

# Chapter 5

## Financing Adaptation Roadmap

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# Financing Adaptation Roadmap

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## ABSTRACT

This chapter discusses the financing of disaster risk management and climate change. Natural disasters and climate change will bring huge costs for the countries in Southeast Asia, and these costs are estimated to increase over time. Domestic finance, both public and private, will be a core source of funding to cover such costs, and several financial instruments, including innovative finance mechanisms, should be considered. Thus, the domestic financial market must be improved and a risk-sharing system developed to manage finance and risks. Therefore, this part proposes a step-by-step approach to make finance and innovative finance mechanisms available in the region. To facilitate this approach, two policy recommendations are proposed.

## 5.1 Introduction

Asia and the Pacific is considered one of the most vulnerable areas in the world in terms of climate change and natural disasters. Over the past decade, the region has been struck by several extreme natural disasters that produced many victims and damaged a wide range of assets, and the area is still dealing with these recent impacts. Disasters also continue to threaten the region's growth. A study by the Asian Development Bank (ADB) and International Food Policy Research Institute (2009) forecasted that climate change will lead to a 15% decrease in irrigated rice yields in developing countries and a 12% increase in the price of rice by 2050. In response to these challenges, member countries of the Association of Southeast Asian Nations (ASEAN) established their own roadmap to address climate change and the increasing incidence of severe disasters. Further, at the regional level, ASEAN has designed several policies to reduce the region's disaster losses, secure food production, and in turn, protect the development gains that have been attained.

In 2005, the ASEAN Agreement on Disaster Management and Emergency Response was signed. The objective of this agreement is ‘to provide effective mechanisms to achieve substantial reduction of disaster losses in lives and in the social, economic and environmental assets of the Parties, and to jointly respond to disaster emergencies through concerted national efforts and intensified regional and international co-operation’ (ASEAN Secretariat, 2005). In 2011, the ASEAN member countries adopted the ASEAN Roadmap for Disaster Risk Financing and Insurance (ASEAN Secretariat, 2011), and created a regional disaster risk financing and insurance programme (ASEAN, 2017) to implement the roadmap.

At the international level, several important agreements were adopted in 2015, including the Sendai Framework for Disaster Risk Reduction 2015–2030, the Addis Ababa Action Agenda, the 2030 Agenda for Sustainable Development, and the Paris Agreement. These agreements reflect long-term objectives to secure lives and livelihoods in sustainable manner. ASEAN member countries, along with other countries, support these agreements and are now preparing their own roadmaps to achieve the goals therein.

All of these agreements recognise the importance of mobilising resources to take the necessary actions. The outcome document of the Third United Nations (UN) World Conference on Disaster Risk Reduction highlights ‘Investing in disaster risk reduction for resilience’ as one of four priorities for action, and describes expected actions at the national and local levels as well as at the global and regional levels (UN, 2015a: paras. 30–31).

Further, the agreement at the Third International Conference on Financing for Development noted the following:

*Shocks from financial and economic crises, conflict, natural disasters and disease outbreaks spread rapidly in our highly interconnected world. Environmental degradation, climate change and other environmental risks threaten to undermine past successes and future prospects. We need to ensure that our development efforts enhance resilience in the face of these threats... We encourage consideration of climate and disaster resilience in development financing to ensure the sustainability of development results. We recognize that well-designed actions can produce multiple local and global benefits, including those related to climate change. We commit to investing in efforts to strengthen the capacity of national and local actors to manage and finance disaster risk, as part of national sustainable development strategies, and to ensure that countries can draw on international assistance when needed. (UN, 2015b: paras. 4, 62)*

Thus, investment and finance are recognised as key tools to achieve these agreements. For ASEAN member countries implementing their own roadmaps, investment and finance are crucial considerations. It is therefore necessary to determine how much funding is needed for climate change adaptation (CCA) and disaster risk reduction (DRR) in ASEAN, and how to manage any funding gaps. This chapter discusses some thoughts on financing the implementation of roadmaps in ASEAN member countries. To this end, we discuss the following questions:

- (i) What is the estimated cost of CCA and DRR?
- (ii) What sort of financial sources and schemes will be used for CCA and disaster risk management (DRM)?
- (iii) How will both short- and long-term funding gaps be managed?
- (iv) What is the ideal strategy for local adaptation and DRR in the fiscal and financial sector in the ASEAN region?

## 5.2 Cost of Climate Change and Disasters

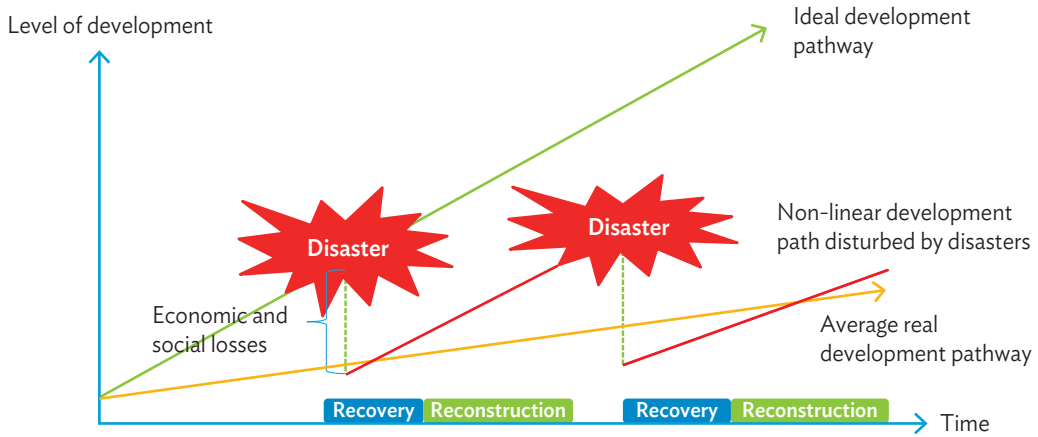
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### 5.2.1 | Damage Caused by Natural Disasters and Climate Change

Disasters are typically barriers to development. In principle, the main purpose of development is to improve people's quality of life. To achieve this goal, policymakers try to design the best development pathway in the context of each country. Such an ideal development pathway may be achievable if, and only if, no external shock occurs. Development efforts are easily disturbed by unexpected external shocks, such as natural disasters.

Figure 5.1 compares a development pathway with and without external shocks such as disasters. When a disaster occurs, many assets and much capital will be lost, and many economic and social activities will be disturbed. In addition, due to the loss of assets as well as business and social opportunities, a country's development may derail from the ideal pathway. If the impact of the external shock is limited and manageable within the country's capacity, it may be easy for the country to resume the derailed development pathway. However, if the impact of the external shock is too large and the country is unable to manage it, the country will incur huge costs and face a long recovery period, making it hard to return to the ideal development path. Developing countries in particular have limited capacity to manage the risk of large external shocks.

**Figure 5.1: Development Path Disturbed by Disasters**



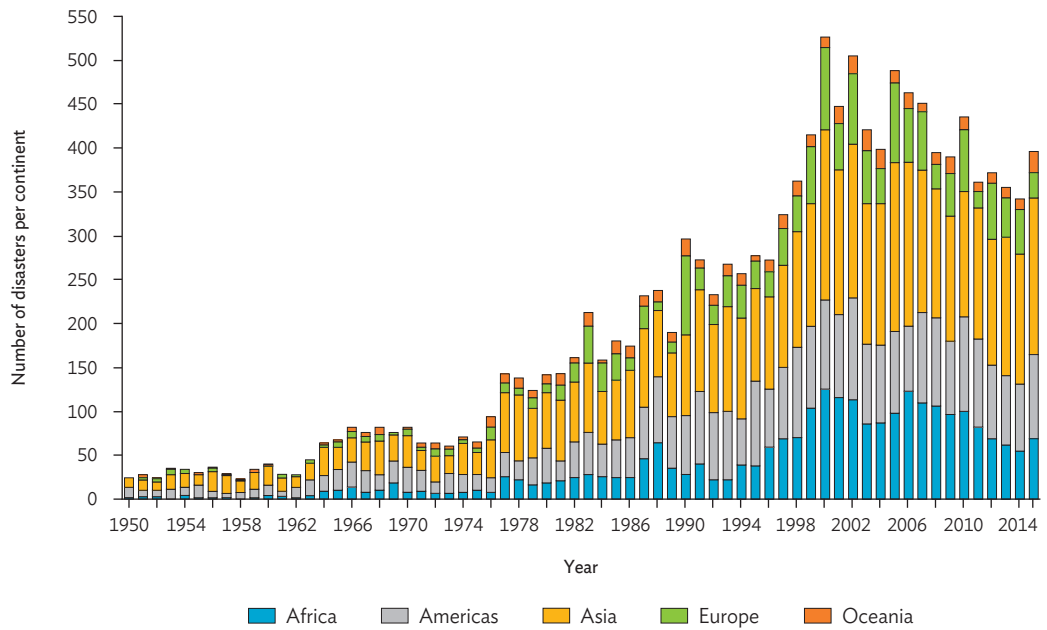
Source: Author.

Furthermore, the number of disasters is increasing. According to data from the Emergency Events Database, the number of disasters has increased exponentially since 1950, and has almost quadrupled since the early 1970s (Figure 5.2). Moreover, the scale of these disasters has also been increasing, inflicting ever greater losses and damage. Of the total number of disasters that have happened each year, around 40% occurred in Asia and the Pacific.

In 2011, Thailand was affected by a large flood. According to the World Bank and the Government of Thailand (2012), the total damage and losses amounted to B1.43 trillion (approximately \$46.5 billion), more than 13% of that year's gross domestic product (GDP). The floods were estimated to have reduced real GDP growth in 2011 by 1.1% from pre-flood projections, reduced Thailand's current account from a projected \$20.6 billion to \$11.9 billion, and caused a 3.7% loss in tax revenue from estimated pre-flood revenues.

