

## **Why is climate change an issue in Malaysia? What climate change mitigation and adaptation measures would you suggest to the government? Discuss.**

*Goldilocks and The Three Bears* is about a naïve girl whose actions hurt others. Her actions created negative externalities, forcing her to face the consequences. Malaysia shares many similarities to Goldilocks. Her geographical location has shielded us from adverse natural disasters as we developed and grew, allowing us to enjoy continuous growth. That's all about to change: our peaceful slumber is being interrupted by climate change.

Three main areas of concern are flooding, agricultural output, and energy production. Rising temperatures contribute to erratic increased rainfall, frequent flooding and lower agricultural yield. The impending threat of depletion of fossil fuels like natural gas puts Malaysia's economy at risk on the macro-level. To respond to the threats faced in these sectors, the Government can use two main strategies: climate mitigation and adaptation.

1. Mitigation refers to policies that work towards a reduction in GHG emissions,
2. Adaptation refers to policies that alter infrastructure or behaviour to accommodate severe climate threats,

### **Malaysia's Climate Threats**

In any battle, the first step to winning is to understand the enemy. As such, we must seek to understand how climate change is threatening our economy. The root cause, greenhouse gas emissions, has two main effects. Melting ice-caps lead to rising sea levels, creating risk of flood or submersion for low-lying lands. It also has adverse effects on weather patterns: disrupted monsoon cycles lead to increased rainfall in Malaysia (Climate Risk Country Profile: Malaysia (2021): The World Bank Group and the Asian Development Bank). Whilst more rain may sound "better" than drought, the rivers in the Malaysian Peninsula do not have the capacity to hold excess water so banks burst. Urban drainage architecture is also insufficient to deal with water run-off in cities, and drains or canals overflow.

Flood damages are only increasing. \$1.37 billion has been lost between 1998-2018 due to floods (Mohtar. J & Yeo. A, 2021), and a recent study considering the years 1998-2022 increases the total to \$1.50 billion (Reuters, 2022). These figures compile repair expenditures for homes and damages to manufacturing industries. The latter of which is the second largest contributor to our GDP. Flooding also affects agricultural output: in 2021, the Malaysian Department of Statistics (DOSM) reported RM90.6 million ringgit worth of losses. Though paddy is not a major export commodity, local production is important for domestic consumption and ensuring the livelihoods of farmers. Rice self-sufficiency has been a key component of the national Malaysia Plans, including the Twelfth Malaysia Plan (2020-2025) which has set the goal of 75% self-sufficiency. As a crop, paddy is sensitive to high night temperatures and rainfall. Vaghefi et al (2016) observed that climate changes will reduce rice yield during main/off seasons in 2030 between 12 and 31.3%.

