

Mitigating Flood Risk in Malaysia through Flood Insurance: Exploring the Feasibility of the United States and Japanese Approaches

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Abstract

Floods have the potential to occur in any location and at any time due to sustained rainfall lasting for several days. In light of these situations, governments that are hesitant to assume these heightened risks may perceive a greater desirability in expanding the involvement of private insurance companies. Nevertheless, the inherent communal nature of these risks necessitates active government intervention to provide sufficient insurance coverage. While there have been considerable studies conducted on flood insurance, there is a noticeable dearth of studies that particularly examine the flood insurance structure in Malaysia. The efficacy of catastrophe recovery in developed nations is contingent upon the crucial functions fulfilled by insurance and government assistance. Nevertheless, it is less common for developing nations to engage in such practices. Hence, this study aims to analyze the flood insurance approaches employed in the United States and Japan. Additionally, the secondary objective involves assessing the current state of flood insurance practices in Malaysia and evaluating its feasibility in adopting flood insurance strategies similar to those implemented in the United States and Japan. This study adopts a library-based approach, and the expected outcome of this research is to propose recommendations for Malaysia to improve its flood insurance system. This investigation adds to the existing body of knowledge by offering fresh perspectives on the efficacy of flood insurance practices in the United States and Japan, and their applicability within the context of Malaysia.

Keywords: Flood Insurance, Flood Risks, Flood Preparedness, Non-structural Flood Mitigation Techniques

Introduction

Flood disasters are increasingly common in numerous countries, primarily driven by climate change. These disasters usually strike floodplain regions, resulting in widespread destruction of property and loss of lives. However, predicting their occurrence remains challenging, as floods can unexpectedly hit areas that have never experienced them before. This natural calamity knows no boundaries, affecting both developed and developing nations alike. According to Ridzuan et al (2023), these disasters can strike any nation, developed or developing, regardless of how well they are prepared. Disasters, both natural and man-made, pose a threat to Malaysia and can inflict substantial damage and loss. Floods have been a major natural disaster in Malaysia for a long time, resulting in many deaths and substantial property loss.

An integral part of addressing present and future flood risk is strengthening building infrastructure to withstand flooding. When it comes to protecting citizens from flooding, government-provided flood protection infrastructure, or structural measures, are insufficient on their own (Hudson & Berghäuser, 2023). To mitigate the impacts of floods under these conditions, it is necessary to implement additional measures aimed at prevention and timely response. These strategies encompass both structural and non-structural flood mitigation measures to reduce flood risks. Ridzuan et al (2022) argued that both measures hold significant importance in equipping both the government and the populace to face flood events. Among the non-structural flood mitigation measures is the adoption of flood insurance (Dawson et al., 2011).

Roslan et al (2019) contended that flood insurance can alleviate the monetary consequences of damage by distributing the financial responsibility among individuals exposed to the same risk. Insurance has the potential to diminish the economic repercussions of property, dwelling, agricultural, or other valuable asset losses, consequently reducing economic fragility and enhancing adaptability. In times of natural calamities, home insurance can play a role in lessening financial hardships (Mahfuzul et al., 2022). In regions with widespread access to flood insurance, there is potential for a swift rebound following flood events (Thieken et al., 2014; Kreibich et al., 2011; Kjellgren, 2013). The availability of flood insurance can have positive societal implications, including promoting stability, facilitating recovery, addressing social equity concerns, and offering a pragmatic alternative to mass relocation in high-risk zones (Priest et al., 2005; Zsamboky et al., 2011; Association of British Insurers, 2005; Lamond & Penning-Rowsell, 2014).

Differences in policy and flood insurance uptake between developed and developing nations are striking. The United Kingdom, France, Germany, and the United States are only a few of the industrialized countries that have adopted insurance policies to protect their citizens from the effects of climate change and flooding (Kabat et al., 2005; Botzen & van den Bergh, 2008). Many people in less developed countries do not have access to flood insurance and must instead rely on ad hoc government payment in the event of flood damage (van Schoubroeck, 1997). This lack of financial protection leaves them vulnerable to the economic consequences of flood-related damages. When individuals and communities lack flood insurance, they are left to bear the full financial burden of repairing and rebuilding after a flood event. This can lead to severe economic hardships, as people may not have the necessary funds to repair their homes, replace lost belongings, or rebuild their businesses.

The costs associated with flood recovery can be substantial and often exceed the financial capacity of those affected.

A research conducted by Tehrany et al (2015) revealed that 9 percent of Malaysia faces the threat of flooding. As highlighted by Thirawat et al (2017); Chan (2015); Ng et al (2012), insurance plays a vital role in the nation's risk management efforts. Despite the recurrence of severe floods nearly every year, the utilization of flood insurance remains limited, even though it plays a pivotal role in efficient flood risk mitigation. As part of Malaysia's broader approach to flood risk management, exploring the possibility of increasing the adoption of flood insurance could be a worthwhile consideration (Roslan et al., 2019).

