

# Chapter 12

## Future Perspectives of Financing Investment in Disaster Risk Reduction and Climate Change Adaptation



Mikio Ishiwatari and Daisuke Sasaki

**Abstract** It is widely recognized that investment is crucial to mitigating disaster damage and adapting to the effects of climate change. This point was emphasized in the Sendai Framework for Disaster Risk Reduction and successive agreements on climate change. The preceding chapters of this book identified various issues that need to be resolved and proposed policies and approaches accordingly. This chapter synthesizes the major findings and proposes innovative approaches to attain sustainable progress toward a resilient future in the Asian region. There are research gaps in many areas of investment in disaster risk reduction. There is a need to develop the estimating methods and the database of investments. The activities that constitute disaster management phases need to be well-coordinated and further developed. The trend in the increasingly adverse allocation of investment between ex-ante before disaster occurrence and response and recovery following disasters needs to be reversed. Since policy- and decision-makers must justify the allocation of budget among various priority activities, the methods to analyze the benefits of disaster risk reduction and climate change adaptation need to be improved. To overcome the paucity of finance, further research should be aimed at developing innovative approaches, such as green infrastructure, partnerships with the private sector, and burden-sharing mechanisms.

**Keywords** Continuity · Disaster recovery · Financial gap · Resilient infrastructure · Sendai Framework for Disaster Risk Reduction

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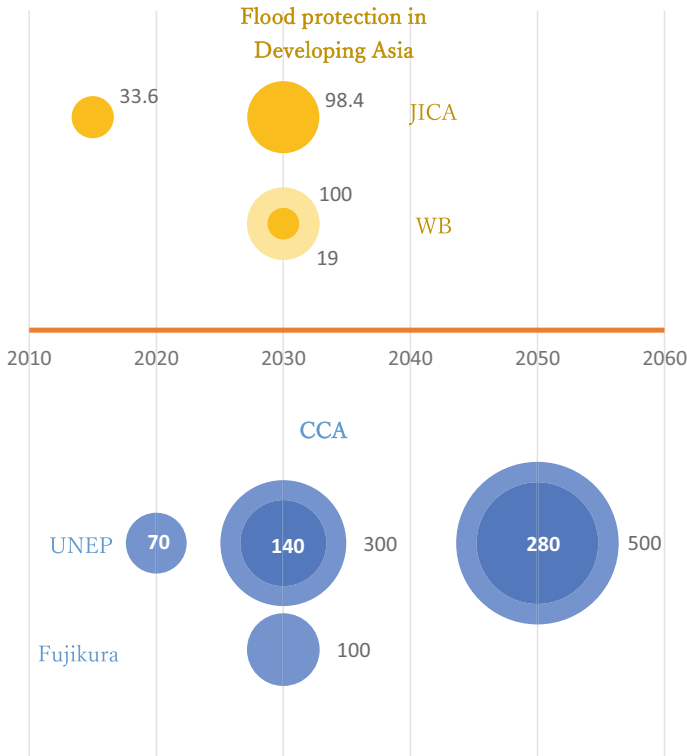
## 12.1 Introduction

The growing recognition of the importance of investing in disaster risk reduction (DRR) and climate change adaptation (CCA) is reflected in the emphasis placed on this point in the Sendai Framework for DRR and agreements on climate change (Ishiwatari 2021a; United Nations 2019; UNISDR 2015). The preceding chapters presented an overview of the investments in these areas, raised various issues that need to be resolved, and identified the opportunities to improve the systems for reducing disaster risks. This chapter derives and synthesizes the major findings of the previous chapters. Further, it proposes investment policies and innovative approaches to achieve sustainable progress toward a resilient future in the Asian region. The chapter concludes by indicating the directions that future research may follow to fill the observed research gaps.

