Evidence Brief 4: Macro Policy Solutions*

What are macro policy solutions

Macro policy solutions are the tools, policies, actions, and partnerships governments can use and create to (financially) manage disaster risk. One tool that has gathered significant attention is recent years is the sovereign risk pool. Because of the large interest and evidence base around this tool, it is being reviewed separately (see the **sovereign risk pools** evidence brief). In addition to the risk pools, governments may 1) take advantage of non-insurance disaster risk finance (DRF); 2) insure public assets and infrastructure; 3) function as insurers and reinsurers; 4) engage in partnerships with the private sector to further their disaster risk management and disaster risk finance objectives; and 5) put in place social policies and programs, such as adaptive social protection (ASP), to help residents manage risk.

Evidence on macro policy solutions

Evidence around sovereign DRF

When deciding how to financially manage the response to natural hazard events ex-post, governments have a lot of tools at their disposal. They can 1) transfer the risk to international markets, 2) retain the risk (and finance the recovery and response through disaster contingency and reserve funds, budget reallocation, offshore sovereign wealth and provident funds, taxation, and (social impact) bonds) or 3) finance the risk through grants and loans from international partners.

Although economic wisdom, based on Arrow and Lind (1970), held that governments are risk neutral and should budget based only on net present value, more recent experience highlights that Arrow and Lind's assumptions do not hold in many cases, especially for highly exposed and lower-income countries (Mechler and Hochrainer-Stigler 2014). While many lessons have been learned as countries around the world implement climate and disaster risk financing projects and strategies[1], including the range of actions governments can take to protect both the state and society, there is limited evidence on the impact, effectiveness, and efficiency of different disaster risk financing tools (World Bank 2014; Le Quesne et al. 2017). Theoretical work suggests that risk financing through the use of (contingent) credit, as part of a broader risk layering approach, may be most appropriate for "middle levels" of risk—neither the most frequent (better retained) nor the most rare (better insured) events (Clarke et al. 2017; Clarke and Mahul 2011; Ozaki 2016).

In recent years, many models have been developed to help policymakers design DRF strategies. A catastrophe simulation model was used for Mexico's FONDEN and although it provided useful information regarding funding gaps, fund availability, and budget volatility, it was also highly

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[1] See OECD (2015) and World Bank (2014) for excellent overviews of disaster risk financing tools used around the world.

sensitive to assumptions and parametrization (Cardenas et al. 2007). Approaches to fiscal risk planning that consider contingent liabilities in addition to direct liabilities allow government to better plan for risk, potentially detecting risk across sectors and reducing budget uncertainty (Mechler, R., Mochizuki, J., Hochrainer-Stigler 2016). A recent report from the World Bank (World Bank 2020) applies the contingent liabilities approach to Sri Lanka, using both historical analysis for direct estimation and probabilistic modelling, and highlighting that the government should consider both preventative measures and financing to help manage costs from contingent liabilities. The Economics of Climate Adaptation (ECA) approach, which has been applied to over twenty cases, similarly uses a probabilistic approach and cost-benefits analysis to help local and national governments identify strategic climate change adaptation investments and identify insurance needs (Wieneke and Bresch 2016; Bresch and Müller 2014). Despite the number of tools that have been developed, challenges related to technical expertise and intergovernmental coordination may limit their effectiveness (Wijenayake 2019a).

Evidence around insurance for public assets and infrastructure

Public assets and infrastructure are critical to a country's economic performance and are relied upon by residents as an input into their livelihoods. Give the cost and life-expectancy of these assets, governments should evaluate the exposure of their public assets and infrastructure to natural hazard risk and determine if and how they should be protected. One option available to the government is to insure these assets. The Insurance Development Forum (2019) has developed guidance for governments on insuring public assets, including case studies from Australia, Colombia, Mexico, and the Philippines. The Southeast Asia Disaster Risk Insurance Facility (Foote et al. 2020) has also created a fact sheet on financial protection of public assets.