# FLOODS IN MALAYSIA

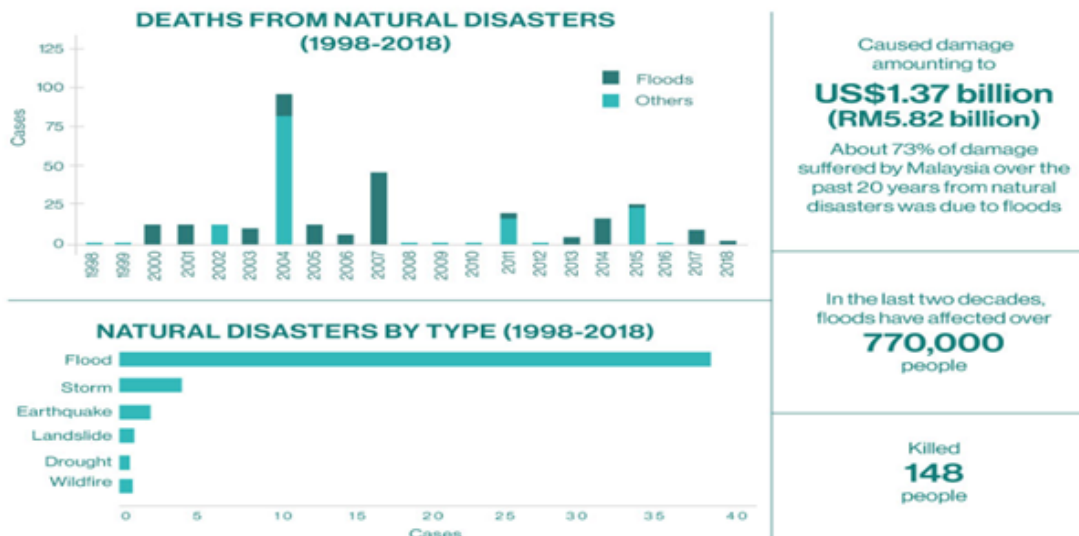


Figure 1. Impact of Floods in Malaysia

Source: The Asean Post, *Extreme Weather: Malaysia's Flood Woes To Worsen*

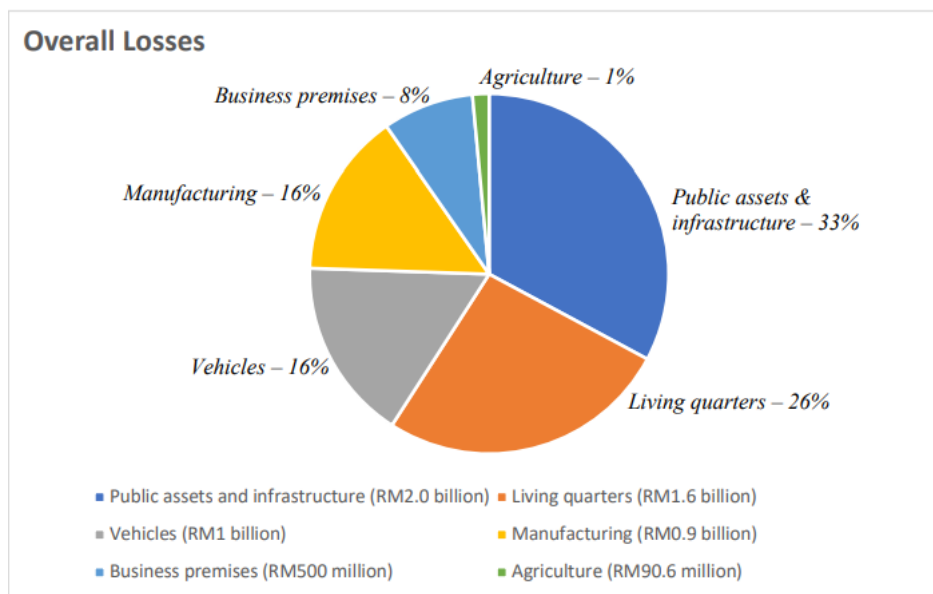


Figure 2. December 2021 Flooding Losses

Source: ISEAS Report, *Malaysia's Floods of December 2021: Can Future Disasters be Avoided?*

Given the gravity of how affected Malaysia will be, there is an urgency to tackle the driving cause of climate change. Electricity generation is the foremost cause of GHG emissions in Malaysia (Susskind et al., 2020), followed by the transport industry. Currently, only 22.4% of power is produced from renewable energy (RE) (KeTTHA, 2017a, Ujang 2018) with the rest from fossil fuels. Natural gas has been a driver of Malaysia's growth thus far, with companies like Petronas contributing to GDP. Thus, the penultimate threat posed by climate change is to Malaysia's development model.

## Mitigation Strategies

To mitigate floods, Malaysia must adopt a multi-level approach that addresses natural and urban flood-risks. The first step is to develop and enforce drainage architecture guidelines for urbanisation projects. The adoption of sustainable drainage systems that utilise infiltration, attenuation and collection of rainwater may improve efficacy. However, state authorities should place more emphasis on the maintenance of existing drainage architecture. Major drains and canals require regular deep cleaning to remove blockages. These blockages, due to littering and improper waste disposal, are the culprit of flash floods. Littering in particular is a behavioural problem amongst Malaysians. Although the act is a crime, it is perhaps the country's least enforced law. Policy-makers should take advantage of behavioural interventions, or nudges, that are low-cost in nature to alter social norms ("An Experiment to Nudge People towards Responsible Litter Disposal," 2015). This would be more cost-effective than revamping existing drainage architecture, particularly in developed areas such as Kuala Lumpur. Suggested nudges include:

- A. Bright-coloured public rubbish bins that attract attention,
- B. Painted footsteps leading towards recycling or rubbish bins,
- C. Waste-management efficacy awards for residential areas, rewarding residents who separate and recycle the most.