## 12.2 Amount of Investment in DRR and CCA

This section summarizes the levels of current and future investments in CCA and DRR observed in the previous chapters of this book. Figure 12.1 shows the current level of the estimated annual expenditure on protection against floods in Asia, CCA in the world, and the future needs for these purposes. The need for investment in flood protection in Asia by 2030 is projected to be approximately 100 billion USD, that is, nearly thrice the investment observed in 2015. CCA will require an investment of at least 100 million USD in 2030 (Fujikura 2022). Some of the amounts to be invested in flood protection may have been included in the projected investment in CCA. Further, there is no unanimity or exactitude in the estimated amounts because the authors have employed various methods of estimation.

Figure 12.2 shows the amount of finance flowing from industrialized countries to developing countries for DRR, humanitarian assistance, and CCA. There are bound to be overlaps in these amounts, but these cannot be identified because the data have been drawn from various sources. The amount of humanitarian assistance, which includes the response to man-made and natural disasters, is similar to CCA and larger than DRR. Investment in the ex-ante measures of DRR, that is, preparing for and mitigating disaster risks, accounts for less than 10% of DRR financing, humanitarian assistance, and CCA financing. Financing CCA aimed at strengthening public resilience in coastal regions accounts for 5–10% of total CCA financing.



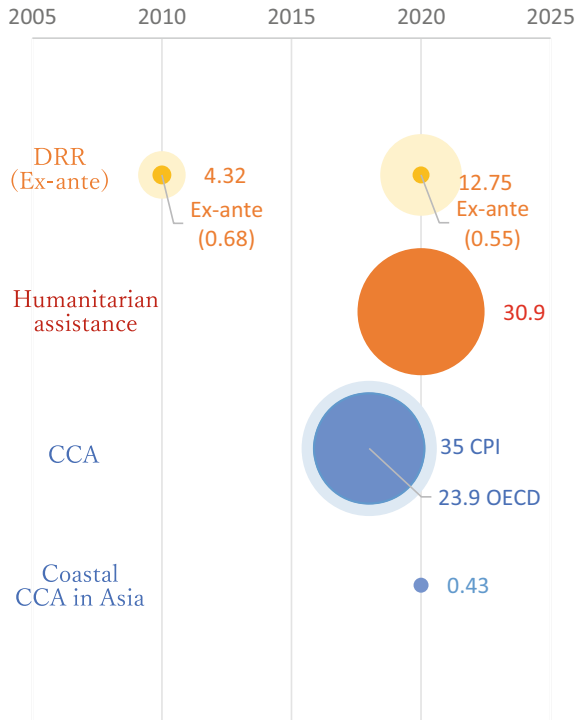
**Fig. 12.1** Estimated annual needs for flood protection in Asia and CCA in the world. Dark color circles indicate lower estimates and light circles higher estimates. Numbers are billions of USD. *Source* Authors' elaboration after Ishiwatari and Sasaki (2020), Rozenberg and Fay (2019), UNEP (2021), and Fujikura (2022)

### 12.3 Issues to Be Resolved, Required Approaches, and Research Gaps

The issues, approaches, and research gaps identified in the previous chapters are discussed in this section. These include the use of unaccredited databases, disconnect among phases of disaster management, difficulties in justifying investment, and developing innovative measures (Fig. 12.3).

#### 12.3.1 Data Definition and Accurate Estimation of Financing DRR and CCA

Building a comprehensive view of CCA financing is challenging because the estimating methods and database of CCA financing have not been sufficiently developed.