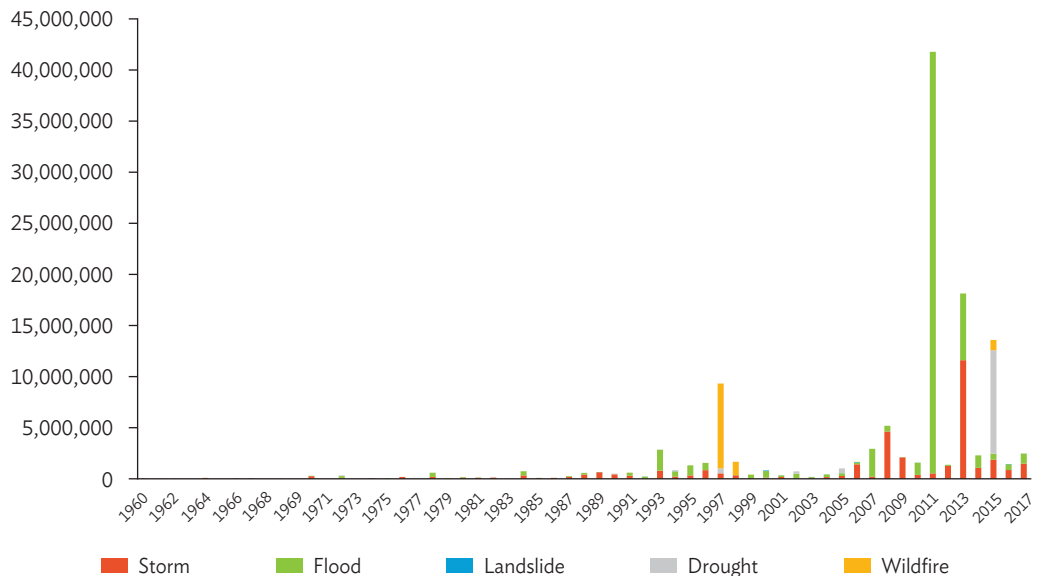
Figure 5.3 shows the economic damage caused by weather-related disasters in Asia. A comparison of the damages reported in Figure 5.2 reveals that economic damage caused by weather-related disasters has been gradually increasing since 2000.

**Figure 5.2: Number of Disasters by Region (1950–2015)**



Source: Centre for Research on the Epidemiology of Disasters (2019), Emergency Events Database. [www.emdat.be](http://www.emdat.be) (accessed 10 February 2019).

**Figure 5.3: Total Damage from Weather-Related Disasters in Asia (\$'000)**

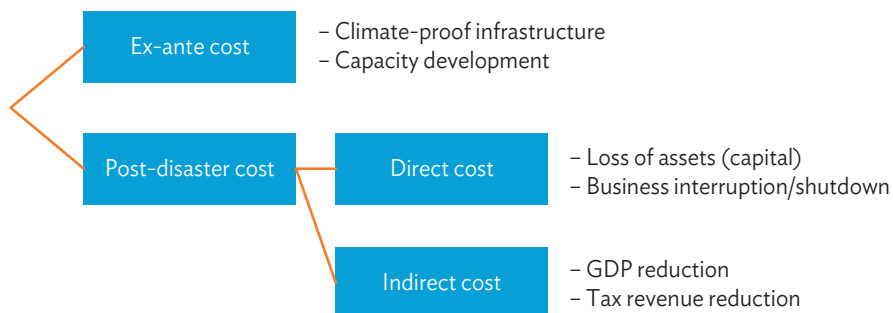


Source: Centre for Research on the Epidemiology of Disasters (2019), Emergency Events Database. [www.emdat.be](http://www.emdat.be) (accessed 10 February 2019).

There are two main reasons for this. First, the strength and frequency of natural disasters have been increasing. When a severe natural disaster hits, it damages many physical assets. Although most of these assets have been designed based on historical disaster data, they are still easily damaged as a result of unexpected changes in phenomena and in the severity of disasters. Second, the number of physical assets has increased due to economic growth, which has led to the increased accumulation of capital. When the number of physical assets increases, the probability of damage and amount of physical assets liable to damage also increase. If such newly developed physical assets are sufficiently resilient to the changing weather conditions, they may be unaffected by the disasters. However, as noted above, most physical assets are designed based on historical disaster data. Thus, economic growth and capital accumulation in terms of the increase in physical assets are two reasons why damage due to disasters is increasing.

Costs incurred for disaster management can be divided into two groups: ex-ante costs and post-disaster costs (see Figure 5.4). Ex-ante costs include several types of costs for disaster prevention measures, including additional costs for making physical assets resilient to disaster and climate change, and developing the capacity of countries to manage disaster and climate change. These are the costs of disaster preparedness. If the government and citizens spend enough on disaster prevention and preparation, the disaster risk exposure may be reduced. However, it is difficult to decide how much the government and citizens should spend to prevent and prepare for disasters.

**Figure 5.4: Costs of Disaster**



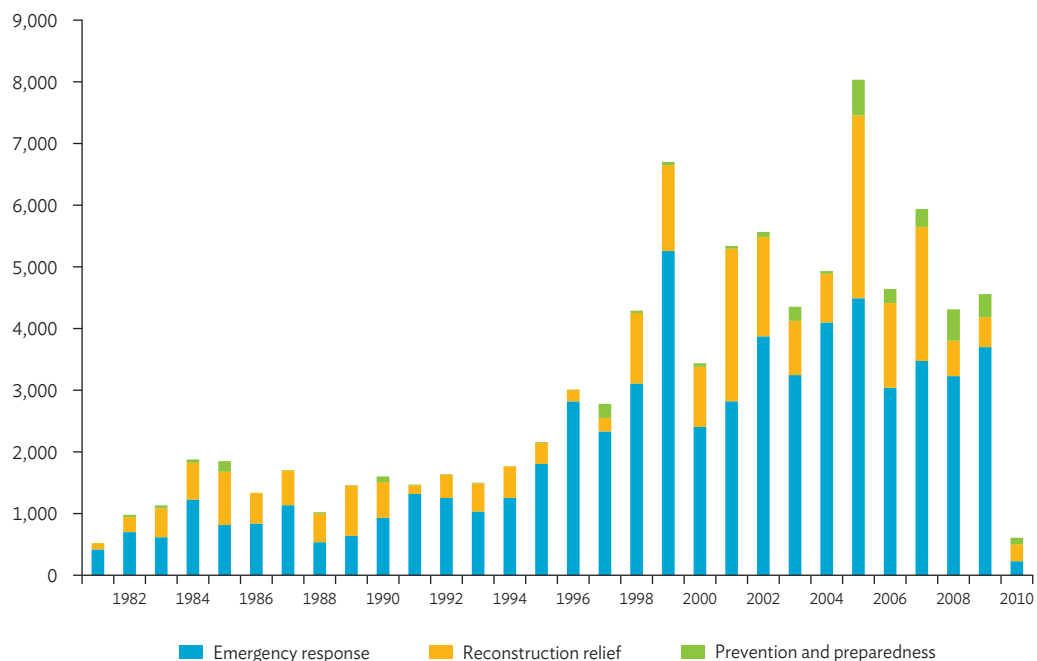
GDP = gross domestic product.

Source: Author.

Post-disaster costs can be divided into direct and indirect costs. Direct costs include the loss of assets and losses caused by business interruption and/or shutdown. When physical assets are damaged by disaster they must be rehabilitated or reconstructed. The owner of the physical assets may lose the value of the original assets, and need to pay to rehabilitate and/or reconstruct damaged assets. In the case of public assets that provide public services to citizens, the loss of assets will affect citizens' lives. Further, damage to assets by a disaster will affect various economic activities.

When severe disasters occur in developing countries, donors may provide financial assistance for disaster management. The World Bank (2013), which compiled disaster-related aid commitment data for a period of 30 years from 1981, has shown that most disaster-related aid is provided as an emergency response (69.2%) and as reconstruction relief (27.1%), while a limited amount (3.7%) is provided for prevention and preparedness activities (Figure 5.5).

**Figure 5.5: Disaster-Related Aid Commitments (\$'000)**



Source: World Bank (2013), *World Development Report 2014: Risk and Opportunity – Managing Risk for Development*. Washington, DC: World Bank.



Although such disaster-related aid is essential for the victims, it can be considered an opportunity cost. If no disaster occurs, the aid money can be used for other development purposes, thus contributing to the country's economic and social development.

Further, disaster-related aid can cover only a limited part of the direct losses and damages caused by the disaster; the government and victims themselves must cover the rest. Victims must also cover indirect losses caused by delayed recovery and a decline in economic activities, which may also affect the clients of businesses run by the victims.

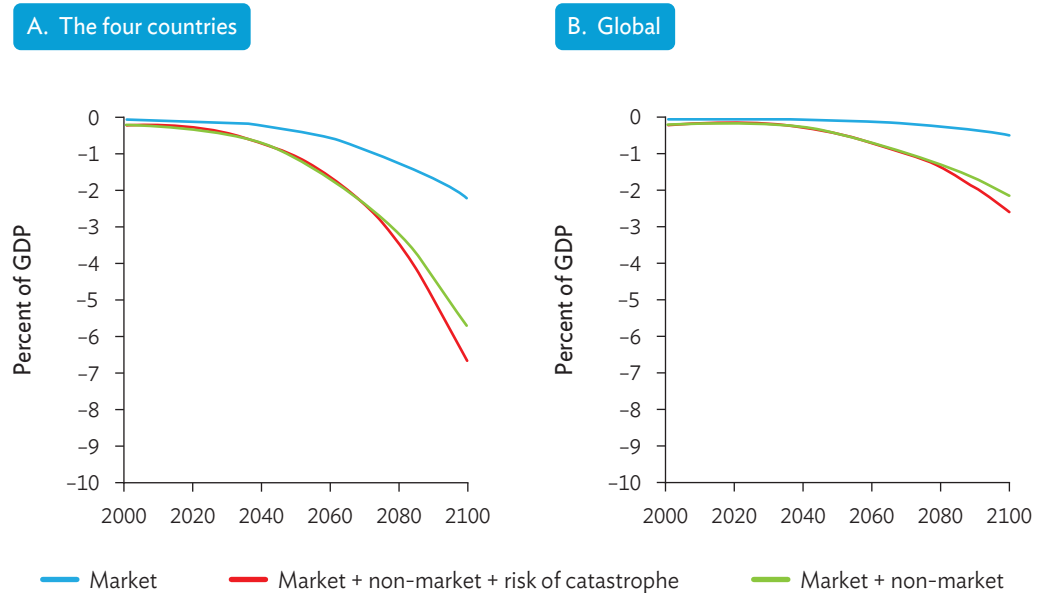
Disasters may also affect the business of financial institutions, such as domestic commercial banks. The most direct impact on the business of a financial institution is damage to its premises (headquarters and branches), and harm to its employees. Although financial institutions can also be victims of a disaster, they must do their best to continue to provide financial services to their clients, since clients affected by the disaster will need to access cash for emergency and recovery purposes.