Although there is limited empirical evidence of the impacts of insurance for public assets, an empirical assessment of the Mexican *Fondo de Desastres Naturales* program (FONDEN), using night lights to proxy for economic growth, indicates that the use of catastrophe bonds to fund municipal-level reconstruction is a cost-effective form of protection from the public service disruptions caused by natural hazards (de Janvry, del Valle, and Sadoulet 2016).

Evidence around the government as insurers and reinsurers

Aside from participating in sovereign risk pools and insuring infrastructure, governments can play a variety of other roles related to insurance. For example, the proposed Philippine City Disaster Insurance Pool is designed to work similarly to the parametric sovereign risk pools, with the Philippines's Government Service Insurance System, a government-owned and -controlled social insurance institution, managing policies and payouts and also housing a special purpose vehicle to reinsure the pool. This is somewhat similar to the Turkish Catastrophe Insurance Pool (TCIP), which was designed to reduce the government's contingent liabilities and (theoretically) requires Turkish homeowners to purchase earthquake insurance. For the development of TCIP, researchers developed an event-based probabilistic loss estimation model to determine economic losses and losses to TCIP from earthquakes (Bommer et al. 2002). While TCIP is often lauded, it has experiences some challenges. For political reasons those without insurance are still likely to receive governmental support after an earthquake. The penetration rate is 35.4% and only a third of buildings in Istanbul are covered by TCIP, partly because commercial buildings are not required to purchase the insurance. There is low demand for the insurance due to insufficient knowledge about the product, high cost, and relevance, among other reasons (Başbuğ-Erkan and Yilmaz 2015).

Evidence on public-private partnership

While governments may act as insurers or reinsurers themselves, they can also cooperate with the private sector to find hybrid solutions, form coinsurance pools, or strengthen the domestic climate insurance market (Golnaraghi 2018). Government involvement can increase the market viability and affordability of insurance solutions, for example by providing climate data, risk assessments, and open data platforms and models, offering cost-effective distribution channels, and taking over part of the financial risk through social security schemes, compensation payments, or subsidies. Furthermore, governments can implement risk reduction measures to lower the risk for private insurers and embark on campaigns to increase financial literacy among potential policyholders (Kreft and Kohler 2019).

Government-level reinsurance, catastrophe bonds, and other connections to the global financial market can in itself be considered a public-private partnership and allows for broader risk diversification across a large group of investors. Macro schemes can also address the vulnerability of micro- and meso-insurance portfolios from extreme events that lead to a large number of simultaneous claims, especially for private sector entities (World Bank 2016).

A major barrier to private sector involvement, particularly in developing countries, is legal and regulatory risk. For instance, very few developing countries have specific legal and regulatory frameworks for index insurance, and this exposes any potential insurer to considerable uncertainty. Unknown legal status and taxation, exposure to potential lawsuits and regulatory action, and the possibility of future changes in regulations that may require costly adjustments reduce the viability of index insurance schemes and disincentivize private companies (Carpenter 2018).

In addition to legal and regulatory issues, several other obstacles to private sector risk transfer products and public-private partnerships have been identified (Golnaraghi 2018; Camargo 2019). These include:

- Lack of access to climate information and data-sharing mechanisms
- Restrictions to insurance transactions, distribution channels, access to reinsurers, and use of technology
- Lack of understanding of importance of climate risk insurance among policymakers
- Need for comprehensive, up-to-date, and accessible risk assessments for all relevant sectors across the country
- Need for comprehensive and integrated risk management plans that include all relevant sectors and levels of government
- Need for coordinated policies that address risk transfer and provide clear focal points for private sector engagement
- Lack of engagement between public and private sector

The public sector can create an enabling environment and framework for the private sector to implement market-based solutions and public-private partnerships. Through regulations that take into account prudential risks, market conduct risks, and consumer protection, but allow for the development and introduction of innovative climate insurance schemes, fast product approval times, regulatory sandboxes, and innovation hubs, the private sector can be incentivized to offer a range of climate insurance products (Carpenter 2018).