Although previous studies have extensively addressed flood insurance, there is a notable lack of studies that specifically delve into the flood insurance framework within Malaysia (Wan Daud et al., 2016). Recognizing the substantial research gap, Danhassan et al (2023) have suggested that upcoming studies should concentrate on investigating flood insurance. Hence, the primary aim of this study is to analyze the flood insurance approaches employed in the United States and Japan. Additionally, the secondary objective involves assessing the current state of flood insurance practices in Malaysia and evaluating its feasibility in adopting flood insurance strategies similar to those implemented in the United States and Japan.

The United States, Japan, China, Great Britain, Germany, and France stand out as the foremost nations in terms of their insurance market development. Notably, the USA and Japan take the lead in this regard, as highlighted by (Miroshnikova & Taskaeva, 2021). The United States is a prominent figure in the field of natural disaster insurance (Miroshnikova & Taskaeva, 2021). In the context of Japan, around half of its population resides in flood-prone areas, and floods affected 80 percent of its municipalities during the 1990s (Lin et al., 2007). The country has encountered a series of unprecedented flood events in recent years, sparking increased societal consciousness and concern about flood risk management. Intense rainfall and recurrent flooding have become more frequent than ever before, amplifying the focus on this issue (Oki, 2008). According to Jiang et al (2019), research into flood insurance and the associated legal frameworks in developed nations has established a hierarchy of the most efficient insurance systems globally, offering valuable lessons for developing countries. Hence, this study adds to the existing body of knowledge by offering fresh perspectives on the efficacy of flood insurance practices in the United States and Japan, and their applicability within the context of Malaysia.

Flood Insurance

Due to the profound societal and economic consequences of flood disasters, insurance emerges as a vital element in bolstering resilience against such events, supporting recovery, and motivating investments in hazard prevention (Jiang et al., 2019; Surminski & Thieken, 2017; Surminski & Oramas-Dorta, 2014). The demand for relief from the additional financial pressure triggered by weather-related incidents drives nations to explore more effective catastrophe insurance schemes worldwide (Shao, 2021). Flood insurance, through collaboration between citizens and private insurers, holds the potential to ease the fiscal burden on governments associated with disaster preparedness and relief. Funds from unaffected policyholders might be channeled to those impacted by the disaster (Lin et al., 2007). Prompt and accurate information on losses, damages, and the toll on life and infrastructure following a disaster is crucial for social insurers to manage claims efficiently and offer post-disaster support (Shakti et al., 2023). While not capable of fully compensating for

financial losses, flood insurance serves as a valuable economic risk mitigation tool. As demonstrated by two separate studies (Lin et al., 2007; Kreibich et al., 2011), having citizens covered by flood insurance can alleviate some of the government's financial burdens, acting as a safety net against losses during floods and reducing reliance on government aid. Within comprehensive ex ante risk management strategies, it is recognized as a pivotal instrument for disaster preparedness and risk transfer (Linnerooth-Bayer et al., 2005). While flood insurance cannot prevent physical property damage or loss of life like structural solutions, it can substantially curtail economic losses, particularly in flood-prone low-income nations (Aliagha et al., 2014).

Focusing on areas prone to frequent flooding, flood insurance enables collaboration among flood victims, governments, and concerned parties, enabling them to collectively manage flood risks. Insurers maintain their operational smoothness by assessing their payout capacity based on their financial strength and sharing risks. This form of insurance allows insurers to accumulate resources before disasters, ensuring post-disaster reconstruction and compensating losses in affected regions using insurance funds from unaffected areas, thereby fostering societal stability and economic viability (Jiang et al., 2019).

Disaster insurance serves to diminish losses stemming from catastrophes, hasten recovery processes, and provide financial security for those covered (Kousky, 2019). Insurance can aid in mitigating disaster-related losses by diminishing the probability of structural damage (Aliagha et al., 2014). Given its role as a financial safety net for life, property, and well-being, among other things, insurance involves recurrent premium payments over time in exchange for policy coverage against unforeseen disasters (Sukono et al., 2017). Climate change has the potential to yield economic ramifications (Arena, 2008; Chetty, 2006; Kugler & Ofoghi, 2005). The scope of insurance products can encompass a wide range of risks, from non-climatic to climate-induced events (Chetty, 2006; Lee et al., 2017; Mohagheghzadeh, 2017). Developing countries, especially within agriculture, often provide substantial subsidies for insurance (Smith & Glauber, 2012; Hazell et al., 2017). Insurance within urban areas might be voluntary or absent. Insurance facilitates collaboration between private and public entities, lessening dependence on public resources during disaster recovery and relief (Ching et al., 2010; Liu et al., 2016; Chen et al., 2012).

