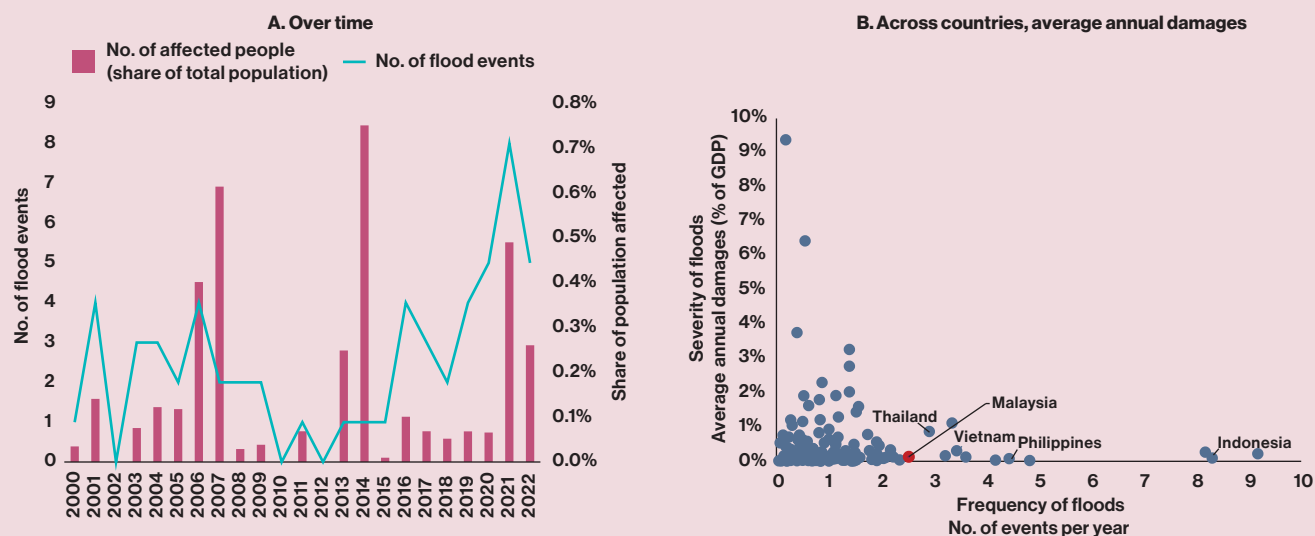


Floods and Finance: Building Resilience of Malaysian Businesses

Since 2000, floods have been the cause for 85% of all natural disasters in the country.¹ The frequency of these events has also increased since 2020. Eight large floods were recorded in 2021 alone compared to the predicted average of two flood events a year (Chart 1A). The severity of these floods may be relatively modest on a global scale. But for Malaysia, flood events have the largest economic impact and affect the highest number of people among all natural disasters (Chart 1B). Economic losses from floods amounted to 0.13% of annual gross domestic product (GDP) on average, and displaced 935,000 Malaysians, both temporarily and permanently, between 2008 and 2022.²

Chart 1: Frequency and Severity of Floods in Malaysia



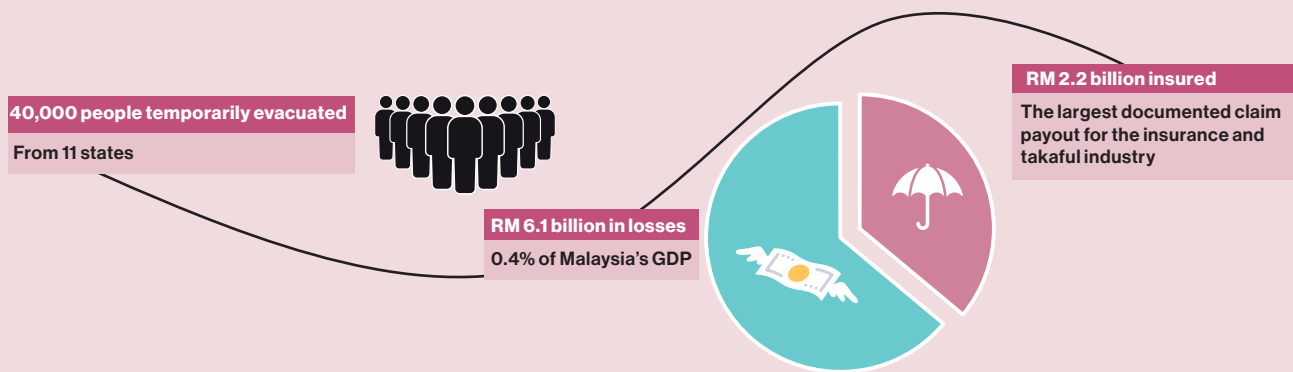
Source: EM-DAT Database, downloaded in May 2023