On the other hand, private insurance and reinsurance companies are institutional investors that play a key role in the economy. The global insurance industry manages around a third of the world's investment capital and can directly invest in resilient infrastructure and property, financial assets

that promote resilience and adaptation, and low-carbon investments. Furthermore, (re)insurance companies can offer products that contribute to integrated risk management, support the development of other risk financing tools, share risk models with public entities, provide specialist knowledge, build capacities among policymakers and public insurers, and create innovation hubs and incubators. Public-private partnerships allow for complementary action of public and private entities, improved data collection and distribution, better access to vulnerable populations, and improved product design for both sides (Camargo 2019; Carpenter 2018; International Association of Insurance Supervisors 2018).

Evidence around social policy

Climate shocks have long-term, persistent impacts, especially on children (Alderman 2010). In addition to thinking about the financial needs of the government in the event of a natural hazard striking, governments should consider how to (re)design social policies to manage disaster risk and meet the ex-post needs of affected residents. This can include changes to social security and pension systems, and the creation of adaptive or shock-responsive social protection programs. The financing of these systems needs to be considered as part of the overall disaster risk financing approach, given that the outlays associated with shock-responsive social programs may often increase at time when governments lack responses due to the impacts of natural hazards and other shocks; insurance should be considered as one way to finance the scaling of these systems (Alderman and Haque 2006; Väänänen et al. 2019). Currently, many of the world's most exposed countries have the lowest levels of social safety net coverage (Bowen et al. 2020) and while many countries have worked to integrate social protection and disaster risk reduction systems in the past two decades, there are still relatively few examples of ASP systems that integrate climate change adaptation and evidence is needed on how these programs impact long-term vulnerability (Arnall et al. 2010; Solórzano and Cárdenes 2019).

In theory, ASP could strengthen resilience and therefore reduce longer-term social protection and emergency response needs of affected households, but empirical evidence is needed (Bowen et al. 2020; Kuriakose et al. 2013). The literature suggests that comprehensive social protection systems that include insurance, assistance, and labour market components will be better able to manage natural hazards (Bowen et al. 2020). A review of social protection programs in South Asia reveals that ASP programs are more likely to have protection and transformation objectives, supporting long-term vulnerability reduction, when compared with programs that did not integrate all three ASP components (Davies et al. 2013). Evidence from social protection programs in Latin America suggests that social protection increases productive activities and assets (Solórzano and Cárdenes 2019), however lessons from the region indicate that tailored financing strategies and strengthened financial, legal, and administrative management and targeting of ASPs could lead to better use of social protection systems for emergency response (Cubas, Gunasekera, and Humbert 2020).

Integrating macro policy solutions into national policy frameworks

Integrating CDRFI into national policies and plans

Integrating risk transfer into national risk management frameworks and policies, including social protection, sectoral policies, disaster management policies, sustainable development, and environmental and climate-related policies, is critical to make it effective (Wijenayake 2019c). Linking risk transfer with sectoral policies incentivizes risk reduction and adaptive behaviour, allows for positive risk-taking, and supports investment while avoiding maladaptive actions and the issue of moral hazard and a false sense of security (Kreft et al. 2017).

Climate risk transfer mechanisms can be part of building resilience and reducing climate risks, adapt to inevitable impacts of climate change, and address issues of loss and damage. For a comprehensive integration into national policies and processes, governments need to take into account different layers of actions (Ramm et al. 2019; Wijenayake 2019b; UNISDR 2010):

- Creating an enabling regulatory and supervisory environment, including laws and policies that facilitate diverse kinds of insurance products, appropriate consumer protection, removal of barriers for implementation and affordability of insurance schemes, and amendment of insurance tax structures; setting up monitoring and evaluation mechanisms for risk transfer
- Mainstreaming multi-hazard, inclusive, and accessible risk reduction and risk transfer into policies in climate-sensitive sectors as identified in the Nationally Determined Contributions, National Adaptation Plans, national climate policies, and national communications to the UNFCCC, including finance, agriculture, livestock, fisheries, forestry, coastal and marine, biodiversity and ecosystems, human settlements and infrastructure, and tourism
- Linking risk transfer with climate-related policies and processes such as National Adaptation Plans or Nationally Determined Contributions; linking risk transfer with development planning and the processes around the sustainable development goals; linking risk transfer mechanisms with social security, social safety nets, healthcare, labour protection and workers' rights, unemployment insurance, livelihood development, and loans
- Setting up institutional coordination and data-sharing mechanisms; risk management and risk transfer need to be implemented across sectors and across ministerial portfolios and mandates, as well as allow for partnerships with and engagement of the private sector; integrating NGOs, CSOs, CBOs, universities, and research institutions into data collection mechanisms and harmonizing data sets
- Including education, awareness creation, and capacity building on climate risk, risk management, and risk transfer into education and sectoral policies to increase climate knowledge, financial literacy, and avenues for public participation and engagement
- Coordinating with existing disaster risk management frameworks, compensations mechanisms, and contingency funds; including insurance-relevant data into data collection mechanisms and policies across different sectors
- Creating joint forums and coordination platforms to address specific local or sectoral risks; forming sustainable partnerships with private sector and other non-governmental entities