## 5.3 Estimated Cost of Climate Change and Disasters

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### 5.3.1 | Existing Research on the Cost of Adaptation and Disaster Risk Reduction in Asia

Several agencies and research institutions have carried out estimations as to the cost of CCA and DRR, and ADB has published several reports on this subject. ADB (2009) examined climate change issues in Southeast Asia, with a particular focus on Indonesia, the Philippines, Singapore, Thailand, and Viet Nam. Using the PAGE2002 model to analyse the situation, ADB (2009) reported that four countries (Indonesia, the Philippines, Thailand, and Viet Nam) could lose 6.7% of GDP by 2100, if non-market impacts and catastrophic risks are taken into account. This is far higher than the global figure of 2.6% (Figure 5.6). This report mainly focuses on the extent to which climate change will impact the macroeconomy, and does not necessarily include the direct cost of climate change-related disasters. However, the indirect cost of climate change is also very large.

**Figure 5.6: Mean Impact under the A2 Scenario**

ADB = Asian Development Bank, GDP = gross domestic product.

Source: Extracted from Asian Development Bank (2009), *The Economics of Climate Change in Southeast Asia: A Regional Review*. Manila: Asian Development Bank.

In a recent report on Asia's infrastructure needs, ADB estimated the financial requirements for developing infrastructure in Asia, noting that 'Compared with the baseline estimates, our climate change-adjusted estimates are 16% higher—rising from \$22.6 trillion to \$26.2 trillion, or from \$1.5 trillion to \$1.7 trillion annually' (ADB, 2017). This amount can be considered part of the ex-ante cost for climate change.

ADB (2017) estimated Southeast Asia's infrastructure investment needs at about \$2,759 billion during 2016–2030 as a baseline. This means that \$184 billion in investment will be required every year. When additional investment for climate change is added, the region's infrastructure investment needs during 2016–2030 increase to \$3,147 billion, with an annual average of \$210 billion. That is to say, \$388 billion in additional investment will be required during 2016–2030 to adjust to climate change factors (Figure 5.7).

**Figure 5.7: Infrastructure Investments by Region, 2016–2030**

Region/Subregion	Baseline Estimates			Climate-adjusted Estimates		
	Investment Needs	Annual Average	Investment Needs as % of GDP	Investment Needs	Annual Average	Investment Needs as % of GDP
Central Asia	492	33	6.8	565	38	7.8
East Asia	13,781	919	4.5	16,062	1,071	5.2
PRC	13,120	875	5.0	15,267	1,018	5.8
South Asia <sup>a</sup>	5,477	365	7.6	6,347	423	8.8
India	4,363	291	7.4	5,152	343	8.8
Southeast Asia	2,759	184	5.0	3,147	210	5.7
Indonesia	1,108	74	5.5	1,229	82	6.0
The Pacific	42	2.8	8.2	46	3.1	9.1
<b>Asia and the Pacific</b>	<b>22,551</b>	<b>1,503</b>	<b>5.1</b>	<b>26,166</b>	<b>1,744</b>	<b>5.9</b>

GDP = gross domestic product, PRC = People's Republic of China.

<sup>a</sup> Pakistan and Afghanistan are included in South Asia.

Source: Extracted from ADB (2017), Meeting Asia's Infrastructure Needs. Manila: ADB. <https://www.adb.org/sites/default/files/publication/227496/special-report-infrastructure.pdf> (accessed 10 February 2019).

The figures in the 2017 ADB report include the cost of both mitigation and adaptation, and cover a limited number of sectors, including power, transport, telecommunications, water, and sanitation. Other sectors vulnerable to climate change such as agriculture are not included in this estimation.

The report observed the following:

*Besides climate proofing in the sectors covered in this report, climate adaptation requires shifts in portfolio and significant investments in sectors not covered here, such as irrigation and food security, disaster risk management (flood control in particular), and coastal protection to maintain and build climate change resilience. (ADB, 2017)*

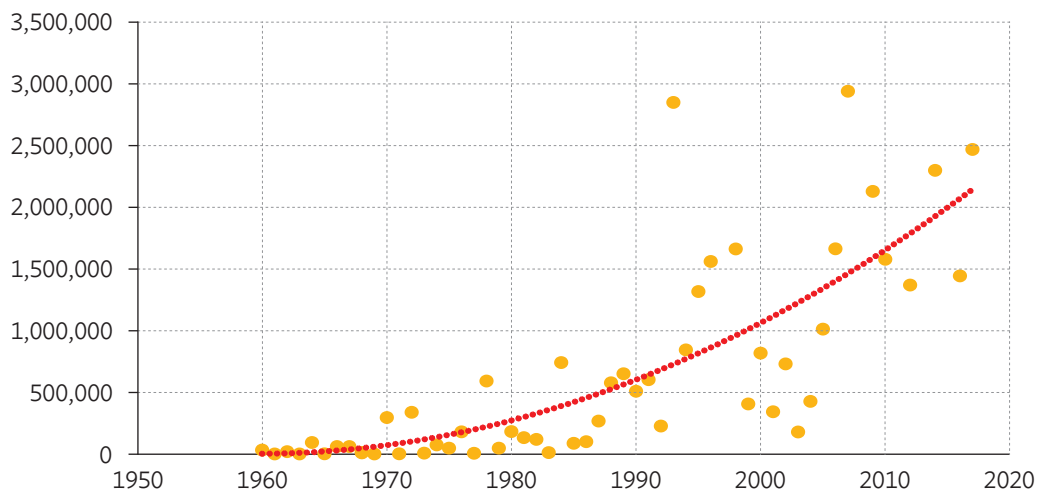
### 5.3.2 | Estimating Loss and Damage Due to Climate Change and Disaster in Asia

As noted above, ADB (2009; 2017) estimated the indirect cost and ex-ante cost reflecting the impact of climate change. However, this does not reflect damage caused by disasters.

To estimate the damages (direct costs), the trend of direct costs should be examined (see Figure 5.3). Figure 5.8 shows the trend of total damages since 1960, excluding years in which the damages were exceptionally huge (1997, 2008, 2011, 2013, and 2015). Even excluding extreme cases, a trend of increasing damage can be identified.

Based on the fit curve in Figure 5.8, we can estimate future damage due to natural disasters at \$3.2 billion in 2030 and \$5.3 billion in 2050. These figures may vary according to the scale of disasters, trends of accumulation of physical assets, and the vulnerability of those assets; however, it is clear that damage due to natural disasters will increase drastically in the future. Moreover, as the frequency and scale of extreme disasters have also been increasing in recent years, it seems likely that these trends will continue to shift due to climate change.

**Figure 5.8: Trend of Total Damage Due to Climate-Related Disasters in Asia**



Source: Centre for Research on the Epidemiology of Disasters (2019), Emergency Events Database. [www.emdat.be](http://www.emdat.be) (accessed 10 February 2019).

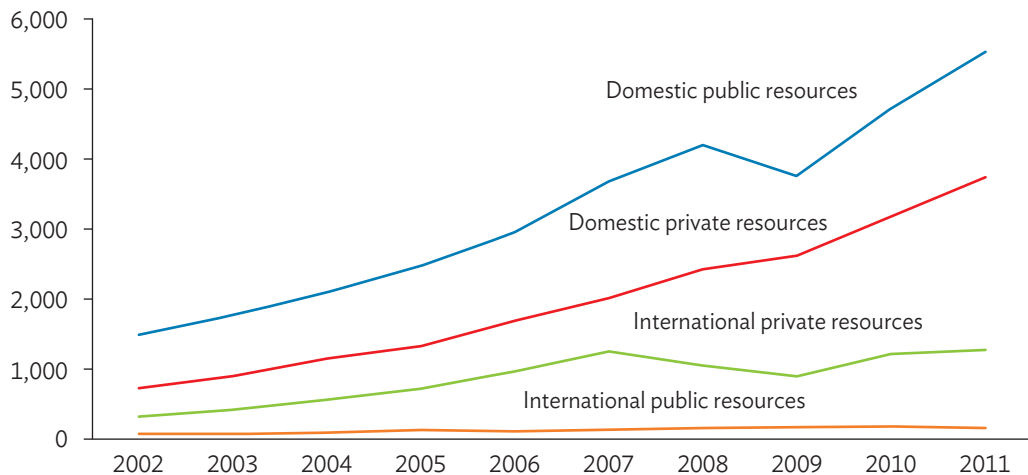
## 5.4 Finance Sources for Disaster Risk Management and Climate Change Adaptation

### 5.4.1 | Trends in Finance Flows in Developing Countries in Asia

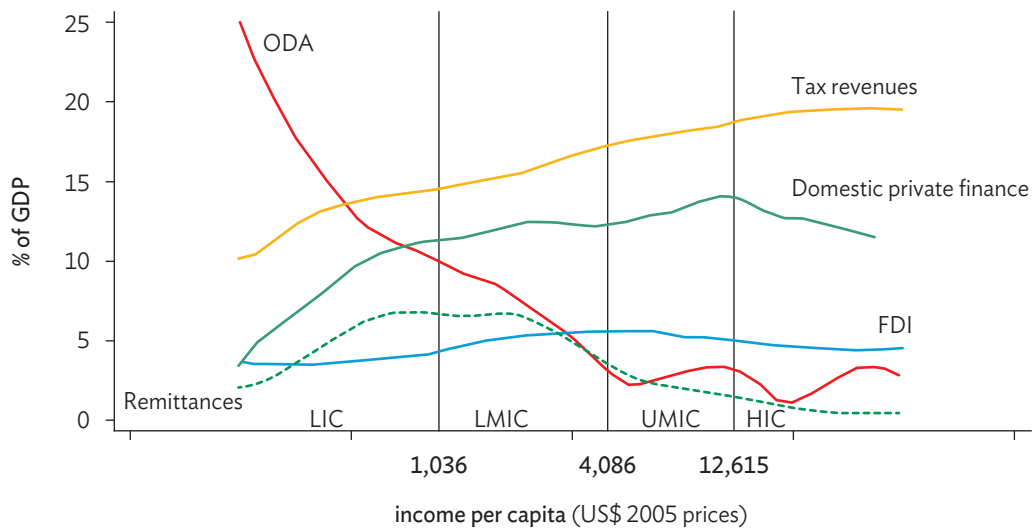
Asia and the Pacific will require billions of dollars to transition to low-carbon growth paths and adapt to the unavoidable impacts of climate change. Nevertheless, developing countries in Asia are in a good position because finance for climate change action is already available from a variety of sources.