Urbanization and the impact of climate change impel governments to reconsider their approach to financial losses linked to floods, leading to an increased role for the private insurance sector (Boudreault & Ojeda, 2022). Flood insurance has long been recognized as pivotal by policymakers and scholars for adaptation. To limit financial impacts, homeowners are mandated to possess flood insurance. Appropriately set insurance premiums can enlighten homeowners about the financial implications of flooding in various locations. This may discourage households from settling in hazardous areas, discourage improper development, and promote flood mitigation (Hennighausen et al., 2023). A robust insurance framework empowers individuals to cope with losses surpassing their financial capacity, thereby expediting recovery and curbing indirect consequences like resource allocation or flood-related restrictions (Botzen et al., 2019). Nonetheless, this necessitates a swift and efficient insurance process, as delays in compensation could exacerbate stress and anxiety for policyholders, potentially surpassing the negative impact of receiving no assistance at all (Poonitirakul et al., 2017). Insurance guarantees proper financial restitution post-natural disaster, thereby expediting recovery (Kousky & Kunreuther, 2014). The anticipated rise in natural disaster insurance rates due to climate change could render them unaffordable for certain populations or exceed their willingness to pay (Lamond & Penning-Rowsell, 2014).

Types of Flood Insurance Schemes

There are four types of flood insurance schemes: bundled insurance backed by private markets and reinsurance (private and bundled), bundled insurance backed by the state (bundle and compulsory), optional/add-on insurance backed by private markets and reinsurance (private and optional), and optional/add-on insurance backed by the state (public and optional). Flood insurance is integrated into primary property insurance to expand the risk pool in bundled insurance supported by private markets and reinsurance (private and bundled). This strategy is known as the UK flood insurance model, and it is used in nations such as Hungary and China. This strategy works well, offering wide coverage to property owners at reasonable rates while ensuring the industry's financial stability and prosperity.

Bundled insurance backed by the state (bundle and compulsory): The government requires flood and other risk coverage in all property insurance plans. This is known as the UK Socialised Flood Insurance Scheme, and it is used by both the French and Spanish governments. Private insurance companies underwrite and sell the policies under this approach, while the state maintains a capital pool paid by a part of all premiums collected to support policy claims. This arrangement is desirable to the industry because it creates a secure market for insurers to operate in.

Optional/additional coverage provided by private markets and reinsurance (both private and optional): This framework is widely used in Germany, Austria, and South Africa. Households can choose whether or not to cover their property with flood insurance. The market concentrates predominantly on high-risk groups, resulting in higher premium prices due to potentially significant claims. Property owners in these countries feel that while constructing or purchasing a building, they should consider flooding and other potential disasters.

This U.S approach is known as the National Flood Insurance Programme (NFIP) and is operated by the Federal Emergency Management body (FEMA), a government body, in the optional/add-on insurance backed by the state (public and optional). This policy focuses on high-risk areas, with rates and coverage based on established flood zones and hazards. In high-risk situations, the NFIP is under political pressure to maintain prices lower than actuarial prices, resulting in relatively modest premiums. However, for risk assessment, this optional system strongly relies on the accuracy and quality of flood maps (Wan Daud et al., 2016).

Developed Countries

In developed nations, disaster recovery hinges on the pivotal roles of insurance and government aid (Michel-Kerjan & Kunreuther, 2011). While flood insurance is typically a voluntary choice in most countries, homeowners and farmers might be obligated to secure coverage as part of mortgage and loan conditions. Some countries, like Spain, Belgium, and France, incorporate mandatory aspects, whereas, in less developed nations, contracted farmers might face insurance mandates (Surminski & Oramas-Dorta, 2013).

In developed countries, the success of disaster insurance is closely tied to robust mitigation efforts, particularly through construction regulations and land management. Elevated risk mitigation significantly contributes to the viability of flood insurance. Enforcing specific building codes and land usage regulations by the government diminishes the likelihood of insurance losses, making catastrophe insurance more feasible. Effective disaster management can be achieved by combining both catastrophe insurance and mitigation techniques. Insurance serves as a risk transfer mechanism, furnishing financial resilience against natural calamities like floods (Millner & Dietz, 2011). Risk transfer methods aim not

to directly decrease flood impacts but to provide the necessary resources for swift recovery (Botzen, 2013). The probability of insurance losses diminishes when robust risk mitigation measures, such as stringent construction codes and land-use planning, are in place. This reduction in risk translates to lower catastrophe insurance costs for individuals and businesses. Essentially, enforcing specific construction and land development standards significantly curtails the potential for insurance losses, resulting in a more successful and economical catastrophe insurance framework in developed nations.