Connecting national policies and international processes

Beyond the national level, countries need to link their domestic policies and plans with international processes related to climate change and sustainable development. This integration allows them to benefit from knowledge sharing, best practices, and lessons learned, to gain access to capacity building and technical expertise, to utilize climate and development finance for the establishment of risk transfer mechanisms, and to participate in regional and global discussions and initiatives.

One way for countries to create a link between national and international climate processes is by including risk transfer into their NDCs under the Paris Agreement and their National Adaptation Plans. The Paris Agreement makes reference to climate insurance under response measures and lists "risk insurance facilities, climate risk pooling and other insurance solutions" under potential areas of cooperation and facilitation to enhance understanding, action, and support (Article 8, Paragraph 4).

Currently, approximately one quarter of submitted NDCs refer to climate risk insurance in some way, but many have not specified these commitments or established concrete mechanisms for their

implementation(Kreft et al. 2017). By including specific commitments to risk transfer and loss and damage as well as mainstreaming risk management across the NDC sectors, countries can use the NDC review process to strengthen their ambitions to protect especially the most vulnerable parts of their population through public, private, or public-private insurance mechanisms (Wijenayake 2019b).

The implementation of NDCs involves laws and policies of many different sectors, which underlines the importance of cross-sectoral coordination and national mechanisms to facilitate the WIM and the Sendai Framework on Disaster Risk Reduction. Under the Warsaw International Mechanism for Loss and Damage Associated with Climate Change Impacts (WIM), risk transfer is prominently featured, with action area two and seven addressing comprehensive risk management and finance in the initial two-year workplan, and an entire strategic workstream (c) on comprehensive risk management (including risk transfer) in the five-year rolling workplan. The WIM Executive Committee has established a technical expert group to enhance knowledge and understanding of comprehensive risk management approaches (TEG-CRM) as well as a clearinghouse for risk transfer that aims to enhance understanding, knowledge, and research, improve policy coherence and collaboration, and enhance action and support on how to set up and implement risk transfer solutions.

To link up climate change and disaster risk reduction, the Sendai Framework for Disaster Risk Reduction refers to risk transfer as well by aiming to “promote mechanisms for disaster risk transfer and insurance, risk-sharing and retention and financial protection, as appropriate, for both public and private investment in order to reduce the financial impact of disasters on Governments and societies, in urban and rural areas” on the national and local levels (30b) and similar commitment for the global and regional level (31b).

Under the 2030 Agenda for Sustainable Development, climate risk transfer mechanisms can directly contribute to the sustainable development goals 1, 2, 9, 11, 13, and 17 and have relevance for many of the other goals as well (Kreft et al. 2017).

Case Study: Sri Lanka

Sri Lanka presents the case of a developing, highly vulnerable country that already has an established risk transfer mechanism. Climate change causes considerable losses, with disasters alone responsible for USD 313 million in annual losses related to housing, infrastructure, agriculture, and relief, and further impacts from slow-onset and long-term impacts (World Bank 2020).

To address this, the country has implemented macro-level agricultural insurance schemes since the 1960s, with different iterations changing the financial setup and expanding coverage to additional crops, livestock, and agricultural assets. In addition to this agricultural insurance, the country also has a national disaster insurance and an agricultural loan protection scheme, covering natural disasters such as droughts, floods, and elephant attacks. Accordingly, Sri Lanka has a legal framework that facilitates insurance solutions and allowed private companies to enter this field from 1999 onwards (SLYCAN Trust 2019).