The catastrophic floods experienced in December 2021 highlight the potential for unabated climate change to have more significant impacts on the Malaysian economy and financial sector going forward (Diagram 1). The non-linearity of climate-related risks further underscore the importance of intensifying ongoing actions to improve flood risk management and mitigate potential consequences to Malaysia. Against this backdrop, the World Bank and Bank Negara Malaysia have worked together to analyse how adversely businesses can be impacted by floods, exposures of the financial sector and its role in supporting businesses to manage flood risks. The study also identified several key policy priorities to develop an enabling ecosystem for effective flood management. Key findings are published in the joint report entitled 'Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia' (the Report).

¹ Source: EM-DAT database, International Disaster Database

² Source: Internal Displacement Monitoring Centre (IDMC) database

Diagram 1: Impact of 2021 Floods



Note: Losses cover those from public assets and infrastructure, living quarters, vehicles, manufacturing, business premises and agriculture.

Source: Department of Statistics Malaysia, Bank Negara Malaysia

Overview of Malaysia's Flood Risk

Malaysia experiences two monsoon seasons: Southwest Monsoon (June through August) and Northeast Monsoon (November through February). The South and East Coasts of Peninsular Malaysia are particularly prone to frequent floods during the year-end monsoon season. Flash floods have become more common in major cities like Kuala Lumpur, Kuching and the state of Penang due to rapid urban expansion that leads to deforestation and insufficient drainage. Precipitation levels increased steadily between 1951 and 2020 and more than one climate model predicts further yearly increases by the end of the 21st century. Without adaptation efforts, this will expose Malaysia to increased flood risks. This means that historically 1-in-100-year floods could become as frequent as 1-in-50 or 1-in-25 years,³ with more damaging impacts to be expected.

Macroeconomic Impact of Flood Risk

In the Report, the macroeconomic impact of future floods was assessed using a two-stage input-output model. This can be equated to a simulation tool that links hazard data on floods with estimated economic impacts at the sectoral level. The model uses estimates of the share of assets at risk to floods in Malaysia for the year 2030, based on expected development patterns and potential climate change effects.⁴ This is combined with flood risk projections to calculate expected losses on aggregate output and employment.⁵ Malaysia is estimated to lose up to 4.1% of GDP or up to 4% of gross output⁶ in 2030 based on the impact of a theoretical 1-in-20-year flood. This takes into account direct losses from floods such as damages to physical assets and infrastructure, and indirect losses such as loss of income from supply chain disruption and diversion of tourism, nation-wide. This also does not consider reconstruction and rebuilding activities post flood event which would likely result in a more moderate impact on GDP and gross output for the year. The agriculture sector in particular could be severely impacted by floods due to its wide geographical coverage. Manufacturing and services sectors would also record a huge impact due to their large size in the Malaysian economy (Chart 2). The estimated impact to gross output⁷ (i.e. 4%) is applied to outstanding bank loans to show the segment of bank loans in each sector that would potentially be exposed in this flood scenario (Chart 3). Collectively, these represent very conservative estimates of the impact given the lack of granular level data especially on assets and bank exposures. BNM intends to refine its methodology for the computation of flood-related impacts to provide greater precision and granularity in future estimations.

³ World Bank Climate Change Knowledge Portal.