Flood insurance has emerged as a tool for managing residual flood risk in countries like the United States, the United Kingdom, and more recently, Australia during the 2011 Brisbane flood, augmenting non-structural approaches. As a result, flood insurance is now an integral part of comprehensive integrated flood risk management (Aliagha et al., 2014). In the United Kingdom, the government and private sector insurers have established an informal Gentlemen's Agreement that has guided private-sector flood insurance since the early 1960s. Except for regions less susceptible to flooding, homeowners are mandated to obtain this insurance policy. While maintaining awareness of the risks, the government might offer incentives for implementing risk mitigation measures (Salleh et al., 2018).

The United States

Flood insurance is integrated into flood risk management in the United States. As part of its flood risk management, the United States government established the National Flood Insurance Programme (NFIP). The federal government-run NFIP was established in reaction to the failure of the private market to offer enough flood insurance (Lin et al., 2007). The National Flood Insurance Act of 1968 established the NFIP, which has been in operation since 1968 to offer insurance to policyholders (Abbott, 2008). There was no market for flood insurance before the Act's adoption. In the 1950s, federal legislators performed a feasibility assessment for private flood insurance, but challenges in calculating prices based on risk probabilities rendered such a market unworkable for private insurance companies (Grossman, 1958).

The NFIP provides flood insurance to towns in exchange for them adopting floodplain management practices and building codes (Horn & Brown, 2022). Residents in the United States buy flood insurance primarily through the federally run NFIP, which was established in 1968 in response to increased federal relief caused by disasters in the 1960s and the insurance industry's refusal to cover this hazard due to their inability to accurately assess the risk (Kunreuther et al., 1978). The NFIP is overseen by the Federal Emergency Management Agency (FEMA). FEMA is in charge of mapping localities that participate in the NFIP and designating high to low flood zone risks within these mapped communities. They are also in charge of determining flood insurance premiums (Michel-Kerjan et al., 2014). Since 1968, the NFIP has offered federal government-guaranteed flood insurance to individuals and businesses, with over 5 million policies in existence and \$1.2 trillion in assets covered by 2015 (FEMA, 2016). Nowadays, the NFIP is the world's longest-running government-run disaster insurance program (Kerjan, 2010).

The NFIP provides flood insurance coverage for events like tropical storms, hurricanes, and heavy rainfall (Orie & Stahel, 2013; Kerjan, 2010). The majority of homes situated in flood-prone zones designated at the national level are required to acquire flood insurance through this program (GAO, 2013). The NFIP aids in subsidizing insurance costs in certain regions and mandates homeowners with federally supported mortgages to secure insurance (Yiannakoulis et al., 2018). Essentially, the NFIP furnishes financial support or cost reductions

for flood insurance to residents in specific geographical areas, making it more accessible to those living in zones susceptible to flooding.

Initially, the government flood insurance program was fully voluntary, but participation remained limited. However, following the substantial damage caused by Hurricane Agnes in 1972 along the Northeastern coast, government assistance was extended to predominantly uninsured coastal properties. In response, Congress revised the NFIP to necessitate insurance for homes located in Special Flood Hazard Areas (SFHAs) (McGuire, 2015). Flood maps have been employed to determine whether an individual or business requires flood insurance (Guat & Ming, 2020). These maps can enhance awareness of flood risks. In the United States, FEMA utilizes flood maps to pinpoint high-risk zones and mandates flood insurance. If a property is situated in a moderate-to-low-risk area rather than a high-risk zone, federal regulations do not mandate flood insurance. However, it is worth noting that historically, one-fourth of all flood claims originated from moderate-to-low-risk areas (FEMA, 2015). Consequently, irrespective of their location, individuals are strongly advised to consider purchasing flood insurance.

Homeowners residing in high-risk regions (designated as "100-year" or "base" levels, where flooding is projected to occur at least once every 100 years) are required to obtain coverage if they hold a federally backed mortgage (Michel-Kerjan & Kunreuther, 2011). A homeowner can secure coverage for both building and contents, with limits set at \$250,000 and \$100,000, respectively, provided their community participates in the program. This entails the creation of a flood-risk map and the establishment of adequate floodplain management regulations by the relevant public authority. Some additional coverage above these thresholds for residential properties is offered by private insurers, although this constitutes a minor portion of the total residential coverage (Michel-Kerjan et al., 2014).

The NFIP places increased responsibility on local governments to supply insurance coverage (Orie & Stahel, 2013). The program also can distribute losses over time by borrowing funds from the federal government to offset deficits, a capacity that commercial insurers lack (Michel-Kerjan et al., 2014). As anticipated, the majority of flood insurance policies under the NFIP are concentrated in densely populated coastal states. Notably, two states—Florida and Texas—account for over half of all active NFIP policies; nearly 70 percent of policies are distributed across five states—Florida, Texas, Louisiana, California, and New Jersey (Michel-Kerjan et al., 2014).