However, the penetration of the public crop insurance scheme is low, as many farmers are not aware of its existence and modalities or do not trust the indemnity-based assessment and compensation mechanism. In addition, there are gaps in financial literacy and inclusion, capacity, technical knowledge, insurance product design, and coordination. The number of private sector climate insurance schemes is still low, and no mature index insurance product is available so far (although several are in development) (Wijenayake 2019c).

To address this, Sri Lanka is further integrating climate risk transfer into its national policies and international commitments. The country's NDCs include climate risk transfer as an explicit commitment under the loss and damage sector as well as another commitment to establish a local mechanism under the WIM. The NDCs of the loss and damage sector are set to be implemented through the relevant sectoral authorities to facilitate better integration and avoid duplication of efforts. In addition, several other sectors include risk management elements, for example, the food security sector and the irrigation sector.

A limited number of civil society organizations have been active on the topic on capacity building of key stakeholders linked to the implementation of loss and damage NDCs and risk transfer actions, with civil society think tanks such as SLYCAN Trust working on policy and research related to the topic. The ongoing NDC review process as well as other sectoral processes, including the development of an overarching agriculture policy and new disaster management plans, offer opportunities to benefit from past experiences, analyse gaps and needs, and enhance the national insurance mechanisms (Wijenayake 2019c) .

Gaps and research needs

While a variety of tools and guides have been developed, no comparison of the tools and their effectiveness is available to guide national policymakers. Guidance on the likely long-terms fiscal impacts of investing in climate adaptation, including an exploration of adaptation financing solutions and how these compare to and impact financing for response and recovery is also needed.

Much of the literature on DRF focuses on the national level. Local governments have a critical role to play in disaster risk management, but there is limited evidence in how regions, counties, municipalities, cities, and townships can efficiently finance disaster risk and also effectively leverage local civil society to ensure transparent, efficient, and people-centred responses. UNISDR (2010) compiles 14 case studies on local governments and disaster risk reduction, but does not provide a thorough discussion of the financing needs of local governments.

While the case for insuring public assets seems clear, more rigorous empirical evidence on the micro- and macro-level impacts of these solutions could better guide decision-makers. There are similar gaps on the impacts of government-run insurance schemes, in terms of both efficiency and impact on the insured, as well as how government-run schemes compare to public-private partnerships and to what extent public schemes crowd out the private insurance sector.

When it comes to social policies, the evidence base is larger. More evidence is needed, however, on the long-term vulnerability-reducing benefits of ASP and other social policies. In particular, a greater understanding of the most cost-effective mix of resilience-building (climate adaptation and risk reduction) and response in social policy (Bowen et al. 2020) would help policymakers and donors.

References

Alderman, Harold. 2010. "Safety Nets Can Help Address the Risks to Nutrition from Increasing Climate Variability." *The Journal of Nutrition* 140 (1). https://doi.org/10.3945/jn.109.110825.

Alderman, Harold, and Trina Haque. 2006. "Countercyclical Safety Nets for the Poor and Vulnerable." *Food Policy* 31 (4): 372–83. https://doi.org/10.1016/j.foodpol.2006.02.003.

Arnall, Alex, Katy Oswald, Mark Davies, Tom Mitchell, and Cristina Coirolo. 2010. "Adaptive Social Protection: Mapping the Evidence and Policy Context in the Agriculture Sector in South Asia." 345. *IDS Working Papers*. IDS Working Paper.

Arrow, Kenneth J., and Robert C. Lind. 1970. “Uncertainty and the Evaluation of Public Investment Decisions.” *American Economic Review* 60 (3): 364–78. https://www.jstor.org/stable/1817987 .

Başbuğ-Erkan, B. Burcak, and Ozlem Yilmaz. 2015. “Successes and Failures of Compulsory Risk Mitigation: Re-Evaluating the Turkish Catastrophe Insurance Pool.” *Disasters* 39 (4): 782–94. https://doi.org/10.1111/disa.12129.