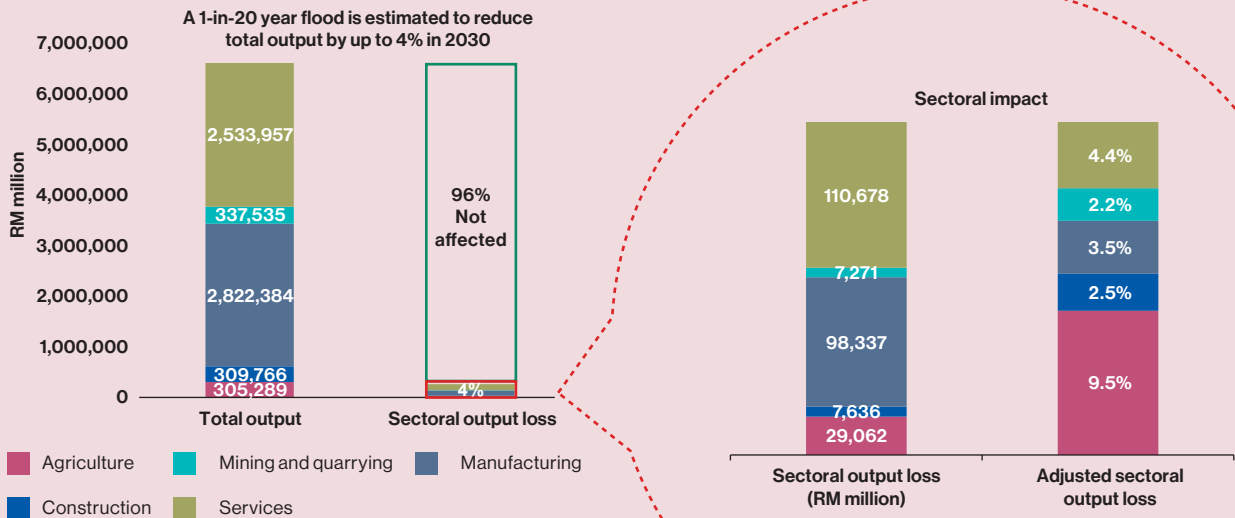
⁴ The main source of data used is the Fathom database, a proprietary database of flood risk maps widely used for flood risk research.

⁵ This model has been validated by comparing the results for several countries against different macro-economic models.

⁶ Gross output is a measure of the total economic activity in the production of goods and services including raw materials, production process and distribution. E.g. where a furniture manufacturer buys wood for RM100, and adds value to it to produce a piece of furniture sold for RM300. GDP is the value of the final product sold (i.e. RM300), whereas gross output is the value of the final product sold plus intermediate consumption (wood as the raw material) (i.e. RM300 + RM100 = RM400).

⁷ Gross output is used to take into account the impacts to supply chains, including nuances between sectors. For example, manufacturing has more intermediate demands that would count towards gross output but not GDP.

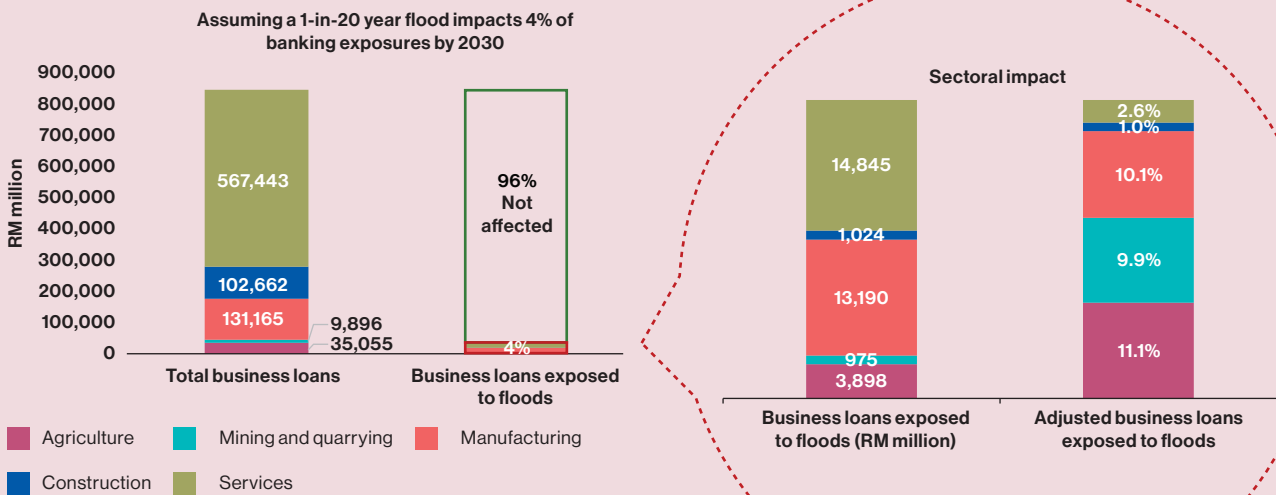
Chart 2: Losses in Output in a 1-in-20-Year Flood



Note: 1. **Adjusted sectoral output loss** refers to the proportion of output potentially lost in a 1-in-20 year flood, by sector.

Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

Chart 3: Banking Loan Exposures to Flood Risks in a 1-in-20-Year Flood

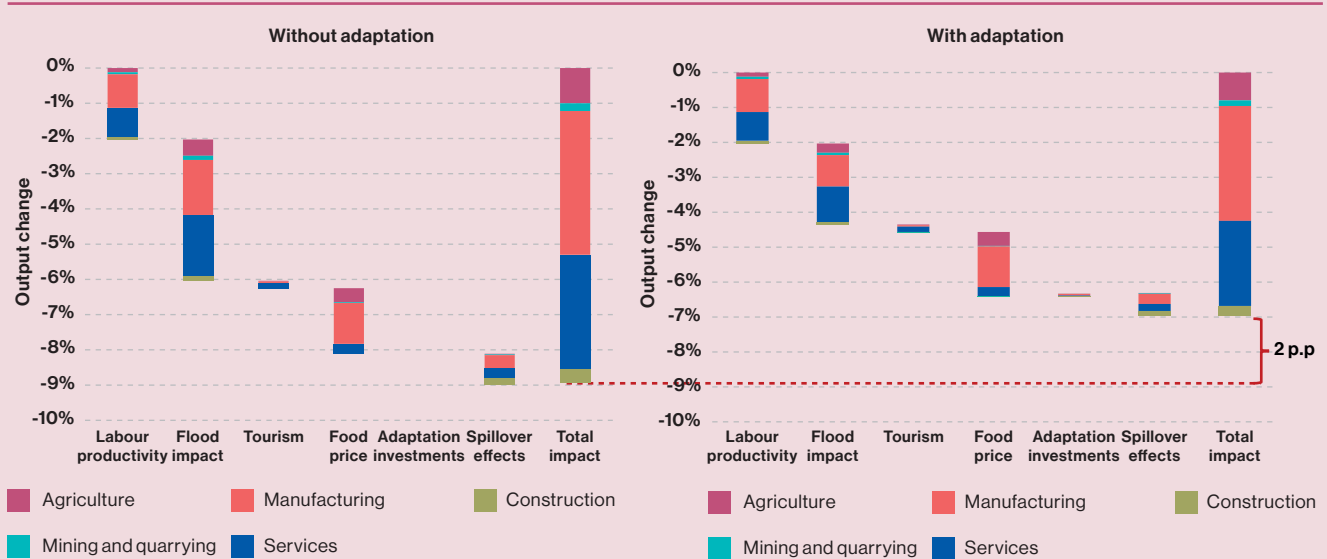


Note: 1. **Business loans exposed to floods** refers to the business loans potentially exposed to floods.
 2. **Adjusted business loans exposed to floods** refers to the proportion of loans potentially impacted by floods, by sector.
 3. Assuming static balance sheet as of December 2023.

Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

For comparison, the model was also run separately for a similar flood scenario where Malaysia undertakes additional climate adaptation measures between now and 2030. Such measures include improved land planning, enforced building standards, more flood resilient infrastructure and improvements to natural ecosystems that retain water. The results indicated that fully-implemented adaptation measures could reduce the economic impact of floods by more than 40% i.e. from loss of up to 4.1% of GDP (in the absence of adaptation efforts) to up to 2.3%. Such adaptation measures are estimated to cost up to 0.2% of annual GDP⁸ (Chart 4).