The NFIP marked a significant turning point in flood management within the United States. As the world's largest national flood insurance program, this system extends both short- and long-term financial assistance to individuals residing in flood-prone areas (Arnell, 1984). By controlling insurance access, the NFIP aims to safeguard property owners against floods while deterring development in high-risk regions. This initiative empowers participating communities to access government-managed flood insurance, safeguarding themselves from losses attributed to flooding. For structures within NFIP-participating areas, flood insurance is obligatory for all loans or credit associated with existing buildings, prefabricated homes, or constructions in progress. The U.S. Congress has restricted flood insurance eligibility to municipalities that have implemented appropriate land use and control measures, incorporating provisions to minimize flood risk (Guat & Ming, 2020).

In the United States, the federal government administers flood insurance through the NFIP, covering approximately US\$31.6 billion in New York State (NYS) and US\$8 billion in New York City (NYC). The NFIP holds significance as a risk reduction program by setting baseline criteria for local flood zoning and building regulations. It also incentivizes homeowners to

engage in risk reduction beyond these minimum standards. The NFIP has achieved notable success in providing flood insurance coverage to numerous U.S. homes that might otherwise lack access to it. Moreover, the program has effectively lowered the vulnerability of newly constructed buildings (Aerts & Botzen, 2011). Additionally, policyholders can benefit from premium discounts via the Community Rating System (CRS), which rewards communities engaging in risk reduction with premium reductions of up to 45 percent of full FEMA rates (Aerts & Botzen, 2011). In essence, the NFIP's protocols and guidelines have proven effective in reducing the susceptibility of newly built properties to potential flood-related damages or losses.

Japan

Japan is susceptible to flooding due to factors like typhoons, intense rainfall, snowmelt, and tsunamis (Fujita & Hamaguchi, 2012). Historical instances of floods have brought about significant consequences. Over recent years, there has been a noticeable increase in the occurrence of severe floods in Japan, leading to extensive harm to properties and loss of human lives (Hirabayashi et al., 2013; Kundzewicz et al., 2013; Misumi et al., 2016; Shakti et al., 2023). For example, significant flood events took place in various regions, such as the Kanto region in 2015 (Misumi et al., 2016; Nakatani & Misumi, 2018), the western part of Japan in 2018 (Kamimera & Misumi, 2020), and the central northern region of Japan in 2019 (Hirano & Iizuka, 2020), with a notable incident occurring in the Kyushu region in July 2020 (Hirano et al., 2020). Each of these cases resulted in substantial damage to both people and property (Shao et al., 2022). Projections linked to climate change indicate that this pattern could intensify in the coming years, contributing to the already increasing cumulative costs of damage in Japan (Alifu et al., 2022; Hirabayashi et al., 2013; Kundzewicz et al., 2013). Due to its geographical features, Japan is susceptible to floods and various other natural calamities. This vulnerability stems from the nation's topography, leading to the presence of rivers that tend to be short, steep, and lack substantial storage capacity in their upstream areas. There is growing concern among both public and commercial organizations about the risks associated with flooding and the societal consequences that come with it (Shakti et al., 2023). This concern is largely driven by the anticipated rise in flood insurance claims.

Japan's Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) reported that the estimated total flood damage in 2019 amounted to 2.15 trillion yen (equivalent to \$19.73 billion). This value has been on an upward trend in recent times, reaching its peak in 2019 (Shao et al., 2022). Despite the potential risks associated with flooding, Japan has primarily concentrated on offering natural hazard disaster insurance specifically for earthquakes, which also encompasses tsunamis, on a national level. Flood insurance, on the other hand, is exclusively provided by private insurance companies (Shao et al., 2022). In Japan, property owners have the option to include flood insurance as part of a conventional fire insurance policy. This approach originated as a response to a noticeable surge in insurance demand brought about by increased occurrences of severe typhoons and heavy rainfall during the early 1980s. To address this, the Japanese insurance market introduced coverage for typhoon wind and flood within comprehensive homeowners' insurance policies in 1984 (Sousounis, 2010).

In Japan, standalone flood insurance is not offered, as indicated by Wolf & Takeuchi (2022); instead, it is provided as an additional feature when purchasing other insurance types. Typically, flood insurance is combined with fire insurance, a requirement for most real estate management companies before tenants move in (GIROJ, 2022). Unlike the United States NFIP,

Japan does not have a nationwide flood insurance program. Thus, both tenants and homeowners must obtain flood insurance directly from insurance companies. Compensation for flood damage occurs when it surpasses 30 percent of the property's value or when flooding reaches a level of over 45 cm (GIROJ, 2022). Conversely, the Japanese government solely supports or endorses earthquake insurance coverage. This implies that the government promotes or secures insurance coverage for damages related to earthquakes (Atreya et al., 2015).