Bommer, Julian, Robin Spence, Mustafa Erdik, Shigeko Tabuchi, Nuray Aydinoglu, Edmund Booth, Domenico Del Re, and Oliver Peterken. 2002. “Development of an Earthquake Loss Model for Turkish Catastrophe Insurance.” *Journal of Seismology* 6 (3): 431–46. https://doi.org/10.1023/A:1020095711419.

Bowen, Thomas, Carlo del Ninno, Colin Andrews, Sarah Coll-Black, Ugo Gentilini, Kelly Johnson, Yasuhiro Kawasoe, Adea Kryeziu, Barry Maher, and Asha Williams. 2020. *Adaptive Social Protection: Building Resilience to Shocks*. Washington, DC: World Bank. https://doi.org/10.1596/978-1-4648-1575-1.

Bresch, David N., and Lea Müller. 2014. “A Global Overview of Case Studies with a Focus on Infrastructure: Economics of Climate Adaptation – Shaping Climate-Resilient Development.”

Camargo, Andrea. 2019. “The Role of Insurance Supervisors in Climate Risk Insurance: Making the Vulnerable More Resilient to Natural Disasters.” Eschborn.

Cardenas, Victor, Stefan Hochrainer, Reinhard Mechler, Georg Pflug, and Joanne Linnerooth-Bayer. 2007. “Sovereign Financial Disaster Risk Management: The Case of Mexico.” *Environmental Hazards* 7 (1): 40–53. https://doi.org/10.1016/j.envhaz.2007.04.005.

Carpenter, Richard. 2018. “Index Insurance. Status and Regulatory Challenges.” Eschborn. https://a2ii.org/sites/default/files/reports/2018_01_24_index_report_web_003.pdf.

Clarke, Daniel, and Olivier Mahul. 2011. “Disaster Risk Financing and Contingent Credit: A Dynamic Analysis.” 5693. *Policy Research Working Paper*. Policy Reserach Working Paper.

Clarke, Daniel, Olivier Mahul, Richard Poulter, and Tse Ling Teh. 2017. “Evaluating Sovereign Disaster Risk Finance Strategies: A Framework.” *Geneva Papers on Risk and Insurance: Issues and Practice* 42 (4): 565–84. https://doi.org/10.1057/s41288-017-0064-1.

Cubas, Diana, Rashmin Gunasekera, and Thibaut Humbert. 2020. “Disaster Risk Finance for Adaptive Social Protection.” *Disaster Risk Finance for Adaptive Social Protection*. https://doi.org/10.1596/34133.

Davies, Mark, Christophe Béné, Alexander Arnall, Thomas Tanner, Andrew Newsham, and Cristina Coirolo. 2013. “Promoting Resilient Livelihoods through Adaptive Social Protection: Lessons from 124 Programmes in South Asia.” *Development Policy Review* 31 (1): 27–58. https://doi.org/10.1111/j.1467-7679.2013.00600.x.

Foote, Matthew, Greg Fowler, Nicola Ranger, Lit Ping Low, and James Allchorne. 2020. “Fact Sheet 3: Information Requirements for Public Asset Disaster Risk Financing and Insurance.” SEADRIF Knowledge Series.

Golnaraghi, Maryam. 2018. “Climate Change and the Insurance Industry: Taking Action as Risk Managers and Investors - Perspectives from C-Level Executives in the Insurance Industry.” https://www.genevaassociation.org/sites/default/files/research-topics-document-type/pdf_public/climate_change_and_the_insurance_industry_-_taking_action_as_risk_managers_and_investors.pdf.

Insurance Development Forum. 2019. “IDF Practical Guide to Insuring Public Assets.”

International Association of Insurance Supervisors. 2018. “Issues Paper on Index-Based Insurances, Particularly in Inclusive Insurance Markets.”

Janvry, Alain de, Alejandro del Valle, and Elisabeth Sadoulet. 2016. *Insuring Growth: The Impact of Disaster Funds on Economic Reconstruction in Mexico*. *World Bank Policy Research Working Paper*. Policy Research Working Papers. The World Bank. https://doi.org/10.1596/1813-9450-7714.