The European Report on Development (2015) shows that finance to developing countries is increasing dramatically (Figure 5.9). Domestic resources in particular (both public and private) are contributing significantly to the increased volume of finance. In contrast, contributions from international resources are stable and relatively limited, although such resources still play an important role in the development of these countries.

**Figure 5.9: Trends in Finance to Developing Countries, 2002–2011 (\$ billion, 2011 prices)**



Source: Overseas Development Institute, European Centre for Development Policy Management, Deutsches Institut für Entwicklungspolitik, University of Athens, and Southern Voice Network (2015), *European Report on Development. Combining Finance and Policies to Implement a Transformative Post-2015 Development Agenda*. Brussels. <http://ecdpm.org/wp-content/uploads/2015-European-Report-on-Development-English.pdf> (accessed 10 February 2019).

**Figure 5.10: Variations in the Composition of Finance by Level of Income (% of GDP)**

FDI = foreign direct investment, GDP = gross domestic product, HIC = high income, LIC = low income, LMIC = lower middle income, ODA = official development assistance, UMIC = upper middle income.

Source: Overseas Development Institute, European Centre for Development Policy Management, Deutsches Institut für Entwicklungspolitik, University of Athens, and Southern Voice Network (2015), *European Report on Development. Combining Finance and Policies to Implement a Transformative Post-2015 Development Agenda*. Brussels. <http://ecdpm.org/wp-content/uploads/2015-European-Report-on-Development-English.pdf> (accessed 10 February 2019).

Several types of finance resources are currently available, and each country relies on different sources depending on its economic scale and level of income. Figure 5.10 shows differences in the composition of countries' finance by level of income.

Figure 5.9 shows that domestic resources dominate the sources of finance and that this volume is increasing dramatically; however, the data in Figure 5.10 show that the poorest countries rely on official development assistance (ODA) rather than domestic resources. This may be one of the reasons why less developed countries often ask donors to increase the allocation of ODA. Over-dependence on external funding, including ODA, could constitute a risk for these countries since they are unable to control external funding. Thus, each source of finance has its own characteristics, potential, and risks.

## 5.4.2 | Characteristics of Financial Sources

Sudo (2016) compared the characteristics, potential, and risks of each finance resource. In the following subsection, we will discuss each source of finance in greater detail.

**Table 5.1: Characteristics, Potential, and Risks of Finance Sources**

Source	Characteristics	Potential	Risk
<b>Domestic public finance</b> <ul style="list-style-type: none"> <li>National budget (national tax)</li> <li>Municipality budget</li> <li>Bonds</li> <li>Domestic financial institutions</li> </ul>	<ul style="list-style-type: none"> <li>Most stable and lowest risk source of finance</li> <li>Good for finance for low-profit public projects</li> <li>Contributes to leveraging domestic private finance</li> </ul>	<ul style="list-style-type: none"> <li>Improved governance and financial system leading to increase in domestic finance flows and foreign direct investment</li> </ul>	<ul style="list-style-type: none"> <li>Political difficulty of increasing tax revenue</li> <li>Lack of capacity for appropriate public fiscal management</li> <li>Risk of crowding out private finance</li> </ul>
<b>International public finance</b> <ul style="list-style-type: none"> <li>ODA</li> <li>OOF</li> <li>Multilaterals</li> </ul>	<ul style="list-style-type: none"> <li>Stable and low-risk finance but low predictability</li> <li>Limited volume of finance</li> <li>Must be used efficiently and effectively</li> </ul>	<ul style="list-style-type: none"> <li>Leveraging of private finance</li> </ul>	<ul style="list-style-type: none"> <li>Risk of crowding out private finance</li> <li>Need for appropriate foreign reserve and foreign exchange management</li> </ul>
<b>Private finance</b>	<ul style="list-style-type: none"> <li>Largest finance source</li> <li>Contributes to sustainable development by investing in projects where social benefits are increased while private benefits are maximised</li> <li>Generates employment opportunities and creates a sustainable development impact through business expansion</li> </ul>	<ul style="list-style-type: none"> <li>Increased private finance flows into developing countries</li> <li>Increased finance flows between developing countries</li> </ul>	<ul style="list-style-type: none"> <li>Unstable due to the economic situation and sensitive to risks</li> <li>Difficult to capture the total flow of private finance</li> <li>Difficult to ensure transparency and accountability due to business confidentiality</li> </ul>
<b>Blended finance</b> <ul style="list-style-type: none"> <li>PPP</li> <li>European Union blending mechanism</li> </ul>	<ul style="list-style-type: none"> <li>Sharing of risks and costs by the public; private finance will be mobilised and contribute to establish a better business environment and market.</li> </ul>	<ul style="list-style-type: none"> <li>Increase in private sector participation</li> </ul>	<ul style="list-style-type: none"> <li>Risk of market distortion</li> <li>Risk of dependence on the public</li> </ul>

ODA = official development assistance, OOF = other official flows, PPP = public-private partnership.

Source: Sudo, T. (2016), 'Domestic and International Finance in a Regional Perspectives' in V. Anbumozhi, K. Kalirajan, F. Kimura, and X. Yao (eds.) *Investing in Low-Carbon Energy Systems – Implications for Regional Economic Cooperation*. Singapore: Springer Science+Business.

#### 5.4.2.1 Domestic Public Finance

Of the available sources of finance, domestic public finance is the most promising, most stable, and lowest risk. In general, domestic public finance will be collected through taxation, the issuing of bonds, and/or fundraising from the domestic market through other public entities, such as the national development bank. Domestic public finance is, in general, managed by the finance ministry and spent through the public expenditure system. Thus, domestic public finance is useful for public services where profit is limited but that provide a large public benefit. In addition, public expenditure may catalyse the mobilisation of private finance flows by sharing (or taking) risks associated with privately funded public projects, or by subsidising low-profit projects with a large public benefit. Therefore, good governance and financial system management along with the catalytic role of public finance may lead to an increase in domestic finance flows and foreign direct investment.

Nevertheless, domestic public finance does carry some risks. First, political difficulties may hinder increases in tax revenue. Although tax revenue may increase naturally if the country's economy grows, increasing tax revenue by changing the tax rate requires political acceptance. Obtaining public acceptance of a tax rate change is one of the most difficult challenges for politicians. Second, the inappropriate management of public finance may send the wrong message to the market (i.e. investors) and lead to a lost opportunity to increase private finance. Third, there is a risk of crowding out the private sector, since public finance is more desirable than private finance.

#### 5.4.2.2 International Public Finance

International public finance, such as bilateral ODA, other official flows, and multilateral development finance, provide stable and low-risk finance. However, as discussed in the previous section, the volume of international development finance covers a very limited part of finance flows, even though the poorest countries still largely rely on ODA and multilateral development finance. In addition, as the main source of international public finance is from donor countries' fiscal budgets, both donor and recipient countries must be responsible for their accountability to their respective taxpayers. In addition to the pros and cons of domestic public finance, recipients need to manage foreign exchange risk and foreign reserves to maintain the stability of the value of their own currency and financial market.

In addition to traditional donors, emerging donors and funds have recently been playing an important role. For example, the Green Climate Fund, which was established to help non-Annex I countries tackle climate change, is expected to play a central role in facilitating



climate change finance. The Government of China recently called for the establishment of the Asian Infrastructure Investment Bank to facilitate infrastructure investment in Asia and the Pacific. Such nontraditional international public finance providers are expected to play an important role in helping Asian countries access international finance.

#### 5.4.2.3 Private Finance

Private finance accounts for a large part of finance flows in Asia and the Pacific. As shown in the previous section, the volume of foreign direct investment flows in Asia is more than 30 times that of ODA. Since private finance is directly linked to business, increasing private finance may lead to several public benefits, such as employment opportunities and market expansion. On the other hand, due to its profit-focused nature and sensitivity to risks, private finance is not necessarily considered a stable source. Further, due to its business confidentiality, it is difficult to ensure transparency and accountability.

In addition, the scale of private finance depends on the depth of the financial market. Access to banks and/or level of financial inclusion are important factors to consider for increased private finance. The level of development of the financial market in Asia differs by country. The Asian Development Bank Institute (2014) has suggested the importance of financial integration and cooperation in ASEAN in the pursuit of the economic integration of ASEAN.