In Japan, two types of insurance exist private accident insurance and collective insurance, such as through Japan Agricultural cooperatives (Nakamura & Llasat, 2017). Flood insurance is encompassed within home fire insurance in both systems. Approximately half of homeowners are covered by fire insurance, with around 80% of those policies also including flood insurance. JA insures approximately 10% of homeowners, and their fire insurance policies inherently include flood coverage (Policy Research Institute, 2011). Interestingly, the insurance premium does not fluctuate based on the flood risk indicated by hazard maps in either insurance system (Nakamura & Llasat, 2017).

In Japan, flood insurance primarily takes the form of home insurance (Shao et al., 2022). The insurance industry was initially hesitant to provide flood coverage in 1948 due to the potentially catastrophic risks (Watanabe, 2013). However, given Japan's susceptibility to typhoons which can lead to devastating floods, the demand for flood insurance has remained consistently high (Shao et al., 2022). A pivotal event was Super Typhoon Vera, one of the most destructive typhoons, which hit Japan from Ise Bay in 1959. The substantial losses incurred during this event prompted a policy shift, leading the government to require insurance companies to offer disaster coverage (Shao et al., 2022). According to an assessment by the Cabinet Office, 66% of Japanese households have flood insurance (Cabinet Office of Japan, 2017). Additionally, the General Insurance Association of Japan reported that a total of 444 billion JPY (approximately 4.2 billion USD, based on an exchange rate of 1 USD = 106 JPY) was paid to 265 thousand customers across Japan in response to Typhoon Hagibis (The General Insurance Association of Japan, 2020).

In Japan, flood insurance coverage is restricted in scope, usually encompassing scenarios where flooding elevates water levels above a building's floor level. Typically, water infiltration occurs at a height exceeding 45 cm (roughly 18 inches) above the floor. Generally, insurance policies have a maximum payout limit, reaching up to 70 percent of the total insured property value in the event of a claim. However, certain companies adopt a different strategy. These carefully selected companies offer flood insurance policies that extend either full or partial coverage for flood-induced damages (Shao et al., 2022). Essentially, broader coverage options are gaining popularity over time in Japan.

The apprehension surrounding flooding has been proven to significantly enhance the likelihood of homeowners seeking insurance in Japan (Takao et al., 2004). The Japanese government has advocated for the transfer of flood risk to insurance carriers through updates to the fundamental disaster management strategy (Hisamatsu et al., 2020). Following the heavy rainfall event in the Kanto-Tohoku region in 2015, revisions were made to Japan's basic disaster management plan (Cabinet Office, Government of Japan, 2017), endorsing the shift of flood risk to insurance in the amended plan (Hisamatsu et al., 2020). Typhoon-induced wind and water damage have resulted in insurance payouts of 217 billion yen since 1991 in Japan, with an average loss of USD 2 billion (The General Insurance Association of Japan, 2019). This shift toward risk transfer through insurance has gained momentum due to shifts in government policies and the increasing threat of coastal flood damage (Hisamatsu et al.,

2022). According to Jiang et al. (2019), the risk distribution mechanism in Japan is mainly characterized by a layered risk transfer approach and a secondary reinsurance market. This means that the sharing of limited risks involves contributions from insurance firms, reinsurance companies, and the government. In simpler terms, all three entities—insurance companies, reinsurance firms, and the government—play roles in distributing and managing risks.

Developing Countries

In more developed countries, flood insurance has been integrated as a non-structural approach to flood control (Champonnois & Erdlenbruch, 2021; Zinda & Williams, 2021; Netusil et al., 2021). However, such practices are less customary in developing nations (Hossain et al., 2022). The number of individuals holding flood insurance policies in developing countries remains significantly lower than in developed counterparts, and the demand for flood insurance often aligns with the growth of per capita income (Hashim, 2019). In developing countries, the predominant approach to flood management primarily revolves around structural solutions, with flood insurance being notably scarce (Lin et al., 2022). The availability of flood insurance, and indeed natural disaster insurance in general, is notably limited in low and middle-income nations due to factors like their heightened susceptibility to extreme weather events, lack of information, insufficient public resources for risk mitigation, issues of affordability, and limited access to international insurance and finance markets (Skees et al., 2008). To manage extensive flood events, less affluent countries often rely on government aid and international assistance. As economies grow, the adoption of insurance mechanisms tends to become more prevalent (Michel-Kerjan & Kunreuther, 2011). Flood insurance is often scarce and not economically viable in many less developed countries. Conversely, in high-income nations, the availability and uptake of flood insurance are progressively increasing. However, the distinctive challenges posed by flood hazards sometimes hinder the feasibility of insuring against them.

Malaysia

In Malaysia, monsoonal floods occur every year, exhibiting fluctuations in their intensity, areas affected, and occurrence timing. The floods witnessed in 2014 across Kelantan, Pahang, Perak, and Johor were deemed some of the most devastating in the nation's history. This event led to significant economic setbacks and imposed a substantial financial load on the government (Wan Daud et al., 2016). As mentioned before, flood insurance stands as a viable option for both the government and residents to alleviate the adverse consequences of flooding.