Kreft, Soenke, and Dirk Kohler. 2019. “Climate Risk Insurance: From Policy to Practice.” *Trendmonitor*, March 2019.

Kreft, Soenke, Laura Schaefer, Eike Behre, and Denise Matias. 2017. “Climate Risk Insurance for Resilience: Assessing Countries’ Implementation Plans.” 23. UNU-EHS Publications.

Kuriakose, Anne T., Rasmus Heltberg, William Wiseman, Cecilia Costella, Rachel Cipryk, and Sabine Cornelius. 2013. “Climate-Responsive Social Protection.” *Development Policy Review* 31 (SUPPL.2): 19–34. https://doi.org/10.1111/dpr.12037.

Mechler, R., Mochizuki, J., Hochrainer-Stigler, S. 2016. “Disaster Risk Management and Fiscal Policy: Narratives, Tools, and Evidence Associated with Assessing Fiscal Risk and Building Resilience.” 7635. Policy Research Working Paper.

Mechler, Reinhard, and Stefan Hochrainer-Stigler. 2014. “Revisiting Arrow-Lind: Managing Sovereign Disaster Risk.” *Journal of Natural Resources Policy Research* 6 (1): 93–100. https://doi.org/10.1080/19390459.2013.873186.

OECD. 2015. *Disaster Risk Financing*. *Disaster Risk Financing: A Global Survey of Practices and Challenges*. Paris: OECD Publishing. https://doi.org/10.1787/9789264234246-en.

Ozaki, Mayumi. 2016. “Disaster Risk Financing in Bangladesh.” 46. *ADB South Asia Working Paper Series*. ADB South Asia Working Paper Series.

Quesne, Felicity Le, Jennifer Tollman, Matthias Ranage, Kehinde Balogun, Michael Zissener, Daniela Bohl, Maxime Souvignet, et al. 2017. “The Role of Insurance in Integrated Disaster & Climate Risk Management: Evidence and Lessons Learned Report.” 22. UNU-EHS Publication Series.

Ramm, Gaby, Kehinde Balogun, Matthias Range, and Maxime Souvignet. 2019. “Integrating Insurance into Climate Risk Management: Conceptual Framework, Tools and Guiding Questions: Example from the Agricultural Sector.” https://united-nations-university.foleon.com/publications/intro/intro/.

SLYCAN Trust. 2019. “Climate Change and Agricultural Insurance in Sri Lanka.” http://slycantrust.org/post/climate-change-and-agricultural-insurance-in-sri-lanka.

Solórzano, Ana, and Iliana Cárdenes. 2019. “Social Protection and Climate Change: WFP Regional Bureau for Latin America and the Caribbean’s Vision to Advance Climate Change Adaptation through Social Protection.” 26. Occasional Paper.

UNISDR. 2010. “Local Governments and Disaster Risk Reduction: Good Practices and Lessons Learned.” Geneva.

Väänänen, Elina, Katharina Nett, Cecilia Costella, and Janot Mendler de Suarez. 2019. “Linking Climate Risk Insurance with Shock-Responsive Social Protection.” Bonn.

Wieneke, Florian, and David N. Bresch. 2016. “Economics of Climate Adaptation (ECA) in Development Cooperation: A Climate Risk Assessment Approach.” 5. Materials on Development Financing. https://doi.org/10.13140/RG.2.1.1575.6003.

Wijenayake, Vositha. 2019a. “Climate Risk and Risk Management for Evidence-Based Climate Adaptation Action.”

———. 2019b. “Integration of SDGs, Sendai, DRR, and NDCs for Effective Developmental Planning.”

———. 2019c. “Policy Gaps and Needs Analysis for the Implementation of NDCs on Adaptation and Loss and Damage in Bangladesh, Nepal, and Sri Lanka.”

World Bank. 2014. “Financial Protection against Natural Disasters: An Operational Framework for Disaster Risk Financing and Insurance.” *WB and GFDRR*. Washington, DC.

———. 2016. “Fiscal Disaster Risk Assessment and Risk Financing Options: Sri Lanka.” Washington, DC.

———. 2020. “Contingent Liabilities from Natural Disasters: Sri Lanka.”