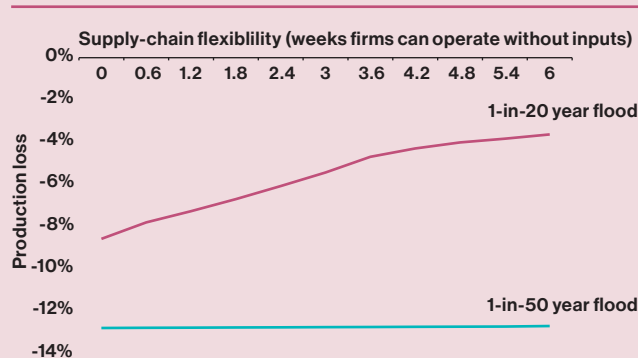
Chart 4: Climate Change Impacts on Output



Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

Further estimates show that actions by businesses themselves are essential to reducing the risk of flooding. Building supply chain resilience, such as diversifying input sources and holding inventory, can reduce expected losses of firms by over 50% in a 1-in-20-year flood. However, the offsetting role of supply chain flexibility is muted in the case of longer or more severe floods (Chart 5). The financial sector too is key in enhancing resilience by providing access to credit and protection as well as advisory services, to support adequate planning and speedy recovery of businesses.

Chart 5: Impacts of Floods on Output with Supply Chain Flexibility



Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

⁸ The data used is estimated based on a regional and global dataset due to lack of information on the specific set of adaptation measures needed in Malaysia. The modelled scenario assumes that all adaptation measures would need to be fully implemented; therefore, estimates can be interpreted as an upper bound for potential benefits of adaptation measures.

Businesses' financial resilience to floods

Based on a survey conducted amongst 1,500 Malaysian companies,⁹ about a quarter were affected by floods in the past three years. While a greater proportion of large firms¹⁰ were affected, small and medium enterprises (SMEs) are likely to incur more damage and disruptions, in particular with respect to indirect impacts of floods.¹¹ Across sectors, businesses operating in the agriculture and manufacturing (particularly automotive, machinery, and equipment) sectors and utility companies, were significantly affected. The latter indicates potential indirect impacts due to disruptions in infrastructure services. Affected firms attributed their losses mainly to a lack of awareness and understanding of flood risks (in particular, among smaller businesses) and inaction to strengthen preparedness to respond to such risk.

There is a range of coping strategies businesses can take to mitigate their vulnerabilities and ensure robust business performance, reduce losses, speed up recovery, and smooth expenses over time. Such strategies include adaptation measures that reduce the impact of floods (e.g. flood walls) and insurance¹² coverage. Our research looked into the factors affecting adoption of these strategies among businesses. The survey showed that businesses that considered floods as a recurring risk were more likely to take measures to strengthen resilience (Chart 6a,6b). Further, regressions indicate that once individual risk exposures are controlled for, the sector or location of businesses does not make them any more likely to take measures, including obtaining insurance. While SMEs and large businesses face common challenges in implementing adaptation strategies, the challenges are generally greater for SMEs due in large part to capacity constraints (Diagram 2). SMEs are less likely to have protection cover or supply chain resilience strategies compared to large businesses.

Chart 6a: Flood Risk Awareness and Adoption of Disaster Preparedness Strategies



Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

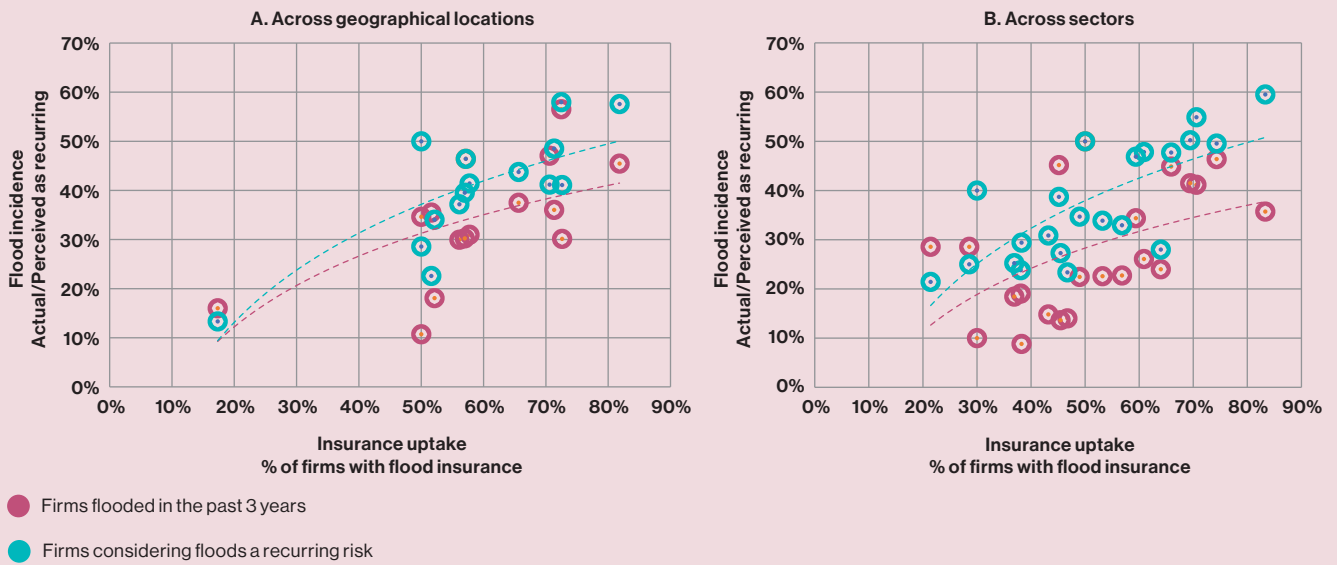
⁹ The survey was conducted in the first half of 2023, and results are representative of Malaysian companies in terms of firm size, business sector and geographic regions.