#### 5.4.2.4 Blended Finance

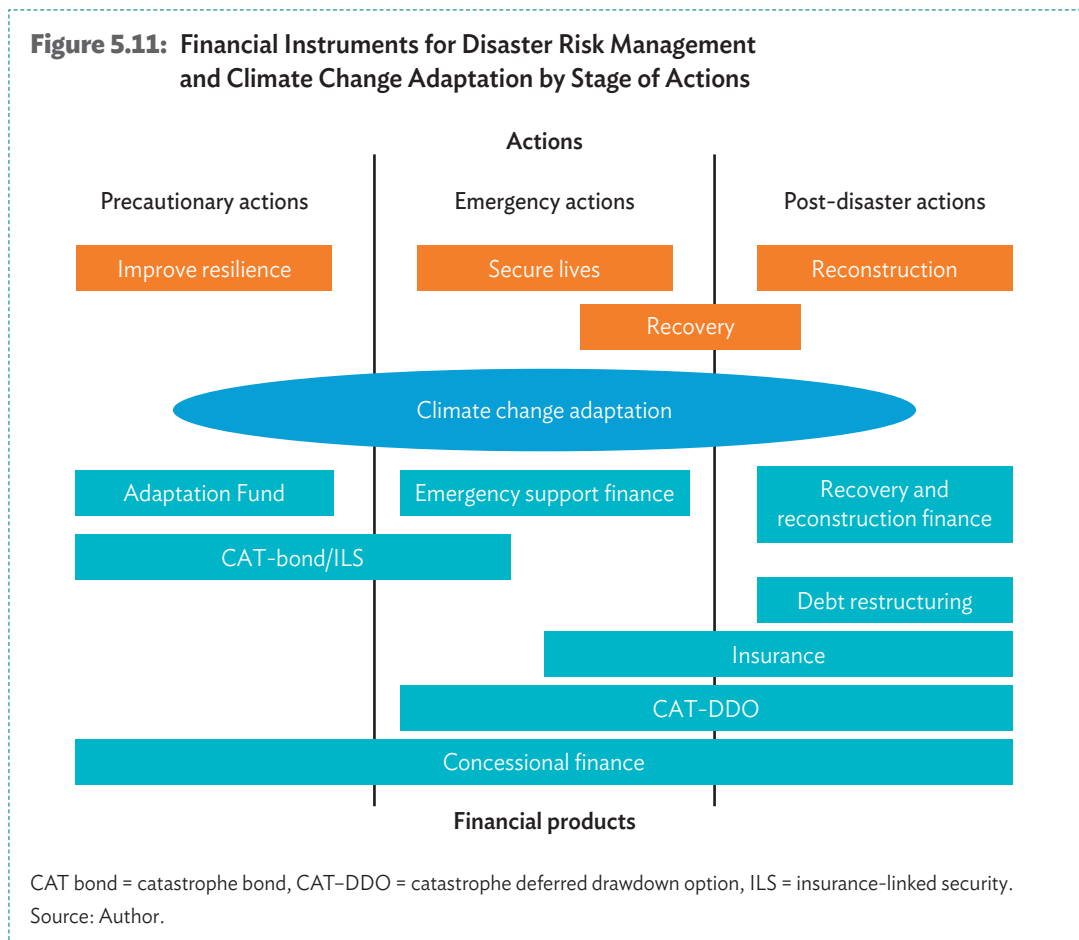
Mustapha, Prizzon, and Gavas (2014: 2) defined blended finance as ‘the complementary use of grants (or grant-equivalent instruments) and non-grant financing from private and/or public sources to provide financing on terms that would make projects financially viable and/or financially sustainable.’ Blended finance may enable the public sector to share risks and costs to facilitate the entry of private finance in infrastructure development.

However, grants or grant-equivalent instruments from the public sector may provide favourable financial conditions for the private sector, which may distort the competitive environment. Thus, blended finance should be used when the competitive environment is secured.

## 5.5 Financial Instruments for Disaster Risk Management and Climate Change Adaptation

### 5.5.1 | What Sort of Financial Instruments Are Available?

Some financial institutions have already developed several financial products to cope with disaster and food security. In this section, we try to identify financial instruments for coping with disaster and food production volatility, and categorise them by stage of events. Figure 5.11 summarises some financial instruments for coping with major disasters. Actions are categorised according to three stages: precautionary, emergency, and post-disaster. The circumstances of these stages differ in terms of uncertainty and necessary terms and conditions of the instrument.



### 5.5.1.1 Financial Instruments for Precautionary Actions

Precautionary actions are defined as actions to prepare for and strengthen resilience to extreme weather events. At this stage, it is unpredictable when and how large disasters will occur due to extreme weather events, creating uncertainty as to the scale of future disasters.

Consequently, project and programme managers must raise finance based on the design and financial requirements of their own project or programme. The manager may incorporate disaster risks into their consideration at the design stage by carrying out a sensitivity analysis. In this sense, the financial instruments used for the projects and programme fall under general project finance.

If the project or programme is sensitive to disaster risks, the managers may select the catastrophe bond (CAT-bond) to minimise (or transfer) the risks of default caused by damage due to a disaster. The nature of a CAT-bond is discussed in greater detail in Section 5.5.2.2.

Further, the public sector will provide services to help citizens cope with the disaster. For example, preparation of an evacuation centre, food stocks, and an early warning system are considered precautionary actions that the public sector should use its budget to undertake. In addition, other external funds, such as the Adaptation Fund and other concessional finance from donor countries and international development finance institutions, will be available for the purpose of supporting precautionary actions.

### 5.5.1.2 Financial Instruments for Emergency Response

Emergency response is defined as actions to secure the lives of victims, quickly repair lifeline utilities, provide evacuation centres and temporary housing for victims, and carry out related works for continuing victims' lives until they can resume their normal activities. Although most of these actions are temporary, they involve enormous costs and amounts of necessary resources. Therefore, quick disbursement and/or payment to cover these costs are essential to secure funds for emergency purposes. Thus, the public sector will generally secure some contingent funds for emergency purposes. However, as the actual scale of future disasters is unknown, this contingent budget will not necessarily be sufficient to cover the entire cost of the necessary emergency actions. In such cases, local governments where a disaster has hit will ask the central government for support in the form of funds and human resources, especially since the local government officials themselves may be victims of the disaster. Thus, mutual support is essential during disaster-related emergencies.

If the scale of the disaster is especially huge, even the central government may be unable to cover the costs of the emergency. In such cases, other countries' governments may provide emergency services, including financial and human resource support, as a courtesy.

Other financial instruments can also be helpful for emergency purposes. Insurance is a traditional and well-known instrument to alleviate the effects of an emergency. When a disaster occurs, the insurance premium will be paid based on the insurance terms and conditions. However, in most cases, the insurance premium will be paid based on the damage assessment. This assessment often takes some time, and recipients may be able to receive the insurance premium during the recovery stage. In some cases, the insurance company may pay the victims a lump sum as a part of the insurance premium in order to meet their needs. Another financial instrument that can be helpful in emergencies is the catastrophe deferred drawdown option (CAT-DDO). The CAT-DDO is a sort of credit line scheme that is used only for emergency purposes. In an emergency, victims as well as the government require cash urgently. Since the CAT-DDO is a sort of line of credit, disbursement therefrom can be achieved quickly when the triggering requirement is satisfied. The details of the CAT-DDO will be discussed in Section 5.5.2.3.

Furthermore, as noted in the previous section, a CAT-bond eases the pressure of redemption and coupon payment for issuers of the bond, since the bond will be invalid if the assumed scale of disaster (trigger) happens. This can ease cash flow for the bond issuers during an emergency, and allows them to use cash prepared for redemption and/or coupon payment for emergency purposes.

### 5.5.1.3 Financial Instruments for Post-Disaster Actions

Post-disaster action is defined as actions to recover from damages, and reconstruct victims' normal lives. Recovery and reconstruction is a long process. In the case of severe damage caused by a disaster it can take years to complete recovery and reconstruction works, and the costs involved are huge. A large-scale disaster inflicts damage not only on physical infrastructure but also on soft infrastructure, such as the social system and institutions. Due to damaged assets, systems, and institutions, economic activity often declines during the emergency and post-disaster stages. This often leads to a decreased fiscal budget for the government due to the decline in tax revenue, and compels financial institutions to secure additional finance due to an increase in client withdrawals. Even if the social system and institutions are damaged by the disaster, the government needs to keep fiscal and financial management stable. Concessional finance from donors can help fill the financial liquidity gap for the government.

On the other hand, victims whose assets are damaged or lost due to the disaster face additional difficulties, as the value of their assets as collateral has decreased or been lost. Although these victims now need supplementary finance from financial institutions, they have limited financial capacity to borrow. In addition, outstanding loan balances and interest obligations may remain for victims who have previously borrowed from the banks. Thus, disaster victims face further financial difficulties.

In the recovery period after the Great Eastern Japan Earthquake, the Ministry of Finance of Japan took special measures for local governments in disaster areas. Fukuda (2014), who reviewed the function of local finance during the recovery process, highlighted the importance of the role of local financial institutions to support local companies that were damaged by the disaster to ensure business continuity and recovery of profit levels, and to assess and financially support new industries and businesses emerging during the recovery process.

Thus, the provision of additional financial liquidity and financial restructuring during the post-disaster stage are effective ways to mitigate the pressure of financial obligations on victims and help them cover the costs of restarting their businesses and/or normal lives as soon as possible so that economic losses due to the disaster can be minimised. Concessional finance, whether general budget support or project-based finance, from donors is helpful for countries in need of additional liquidity.

Insurance is the traditional financial instrument to cover the costs of damage due to a disaster. Once the insurance claims are settled, insured clients will receive funds to reconstruct their lives. The CAT-DDO plays a similar role in terms of liquidity support. Including the CAT-bond in the debt portfolio can help to restructure the portfolio, as the CAT-bond will be cancelled if the scale of the disaster exceeds the cancellation trigger condition.

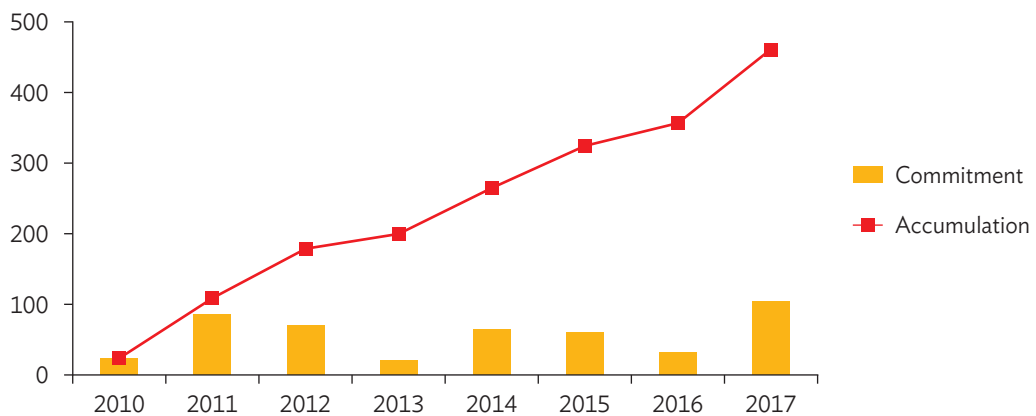
### 5.5.2 | How the Financial Instruments Work

In this section, we review some of the financial instruments for coping with disaster-related actions. As discussed in the previous section, there are several financial instruments that can help support disaster-related actions. Of these, we highlight the Adaptation Fund, CAT-bond, and CAT-DDO, amongst others.