Both Japan and Malaysia are recognized for possessing some of the world's leading flood management systems (Ujih et al., 2012). However, within Malaysia, flood insurance has unfortunately been disregarded as a fundamental element of a comprehensive, integrated approach to managing flood-related risks (Aliagha et al., 2014). Despite the prevalence of flooding in Malaysia, insurance coverage is primarily limited to vehicles, and a significant portion of the population lacks flood insurance for their residences, buildings, or businesses. Regrettably, as indicated by a study conducted by Zurich Malaysia involving 1,201 respondents in 2021, only 26 percent of Malaysian homeowners held flood insurance. Even though flash floods are recurrent and monsoon seasons are cyclical, 74 percent of Malaysian households remain vulnerable to flooding. However, the adoption of extensive flood insurance for motor vehicles notably surged in the initial six months of 2022, experiencing an

increase surpassing 100%, reaching 12% in comparison to the 5% reported for the entirety of 2021 (Nadzari, 2022).

The general public lacks awareness about the existence of flood insurance and often asserts that their area is not prone to flooding (Aliagha et al., 2014). Flood risk is commonly underestimated, leading to a deficiency in the demand for flood insurance (Wan Daud et al., 2016). Despite being among the available non-structural methods for flood risk management, flood insurance remains relatively uncommon in Malaysia (Ho, 2009). In this country, floods are commonly regarded as "Acts of God," resulting in an underdeveloped flood insurance market (Abdullah, 2004). Nevertheless, specific private insurance companies do provide flood coverage at a higher cost (Ho, 2009). According to Aliagha et al (2014), significant floods with considerable impact have nearly become an annual occurrence in Malaysia, yet flood insurance continues to be an undervalued and underutilized component of a comprehensive flood risk management approach.

Currently, the Malaysian government provides unscheduled flood relief assistance to affected individuals in the form of monetary aid, up to a maximum of RM500 per affected household. Nevertheless, the speed of disbursement poses challenges, and the provided amount is insufficient to cover the necessary flood recovery efforts (Ismail et al., 2019). Nonetheless, Jiang et al (2019) contended that governmental aid is often perceived as a form of free social welfare, potentially fostering a dependency on post-disaster government relief. This dependency can adversely affect people's incentive to actively participate in disaster mitigation and loss prevention measures. Consequently, it becomes imperative to establish and implement a comprehensive national insurance framework that ensures adequate funding for rehabilitation endeavors and facilitates a prompt recovery process for flood victims (Ismail et al., 2019).

Notably, the floods experienced in December and January of 2007 incurred an approximate cost of RM100 million (USD 30.4 million) for Malaysian insurance companies. However, the insurance claims only accounted for 7 percent of the overall damages, a fraction when compared to the government's expenditure of RM1.5 billion (Singh, 2007). The reasoning behind the low frequency of flood insurance claims might be attributed to the fact that coverage in Malaysia remains quite minimal, under 5 percent (revenue Times, 5 March 2007), despite the considerable potential for revenue that flood insurance holds (Aliagha et al., 2014).

The fire insurance scheme available in Malaysia primarily aims to address property loss related to homes. This policy, subject to tariff rates, specifically covers damages caused by fire, domestic explosions, or lightning. Additional perils, like floods, require an extra contribution. However, for economically disadvantaged communities, affording this insurance can be challenging. Moreover, some insurers and takaful operators might be hesitant to provide coverage for areas prone to flooding, leading to apprehensions about purchasing insurance (Wan Daud et al., 2016).

Expanding the coverage of flood-related risks under general dwelling insurance in Malaysia is possible through the payment of an added premium. Crafting flood insurance as a standalone policy targeted at individuals with lower incomes is of crucial importance (Salleh et al., 2018). Richard Low, the Executive Director of Stable Vision Corporation Sdn Bhd, noted that despite offering natural disaster protection for an extended period, many individuals opt out due to the extra premium involved. The standard rate for natural disaster coverage includes an additional 0.086 percent for floods. In the case of automobiles, the extra cost varies across insurance providers but typically ranges from 0.2 percent to 0.25 percent added

to the coverage amount. People and households can become eligible for compensation if they choose to include flood and natural disaster clauses in their vehicle and property insurance plans (Zainuddin, 2021).