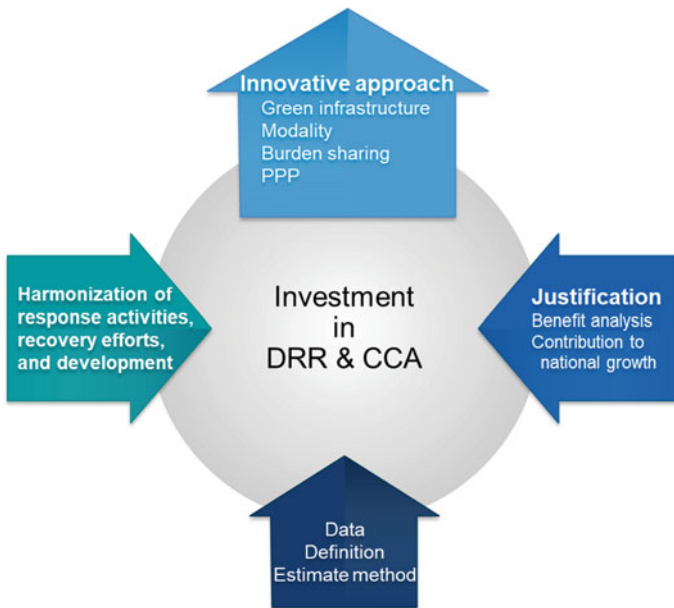


**Fig. 12.2** Finance to DRR, Humanitarian Assistance, and CCA. Numbers are billions of USD. Dark color circles in DRR indicate ex-ante amounts in DRR; the dark circle in CCA indicates Organisation for Economic Co-operation and Development (OECD) estimate, and the light color CPI estimate. *Source* Authors' elaboration after Kellett and Caravani (2013), UNDRR (2021), Development Initiatives (2021), Buchner et al. (2019), CPI (2019), OECD (2020), and Shiiba (2022)

In Chap. 2, Fujikura (2022) argues that the reported amount of CCA financing could be overestimated because of the lack of clarity in estimation methods. This argument is substantiated by Shinohara's report in Chap. 5 that, in the Philippines, the proportion of CCA financing by local government units dominated the infrastructure projects, such as highways. The reason is that the organizations in the Philippines categorize the entire estimated project costs as CCA costs if the project includes CCA activities, even as a part of the total project. For example, if a highway project includes the works of disaster prevention, the cost of the entire project could be categorized as an investment in CCA (Shiohara 2022).

Shiiba (2022), in Chap. 7, examines the international financing of CCA for coastal resilience projects. Since the database of coastal resilience projects is not available, Shiiba collected the data on projects from multilateral development banks (MDB).

The Intergovernmental Panel on Climate Change (IPCC 2014) defined adaptation as “the process of adjustment to actual or expected climate and its effects.”



**Fig. 12.3** Required approaches identified in the book. *Source* Authors' elaboration

Theoretically, incremental costs that will be incurred in adapting to the effects of climate change should be counted as CCA costs. Furthermore, MDB agrees with the methodology of estimating CCA financing (MDB 2019). CCA projects must be based on clear identification and evidence-backed assessment of the vulnerability of the activities to be undertaken in the project areas (Barbara 2019). The CCA activities should be distinguished from the standard development components of a project. CCA activities must be aimed clearly at improving social resilience to climate change. While the methodology is clear, without much distinction, the banks are unable to accurately count the incremental cost of adapting to climate change.

Distinguishing the elements of adaptation finance from development operations is another challenge. The two are interconnected, and incremental costs of CCA activities are usually not shown separately in the total financial requirements of projects. For example, it is difficult to segregate the incremental costs of CCA from drainage projects. It is necessary to project the increase in rainfall and the resultant increase in the volume of flood waters to facilitate the projection of the increase in the cost of expanding the drainage facility to avoid the adverse effects of climate change. Further, this cost should be separated from the cost of managing floods. It is necessary to develop detailed methodologies for this purpose. Moreover, since CCA relates to several areas, such as DRR, water, and agriculture, collecting and financing data from scattered data sources require huge efforts (Timilsina 2021).

## **12.4 Harmonization of Pre-disaster, Response Activities, Recovery Efforts, and Development**

Various international and national organizations are involved in financing and coordination of the successive phases of disaster management, which are pre-disaster, response activities, recovery effort, and development. The various organizations involved lead to poor coordination among these activities and an imbalance in their funding.

### ***12.4.1 Imbalance in the Allocation of Assistance Funding Among the Pre-disaster and the Response and Recovery Phases***

Countries and assistance agencies should emphasize taking proactive measures before a disaster strikes to prevent or minimize the damage caused by the disaster. As UNISDR (2015) stressed, investment in structural and non-structural measures to prevent or reduce the risk of disaster is essential and cost-effective in saving lives and preventing and reducing losses.