¹⁰ Defined as businesses with revenues above RM50 million.

¹¹ This includes impacts to customers, employees, supply chains and financial transactions.

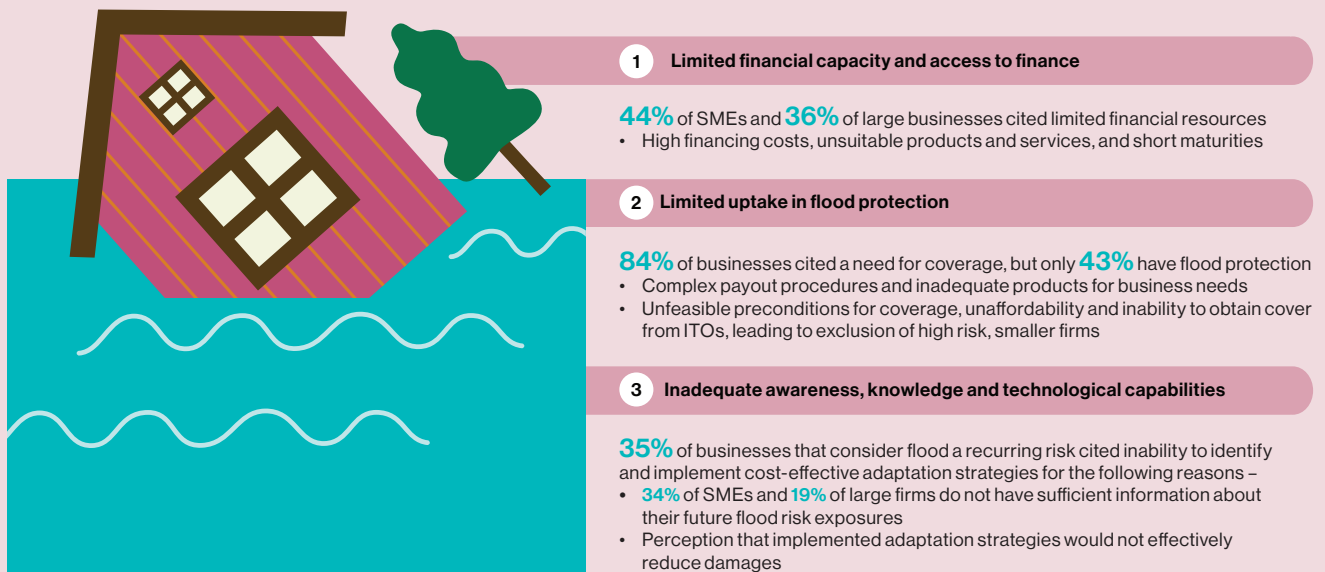
¹² The term insurance in this article refers to both insurance and takaful protection.