Large-scale infrastructure is another contending solution. Government development schemes can opt for a SMART Tunnel approach in low-lying urban areas. These areas are susceptible to floods due to the geographical landscape. In line with this, there have been signs of building a SMART Tunnel in cities like Shah Alam (Bala Krishnan, 2022). Note that such a project is expensive upfront and has high maintenance costs. For areas where flash-flooding is more common, implementing such projects is akin to using a chainsaw to cut tofu (Department of Irrigation and Drainage, n.d.). SMART Tunnels should not be the primary mitigation method. Additionally, approval for such projects should only come after both a social cost-benefit and urban planning analysis. This will ensure implementation in cities where they are most needed, and are well-integrated to the cityscape.

A primary remedy to overflowing banks is the use of water-catchments. A 2019 press release by Perbadanan Bekalan Air (PBA) Pulau Pinang highlighted the importance of these catchment areas - not just as a method to mitigate floods, but as a source of raw water. One example is the forest in Ulu Muda, providing 80% of Penang's raw water. This highlights the importance of forests. They act as water-catchments, water sources and carbon sinks. Flood water is not wasted, and can be reused. Forestry protection is thus an important tenet of successful climate mitigation. Studies have found that *legal* logging is troublesome due to poor enforcement of existing quotas (Susskind et al., 2020). Ulu Muda has been gazetted since 1932 as a permanent forest reserve, yet logging continued to occur until 2018 (PBA, 2019). Inconsistency riddles and plagues the federal Government's forestry protection policy. Resolving this requires a review of each states' forestry departments and the existing guidelines for Sustainable Forest Management (SFM) practices.

The penultimate challenge for Malaysia is sustainable growth. Malaysia needs to increase GDP without relying on coal, oil or natural gas to fuel that growth. Our ability to overcome this challenge requires a low-carbon development path. This entails a serious change in how we generate

electricity, and what modes of transport we use. Currently, only 22.4% of power is produced from renewable energy (RE) (KeTTHA, 2017a, Ujang 2018) which largely comes from hydropower. There is no obvious renewable substitute to natural gas. High humidity and cloud cover reduce efficiency of solar, and limited unused land mean large farms are expensive. Also, wind and large-scale hydro face difficulties supplying populated areas due to space requirements. It is likely that Malaysia will need to use a range of options instead of being able to invest in one. It is costlier, but yields an opportunity for new players to enter the energy market and compete with Tenaga Nasional Berhad (TNB).

The existing policy approach uses feed-in-tariffs (FIT) and net energy metering (NEM) to encourage the production of electricity from RE sources. This guarantees producers an above-market price. However, TNB is not required to connect RE plants to their grid. As a result, producers have to develop their own electric grids which increases costs and disincentives new projects. The Government should consider a change in this policy, shifting TNB's role from energy provider to a national *coordinating* manager. TNB would no longer be a market competitor, but the foundation and infrastructure upon which RE contractors can build future green energy capacity.

### **Adaptation Strategies**

The incidence of climate-related threats is only going to increase. In the face of such adversity, Malaysians need a plan. Government agencies such as The National Disaster Management Agency (NADMA) and the Malaysian Meteorological Department (Met Malaysia) should supply these. They must publish clear flood response guidelines and be accountable for their poor support over the last two years. Their flood-response was insufficient, leaving many Malaysians stranded, hungry and homeless.

The Environment and Water Ministry (KASA) proposed the identification of permanent relief centres (PPS). Such centres must be equipped with toilets, bathrooms and storage areas as soon as possible. We would suggest that centres have rescue equipment such as inflatable buoys, life-jackets and be the broadcasting centre for flood warning alarm systems. Access to strong internet connection to avoid communication blackouts during heavy storms is a must. The centres should be widespread and accessible, especially in East Malaysia. Roads or dirt paths may need to be cleared to connect rural villages to the PPS. During the dry seasons, PPS can function as communal areas for residents to learn flood-proofing techniques from the Government and each other. The strategies used by Kampung Giching residents in Sepang to adapt to floods (Chen, 2022) highlight the ingenuity of Malaysians. These solutions are curated and the best fit for residents in kampungs similar to the one in Giching. State governments can facilitate this level of adaptation by making it more affordable for residents to purchase flood-proofing equipment via subsidy or handouts.