### 5.5.2.1 Adaptation Fund

The Adaptation Fund is a financial mechanism established under the Kyoto Protocol of the UN Framework Convention on Climate Change. The objective of the Adaptation Fund is to finance concrete adaptation projects and programmes in developing countries, particularly countries vulnerable to the adverse impacts of climate change. As of September 2017, the Adaptation Fund had committed about \$461 million to 95 projects. Annual commitments and accumulation of the commitment amounts are shown in Figure 5.12. The average project size is \$4.9 million, while that of projects (other than readiness grants) is \$6.6 million. Of the total committed amount, about \$171 million (37.2% of commitments) has been disbursed so far.

**Figure 5.12: Annual and Accumulated Commitments by the Adaptation Fund (\$ million)**



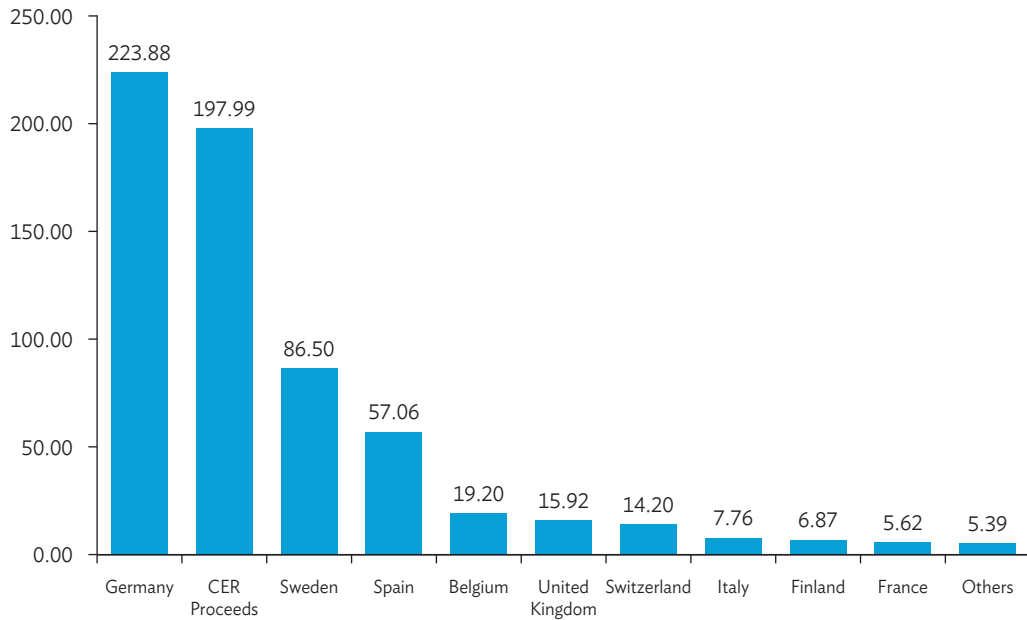
Source: Extracted from the Adaptation Fund (2017). <https://www.adaptation-fund.org/> (accessed 30 October 2017).

The Adaptation Fund was originally designed to be financed from a 2% share of the proceeds of certified emission reductions issued for clean development mechanism projects.

The Adaptation Fund is now receiving contributions from public and private donors.

The World Bank (2017), as a fund trustee, reported the financial status of the Adaptation Fund. Figure 5.13 shows the receipt of funds by resources. As of 30 September 2017, the Adaptation Fund had received \$442.40 million from donor contributions, more than twice the amount from certified emission reduction proceeds (\$197.99 million), the originally expected source of funds. The top donor is Germany, followed by Sweden, Spain, Belgium, and the United Kingdom.

**Figure 5.13: Receipt of Funds by Resources (\$ million)**



CER = certified emission reduction.

Source: World Bank (2017), *Adaptation Fund Trust Fund Financial Report Prepared by the Trustee*. 30 September 2017. <https://www.adaptation-fund.org/wp-content/uploads/2017/09/AFB.EFC...21.8-Trustee-Report-June-2017-with-report.pdf> (accessed 30 October 2017).

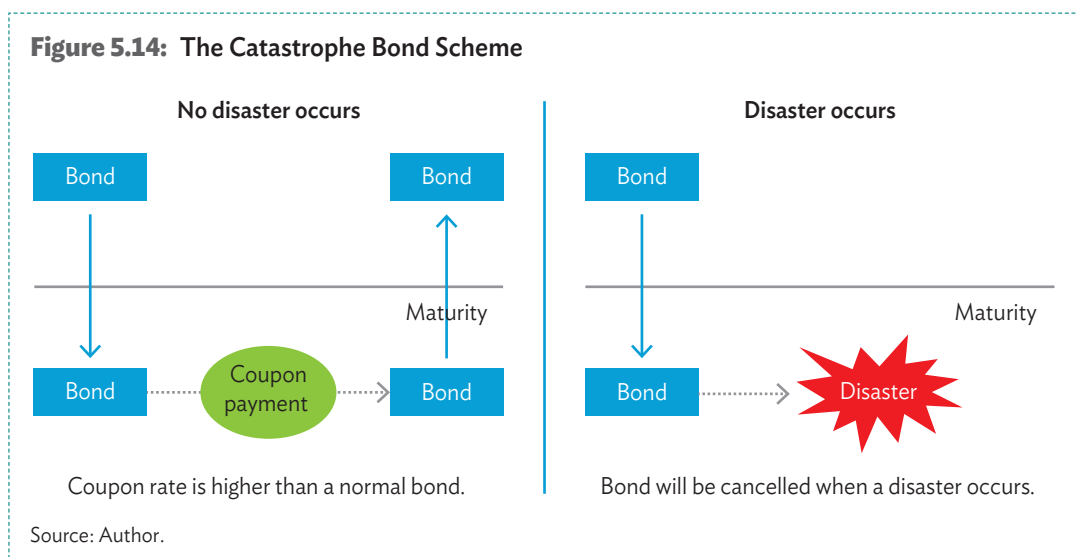
Although the Adaptation Fund is one of the key financial mechanisms under the UN Framework Convention on Climate Change, it constitutes a very limited part of contributions to adaptation, compared to contributions from other financial sources and considering the size of the financial need.

Trujillo and Nakhouda (2013: 28) pointed out that ‘the operationalization of the Adaptation Fund has played an important role in scaling up available finance for adaptation in developing countries, albeit from a very low baseline,’ and they evaluated the role of the Adaptation Fund as having ‘developed a functional system for delivering adaptation finance that meets high levels of transparency, and has important provisions for accountability and learning.’

Although the Adaptation Fund plays an important role, as noted above, it primarily covers the cost of precautionary actions against climate change, meaning that, due to its limited scale, it mainly supports capacity development for adaptation planning.

### 5.5.2.2 Catastrophe Bond

A CAT-bond is a disaster-risk linked security that transfers the risks of disaster-related damages from a bond issuer to investors. If no disaster occurs, the bond issuer would pay a coupon to the investors. If trigger conditions (such as the occurrence of a large-scale disaster) are met, the principal will be forgiven. Figure 5.14 shows how the CAT-bond mechanism works. CAT-bonds are typically used by insurers as an alternative to traditional catastrophe reinsurance. Therefore, the CAT-bond is considered to be an insurance-linked security (ILS).

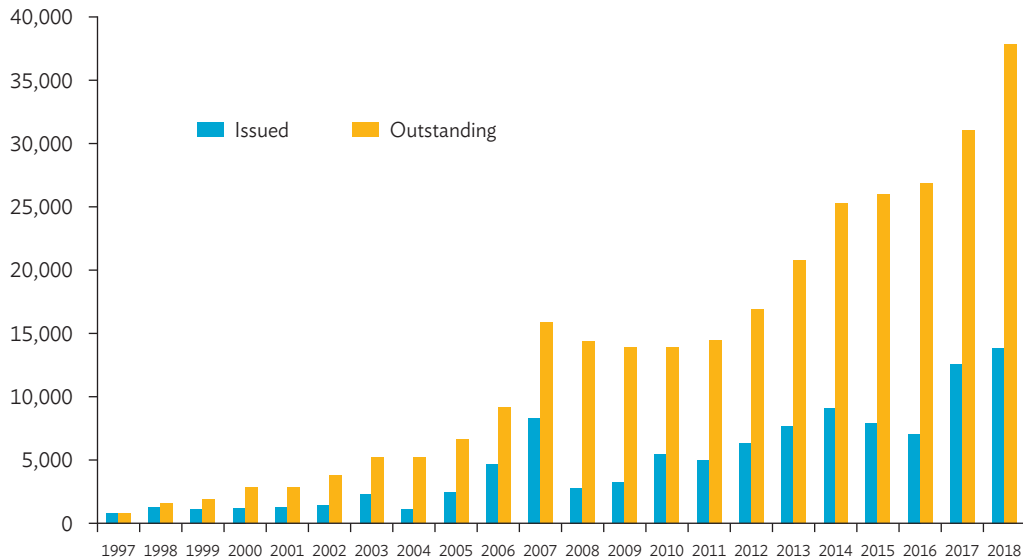


Since the CAT-bond is considered a risky security, its coupon rate is higher than that of normal bonds issued by the same issuer with the same maturity. That is, the coupon rate reflects the default risks of the bond triggered by a catastrophic disaster.

For the bond issuers, although they have to pay a higher coupon rate, they will be released from the burden to repay the principal and of the bond if the cancellation condition is triggered. This helps bond issuers secure finance for recovery and reconstruction. On the other hand, investors will receive higher returns if no disaster occurs. Sudo (2008) analysed the effectiveness of the CAT-bond as a tool to share disaster risks with the market, and found that the potential of a CAT-bond applies to fundraising on the part of both insurance companies and commercial companies as a part of their debt portfolio.