Previously, the suggestion was made for the government to explore the necessity of flood insurance policies for safeguarding individuals during natural disasters. At that time, the Minister of Communication and Multimedia also proposed that legislative changes could compel companies to cooperate, ensuring flood victims receive such benefits. This insurance program could be funded through the 1Malaysia People's Aid (BR1M) for the 1Malaysia People's Group Takaful Insurance (i-BR1M), initiated in 2015. Deductions of RM50-100 might be allocated for insurance, a burden-lightening approach. However, after nearly a year of implementation, issues arose such as a lack of public awareness about claiming requirements and insufficient promotion by insurance companies and Takaful operators. As a result, substantial amounts of money designated for flood coverage have remained unclaimed by the public. If the money was left unclaimed, the funds revert to the corporation, in line with insurance practices. This circumstance has cast a negative light on the program's future continuation, with no alternative approach to alleviating the financial strain on flood victims currently available (Salleh et al., 2017).

Conclusion

In Malaysia, the prevalence of flood insurance purchases among Malaysians is comparatively low concerning other types of insurance, particularly motor vehicle insurance. Besides that, public awareness regarding flood insurance is currently insufficient. One of the contributing factors to the low uptake of flood insurance in Malaysia is the reliance on the governmental assistance for flood relief. Nevertheless, excessive reliance on the governmental support is inadequate in fostering resilience among flood victims due to the time-sensitive nature of flood-related financial aid. The absence of affordability is additionally identified as a contributing reason for the uptake of flood insurance among a significant portion of the population.

It is indisputable that flood catastrophes are an unavoidable occurrence, and Malaysia's susceptibility to such disasters is attributed to its geographical location. One potential measure to mitigate the consequences of floods is the acquisition of flood disaster insurance. Flood insurance confers significant advantages, particularly for individuals residing in areas susceptible to flooding. It is imperative for all stakeholders to actively participate in promoting the uptake of flood insurance among Malaysians, thereby mitigating the adverse financial consequences associated with flooding incidents.

The government may consider adopting flood insurance practices observed in developed nations like the United States and Japan. These countries possess greater expertise in flood management and face higher susceptibility to flood hazards due to their geographical characteristics, in contrast to Malaysia. The National Flood Insurance Programme (NFIP), which operates at the federal level in the United States, offers flood insurance coverage to municipalities that implement and adhere to a set of minimum floodplain management regulations. The NFIP mandates that properties situated in susceptible Special Flood Hazard Areas (SFHAs) must possess flood insurance coverage. Flood maps have been utilized as a means of ascertaining the necessity of flood insurance for both individuals and businesses. Furthermore, the NFIP offers flood protection to towns that adhere to and enforce floodplain management practices and building rules. Simultaneously, it discourages development in high-risk regions by restricting insurance accessibility.

A requirement has been introduced by the United States Congress to facilitate the provision of flood insurance. The provision of flood insurance is limited exclusively to localities that have implemented particular measures regarding land use and management. The aforementioned measures are implemented to mitigate the possible hazards associated with floods. Municipalities must have enacted procedures and regulations aimed at mitigating the risks associated with floods to meet the eligibility criteria for flood insurance. The need for proactive planning and risk reduction initiatives in communities aiming to get flood insurance coverage is emphasized by this criterion. In addition, policyholders have the opportunity to get premium savings via the Community Rating System (CRS), which provides communities that prioritize risk reduction with discounts of up to 45 percent off the rates established by FEMA.

In addition to the United States, Malaysia can also emulate the positive practices implemented in Japan. The distribution of risks in Japan is allocated between multiple stakeholders, encompassing insurance firms, reinsurance companies, and the government. Fundamentally, each of these companies has a role in assuming a proportionate share of the risks. Insurance firms assume a specific degree of risk, which they then transfer to reinsurance companies, with the government also playing a role in this process. The adoption of a collaborative strategy among various entities facilitates the effective management and mitigation of potential risks, hence minimizing the adverse consequences for any one party involved.

By engaging diverse stakeholders, the potential risks are effectively spread among different sectors and entities. The act of diversification serves to decrease the likelihood of a solitary entity assuming the entirety of a substantial risk occurrence, hence mitigating potential losses. When multiple stakeholders bear the burden of risks, the financial consequences of a significant risk occurrence are not concentrated solely on a single party. On the contrary, the distribution of the burden mitigates the risk of incurring substantial financial losses that could pose significant challenges for an individual organization in terms of recovery.

Every participant involved in the collaborative arrangement contributes their knowledge to the collective effort. Insurance businesses possess extensive expertise in the evaluation and control of risk, while reinsurance companies concentrate on the management of substantial and intricate risks. Additionally, governmental entities can offer regulatory supervision and financial assistance. The accumulation of this shared information contributes to the improvement of the comprehensive risk management procedure. Various stakeholders possess varying capacities to manage and mitigate risks. Insurance businesses have the necessary capabilities to manage risks of a routine nature, while reinsurance companies are adequately prepared to address risks of a more significant magnitude. In exceptional circumstances, the government can intervene to assist. The equitable allocation of liabilities guarantees that risks are assumed by the party most capable of effectively handling them.

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