Chart 6b: Flood Insurance Uptake



Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

Diagram 2: Challenges for Businesses in Developing Adaptation Strategies



Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

Adaptation finance solutions by the financial sector

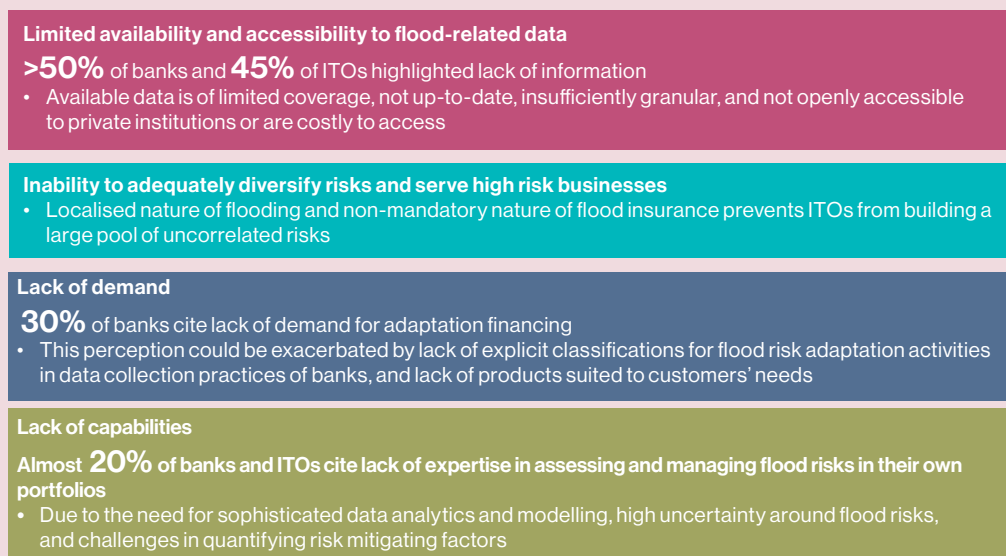
Globally, adaptation finance solutions remain under-developed for a range of reasons. Investments in flood resilience are often unattractive due to high upfront costs aside from longer payback periods and uncertain returns. Flood resilience projects also may not offer clear revenue streams or source of income for investors. In Malaysia, there is a limited project pipeline as resilience actions are not prioritised by businesses themselves. This is particularly the case for SMEs, which typically have high entry and exit rates. Inadequate action can also stem from the high uncertainty about the effectiveness of potential climate adaptation strategies. Additionally, limited information about government investment and initiatives in flood adaptation can hinder effective coordination between public and private sectors.

In Malaysia, adaptation finance largely exists in the form of revolving credit lines and term financing, bond and sukuk financing for natural disaster prevention measures and insurance/takaful coverage. Around 80% of surveyed banks offer such financing, with scope for further expansion in offerings. 60% of banks have started to assess flood risks of business clients. While the integration of such risk considerations into credit risk assessments remains in early stages, banks are increasingly engaging higher risk customers on flood cover or adaptation measures to mitigate exposures to flood risks as part of financing terms. Monitoring and reporting flood risks within banks are also in early stages. About 30% of banks are currently reporting these risks in internal or external assessments. The full implementation of BNM’s Climate Risk Management and Scenario Analysis (CRMSA) and the industry-wide climate risk stress testing are expected to enhance flood risk management and capacity within banks. This in turn is expected to expand opportunities to enhance financing solutions, but it could also increase challenges for businesses if financing needs for adaptation activities are not adequately supported.

Emergency financing following a flood event is typically offered by the Government but is limited to households. Businesses are thus reliant on the financial sector for financing for recovery and reconstruction efforts as well as debt servicing assistance in the aftermath of a flood event. At present, this largely takes the form of temporary moratorium on financing instalments. In the context of the 2021 flood, BNM stepped in to provide emergency funding with the Disaster Relief Facility (DRF). The DRF offers RM500 million in financing facility to micro and small and medium enterprises (MSME) affected by floods.

Flood insurance/takaful in Malaysia is typically offered as a non-mandatory ‘add-on’ peril to fire and motor protection products and is largely location-dependent. 80% of insurers and takaful operators (ITOs) currently consider flood risks when assessing business clients. Banks and ITOs highlight similar challenges in providing financing and protection to businesses (Diagram 3).

