has worked with the Malaysian Government to issue Ringgit-denominated Sustainable Development Goals (SDG) sukuk in September 2022. This inaugural issuance is expected to pave the way for more regular SDG government and corporate bond issuances in the future, which will be critical in developing the benchmark to spur private sector issuances.

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