On the agricultural front, the Government can build capacity for precision agriculture (PA). PA leverages technology and data collection on productivity, soil moisture and other environmental factors to manipulate planting times and deliver targeted interventions. Automated systems are used to minimise wasting water and fertiliser, and adjust watering schedules according to humidity levels. The use of PA can be applied to palm oil and paddy farming for monopolising harvest times, monitoring tree health, and automated watering or fertilising for fields. The primary obstacles to adoption are the high investment costs and the lack of technical expertise. The players who can take

advantage of PA, like Bernas, should do so. Policy requiring corporations using PA to share their data for research will support consolidation initiatives.

Climate change is likely to surpass the rate of advancement in technological implementation. As a tropical developing country, management strategies at the farm level can be widely adopted. A study looking at small-scale rice farmers in the Rajshahi District, Bangladesh found that practices of changing planting times, using early maturing rice variants and drought-tolerant rice were adopted (Ali et al., 2021). However, strategies requiring more knowledge about the ecosystem and cross-farm support saw lower employment. Other methods include incorporating trees on rice farms, building embankments and using mixed cropping. These measures can be the focus of knowledge transfer programmes. Farm-level strategies offer climate change adaptation that can be implemented sooner rather than later.

## **Conclusion**

Malaysia is limited by many factors. High barriers to adoption of mitigation measures are political, societal and financial. The authors have recommended low-cost measures that require less political will to combat this. Green nudging, knowledge transfer programmes and small-scale mitigation strategies are some examples. However, such measures would be insufficient without investing in long-term projects: research is a prerequisite to building the capacity to overcome climate change tomorrow.

Cooperation between stakeholders is integral to achieving these goals. The Federal and State Government, agencies, non-government organisations (NGOs) and corporations must work together. To harmonise stakeholder objectives, the Government may want to consider the creation of a new PEMANDU (Performance Management and Delivery Unit). PEMANDU was used in 2010 to facilitate the implementation of the National Transformation Plan. A newer version of PEMANDU can look towards connecting stakeholders and developing solutions, acting as a decarbonisation organisation for the country. The new PEMANDU must have sufficient power and authority, equivalent to its predecessor, to enforce its policy to ensure meaningful change. If PEMANDU 202X is as efficient as it was in 2010, Malaysia has hope in overcoming federal-state friction. Hope that we move to a low-carbon development path, and hope that our Goldilocks story doesn't end in disaster, but in harmony with our environment.

Constraints	Description
Federal-State friction	Policies enacted by the federal government are not always implemented by the state governments. This results from differences in political aims, revenue streams, capacity, language, and jurisdiction.
Limited government capacity and willingness to regulate	Malaysia has set ambitious environmental goals but struggles with enforcement. This is both a result of capacity limitations, especially at the state level, and lack of political will. The urban-centered seat and focus of the federal government further limits its ability to oversee and enforce mitigation projects outside of the major urban areas.
Absence of dedicated "decarbonization" agency	Challenges related to collecting data from different agencies and harmonizing ministry-specific approaches and policies as well as state-federal government agendas arise, in part, due to the absence of a dedicated agency to oversee Malaysia's transition to a low-carbon development pathway.
Lack of international funding and support	Promises by the developed world to provide Malaysia with significant financial and technological support have not materialized. Malaysia faces numerous barriers to importing green technologies. For example, developed countries are unwilling to share proprietary technologies, thus slowing down Malaysia's green technology transition.
Nascent public awareness	Malaysia's environmental awareness and activism, particularly concerning climate change, is still in its infancy. Older generation Malaysians and local and small and medium enterprises are the constituencies most disconnected from environmental concerns.
Barriers to renewable energy adoption	Malaysia's challenge in shifting to renewable energy are 2-fold. First, no one clear renewable energy alternative exists. Second, the lack of environmental awareness, financial status of many of its citizens, and private financing obstacles constrain investment.

Figure 3. Strategic Constraints to Malaysia's Decarbonisation

Source: Susskind, L., Chun, J., Goldberg, S., Gordon, J. A., Smith, G., & Zaerpoor, Y. (2020). Breaking Out of Carbon Lock-In: Malaysia's Path to Decarbonization. *Frontiers in Built Environment*, 6.

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