However, as Ishiwatari and Sasaki (2022) stated in Chap. 1, only limited amounts of international assistance for natural disasters are allocated to the ex ante measures, and this situation is worsening. Financing for ex ante measures declined from \$680 million/year in 1991–2010 to \$550 million/year in 2011–2020, and the share of DRR assistance in this finance declined from 12.7% to 4.1% (Kellett and Caravani 2013; UNDRR 2021).

The declining trend in ex ante measures indicates the difficulties in securing funds for such measures before a disaster occurs. DRR facilities, such as dykes and early warning systems, can mitigate human and economic losses, but cannot provide tangible benefits unlike other infrastructures, such as roads and water supply. Most DRR facilities are useful only when disasters strike, but they do not provide any services to the general public in normal times (Ishiwatari and Sasaki 2021a). Large structures, such as dams and diversion channels may take years to construct and the benefits from such projects are not available to the public until they are completed. The execution of such projects requires large financial resources and technical expertise, but both are limited in developing countries.

In contrast to building DRR facilities, when a disaster strikes, governments and assistance agencies naturally respond to the needs of the affected people that are evident. The victims need food, water, other relief supplies, shelter, and sustained recovery efforts to restore livelihoods, houses, and communities. The damaged infrastructure, such as communication, electricity, and other public utilities, needs to be repaired without delay to be useful in response operations and rehabilitation programs.

The High-level Experts and Leaders Panel on Water and Disasters (HELP) was established in 2007 to assist the international community, governments, and stakeholders in mobilizing political will and resources to deal with disasters. In its global report of 2019, HELP stressed striking a rational balance between the proportions of finance allocated to preparedness and mitigation on the one hand, and emergency response and rehabilitation on the other.

### ***12.4.2 Barriers to Accomplishing Continuity from Response to Recovery and Development***

Besides the imbalanced allocation of funds among ex ante activities and response and recovery activity phases, there is a lack of coordination in the implementation of these phases and with the development that follows recovery. There are barriers to accomplishing continuity in the range of activities from disaster response to recovery and development.

In Chap. 8, Katsube (2022) considered four recent major disasters in Asia Pacific Region and puts the estimated need for funds for early recovery at 0.04–0.06% of the total funds needed for humanitarian assistance. The insignificance of this amount indicates that early recovery is not recognized as a life-saving activity, that is, the finance earmarked for humanitarian assistance is not readily available for recovery efforts.

In Chap. 9, Jibiki et al. (2022) argued that there was a disconnect between recovery efforts and development activities. The reason for this disconnect in the cases of the Philippines and Indonesia is the limited coordination between the recovery efforts made by the offices of disaster management and climate change. Jibiki et al. pointed out that investment in DRR and CCA is not adequately covered by the laws, ordinances, and guidelines regarding post-disaster needs assessment (PDNA). While PDNA mainly estimates the need for rehabilitating facilities and economic activities in a wide range of sectors, it also unnecessarily covers the need for making society more resilient to climate change and disasters. Policy research to develop approaches to connect recovery efforts with development is necessary.

## **12.5 Justification of Investment in DRR and CCA**

It is necessary to justify the demanded quantum of investment in DRR and CCA at the national level and project scale (Ishiwatari 2019, 2021b; Kawasaki and Rhyner 2018). Moreover, the factors that affect the quantum of finance should be analyzed to facilitate the strengthening of investment policies.

### ***12.5.1 National Level***

To gain the support of policymakers for investment in DRR and CCA, the contribution of these activities to national growth must be explained to them. In Chap. 3, Sasaki and Ishiwatari (2022) examined new beneficial concepts of DRR and CCA proposed by The World Bank and Asian Development Bank (ADB). The new concept of the triple dividend of resilience consists of (i) avoiding disaster losses, (ii) stimulating economic activities, and (iii) providing co-benefits in socio-economy and environment. ADB also emphasized the importance of women-focused investment. Some academic papers have supported these concepts. However, further studies are needed to strengthen these concepts theoretically.