Diagram 3: Challenges Faced by Banks and ITOs in Providing Flood Financing and Protection

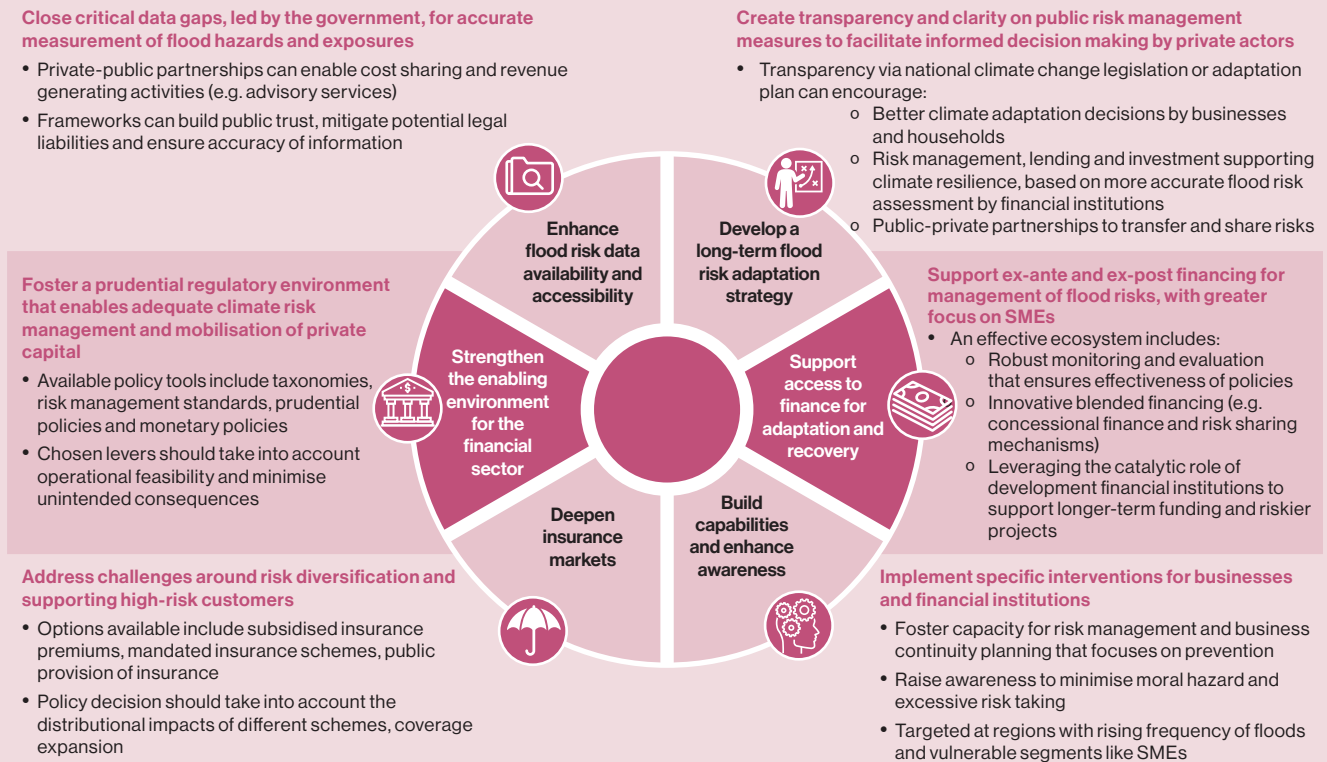


Source: World Bank and Bank Negara Malaysia, Managing Flood Risks: Leveraging Finance for Business Resilience in Malaysia

Public policies to support the management of flood risks

The Government plays a crucial role in developing comprehensive climate adaptation policies that enable and align incentives for businesses to adopt more resilient practices, and for the private sector to play a bigger role in financing adaptation activities. This in turn is vital to encourage the flow of private capital towards adaptation progress. The Report identifies six key policy priorities to ensure a facilitative ecosystem for effective flood management in Malaysia (Diagram 4).

Diagram 4: Key Recommendations for an Enabling Ecosystem for Effective Flood Management



Source: World Bank and Bank Negara Malaysia, Managing Flood Risk: Leveraging Finance for Business Resilience in Malaysia

Moving forward

This study is a first attempt by BNM to assess the macroeconomic and financial stability impact of flood events. BNM will continue to refine our methodology and assessment of the financial sector and economy's exposure to flood risks. This will also entail pursuing efforts together with the industry to address key challenges surfaced by the Report, such as data, capacity, products and solutions.

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EM-DAT (2008). EM-DAT: The International Disaster Database (Available at: <https://www.emdat.be>)

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