**Figure 5.15: Catastrophe Bond and Insurance-Linked Securities Risk Capital, Issued and Outstanding, by Year (\$ million)**

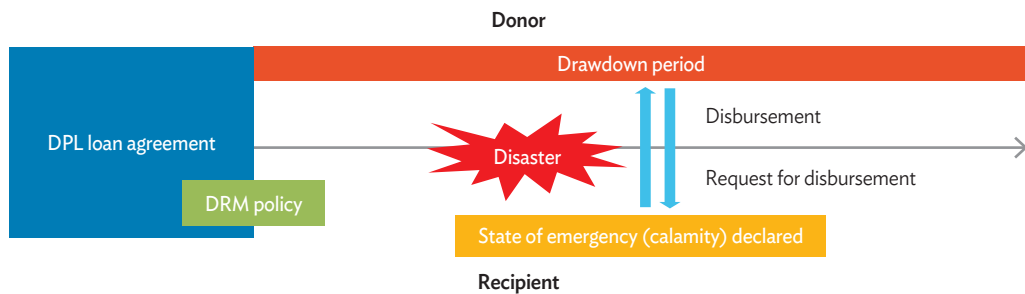


Source: Artemis Deal Directory. <http://www.artemis.bm/dashboard/catastrophe-bonds-ils-issued-and-outstanding-by-year/> (accessed 10 February 2019).

Figure 5.15 shows the trends of issued and outstanding CAT-bond and ILS risk capital as reported by Artemis (2019). According to these data, the issuance of the CAT-bond and ILS has increased gradually since 1997, with the largest issuance of the decade occurring in 2007, before declining drastically in 2008. After that, issuances of the CAT-bond and ILS gradually recovered, and the historically largest issuance of the bond occurred in 2017 and 2018. Reflecting this trend, the outstanding CAT-bond and ILS risk capital has been increasing, reaching around \$35 billion at the end of 2018.

### 5.5.2.3 Development Policy Loan with a Catastrophe Deferred Drawdown Option

The CAT-DDO is an application of the development policy loan (DPL) with a drawdown option, and was developed by the World Bank (World Bank, 2011a). The DPL is a lending scheme to support the fiscal budget of the government of a developing country. In the DPL, donors and the recipient country agree to a list of actions for specific policy purposes when the loan agreement is concluded. Both the donors and recipient country monitor the progress of the actions in the list, and the disbursement will be made when the targeted actions are implemented.

**Figure 5.16: Transaction of the Catastrophe Deferred Drawdown Option**

DPL = development policy loan, DRM = disaster risk management, RQ = request.

Source: Author.

Figure 5.16 shows how the CAT-DDO works. The scheme of the CAT-DDO is almost the same as that of the DPL. The difference between the DPL and CAT-DDO is whether or not the trigger for disbursement occurs. In the CAT-DDO, the policy matrix is formulated as a list of policy actions related to DRM. Once the policy actions are completed, the drawdown option is enacted, that is, the disbursement will be made once the trigger event occurs.

The World Bank provided a CAT-DDO to the Philippines in 2011. The objective of the project was to enhance the capacity of the Government of the Philippines to manage the impacts of natural disasters. This objective was achieved by supporting the following aspects of the government's DRR and DRM framework: (i) strengthen institutional capacity for DRM efforts, (ii) mainstream DRR measures into development, and (iii) better manage the government's fiscal exposure to natural disaster impacts. The World Bank explained:

*The CAT-DDO allows governments to respond quickly to emergency needs without diverting resources from important long-term development projects. The product is typically used to finance liquidity gaps in the government budget for countries exposed to natural disasters. It is triggered by a Presidential Declaration of a State of Calamity.* (World Bank, 2011b)

The triggering disaster, tropical cyclone Sendon (Washi), occurred in December 2011, and the Government of the Philippines declared a state of calamity, after which the World Bank quickly disbursed \$500 million from the DPL. Thus, the CAT-DDO works as a contingency line of credit, which provides emergency liquidity to help recipients cope with extreme disasters.

#### 5.5.2.4 Traditional Insurance Scheme

Insurance is a traditional means of protection from financial loss. In 2016, Asia suffered higher economic losses due to natural and manmade catastrophes than any other region in the world. Swiss Re (2017) reported that economic losses from disaster events in Asia in 2016 reached an estimated \$83 billion, of which approximately \$9 billion was covered by insurance. This includes the damage caused by the magnitude 7.0 earthquake in Kyushu, Japan, in April. Economic losses caused by this earthquake were estimated at \$25 billion–\$30 billion, of which \$4.9 billion was insured. In the rest of the Asian region, other disasters in 2016 caused \$53 billion–\$58 billion in economic losses, of which \$4.1 billion was covered by insurance. That is, less than 10% of economic losses that occurred due to disasters in the rest of the Asian region were insured. There are a number of problems with the traditional insurance scheme, including adverse selection, moral hazard, information asymmetry, and high transaction costs such as monitoring and administrative costs in developing countries. Further, Nakata (2015) noted that insurance for natural disaster is uncommon in practice, since the fact that a catastrophe typically incurs a macro risk invalidates the application of the strong law of large numbers, on which a typical insurance mechanism is based. Nakata, Sawada, and Tanaka (2010) showed that the diverse probability belief is inevitable, resulting in a weak demand for catastrophe insurance. Further, Chantararat et al. (2015) pointed out that, without an effective insurance market, public disaster assistance and highly subsidised public insurance programmes have constituted the key supports for affected populations.

With regard to agriculture, crop insurance is an insurance scheme against the loss of crops due to natural disasters. In the United States, a subsidised multi-peril federal insurance programme administered by the Risk Management Agency is available to most farmers. This scheme covers 551 types of crops. The United States Department of Agriculture (2017) reported that, as of 21 December 2017, more than \$3.4 billion in indemnities for the year had been paid. Pierro and Desai (2009: 2) noted that ‘traditional crop insurance has been seen as a poor model for export, particularly in developing countries, most of which are under serious fiscal constraints and have smallholder economies suffering from high exposure to covariate risk, the risk of simultaneous losses from a single event’.

In view of the person insured, a traditional insurance scheme is a matured and reliable risk management scheme covering economic losses caused by disasters. However, the settlement of insurance claims may be delayed since damage assessment by insurance

companies takes a long time; this in turn delays recovery actions on the part of the victims, leading to additional economic losses. Therefore, some insurance companies include partial payments to the insured as a part of insurance claims so that the insured can use these funds for emergency recovery.

#### 5.5.2.5 Index-Based Insurance

An index-based insurance scheme is an alternative to the traditional insurance scheme. Index-based insurance is financial protection based on the performance of a specific index in relation to a specific trigger. Unlike traditional insurance, contracts for index-based insurance are written on an objective index (e.g. precipitation and temperature) that works as a proxy for crop losses. Under index-based insurance, there is no need to use insured farmers' actual losses to determine an insurance claim. This can drastically reduce transaction costs and time to assess damages.

Pierro and Desai (2009) offered some practical examples of index-based insurance in certain countries. Some international organisations, such as the World Bank (2011c), International Fund for Agricultural Development, and World Food Programme (2011), have compiled detailed information on the creation of weather index-based insurance schemes based on their experiences in several countries. Chantarat et al. (2015) discussed the index-based insurance scheme as an attractive means of addressing traditional insurance imperfections, with a case study on index-based insurance for rice farmers in Thailand.

The Bank for Agriculture and Agricultural Co-operatives, in collaboration with the World Bank and Japan Bank for International Cooperation, introduced a pilot weather index-based insurance scheme for maize and rice. According to Yimlamai (2010), the World Bank pilot for maize began in 2006 and covered 110 farmers on 1,970 acres in Nakhon Ratchasima Province. This project was expanded to 2,535 farmers in seven provinces (Nakhon Ratchasima, Saraburi, Lopburi, Nakhon Sawan, Phetchabun, Pitsanulok, and Nan). The index was developed based on the growth pattern and water requirement of maize.

Since these schemes were implemented as a pilot, coverage of the insured was limited. Index-based insurance also faces the basis risk of differences between the payout as measured by the index and the actual loss incurred by the farmer; this may cause losses for farmers and, in turn, loss of trust in this scheme.

### 5.5.3 | Pros and Cons of Disaster-Related Financial Instruments

There are several financial instruments to cope with large-scale natural disasters and CCA. However, due to differences in the nature of these financial instruments, their applicability differs depending on several different factors, including purpose, stage, scale of finance, and beneficiary. As policymakers do not necessarily appreciate the nature of these financial instruments, they may sometimes misunderstand and/or misuse the instruments. To facilitate understanding of the differences amongst financial instruments for DRM and CCA, Tables 5.2 and 5.3 show the pros and cons of different financial instruments based on the conditions mentioned above.

**Table 5.2: Pros and Cons of Financial Instruments (for Precautionary Actions)**

	Pros	Cons
Adaptation Fund	<ul style="list-style-type: none"> <li>• Clear objective of the fund</li> <li>• Useful for capacity development in adaptation</li> </ul>	<ul style="list-style-type: none"> <li>• Limited in scale</li> </ul>
Climate-proof financing	<ul style="list-style-type: none"> <li>• Supporting disaster-resilient infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>• Difficulty of finding appropriate levels of resilience and cost</li> </ul>
CAT-bond	<ul style="list-style-type: none"> <li>• Debt service will be cancelled or reduced when a disaster occurs.</li> </ul>	<ul style="list-style-type: none"> <li>• Higher financial costs</li> </ul>

CAT = catastrophe.

Source: Author.

**Table 5.3: Pros and Cons of Financial Instruments (for Post-Disaster Actions)**

	Pros	Cons
Emergency grant assistance	<ul style="list-style-type: none"> <li>• Cost-free and additional finance</li> </ul>	<ul style="list-style-type: none"> <li>• Uncertainty as to the amount to be received (depends on donors' efforts)</li> </ul>
CAT-DDO	<ul style="list-style-type: none"> <li>• Quick disbursement</li> <li>• Supports emergency liquidity</li> </ul>	<ul style="list-style-type: none"> <li>• Limited cases</li> <li>• Uncertainty for finance provider in disbursement (monetary cost for preparing to disburse)</li> </ul>
Insurance	<ul style="list-style-type: none"> <li>• Traditional and established scheme</li> <li>• Partial payment will be provided as a part of insurance claims.</li> </ul>	<ul style="list-style-type: none"> <li>• Insurance is not necessarily suitable for large-scale disasters.</li> <li>• Adverse selection, moral hazard, information asymmetry, and high transaction costs</li> <li>• Lengthy damage assessment period and delayed settlement of claims</li> </ul>
Index-based insurance	<ul style="list-style-type: none"> <li>• Reduces the inefficiency of traditional insurance such as adverse selection, moral hazard, information asymmetry, and high transaction costs</li> <li>• Quickly settled once triggers are met</li> </ul>	<ul style="list-style-type: none"> <li>• Data availability—difficulty of setting appropriate triggers</li> <li>• Basis risk—difference between the payout as measured by the index and the actual loss incurred by the farmer</li> </ul>

CAT-DDO = catastrophe deferred drawdown option.