Few studies have empirically analyzed the relationship between investment and damage at the national level (Ishiwatari and Sasaki 2021a). Tsukahara and Kachi (2016) estimated that Japan benefits by several trillion JPY (tens of billions of USD) annually from investment in flood protection. Ishiwatari and Sasaki (2021b) adopted this method and found that investments in flood protection in the People's Republic of China (PRC) and the Philippines are cost-effective.

### ***12.5.2 Project Scale***

It is necessary for organizations that implement the DRR and CCA projects to show their cost-effectiveness on a project scale. Various studies have found that DRR measures are cost-effective. For example, the cost–benefit ratios of mitigation programs in the United States vary from 4:1 to 11:1. The mitigation programs cover the countermeasures, such as adopting building codes, retrofitting infrastructure, and projects for preventing riverine and coastal flooding, damage by hurricanes, earthquakes, and fires implemented by spending the grants from the federal agencies' grant programs (Multi-Hazard Mitigation Council 2019). Davlasheridze et al. (2017) examined measures against hurricanes in the United States and found that a marginal return from long-term mitigation projects for pre-empting hurricane damage is almost twice that of the marginal return from post-hurricane recovery programs.

As Sakamoto et al. (2022) pointed out in Chap. 11, while there are studies that examined the cost-effectiveness of the DRR projects, there is a need to further refine the methods of estimating benefits arising from DRR. Since 1970, the Japanese government has developed methods to estimate the benefits of flood protection. However, the methods do not estimate the benefits of saving human lives and minimizing long-term economic losses because of the complexity of these beneficial effects.



### ***12.5.3 Resilient Infrastructure***

In Chap. 6, Mizutani (2022) stressed the importance of maintenance to keep infrastructure resilient against disasters. Without proper maintenance, structures can deteriorate over time and become vulnerable to disasters. Further studies need to develop methods to optimize the lifecycle costs of disaster-management infrastructure.

### ***12.5.4 Factors Affecting Investment Needs***

Understanding factors affecting the need of investment in DRR is crucial for strengthening investment policies. Pelupessy et al. (2022) studied people's perception of investing in flood protection in Jakarta and found that community members would have a heightened sense of resilience as developing a sense of place attachment and collective efficacy. This points toward the need for research to assess people's perceptions of investment in DRR in other countries at the community and national levels.

## **12.6 Innovative Measures of Investment in DRR and CCA**

There is a need to develop innovative means of financing to increase the investment in DRR and CCA projects and the efficiency of their implementation. Stakeholders should share roles and responsibilities in financing projects in various countries based on the characteristics and history of each country. While the public sector meets the costs of DRR and CCA, the private sector and local communities could share some responsibility and costs.

### ***12.6.1 Issues Found***

The world could not achieve the target of investing 100 billion USD annually in climate financing in 2020 and 2021 to which it had agreed at the 2009 United Nations Climate Change Conference in Copenhagen (Timperley 2021). However, industrialized countries are expanding finance to CCA in developing countries to reach the agreed target.

In Chap. 2, Fujikura (2022) pointed out the importance of designing new modalities to finance CCA. Furthermore, new modalities should be developed to tackle the challenge of involving the private sector in financing CCA. The topics discussed in the other chapters were some of the new financing modalities for CCA, green

infrastructure, local governments' contribution, and the partnership between public and private sectors.

In Chap. 10, Nakamura (2022) examined the Japanese approaches to green infrastructure and stressed that green infrastructure could produce multiple benefits. These include, besides DRR or CCA, benefits in a wide range of areas, such as climate change mitigation, environmental conservation, and stimulating the local economies.

National and local governments share the responsibilities in creating DRR and CCA facilities and their respective financial burden of investments. Local governments in the Philippines play crucial roles in promoting CCA. In Chap. 5, Shiohara (2022) analyzed their budgets for CCA. While local governments have the primary responsibility for DRR, national governments provide the local governments with financial support for developing DRR facilities as the basic infrastructure.

### ***12.6.2 Research Gaps***

It was found that there are research gaps in developing the approaches to mobilizing finance from various stakeholders. There is no common agreement across societies over the sharing of burden among national governments, local governments, local communities, and the private sector. Further, for proposing new policies of financing, empirical research into the following issues is necessary.

In Japan, within the context of decentralization, cost-sharing between national and local governments for flood protection projects became a controversial issue during the late 2000s. Local governments cover one-third of the costs for the national projects of flood protection from the viewpoint of sharing expenses by beneficiaries. The national governments insisted that the national government should promote works for river basins, covering multiple prefectures through coordinating local governments and envisage projects to secure balanced safety throughout the country. Local governments required more initiatives in deciding on flood protection projects rather than just following the national government's decisions. It is because the national government did not disclose the detailed information on projects, such as the break-downs and backgrounds of costs, nor did it properly consider the financial and societal situations of local governments for project sites and schedules. Furthermore, local governments require devolving financial resources and responsibilities of flood protection from the national governments to local governments.

Local communities have certain resources which they contribute as their share of investment in DRR and CCA. For example, community-based organizations in the Netherlands and Japan have historically been actively involved in disaster management by taking flood management measures to protect themselves (Ishiwatari and Surjan 2019). Water boards are the oldest democratic organizations in the Netherlands. They began water management including flood protection in their communities during the thirteenth century. At their peak, several thousand boards were active and currently, 21 boards are functioning (Van Stokkom et al. 2005). They can collect revenues in the form of the water board charges and the pollution levy. The water

boards are expected to play an important role in adapting local water systems to meet the impacts caused by climate change (Kamperman and Biesbroek 2017).

In Japan, the local communities of farmers became autonomous in the middle or early modern period and began developing facilities to protect their paddy fields and houses against flooding (Ishiwatari 2012). In the early seventeenth century, the local communities of the Nobi plain constructed dykes around the communities to keep flood waters out of their communities (Baba and Ito 2018).

While investment in DRR and CCA is regarded as unprofitable and may not attract investment from the private sector (Timilsina 2021), the private sector can play an important role in these activities (Mavrodieva et al. 2019). The government can encourage the private sector to invest in DRR and CCA by granting tax rebates, relaxing certain regulations, and providing guidance in constructing the facilities for mitigating disaster damage (Ishiwatari 2016). Khattri et al. (2010) identified three reasons why the private sector might invest in CCA and DRR: (i) to maintain business continuity by protecting their operations from disasters and the effects of climate change, (ii) if they are stakeholders in developing the infrastructure and providing technical solutions, (iii) if CCA and DRR projects provide a market for their products.

## 12.7 Conclusion

Though the Sendai Framework for DRR and international agreements on climate change urge governments and other entities to invest in DRR and CCA, several issues that hamper such investment have been identified in this book. For example, there are research gaps in fundamental areas. Even estimating the current scale of investments is a challenge. Further, estimating the projected need for investments is a complex task. Therefore, there is a need to develop estimating methods and databases.

The crucial issues of connecting the activities within disaster management phases and with the overall development have been discussed (Gómez and Kawaguchi 2018). It is widely recognized that investment in disaster mitigation and preparedness is cost-effective (UNISDR 2015). However, the complexity of balancing investment between ex ante and response and recovery is increasing. Policy- and decision-makers need justification for allocating budgets for DRR and CCA. It is necessary to develop the methods to analyze the benefits that are to be derived from individual DRR and CCA projects and sum-total of all project-level benefits at the national level. To bridge financial gaps, further research is needed to develop innovative approaches to green infrastructure, partnership between public and private sectors, and burden-sharing mechanisms.

As mentioned above, to attract increased investment in DRR and CCA, several major issues need to be resolved. The issues are (i) the definition of data and accurate estimation of the necessary quantum of finance for executing DRR projects and CCA activities; (ii) ensuring harmony among response activities, recovery efforts,

and development; and (iii) devising methods to weigh the costs and benefits of DRR and CCA to justify the investment. Academic research can, doubtlessly, play a key role in finding clues that would lead to the resolution of these issues. The previous chapters of this book have shed light on some innovative approaches and measures that could, possibly, be the solutions to the above issues. The authors note that exhaustive research on innovative approaches is needed. In the end, we hope that this book can contribute to bringing DRR and CCA recognition as profitable avenues of investment.

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