Source: Author.

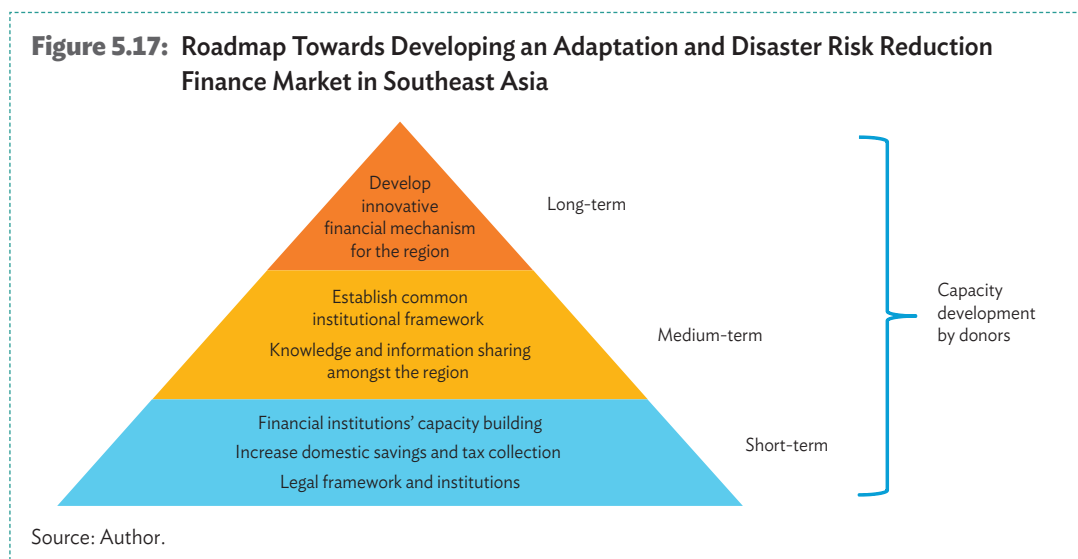
These tables show that no single instrument can meet all DRM and CCA purposes at every stage. Thus, it is crucial for policymakers to understand what choices, combinations, and uses of financial instruments are appropriate.

## 5.6 Roadmap Towards Developing an Adaptation and Disaster Risk Reduction Finance Market in Southeast Asia

### 5.6.1 | Long-Term Process to Develop Capacity to Mobilise Finance

Several funding sources and financial instruments have been identified in previous chapters. Although CCA, and DRM involve extensive costs, these can be covered by the available funding sources and financial instruments if the countries in Southeast Asia use them effectively. Although many of these options are applicable in the region, several need to be improved to make all options for finance mobilisation available. As it is difficult to use advanced technology without fulfilling the requirements, a step-by-step approach is the most appropriate way to develop capacity.

Figure 5.17 shows the steps for developing capacity to mobilise funding and use financial instruments appropriately. These steps are divided into three timeframes: short-, medium-, and long-term.



### 5.6.1.1 Short-Term Actions

In the short term, the institutional foundation should be developed. This includes the creation of a legal and institutional framework, increased savings and tax collection, and enhanced capacity of financial institutions to manage risks and appraise investment. A legal and institutional framework is the core of this foundation. Without a legal and institutional system, the financial market will not be confident, preventing institutions from working effectively and citizens from using financial services such as deposits and savings. Therefore, the development of a reliable and stable legal and institutional framework is key to advance to the next step. Based on such a framework, domestic financial institutions should develop their own capacity to provide efficient, effective, and reliable financial services to their clients.

### 5.6.1.2 Medium-Term Actions

In the medium term, the above actions should be expanded at the regional level. Once each country establishes its own legal and institutional system, the country will be able to manage its own financial market. This means that each country will need to manage a variety of risks, including disaster and climate change. However, current and future trends of natural disaster and climate change indicate that a country will be unable to manage some circumstances on its own. In such cases, loss and damage should be covered by other countries, particularly neighbouring countries. In this sense, knowledge and information on natural disasters and climate change should be shared at the regional level so that each country will be able to use this knowledge and information to manage disaster and climate change risks. Further, a common legal and institutional system amongst countries in the region will expand risk absorption capacity, since large risks associated with natural disasters and climate change can be shared amongst the countries in the region. Differing legal and institutional systems amongst countries limit capacity to absorb risk. Therefore, communalising the legal and institutional systems of countries in the region will be indispensable to advance to the next step.

### 5.6.1.3 Long-Term Actions

Once a common legal and institutional system and risk-sharing system are established amongst the countries in the region, financial risks can be absorbed by the common financial market, and countries in the region will be able to use innovative finance mechanisms. As noted in previous chapters, several innovative financial mechanisms will be applicable under this condition. In the long term, each country can select several innovative financial mechanisms, and/or develop its own innovative financial mechanisms appropriate for its own circumstances and conditions.

#### 5.6.1.4 Need for Capacity Development

A step-by-step approach is the appropriate way for countries in the region to approach these problems. However, it is crucial for these countries to undertake capacity development since they have limited capacity and experience to take these steps. Therefore, developed countries like Japan and other donors should support capacity development for these countries based on their own knowledge and experiences. Donors will also benefit from improved financial markets in the region, as well as countries' greater capacity to manage risks associated with disasters and climate change. Thus, donors should support these countries in advancing their actions step by step.

### 5.6.2 | Managing Funding Gaps

As discussed in the previous section, it is important to establish a reliable, efficient, and effective financial market in the region on a step-by-step basis. Unfortunately, however, nobody knows when a large-scale natural disaster will hit a country, creating a huge amount of direct and indirect post-disaster costs. Therefore, actions to address CCA and natural disasters cannot be postponed until then, and countries must consider how to manage funding gaps in both the short and long term.

#### 5.6.2.1 Short Term

In the short term, the key finance sources are domestic investment and finance, both public and private. To increase the amount of domestic investment and finance, the government should improve the liquidity of the domestic financial market. Since the main source of finance by the banking sector is savings, the government and banking sector should motivate citizens and companies to increase savings as a source of private sector finance, and the government should review the tax collection system to improve tax revenue as a source of public finance. However, market conditions in developing countries are sometimes vulnerable to external and internal shocks, and any failure of market operation can cause economic growth to decline. Therefore, careful policy implementation and market operation are desirable. At the same time, the capacity of domestic financial institutions to manage risks and conduct appropriate financial appraisals should be developed and recipients' creditworthiness improved through financial institutions' advising function. Donor backing of such actions will be an effective means of support.



Use of international and regional donor finance is another option to improve domestic market liquidity. However, it should be noted that too much dependency on donor finance may weaken a country's ability to manage its own market. Thus, improving the domestic market system is the best way to manage a short-term funding gap.

### 5.6.2.2 Long Term

In the long term, if a country takes a step-by-step approach as outlined in the previous section, funding options for managing funding gaps will be increased, and the government and private sector (including citizens) may be able to use several funding options, including innovative financial mechanisms. The availability of such mechanisms depends on the financial risk management capacity of financial institutions. Once a common risk (or finance) pool is established amongst the countries in the region, financial institutions may be able to manage their financial risks by using a common risk pool. Such a pool could serve as infrastructure for sharing risk information amongst the financial institutions and governments in the region.

### 5.6.2.3 Overarching Strategy for Local Adaptation in the Fiscal and Financial Sector

Local-level barriers include the accessibility and availability of finance. As local areas are vulnerable to external shocks such as natural disasters and climate change, fiscal and financial support for improving the resilience of local areas to such shocks is essential.

In terms of fiscal support from the government, it is essential to invest in local infrastructure such as climate-proofing measures for the electricity, transport, and agricultural sectors. In particular, improving the value (supply) chain system (including roads, bridges, and storage) is important to secure economic activities as well as the lives of citizens. In many cases, foods will be supplied from rural areas to cities, and some goods will be supplied from cities to rural areas. Thus, securing value (supply) chains is indispensable to secure the lives of citizens in both urban and rural areas.

Further, financial access for local areas should be improved. Although microfinance and microinsurance schemes can effectively support daily life in rural areas, these financial instruments are often insufficient when a large-scale natural disaster occurs. In this regard, public support mechanisms for rural areas are indispensable. The government should also involve local stakeholders to share information and manage risks on natural disasters and climate change.

## 5.7 Conclusion and Recommendations

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### 5.7.1 | Conclusion

This chapter discussed the financial issues in DRM and CCA. Several estimations of disaster costs reveal that these are increasing. Thus, countries in Southeast Asia should consider how to manage risks associated with disasters and climate change, and how to mobilise finance to manage such risks.

There are several financial sources available in the region. The largest of these are domestic public and private finance. Several other financial instruments are useful for managing risks associated with disasters and climate change. These innovative financial mechanisms are required to manage financial risks; however, their availability is currently limited.

Based on these discussions, this chapter provides a roadmap to mobilising financial instruments effectively using a step-by-step approach. Such an approach can enable countries in the region to improve their domestic financial markets and share risks and information within the region. In turn, several innovative finance mechanisms will be available in the region, thus expanding the options for mobilising finance for DRM and CCA.

### 5.7.2 | Policy Recommendations

Based on the above argument, the following policy recommendations are identified.

- (i) Improve the market foundation (short term).

Domestic finance sources, both public and private, are at the core of financing CCA and DRR actions. Therefore, improving the domestic financial system (including the legal and institutional systems) is highly recommended to strengthen the foundation of the financial market.

Once the financial market foundation is strengthened, the government should encourage financial institutions and their clients to increase liquidity in the market, and the government should improve the tax collection system to increase tax revenues.

- (ii) Develop innovative finance mechanisms appropriate for each country's condition (long term).

In the long term, countries in the region should establish risk (finance) pooling mechanisms to share the financial risks. When such a risk-pooling mechanism works well, each country will be able to use and/or develop innovative finance mechanisms suited to its own circumstances.

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